Pseudocode
1995-2019

May/June 1995

Question 10:

A shop sells items each of which has a unique identifying number. When a customer purchases an item, its identifying number is entered at a terminal. A computer looks up this number in a file and returns the description and price of the item. After the last item a '#' is entered and the computer calculates the change.

Part of the file item stocking shown here.

CODE	DESCRIPTION	PRICE
1276	Pop	65
1489	Chocolate Bar	85
2371	Plain Biscuit	80
2483	Chocolate Biscuit	90
3514	Cereals	130
3515	Butter	90
3760	Eggs	70
4010	Tin Soup	60
4127	Tin Fruit	80

(a) Write an algorithm to allow a till receipt to show

- **The name of each article purchased**
- **Its price**
- **The total cost of purchases**
- **The amount the customer offers**
- **The change due to the customer.**

Test your algorithm with this data.

3514
2371
3760
4010
#
500

```
(a)total = 0
   read code
          While code <># Do
              Look up description & price
              Print description & price
              Total = total + price
              Read code
           Endwhile
Print total cost
Read amount offered
Print offered offered
Catalogue & print change.
```

Question 13:

The following algorithm is used to award grades in an examination. The examination consists of two papers which are given marks called mark A amd mark B.

```
READ name, mark A, mark B
IF mark A is greater than 70 THEN
   IF mark B is greater than 70 THEN
      Grade is 1
   ELSE
   IF mark B is greater than 40 THEN
      Grade is 2
ELSE
     Grade is fail
ENDIF
ENDIF
ELSE
     IF mark A is greater than 40 THEN
       Grade is 3
ELSE
       Grade is fail
       ENDIF
ENDIF
ELSE
       Grade is fail
       ENDIF
ENDIF
PRINT name, grade
```

For each of the following sets of data write down the output.

(a)John Williams, 80, 85 .....

(b)Mary Brown, 45, 60 .....

(c)Ian Ford, 40, 39 ..... [6]

(a)John Williams I
(b)Mary Brown 3
(c)Ian Ford Fail

May/June 1997:

Question 14:

Wages at Microsoft are paid using $ 20 and $ 10 bank notes.

Write an algorithm which will:

- **Input a request for a sum of money**
- **Only accept a sum of money which is multiple of 10**
- **Output the number of $20 notes required**
- **Output the number of $ 10 notes required.**

The total number of notes should be minimum

You should explain the meaning of any functions that you use. [6]

SOLUTION ONE

```
{Initialisation}
twenty = 0
ten = 0
 {Check for valid input}
REPEAT
    READ sum of money
UNTIL sum is divisible by 10
{Calculate number of $20 notes}
WHILE sum >= 20 DO
        sum = sum -20
        twenty = twenty + I
ENDWHILE
{Check to see if any $10 notes needed}
IF sum = 10 THEN ten = I
 {Output results}
PRINT twenty, ten
```

SOLUTION 2

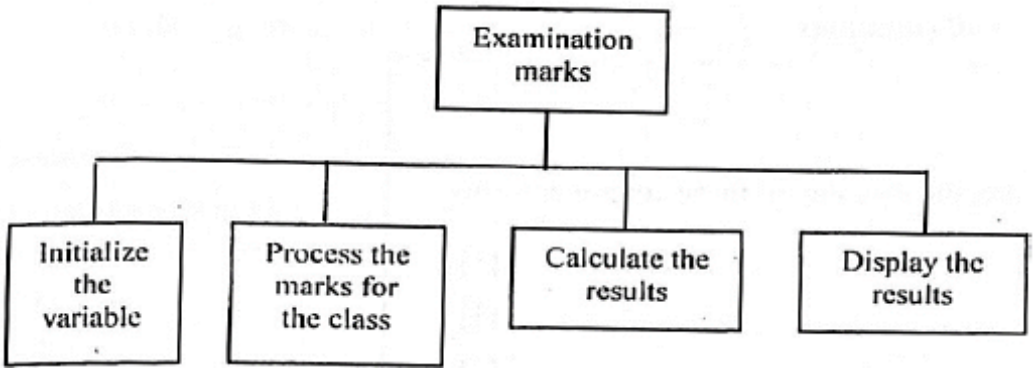
```
{Check for valid input}
REPEAT
    READ sum of money
UNTIL sum is divisible by 10
{Calculate number of $20 notes}
twenty = sum of money DIV 20
{Calculate number of $10 notes}
 ten = sum of money MOD 20
PRINT twenty, ten
```

Oct/Nov 1997:

Question 11:

Mr Grantham grades his students' examination marks. To do this he needs to know the lowest and highest marks, the range of marks (highest minus lowest) and the average mark, (the total number of marks divided by the number of students). There are 30 students in the class and the marks are out of 100.

(a)Using this design, or otherwise, write an algorithm to read the marks and to print the smallest mark, largest mark, range of marks and average mark [10]



(b) Give two advantages of using top-down design solving such a problem.

Advantage I…….

Advantage 2…….. [2]

(a)
```
READ mark
LOWEST = mark
HIGHEST = mark
TOTAL = mark
FOR I: 1 to 30 DO
  READ mark
   IF mark is less than lowest THEN
      Lowest = mark
   ENDIF
   IF mark is greater than highest THEN
         Highest = mark
ENDIF
Total = total + mark
NEXT I
Range = highest-lowest
Average = total/30
PRINT lowest, highest, range, average
```

(b) Advantage 1: It is easy to write and to modify
Advantage 2: The main task is split into further tasks so it is easy to understand.

May/June 1999:

Question 14

Read this algorithm.

```
Value = 0
Next-value = 0
Input Value
Input Next-value
While Next-value is not equal to zero do
        If Next-value is greater than Value then
                Value is equal to Next-value
        Endif
        Input Next-value
Endwhile
Output Value
```

(a)What is the output if the following numbers are input. [2]

(b)Write a modified algorithm to solve the same problem but always end after four, numbers have been input [3]

(a)8

(b)
```
Value = O
  Next-value = 0
  Counter = 0
  Input Value
  Input Next-value
        .Repeat
                If Next-value is not equal to zero do
                Value is equal to Next-value
         Counter = Counter + I
        End if
Input Next-value
        Until Counter is <=4
End while
Output Value
```

Oct/Nov 1999:

Question 16:

A microprocessor controls an oven used to bake bread.

(a)Describe the input data needed by the microprocessor

(b)Write an algorithm that uses the input data to control the process of baking the bread

(a)The temperature at which the cake has to be baked and the time of the baking process. Also, program number (already stored programs) and weight of the dough could be input.

(b)Select baking on the oven

```
    Time = o
    Temperature = 0
            Input time = t
            Input Temperature = p
Switch Heater on
Switch timer on
        If temperature >= p
                Switch Heater off
        If time >= t
                Sound Buzzer
Endif
Endif
```

Oct/Nov 2000:

Question 17

Using pseudo code or otherwise, write an algorithm which will accept ten numbers and print out the smallest number. **[5]**

```
READ number
LOWEST = number
(Process rest of number)
(Loop to read next 9 numbers)
FOR i = 2 to 10 DO
READ mark
  IF number is less than lowest THEN
  Lowest = number
ENDIF
NEXT i
PRINT LOWEST
```

May/June 2001:

Question 17

An algorithm is needed to input the heights-of 15 students in centimeters and print out the height of the tallest student in meters and centimeters.

Write a detailed algorithm to do this. [5]

```
READ height
HIGHEST = height
(Loop to read next 14 heights)
FOR i = 2 to 14 DO
        READ height
                IF height is greater than HIGHEST THEN
                HIGHEST = height
        ENDIF
NEXT i
Height in meters = highest/100
PRINT Height in meters, highest
```

Oct/Nov 2001:

Question 16:

Employees of a shop are entitled to a discount of 10% on the value of goods bought from the shop. However, if an employee has worked at the shop for five or more years, they are entitled to a discount of 20%. Only employees are allowed discounts. The discount on electrical goods is fixed at only 10%.

Using pseudo code or otherwise, write and algorithm which will determine what discount applies when any person buys them…… [5]

```
INPUT employee
(if employee <> "yes") then (discount = 0%)
        else (if no_of_years < 5) or (type_of_good = "electrical")
                        then discount = 10%
        else discount = 20%
```

Oct/Nov 2002:

Question 19:

Using pseudocode or otherwise, write an algorithm which will input any three different numbers and then print them out in ascending order. [4]

```
Set a, b. c = 0
Input a, b, c
Max: = a
Min: = a
If b > max then
Max: = b
Else
If b < min then
Min: = b
Else
If c > max then
Max: = c
Else
If c < min then
Min: = c
End if
Print min
If a ≠ max AND a ≠ min then
```

```
Print a
Else
If b ≠ max AND b ≠ min then
Print b
Else
If c ≠ max AND c ≠ min then
Print c
End if
Print max
End
```

May/June 2003:

Question 17:

A school wants to monitor the number of hours spent by a class of 30 students on the Internet.
Using pseudo-code or otherwise, write an algorithm which will;

- **for each student, record the times logged on and logged off**
- **calculate the length of time each student spends online**
- **calculate and output the average length of time per day spent by each student on the Internet.[6]**

```
Set logon time = 0
Set logoff time = 0
Total time = 0
Counter = 0
WHILE Counter <= 30
   INPUT logon time
   INPUT logoff time
  READ INPUT
  Total time = logoff time - login time
  Counter = counter – 1
  Repeat
  Until Total time <= 24
END WHILE
Calculate average length of time/day= Total time / 30
PRINT average length
END
```

OCT/NOV 2003:

Question 16:

(a)Write an algorithm, using pseudocode or otherwise which;

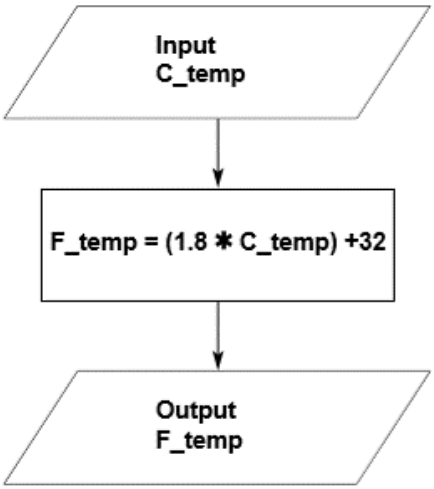
- **inputs 50 numbers.**
- **checks whether each number is in the range 1000 to 9999.**
- **outputs how many of the input numbers were out of range.**
- **outputs the percentage of input numbers which were out of range. [6]**

```
wrong = 0
for count = 1 to 50
            input number
            if number < 1000 or number > 9999
                  then wrong = wrong + 1
            endif
next count
percent = wrong * 2
output wrong, percent
```

May/June 2004:

Question 15

Read this algorithm. The algorithm converts a temperature from degrees Centigrade to degrees Fahrenheit.



(a)Write down the output for each of the following inputs:

(i)1 [1]

(ii)5 [1]

(b)Using pseudocode, or otherwise, write an algorithm that will input the hourly temperatures for one day in Centigrade and print out in Fahrenheit

- **the maximum temperature**
- **the minimum temperature**
- **the average temperature**

for that day.

(a) **(i)** 33.8
(ii) 41

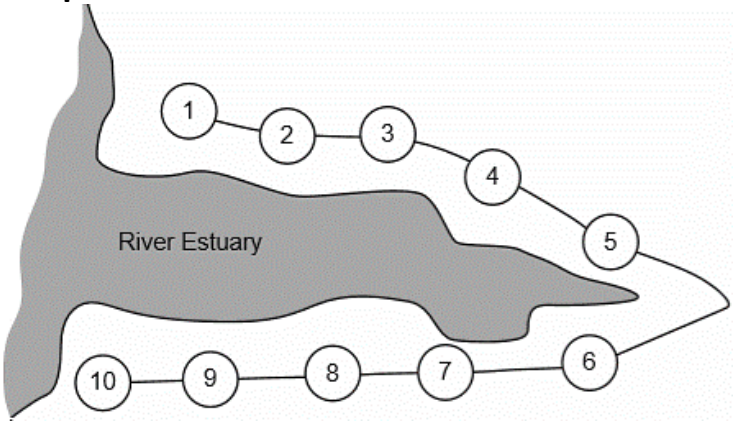
(b) **(i)**
```
sum = 0
min = 100
max = 0
count = 1
while count <= 24 do
    input temp
    F = (temp*1.8) + 32
    sum = sum + F
    if F < min then min = F
    if F > max then max = F
    count = count + 1
endwhile
average = sum/24
print average, min, max
```

(ii)
```
sum = 0
min = 100
max = 0
count = 1
repeat
    input temp
    F = (temp*1.8) + 32
    sum = sum + F
    if F < min then min = F
    if F > max then max = F
    count = count + 1
until count > 24
average = sum/24
print average, min, max
```

OCT/NOV 2004:

Question 19:

The following diagram shows a rail network.



The rail network consists of 10 stations. The fare between each station is $2. There is a 10% discount when 3 or more passengers travel together. Tickets can be purchased at any station using automated terminals.

Using pseudocode, or otherwise, write an algorithm for the automated terminals to:
- **input the starting station number, the destination station number and the number of passengers**
- **calculate the total fare and output the amount to be paid**
- **calculate the change (if any)**
- **issue the rail ticket(s) and change [3]**

```
repeat
    input start_point
    input end_point
    input number
    cost = abs(start_point - end_point) * number * 2
    if number >= 3 then cost = cost – (cost/10)
    input money
    change = money – cost
    for x =  1 to number
            print ticket
    next x
    output change
until no more customers
```

May/June 2005:

Question 17:

Using pseudocode or otherwise, write an algorithm that will input 25 marks and output the number of DISTINCTION, MERIT, PASS or FAIL grades.

A mark greater than 69 will get a DISTINCTION, a mark between 69 and 60 (inclusive) will get a MERIT and a mark between 59 and 50 (inclusive) will get a PASS.

```
10 INPUT MARK
20 FOR M = 1 To 25
30 IF MARK > 69
40 PRINT DISTINCTION
50 ELSE IF MARK < 69 AND > 60
60 PRINT MERIT
70 ELSE IF MARK < 59 AND > 50
80 PRINT PASS
90 ELSE PRINT FAIL
100 END IF
110 NEXT M
120 END IF
```

OCT/NOV 2005:

Question 17:

A school uses a computer to store student marks obtained in an end of term mathematics exam. There are 150 students doing the exam and the maximum mark is 100.Write an algorithm, using pseudocode or otherwise, which

- **inputs the marks for all students**
- **checks if each mark is in the correct range and, if not, the mark is re-input**
- **outputs the smallest mark**
- **outputs the highest mark**
- **outputs the average mark for the exam.**

```
m1 = 100
m2 = 0
sum = 0
n = 1
while n < 151 do
  repeat
                read mark
  until (mark >= 0 and) mark <101
  if mark < m1 then m1 = mark
  if mark > m2 then m2 = mark
  sum = sum + mark
  n = n + 1
endwhile
average = sum/150
output average, m1, m2
```

May/June 2006:

16 (a) Fuel economy for a car is found using the formula:

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres}) \times (\text{height in metres})}$$

What would be the Fuel Economy of a car travelling 40 km on 10 litres of fuel? [1]

(b) The Fuel Economy for 1000 cars is to be calculated using the formula in Question 16(a). Write an algorithm, using pseudocode or otherwise, which inputs the Distance Travelled (km) and the Fuel Used (litres) for 1000 cars. The Fuel Economy for each car is then calculated and the following outputs produced:

- **Fuel Economy for each car**
- **average (mean) Fuel Economy for all of the cars input**
- **the best Fuel Economy (i.e. highest value)**

• the worst Fuel Economy (i.e. lowest value) [6]

(a)20
(b)LET BMI = 0
LET COUNTER = 0
REPEAT
INPUT ID
INPUT WEIGHT(kg)
INPUT HEIGHT(m)
LET BMI = WEIGHT(kg)/HEIGHT(m)*HEIGHT(m)
IF BMI > 25
PRINT "OVER WEIGHT"
ELSE
IF BMI <25 AND >= 19
PRINT "NORMAL"
ELSE
PRINT "UNDER WEIGHT"
END IF
UNTIL COUNTER = 30
PRINT ID, BMI

Oct/Nov 2006:

9 A computer program is required which inputs 10 numbers, multiplies them together and finally outputs the answer (the product). The following algorithm has been written to do this.

```
1   count = 0
2   product = 0
3   while count <= 10 do
4       input number
5       product = product * number
6       count = count + 1
7       print product
8   endwhile
```

(a) There are three errors in the algorithm. Locate and describe these errors. [3]

(b) A while … do loop has been used in the algorithm. State another type of loop that could have been used. [1]

(a) error 1: product = 0 on line 2
should use product = 1

error 2: loop control, count <= 10 on line 3
should use count < 10 or alternatively alter count value on line 1 to count = 1

error 3: print value of product inside loop on line 7
output should come after the endwhile statement

(b) Accept either of the following loop controls:

repeat
until count = 10
(accept repeat

until count ≥ 11

if line 1 changed to count = 1)

OR

for count = 1 to 10
next count

Question 20:

Temperatures (°C) are being collected in an experiment every hour over a 200-hour period. Write an algorithm, using pseudocode or otherwise, which inputs each temperature and outputs

- **How many of the temperatures were above 20°C**
- **how many of the temperatures were below 10°C**
- **the lowest temperature that was input**

```
count = 0
total1 = 0
total2 = 0
lowest = 1000
while count < 200 do
        input temp
                if temp < 10 then total1 = total1+1
                if temp > 20 then total2 = total2+1
                if temp < lowest then lowest = temp
count  = count + 1
endwhile
output total1, total2, lowest
```

May/June 2007:

19 A company has 5000 CDs, DVDs, videos and books in stock. Each item has a unique5-digit code with the first digit identifying the type of item, i.e.

1 = CD
2 = DVD
3 = video
4 = book

For example, for the code 15642 the 1 identifies that it is a CD, and for the code 30055 the 3 identifies that it is a video.

Write an algorithm, using pseudocode or otherwise, that

- **Inputs the codes for all 5000 items**
- **Validates the input code**
- **Calculates how many CDs, DVDs, videos and books are in stock**
- **Outputs the four totals.**

Sample program 1:

```
set c, d, v, b = 0: set count = 0
repeat
        input code
        x = code/10000
        y = INT(x)
        if y = 1  then c = c + 1
                  else if y = 2 then d = d + 1
                  else if y = 3 then v = v + 1
                  else if y = 4 then b = b + 1
                  else print "error"
        count = count + 1
until count = 5000
print c, d, v, b
```

Sample program 2:

```
set c, d, v, b = 0: set count = 0
repeat
        input code
        if code >= 1000 and code < 2000 then c = c + 1
        else if code >= 2000 and code < 3000 then d = d + 1
        else if code >= 3000 and code < 4000 then y = y + 1
        else if code >= 4000 and code < 5000 then b = b + 1
                else print "error"
        count = count + 1
until count = 5000
print c, d, v, b
```

(NOTE – OK to use statements such as *if code begins with a 1* as code checks)

Oct/Nov 2007:

16 (a) Fuel economy for a car is found using the formula:

$$\text{Fuel Economy} = \frac{\text{Distance Travelled (km)}}{\text{Fuel Used (litres)}}$$

What would be the Fuel Economy of a car travelling 40 km on 10 litres of fuel? [1]

(b) The Fuel Economy for 1000 cars is to be calculated using the formula in Question 16(a).
Write an algorithm, using pseudocode or otherwise, which inputs the Distance Travelled (km) and the Fuel Used (litres) for 1000 cars. The Fuel Economy for each car is then calculated and the following outputs produced:
- **Fuel Economy for each car**
- **average (mean) Fuel Economy for all of the cars input**
- **the best Fuel Economy (i.e. highest value)**
- **the worst Fuel Economy (i.e. lowest value)**

(a) 40/10 = 4
(b)
```
total = 0, count = 0, best = 0, worst = 1000
repeat
        input litres, distance
        economy = distance/litres
        print economy
        if economy > best then best = economy
        if economy < worst then worst = economy
        total = total + economy
        count = count + 1
until count = 1000
average = total/1000
print average, best, worst
```

May/June 2008:

12 Algorithms and programs use loops to control the number of times a particular procedure is used. Two methods are repeat … until and for … to.
(a) Write a procedure using both these loop methods to input 20 numbers into a variable called x.
(i) repeat … until [2]
(ii) for … to [2]
(b) Name another loop structure. [1]

(a)(i)
```
count = 0
repeat
    input x
    count = count + 1
until count = 20
```
(ii)
```
for count = 1 to 20
    input x
next count
```
(b) while…do

Question 16:
The washroom in a hotel uses lights controlled by a computer system. If the washroom is unoccupied for 10 minutes, the lights go out automatically. As soon as someone enters, the lights come on.

(b) Write down a set of instructions which would enable the computer to decide when to turn out the lights?

```
repeat
    get signal from sensor
    if signal then set timer = 10
    else if timer = 0 then switch light off
    else countdown timer
until system switched off
```

19 Customers can withdraw cash from an Automatic Teller Machine (ATM).
- **withdrawal is refused if amount entered > current balance**
- **withdrawal is refused if amount entered > daily limit**
- **if current balance < $100, then a charge of 2% is made**
- **if current balance $100, no charge is made**

Write an algorithm which inputs a request for a sum of money, decides if a withdrawal can be made and calculates any charges. Appropriate output messages should be included. [5]

```
input amount
    if amount > balance then x = 1
        else if amount > daily limit then x = 1
        else x = 0
        while x = 0
            if balance < 100 then charge = 0.02 * amount
                else charge = 0
        endwhile
if x = 1 then print "Sorry, withdrawal refused"
print charge
```

Oct/Nov 2008

19: The manufacturing cost of producing an item depends on its complexity. A company manufactures three different types of item, with costs based on the following calculations:

Item type 1: item cost = parts cost * 1.5
Item type 2: item cost = parts cost * 2.5
Item type 3: item cost = parts cost * 5.0

The company makes 1000 items per day.

Write an algorithm, using pseudocode, flowchart or otherwise, which
- **inputs the item type and parts cost of each item**
- **outputs the item cost for each item**
- **calculates and outputs the average (mean) item cost per day (based on 1000 items being made). [5]**

```
total cost = 0
for x = 1 to 1000
    input type, partcost
        if type = 1 then itemcost = partcost * 1.5}
        if type = 2 then itemcost = partcost * 2.5}
        if type = 3 then itemcost = partcost * 5.0}
        else print error
   totalcost = totalcost + itemcost
   print itemcost
next x
average = totalcost/1000
print average
```

May/June 2009

18: A small airport handles 400 flights per day from three airlines:

FASTAIR (code FA)
SWIFTJET (code SJ)
KNIGHTAIR (code KA)

Each flight is identified by the airline code and 3 digits. For example, FA 156.
Write an algorithm, using pseudocode or otherwise, which monitors the 400 flights into and out of the airport each day. The following inputs, processing and outputs are all part of the monitoring process:

- **input flight identification**
- **calculate number of flights per day for each of the three airlines**
- **output the percentage of the total flights per day by each airline**
- **any validation checks must be included [5]**

```
fa = 0
sj= 0
ka = 0

for x = 1 to 400
    input lettercode
    input numbercode
    if lettercode = "FA" then fa = fa + 1
    if lettercode = "SJ" then sj = sj + 1
    if lettercode = "KA" then ka = ka + 1
    else print "error"
next x

fapercent = fa/4
sjpercent = sj/4
kapercent = ka/4
print fapercent, sjpercent, kapercent
```

Oct/Nov 2009. P11

17 (a) A car's speed is measured between points A and B, which are 200 km apart.

The final speed of the car is calculated using the formula:

$$\text{Final Speed} = \frac{200}{\text{Time (hours)}}$$

What is the final speed of a car if it takes 2 hours to get from A to B? [1]

(b) Write an algorithm, using pseudocode or otherwise, which inputs the times for 500 cars, calculates the final speed of each car using the formula in part (a), and then outputs:

- **the final speed for ALL 500 cars**
- **the slowest (lowest) final speed**
- **the fastest (highest) final speed**
- **the average final speed for all the cars. [6]**

(a) 100 (km/hr)

(b)
```
total = 0
highest = 0
slowest = 1000
for n = 1 to 500
    input time
    finalspeed = 200/time
    print finalspeed
    total = total + finalspeed
    if finalspeed > highest
        then highest = finalspeed
    if finalspeed < slowest
        then slowest = finalspeed
next n
average = total/500
print average, highest, slowest
```

May/June 2010. P12

16 (a) Write an algorithm, using pseudocode or a flowchart, which:

- **inputs 50 numbers**
- **outputs how many of the numbers were > 100 [3]**

(b) Write an algorithm, using pseudocode or a flowchart, which:

- **inputs 100 numbers**
- **finds the average of the input numbers**
- **outputs the average [3]**

(a)
```
total = 0
for x = 1 to 50
    input number
    if number > 100 then total = total + 1
next x
output total
```

(b)
```
total = 0
for x = 1 to 100
    input number
    total = total + number
next x
average = total/100
output average
```

<u>May/June 2010. P11</u>

18: A group of students were monitoring the temperature every day over a one-year period. Readings were taken ten times every day (you may assume a year contains 365 days).

Write an algorithm, using pseudocode or flowchart, which

- **inputs all the temperatures (ten per day)**
- **outputs the highest temperature taken over the year**
- **outputs the lowest temperature taken over the year**

- **outputs the average temperature per day**
- **outputs the average temperature for the whole year [7]**

```
highest = -100: lowest = 100: total_year = 0

for c = 1 to 365

    total_day = 0

    for d = 1 to 10

        read temp

        total_day = total_day + temp

        total_year = total_year + temp

        if temp > highest then highest = temp

        if temp < lowest then lowest = temp

    next d

    average_day = total_day/10

    print average_day
    next c

    average_year = total_year/3650

    print highest, lowest, average_year
```

12: A golf course charges $10 for each game of two people. Each additional person incurs a further charge of $2 per game. If they book two or more games in advance, they get a 10%discount on the total charge.

The following program has been written in pseudocode to calculate the charges for a game.

```
1   extracost = 0
2   input numberpeople, numbergames
3   charge = 10 * numbergames
4   extrapeople = numberpeople – 2
5   if numberpeople < 2 then extracost = 2 * extrapeople * numbergames
6   charge = extracost
7   if numbergames > 1 then charge = charge * 0.1
8   print charge
```

There are three errors in the program. Locate these errors and suggest a correct piece of coding. [6]

– error
line 5: **numberpeople < 2** is incorrect
correction:
numberpeople > 2

– error
line 6: the formula/**charge = extracost** is incorrect
correction:
charge = extracost + charge

– error
line 7: discount calculation/**charge = charge * 0.1** is incorrect,
correction:
charge = charge * 0.9

Oct/Nov 2010. P11

9 The following algorithm inputs 20 numbers and outputs how many numbers were positive (> 0) and how many numbers were negative (< 0).

```
1   negative = 1
2   positive = 1
3   for count = 1 to 20 do
4       input number
5       if number < 0 then negative = negative + 1
6       if number > 0 then positive = positive + 1
7       count = count + 1
8       print negative, positive
9   next count
```

There are three different errors in this algorithm.
Locate each error and give the reason why you think it is an error. [6]

- line 1/negative=1 and/or line 2/positive=1
- negative and/or positive should be set to zero
- line 7/count=count+1
- don't need a count within a **for .... to next** loop
- replace loop with a **repeat...until** loop
- line 8/**print** negative, positive or line 9/**next** count
- outputs should come after the **next count** statement

17 A school is doing a check on the heights and weights of all its students. The school has 1000 students. Write an algorithm, using pseudocode or a flowchart, which

- **inputs the height and weight of all 1000 students**
- **outputs the average (mean) height and weight**
- **includes any necessary error traps for the input of height and weight [5]**

```
total1 = 0: total2 = 0

for x = 1 to 1000

    input height, weight

        if height > 2 or height < 0 then print "error": input height

        if weight > 130 or weight < 0 then print "error": input weight

            else total1 = total1 + height: total2 = total2 + weight

next x

average1 = total1/1000

average2 = total2/1000

print average1, average2
```

Oct/Nov 2010. P13

17 (a) Write an algorithm, using pseudocode or a flowchart, which

- **inputs a set of positive numbers (which end with -1)**
- **outputs the average (mean) value of the input numbers**
- **outputs the value of the largest (highest) number input [4]**

(b)Write an algorithm, using pseudocode or a flowchart, which

- **inputs a whole number (which is > 0)**
- **calculates the number of digits in the number**
- **outputs the number of digits and the original number (E.g. 147 would give an output of 3, 147) [4]**

(a)
```
highest = –100; total = 0: count = 0
input number
while  number < > –1 do
        total = total + number
        count = count + 1
        if number > highest then highest = number
        input number
endwhile
average = total/count
print average, highest
```

(b)
```
d = 0
input number
t = number
repeat
    t = t /10
    d = d + 1
until t < 1
print number, d
(** NOTE: there are other ways of finding number of digits e.g.
    if number > 0 then d = 1
       else if number > 9 then d = 2
       ... ... ... ... ... ... ... ... ... ... ... ...
                              else if number > 999999 then d = 7 etc.)
```

If no loop then 0 for loop and 0 for output

May/June 2011. P11

17 Daniel lives in Italy and travels to Mexico, India and New Zealand. The times differences are:

Country	Hours	Minutes
Mexico	-7	0
India	+4	+30
New Zealand	+11	0

Thus, if it is 10:15 in Italy it will be 14:45 in India.

(a)Write an algorithm, using pseudocode or otherwise, which:
- **Inputs the name of the country**
- **Inputs the time in Italy in hours (H) and minutes (M)**
- **Calculates the time in the country input using the data from the table**
- **Outputs the country and the time in hours and minutes [4]**

(b) Describe, with examples, two sets of test data you would use to test your algorithm. [2]

(a)
```
input name$
input H, M
    if name$ = "Mexico" then H = H – 7
       else if name$ = "India" then H = H + 4: M = M + 30
          else if name$ = "New Zealand" then H = H + 11
             else print "error"
print H, M
```

(b) Normal hours: (hours which do not change the day) e.g. 8
hours which change the day (e.g.. 13 + country = New Zealand)
Normal minutes (which do not change the hour) eg.25
minutes which change the hour (e.g. 40 + country=India)

May/June 2011. P12

17 A school has 1800 students. The start date and leaving date for each student is stored on file. Dates are in the format YYMMDD (e.g. a student starting on 10th September 2007 and leaving on 4th August 2012 has the data 070910 and 120804 on file).

(a)Write an algorithm, using pseudocode or otherwise, which

- **inputs Student ID for all 1800 students**
- **inputs the start date and leaving date for each student**
- **carries out a check to ensure the second date is later**
- **if error, increments error counter**
- **outputs the number of errors [5]**

(b) Describe, with examples, TWO sets of test data you would use to test your algorithm. [2]

(a)
```
total = 0
for x = 1 to 1800
    input student_id
    input start_date, leaving_date
    if leaving_date <= start_date then total = total + 1
next x
print total
```

(b) normal data that will be accepted:
- e.g. 110906 and 220710 or 060911 and 100722

abnormal data that should be rejected:
- e.g. 150911 and 201009 or 110915 and 091020

negative numbers that should be rejected:
- e.g. –110209 or –090211

month/day/year out of range that should be rejected:
- e.g. 352210 or 102235

use of text that should be rejected:
- e.g. September 15, 2010 or 15th September 2010

Oct/Nov 2011. P11

17 (a) Write an algorithm, using pseudocode or flowchart only, which:

- **inputs three numbers**
- **outputs the largest of the three numbers**

(b) Write an algorithm, using pseudocode or flowchart only, which:

- **inputs 1000 numbers**
- **outputs how many of these numbers were whole numbers (integers)**

(You may use INT(X) in your answer e.g. Y = INT(3.8) gives the value Y = 3)

(a)
```
input a, b, c
    if a > b and a > c then print a
        else if b > c then print b
            else print c
```

(b)
```
for x = 1 to 1000
    input number
        difference = INT(number) – number
        if difference = 0 then total = total + 1
next x
print total
(NOTE: alternative to lines 3 and 4:
if INT(number) = number then total = total + 1
```

Oct/Nov 2011. P13

16 The weather conditions in a town are being monitored over a year (365 days). The valuesrecorded per day are weather type and temperature (e.g. CLOUDY, 25). Write an algorithm, using pseudocode or flowchart only, which:

- **inputs the weather type and temperature for each day**
- **outputs the number of days that were CLOUDY, RAINING, SUNNY or FOGGY**
- **outputs the highest recorded temperature for the year**
- **outputs the lowest recorded temperature for the year**

```
c = 0: r = 0: s = 0: f = 0
high = 0 (or a negative number)
low = 1000
for x = 1 to 365
    input weather, temp
    if weather = "CLOUDY" then c = c + 1
        else if weather = "RAINING" then r = r + 1
            else if weather = "SUNNY" then  s = s + 1
                else if weather = "FOGGY" then f = f + 1
    endif
    if temp > high then high = temp
    if temp < low then low = temp
next x
print c, r, s, f, high, low
```

May/June 2012. P12

15 An estate agent advertises houses for sale. The customer enquiries for a 7-day working week are entered weekly into a computer. Write an algorithm, using pseudocode or a program flowchart only, which:

- **inputs the number of customer enquiries each day,**
- **inputs the house price each customer enquiries about,**
- **outputs how many customers enquired each day about houses costing less than $100 000,**
- **outputs the percentage of all enquiries made during the week about houses costing more than $500 000.**

sample program:

```
total2 = 0: totalenquiries = 0
for day = 1 to 7
    input enquiries
    total1 = 0
    totalenquiries = totalenquiries + enquiries
        for i = 1 to enquiries
            input cust_enquiry
            if cust_enquiry < 100000 then total1 = total1 + 1
            if cust_enquiry > 500000 then total2 = total2 + 1
        next i
        print total1
next day
percent = (total2/totalenquiries) * 100
print percent
```

Oct/Nov 2012. P12

17 (a) Write an algorithm, using pseudocode or a program flowchart only, that:

- **inputs a series of positive numbers (-1 is used to terminate the input),**
- **outputs how many numbers were less than 1000 and**
- **outputs how many numbers were greater than 1000. [4]**

(b)Write an algorithm, using pseudocode or a program flowchart only, that

- **inputs fifty numbers each as 4 separate digits, for example: 1 5 4 1**
- **outputs the percentage of numbers that were palindromes.**

(note: a palindrome reads the same way backwards or forwards. For example, 1331 is a palindrome but 1541 is not).

Use separate variables to store the separate digits of a number (for example D1, D2, D3, D4). [4]

(a)
```
x = 0: y = 0
input number
while number < > -1 do
    if number > 1000 then x = x + 1
        else if number < 1000 then y = y + 1
    input number
endwhile
print x, y
```

(b)
```
T = 0
for N = 1 to 50
    read D1, D2, D3, D4
        if D1 = D4 and D2 = D3 then T = T+1
next N
percent = T * 2
print percent
```

Oct/Nov 2012. P13

16 A small café sells five types of item:

bun 0.50 dollars
coffee 1.20 dollars
cake 1.50 dollars
sandwich 2.10 dollars
dessert 4.00 dollars

Write an algorithm, using pseudocode or a program flowchart only, which

- **inputs every item sold during the day,**
- **uses an item called "end" to finish the day's input,**
- **adds up the daily amount taken for each type of item,**
- **outputs the total takings (for all items added together) at the end of the day,**
- **outputs the type of item that had the highest takings at the end of the day. [4]**

```
x = 0: tbun = 0: tcoffee = 0: tcake = 0: tsand = 0: tdessert =0
repeat
    input item
    if item = "bun" then tbun = tbun + 0.5
    else if item = "coffee" then tcoffee = tcoffee + 1.20
    else if item = "cake" then tcake = tcake + 1.50
    else if item = "sandwich" then tsand = tsand + 2.10
    else if item = "dessert" then tdessert = tdessert + 4.00
    else print "error"
until item = "end"
if tbun > x then x = tbun
if tcoffee > x then x = tcoffee
if tcake > x then x = tcake
if tsand > x then x = tsand
if tdessert > x then x = tdessert
total = tbun + tcoffee + tcake + tsand + tdessert
print total, x
```

May/June 2013. P11

16 Name two different types of loop structure in a typical programming language. Give an example of how ten numbers could be input using the named loop. [6]

16 A small shop uses barcodes which represent 5 digits. The last digit is used as a check digit.

For example:

a	b	c	d	e
0	1	2	3	4

The check digit (e) is found by:

- **multiplying the first and third digits (i.e. a and c) by 3**
- **multiplying the second and fourth digits (i.e. b and d) by 2**
- **adding these four results together to give a total**
- **dividing this total by 10**
- **remainder is check digit (e)**

Write an algorithm, using pseudocode or flowchart only, which

- **inputs 100 five-digit barcodes in the form a, b, c, d, e**
- **re-calculates the check digit for each number and checks whether the input check digit(e) is correct**
- **outputs the number of barcodes which were entered correctly** **[5]**

```
match = 0
```

1 mark

```
for number = 1 to 100
    input a, b, c, d, e
    total = (a * 3) + (c * 3) + (b * 2) + (d * 2)
    repeat
        total = total – 10
    until total < 10
    if total = e then match = match + 1
next number
print match
```

May/June 2013. P12

17 A country has four mobile phone network operators. Each mobile phone number has eight digits. The first three digits identify the network operator:

444 Yodafone
555 N2 network
666 Kofee mobile
777 Satsuma mobile

Write an algorithm, using pseudocode or flowchart only, which reads 50 000 eight-digit mobile phone calls made during the day and outputs the number of calls made on each of the four networks.

```
Y = 0: N = 0: K = 0: S = 0
for count = 1 to 50 000
    input number
    X = number/100 000 000
    if X > 0.7 then S = S + 1
        else if X > 0.6 then K = K + 1
            else if X > 0.5 then N = N + 1
                else if X > 0.4 then Y = Y + 1
                    else print "error in number"
next count
print Y, N, K, S
```

Oct/Nov 2013. P13

10 (a) The following pseudocode was written to input 1000 dates.

```
1  count = 1
2  repeat
3     input day, month, year
4     count = count + 1
5  until count = 1000
```

(i) Describe why the loop only inputs 999 dates instead of 1000. [1]

(ii) What needs to be changed or added to the above code to make sure 1000 dates are input? [1]

(b) Errors in code can be found using test data.
Name three different types of test data. Using month from the pseudocode above, give an example of each type of test data. [6]

(a) (i) – value of count starts at 1 so only 999 iterations
– value of count reaches 1000, but before 1000th input

(ii) – line 1 should read ***count = 0***
– line 5 should read ***count = 1001*** (or ***count >1000***)
– change to appropriate loop structure

(b) – 1 mark for naming data type + 1 mark for example related to month

– normal/valid (test data)
– any value in given range (1 to 12) e.g. 4
– abnormal/invalid (test data)
– any value which is outside the range/any value not acceptable
– i.e. letters, negative numbers, values > 12 e.g. adfrk, -20, 36

– extreme/boundary (test data)
– data which is on the boundaries/edges of the acceptable range
– i.e. 1 or 12 for extreme; 0, 1, 12 or 13 for boundary

– Month names, instead of values, are acceptable e.g. April

15 5000 numbers are being input which should have either 1 digit (e.g. 5), 2 digits (e.g. 36), 3digits (e.g. 149) or 4 digits (e.g. 8567). Write an algorithm, using pseudocode or flowchart only, which
• inputs 5000 numbers
• outputs how many numbers had 1 digit, 2 digits, 3 digits and 4 digits
• outputs the % of numbers input which were outside the range [6]

```
single = 0: two = 0: three = 0: four = 0: error = 0
for x = 1 to 5000
    input number
        if number > 999 and number < 10000 then four = four + 1
            else if number > 99 then three = three + 1
                else if number > 9 then two = two + 1
                    else if number > 0 then single = single + 1
                        else error = error + 1
next x
percent = error/50
print single, two, three, four, percent
```

Oct/Nov 2013. P12

16 (a) A greenhouse is being monitored by a computer using 2 sensors. SENSOR1 measures the temperature and SENSOR2 measures oxygen levels. If the temperature exceeds 45°C or oxygen levels fall below 0.19, then an error message is output by the computer.
Write an algorithm, using pseudocode or flowchart only, which
• inputs both sensor readings
• checks the sensor input values and outputs a warning message if either are out of range
• continues monitoring until the <ESCAPE> key is pressed

(You may assume that READ SENSORn will take a reading from SENSORn and that READ KEY inputs a key press from the keyboard). [5]

```
(a) repeat
        read sensor1
        read sensor2
            if sensor1 > 45 then print "warning"
            if sensor2 < 0.19 then print "warning"
        read key
    until key = ESCAPE
```

(b) DAC

- need to convert computer output to analogue values
- to allow it to operate motors, actuators, ……
- …… to open/close windows, switch heaters on/off etc.
- devices may not understand/respond to digital signals

May/June 2014 P12

18 A school has 1500 students. It is conducting a survey on their music preferences. Each student uses a computer and inputs their name and then chooses one of 5 options:

- **rock (input value 1)**
- **soul (input value 2)**
- **pop (input value 3)**
- **jazz (input value 4)**
- **classical (input value 5)**

Write an algorithm, using pseudocode or a flowchart, which:

- **inputs the choice of all 1500 students (values 1 to 5)**
- **outputs all the names of the students who chose classical music**
- **outputs the percentage who chose each option**

```
rock = 0: soul = 0: pop = 0: jazz = 0: classical = 0

for student = 1 to 1500

    input choice, pupil_name
        if choice = 1 then rock = rock + 1
        if choice = 2 then soul = soul + 1
        if choice = 3 then pop = pop + 1
        if choice = 4 then jazz = jazz + 1
        if choice = 5 then classical = classical + 1
        if choice = 5 then output pupil_name

next student
percent1 = rock/15
percent2 = soul/15
percent3 = pop/15
percent4 = jazz/15
percent5 = classical/15
output percent1, percent2, percent3, percent4, percent5
```

(sample pseudocode showing a possible **case ... of** construct:
(alternative to rows 4 to 9 in above algorithm)

```
case of choice:
1: rock = rock + 1
2: soul = soul + 1
3: pop = pop + 1
4: jazz = jazz + 1
5: classical = classical + 1
output pupil_name
endcase)
```

5 The following algorithm should:

- **input ten numbers**
- **output the largest number input**
- **output the average value of the input data**

```
10      largest = 0
20      sum = 0
30      for x = 1 to 10
40          input x
50          if x > largest then x = largest
60          output largest
70          sum = sum + x
80      next x
90      average = sum * 10
100     output average
```

There are four errors in this algorithm.

Locate these errors and suggest a correction.

error: line 40: input x; using same input value as loop variable will cause problems or line 30: **for** x = 1 **to** 10
correction: change loop variable e.g. **for** count = 1 **to** 10 or change input variable e.g. **input** number

error: line 50: formula is reversed
correction: .... **then** largest = x (or largest = number)

error: line 60: output shouldn't be inside the loop
correction: 100 **output** average, largest

error: line 90: incorrect formula
correction: average = sum/10

May/June 2014. P11

15 A survey is being carried out which involves reading and recording sound levels near a busy road junction. Once all the data are collected, they are input manually into a computer. A sound level of 0 decibels (0 dB) is input to indicate the end of the data. Write an algorithm, using pseudocode or a flowchart, which:

- **inputs all the sound levels**
- **after a sound level of 0 is input, outputs the following:**
  - **average sound level**
  - **highest recorded sound level.**

```
total = 0: highest = 0: count = 0

input sound

while sound > 0 do
    total = total + sound
    if sound > highest then highest = sound
    count = count + 1
    input sound

endwhile

average = total/count

print average, highest
```

Oct/Nov 2014. P12

Question 6:

The following section of a pseudocode algorithm should:

- **input 500 numbers**
- **generate a ratio called k**
- **output each value of k**

• output how many numbers were larger than 10

```
10  total = 1
20  FOR x = 1 TO 500
30     IF number < 10 THEN total = total + 1
40     k = x / number
50     x = x + 1
60     OUTPUT k
70  NEXT x
80  OUTPUT x
```

(a)There are five errors in the above code.
Locate these errors and suggest a correction. [5]

(b)The corrected algorithm was converted to a computer program and run. However, after several numbers were input, the program stopped and an error message was generated, showing that there was a further error at line (k = x / number).

State what could cause this error to occur.
Suggest a change to line 40 to overcome this problem. [2]

(a) **error:** line 10: total = 1
correction: totals should be set to zero; total = 0

error: line 30: … number < 10 …
correction: check should be made if number > 10; … number > 10 …

error: no input inside loop
correction: **input** number

error: line 50: x = x + 1
correction: **for … to** loops don't need a counter; remove line 50 altogether

error: line 80: **output** x
correction: output should be total value; **output** total

(b) division by zero error (or similar description of error produced when dividing by 0)
add an error trap after input of number
e.g. 40 **if** number = 0 **then** k = 0 **else** k = x/number

Question 16:
A school has 3000 students sitting final examinations.
Each student sits eight examinations.
Write an algorithm, using pseudocode or a flowchart, which:
• inputs the marks for all 8 examinations for each student
• outputs for each student the average mark for their 8 examinations
• outputs the highest mark overall

```
highest = -1
for student = 1 to 3000
    total = 0
    for exam = 1 to 8
        input mark
        total = total + mark
        if mark > highest then highest = mark
    next
    average = total/8
    output average
next
output highest
```

JUNE 2015 (VARIANT 1)

2 Read this section of program code that should input 10 positive numbers and then output the smallest number input.

```
1 Small = 0
2 Counter = 0
3 REPEAT
4   INPUT Num
5   IF Num < Small THEN Num = Small
6   Counter = Counter + 1
7   PRINT Small
8 UNTIL Counter < 10
```

There are four errors in this code.
Locate these errors and suggest a corrected piece of code for each error.

1. Line 1: Small = 999
2. Line 5: IF Num < Small THEN Small = Num
3. Line 7: Line 7 should come after the end of the Repeat Loop
4. Line 8: UNTIL COUNTER = 10

6 Identify three different loop structures that you can use when writing pseudocode. [3]

1. FOR … TO … NEXT
2. WHILE … DO … ENDWHILE
3. REPEAT … UNTIL

JUNE 2015 (VARIANT 2)

2 Read this section of program code that should input 30 positive numbers and then output the largest number input.

```
1 Large = 9999
2 Counter = 0
3 WHILE Counter > 30
4 DO
5   INPUT Num
6   IF Num < Large THEN Large = Num
7   Counter = Counter - 1
8 ENDWHILE
9 PRINT Large
```

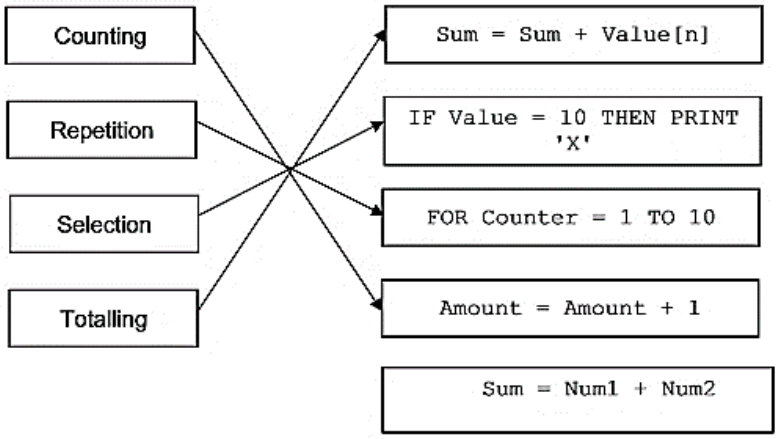
There are four errors in this code.
Locate these errors and suggest a corrected piece of code for each error.

1. Line 1: Large = 0
2. Line 3: WHILE Counter < 30
3. Line 6: IF Num > Large THEN Large = Num
4. Line 7: Counter = Counter + 1

4 Four programming concepts and four examples of programming code are shown below.
Draw a line to link each programming concept to the correct example of programming code. [4]

Programming concept	Example of programming code
Counting	Sum = Sum + Value[n]
Repetition	IF Value = 10 THEN PRINT 'X'
Selection	FOR Counter = 1 TO 10
Totalling	Amount = Amount + 1
	Sum = Num1 + Num2

Solution:



5 (a) Write an algorithm, using pseudocode and a FOR … TO … NEXT loop structure, to input 1000 numbers into an array. [2]
(b) Rewrite your algorithm using another loop structure. [4]

(a) 1 mark for FOR … TO … NEXT 1 mark for INPUT

```
FOR Count ← 1 TO 1000
  INPUT A[Count]
NEXT (Count)
```

(b) Example1

```
Count ← 1
REPEAT
  INPUT A[Count]
  Count ← Count + 1
UNTIL Count > 1000
```

Example2

```
Count ← 0
WHILE Count < 1000
  DO
  Count ← Count + 1
  INPUT A[Count]
ENDWHILE
```

NOVEMBER 2015 (VARIANT 1)

2 Read this section of program code that should input 50 numbers and then output the average of the positive numbers only.

```
1 Total = 0
2 PosCount = 0
3 FOR Counter = 1 TO 50
4   INPUT Num
5   IF Num < 0 THEN Total = Total + Num
6   IF Num > 0 THEN Counter = Counter + 1
7   Average = Total/PosCount
8 NEXT Counter
9 PRINT Num
```

There are four errors in this code.

Locate these errors and suggest code corrections to remove each error.

1. Error: Line 5
   Correction: IF NUM > 0 THEN Total = Total + Num
2. Error: Line 6
   Correction: IF NUM > 0 THEN PosCount = PosCount + 1
3. Error: Line 7
   Correction: This line should come outside and after the FOR Loop. This can be achieved by interchanging line 7 and line 8.
4. Error: Line 9
   Correction: Print Average

3 (a) This pseudocode inputs an integer. The predefined function `DIV` gives the value of the division, e.g. `Y ← 10 DIV 3` gives the value `Y = 3`. The predefined function `MOD` gives the value of the remainder, e.g. `Y ← 10 MOD 3` gives the value `Y = 1`.

```
INPUT X
WHILE X > 15
  DO
  T1 ← X DIV 16
  T2 ← X MOD 16
  CASE T2 OF
    10:OUTPUT A
    11:OUTPUT B
    12:OUTPUT C
    13:OUTPUT D
    14:OUTPUT E
    15:OUTPUT F
    OTHERWISE OUTPUT T2
  ENDCASE
  X ← T1
ENDWHILE
CASE X OF
  10:OUTPUT A
  11:OUTPUT B
  12:OUTPUT C
  13:OUTPUT D
  14:OUTPUT E
  15:OUTPUT F
  OTHERWISE OUTPUT X
ENDCASE
```

Complete a trace table for each of the **two** input values 37 and 191.

Trace table for input value 37

X	T1	T2	OUTPUT

Trace table for input value 191

X	T1	T2	OUTPUT

[4]

(b) State the purpose of the pseudocode in **part (a)**. [2]

(a) Number 1 Trace Table

X	T1	T2	Output
37	2	5	5
2			2

← (1 mark) →← (1 mark) →

Number 2 Trace Table

X	T1	T2	Output
191	11	15	F
11			B

← (1 mark) →← (1 mark) →

(b) – convert a denary number to hexadecimal
– and output it in reverse order

NOVEMBER 2015 (VARIANT 2)

2 Read this section of program code that should input 50 numbers and then output the average.

```
1 Total = 0
2 For Counter = 1 TO 50
3  INPUT Num
4  Total = Total + 1
5  Counter = Counter + 1
6  Average = Total/Counter
7 NEXT Counter
8 PRINT Average
```

There are four errors in this code.
Locate these errors and suggest code corrections to remove each error. [4]

1. Error: Line 4
   Correction: Total = Total + Num
2. Error: Line 5
   Correction: Delete this line as the FOR Loop will automatically increment the value of the 'counter' variable.
3. Error: Line 6
   Correction: Average = Total/50
4. Error: Line 6
   Correction: This line should be outside and after the FOR Loop. This can be achieved by swapping Line 6 and Line 7.

5 Identify two different conditional statements that you can use when writing pseudocode. [2]

- IF (… THEN … ELSE … ENDIF)
- CASE (… OF … OTHERWISE … ENDCASE)

JUNE 2016

2.Read this section of program code that inputs 10 positive numbers and then outputs the total.

```
1 Total = 0
2 Counter = 0
3 REPEAT
4   INPUT Num
5   Total = Total + Num
6   PRINT Total
7   Counter = Counter + 1
8 UNTIL Counter = 10
```

This code works, but it is inefficient.

(i) Suggest three improvements that could be made. [3]

(ii) Rewrite the program code with your improvements. [3]

(i)1. Use a FOR…NEXT Loop instead of a REPEAT…UNTIL Loop
2. Move Line 6 (PRINT Total) after the end of the loop.
3. Add statements to check that only Positive Numbers are input.

(ii)

```
1 Total = 0
2   FOR Counter = 1 To 10
3    REPEAT
4      INPUT Num
5   UNTIL Num >0
6      Total = Total + Num
7 NEXT Counter
8 PRINT Total
```

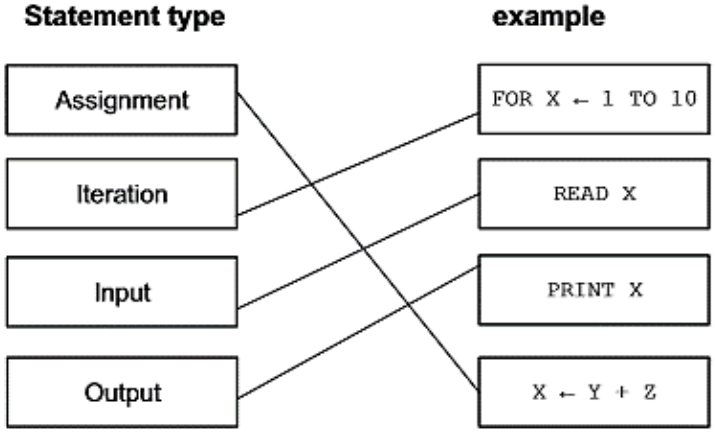
4 Four statement types and four examples are shown below.

Draw a line to connect each statement type to the correct example.

Statement type	Example
Assignment	FOR X ← 1 TO 10
Iteration	READ X
Input	PRINT X
Output	X ← Y + Z

[3]

Solution:



6 Identify two different selection statements that you can use when writing pseudocode. [2]

– IF (… THEN … ELSE … ENDIF)

– CASE (… OF … OTHERWISE … ENDCASE)

NOVEMBER 2016

2 Read this section of program code that inputs positive numbers, discards any negative numbers and then outputs the average. An input of zero ends the process.

```
1  Total = 0
2  Counter = 100
3  REPEAT
4    REPEAT
5      INPUT Num
6    UNTIL Num < 0
7    Total = Total + 1
8    Counter = Counter + Num
9  UNTIL Num = 0
10 Average = Total / (Counter - 1)
11 Print Average
```

There are four errors in this code.

Locate these errors and suggest a correction to remove each error.

– line 2 `or Counter = 100`

– `Counter = 0`

– line 6 or `UNTIL Num < 0`

– `UNTIL Num >= 0`

– line 7 or `Total = Total + 1`

– `Total = Total + Num`

– line 8 or `Counter = Counter + Num`

– `Counter = Counter + 1`

4 IF ... THEN ... ELSE ... ENDIF and CASE ... OF ... OTHERWISE ... ENDCASE are two different conditional statements that you can use when writing pseudocode.

Explain, using examples, why you would choose to use each conditional statement.

Example 1

Reason for choice

Example 2

Reason for choice **[6]**

```
IF X > 0 AND X <= 10
  THEN PRINT 'In Range'
  ELSE PRINT 'Out of Range'
ENDIF
```

– e.g. checking a condition that may be complex//uses relational operators// checking for a range of values// only 2 options

```
CASE X OF
  1 : PRINT 'Option 1'
  2 : PRINT 'Option 2'
  3 : PRINT 'Option 3'
  OTHERWISE PRINT 'Incorrect choice'
ENDCASE
```

– e.g. checking for discrete/large number/more than 2 of values

---

JUNE 2017 (VARIANT 1)

2 This section of program code asks for 50 numbers to be entered. The total and average of the numbers are calculated.

```
1   Total = 0
2   Counter = 50
3   PRINT 'When prompted, enter 50 numbers, one at a time'
4   REPEAT
5     PRINT 'Enter a number'
6     INPUT Number
7     Total + Number = Total
8     Number = Number + 1
9   UNTIL Counter = 50
10  Average = Number * Counter
11  PRINT 'The average of the numbers you entered is ', Average
```

There are four errors in this code.

State the line number for each error and write the correct code for that line.

Line 2 *Correct code* `Counter = 0`
Line 7 *Correct code* `Total = Total + Number // Number + Total`
Line 8 *Correct code* `Counter = Counter + 1 // 1 + Counter`
Line 10 *Correct code* `Average = Total / Counter //`
`Average = Total / 50`

5 (a) Describe the purpose of each statement in this algorithm. [2]

```
FOR I ← 1 TO 300
  INPUT Name[I]
NEXT I
```

(b) Identify, using pseudocode, another loop structure that the algorithm in part (a) could have used. [1]

(c) Write an algorithm, using pseudocode, to input a number between 0 and 100 inclusive. The algorithm should prompt for the input and output an error message if the number is outside this range. [3]

(a)	Any **two** from: - Loop with 300 repetitions (starting at 1) / Loops from 1 to 300 - Values input/stored (in consecutive/different locations) in an array (at position I) - Increases the loop counter/I value by 1 (and returns to the start of the loop)
(b)	`REPEAT (… UNTIL)` `WHILE (… DO … ENDWHILE)`

(c)	`OUTPUT "Enter a number between 0 and 100 "`
	`INPUT Number`
	`IF Number < 0 OR Number > 100`
	`THEN`
	`OUTPUT "The number you have entered is outside the specified range"`

JUNE 2017 (VARIANT 2)

Question 2

(a) Write an algorithm to input three different numbers, and then output the largest number. Use either pseudocode or a flowchart. [4]

(b) Give two sets of test data to use with your algorithm in part (a) and explain why you chose each set.

Test data set 1

Reason

Test data set 2

Reason [4]

(a)

```
INPUT Num1, Num2, Num3
IF (Num1 > Num2) AND (Num1 > Num3) THEN PRINT Num1
                ENDIF
IF (Num2 > Num1) AND (Num2 > Num3) THEN PRINT Num2
                ENDIF
IF (Num3 > Num1) AND (Num3 > Num2) THEN PRINT Num3
                ENDIF
```

or

```
INPUT Num1
Big ← Num1
INPUT Num2, Num3
IF Num2 > Big THEN Big ← Num2 ENDIF
IF Num3 > Big THEN Big ← Num3 ENDIF
PRINT Big
```

(b)

Test data set 1: 30, 29, 28
Reason: first number is the largest

Test data set 2: x, y, z
Reason: abnormal data, should be rejected

4 An algorithm has been written in pseudocode to input 100 numbers and print out the sum. A REPEAT … UNTIL loop has been used.

```
Count ← 0
Sum ← 0
REPEAT
  INPUT Number
  Sum ← Sum + Number
  Count ← Count + 1
UNTIL Count > 100
PRINT Sum
```

(a) Find the error in the pseudocode and suggest a correction. [2]
(b) Rewrite the correct algorithm using a more suitable loop structure. [3]

(a)Error: UNTIL Count > 100
Correction: UNTIL Count = 100
(b)SUM = 0
FOR Count = 1 TO 100
INPUT Number
Sum = Sum + Number
NEXT Count
PRINT Count

NOVEMBER 2017 (VARIANT 2)

2 Write an algorithm using either pseudocode or a flowchart, to:
- **input a positive integer**
- **use this value to set up how many other numbers are to be input**
- **input these numbers**
- **calculate and output the total and the average of these numbers. [6]**

```
INPUT NumberCount
Total ← 0
FOR Count ← 1 TO NumberCount
  INPUT Number
  Total ← Total + Number
NEXT
Average ← Total/NumberCount
  PRINT Total, Average
```

4 IF … THEN … ELSE … ENDIF is one type of conditional statement used when writing pseudocode.

Identify and describe another type of conditional statement that you could use when writing pseudocode. Give a reason why you would use this type of conditional statement.

Conditional statement
Description
Reason

Identification:

```
CASE …
… OF … OTHERWISE … (ENDCASE) or
… OF … (OTHERWISE) … ENDCASE
```

Description:

- a statement that allows for multiple selections // not any of the above

Reason:

- to simplify pseudocode/ make pseudocode more understandable etc.

NOVEMBER 2017 (VARIANT 1)

2 This section of program code asks for 80 numbers between 100 and 1000 to be entered. It checks that the numbers are in the correct range, and stores them in an array. It counts how many of the numbers are larger than 500 and then outputs the result when the program is finished.

```
1 Count = 0
2 FOR Index = 1 TO 80
3   INPUT 'Enter a number between 100 and 1000', Number
4   WHILE Number = 99 AND Number = 1001
5     INPUT 'This is incorrect, please try again', Number
6   ENDWHILE
7   Num[80] = Number
8   IF Number > 500 THEN Count = Count + 1
9  UNTIL Index = 80
10 PRINT Index
11 PRINT ' numbers were larger than 500'
```

There are four lines of code that contain errors.
State the line number for each error and write the correct code for that line. **[4]**

Line 4 **correct line** `WHILE Number <= 99 OR Number > 1000`
Line 7 **correct line** `Num[Index] = Number`
Line 9 **correct line** `NEXT (Index)`
Line 10 **correct line** `PRINT Count`

4 (a) Four pseudocode descriptions and five pseudocode statements are shown. Draw one line to link each pseudocode description to the correct pseudocode statement. Not all pseudocode statements will be used.

Pseudocode description	Pseudocode statement
A loop that will iterate at least once.	FOR...TO...NEXT
A conditional statement to deal with many possible outcomes.	IF...THEN...ELSE...ENDIF
A loop that will iterate a set number of times.	WHILE...DO...ENDWHILE
A conditional statement with different outcomes for true and false.	CASE...OF...OTHERWISE...ENDCASE
	REPEAT...UNTIL

(b) Write an algorithm in pseudocode, using a single loop, to print 50 names that have been stored in an array. [3]

(a)

Pseudocode description	Pseudocode statement
A loop that will iterate at least once.	FOR...TO...NEXT
A conditional statement to deal with many possible outcomes.	IF...THEN...ELSE...ENDIF
A loop that will iterate a set number of times.	WHILE...DO...ENDWHILE
A conditional statement with different outcomes for true and false.	CASE...OF...OTHERWISE...ENDCASE
	REPEAT...UNTIL

(b)

```
Count ← 0
WHILE Count < 50 DO
   OUTPUT Name[Count]
   Count ← Count + 1
ENDWHILE
```

JUNE 2018 (VARIANT 1)

2 (a) Write an algorithm to input 1000 numbers. Count how many numbers are positive and how many numbers are zero. Then output the results. Use either pseudocode or a flowchart. [6]

(b) Give one change you could make to your algorithm to ensure initial testing is more manageable. [1]

(a)
```
zero ← 0
posCount ← 0
FOR count ← 1 TO 1000
  INPUT number
  IF number > 0
    THEN posCount ← posCount + 1
  ENDIF
  IF number = 0
    THEN zero ← zero + 1
  ENDIF
NEXT
OUTPUT posCount, " positive numbers"
OUTPUT zero, " zeros"
```

(b) Reduce the number of iterations to a manageable amount // Simulate the input (e.g. random generation)

3 The global trade item number (GTIN-8) barcode has seven digits and a check digit. This pseudocode algorithm inputs seven digits and calculates the eighth digit, then outputs the GTIN-8.
DIV(X,Y), finds the number of divides in division for example DIV(23,10) is 2.
MOD(X,Y), finds the remainder in division for example MOD(23,10) is 3.

```
FOR Count ← 1 TO 7
   INPUT Number
   Digit(Count) ← Number
NEXT
Sum ← (Digit(1)+Digit(3)+Digit(5)+Digit(7))*3+Digit(2)+Digit(4)+Digit(6)
IF MOD(Sum,10) <> 0
   THEN Digit(8) ← DIV(Sum,10)*10 + 10 - Sum
   ELSE Digit(8) ← 0
ENDIF
OUTPUT "GTIN-8"
FOR Count ← 1 TO 8
   OUTPUT Digit(Count)
NEXT
```

(a) Complete the trace table for the input data: 5, 7, 0, 1, 2, 3, 4

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT

Complete the trace table for the input data: 4, 3, 1, 0, 2, 3, 1

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT

[5]

(b) Explain how you would change the algorithm to input eight digits (seven digits and the check digit) and output if the check digit entered is correct or not. [3]

(a)

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT
5	7	0	1	2	3	4	6	44	GTIN-8
									57012346

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT
4	3	1	0	2	3	1	0	30	GTIN-8
									43102310

One mark for data entry – both sets of digits 1–7
One mark for both Digit(8)
One mark for each Sum (max **Two**)
One mark for both OUTPUT

(b) Any **three** from
1 Change first loop to 8 iterations
2 Check that the input `Digit(8)` is equal to the calculated `Digit(8)`…
3 … if equal output check digit correct
4 … otherwise output check digit incorrect

Or

1 Change first loop to 8 iterations
2 Put all 8 digits through the algorithm to calculate `Sum` …
3 … if `MOD(Sum,10)` is equal to zero, check digit correct
4 … otherwise output check digit incorrect

JUNE 2018 (VARIENT 2):

3 This pseudocode algorithm inputs two non-zero numbers and a sign, and then performs the calculation shown by the sign. An input of zero for the first number terminates the process.

```
INPUT Number1, Number2, Sign
WHILE Number1 <> 0
   IF Sign = '+' THEN Answer ← Number1 + Number2 ENDIF
   IF Sign = '-' THEN Answer ← Number1 - Number2 ENDIF
   IF Sign = '*' THEN Answer ← Number1 * Number2 ENDIF
   IF Sign = '/' THEN Answer ← Number1 / Number2 ENDIF
   IF Sign <> '/' AND Sign <> '*' AND Sign <> '-' AND Sign <> '+'
      THEN Answer ← 0
   ENDIF
   IF Answer <> 0 THEN OUTPUT Answer ENDIF
   INPUT Number1, Number2, Sign
ENDWHILE
```

(a) Complete the trace table for the input data:
5, 7, +, 6, 2, –, 4, 3, *, 7, 8, ?, 0, 0, /

Number1	Number2	Sign	Answer	OUTPUT

[3]

(b) Show how you could improve the algorithm written in pseudocode by writing an alternative type of conditional statement in pseudocode. [3]

3(a)

Number1	Number2	Sign	Answer	OUTPUT
5	7	+	12	12
6	2	-	4	4
4	3	*	12	12
7	8	?	0	
0	0	/	(0)	

3(b)

`CASE Sign OF ... ENDCASE` (1)
List +, -, *, / with correct assignments (1)
`OTHERWISE Answer ← 0` (1)
Example

```
CASE Sign OF
    '+' : Answer ← Number1 + Number2
    '-' : Answer ← Number1 - Number2
    '*' : Answer ← Number1 * Number2
    '/' : Answer ← Number1 / Number2
    OTHERWISE Answer ← 0
ENDCASE
```

NOVEMBER 2018 (VARIANT 1)

3 Give an example of a pseudocode statement or statements to perform each of the following functions.
A condition-controlled loop
A conditional statement
Totalling **[3]**

Condition controlled loop – 1 mark for each correct answer e.g.

```
WHILE Number > 0 DO … ENDWHILE // REPEAT … UNTIL Number > 0
```

Conditional statement - 1 mark for each correct answer e.g.

```
IF Number = 0 THEN (… ELSE) Number ← 1 ENDIF //
CASE Number OF
0: Number ← 1
(… OTHERWISE) … (ENDCASE)
```

Totalling - 1 mark for each correct answer e.g.

```
Total ← Total + Number
```

4 This is a section of program code.

```
1 Total = 100.00
2 PRINT 'Enter the height of each member of your class, one at a
  time, when prompted'
3 FOR Count = 1 TO 30
4   PRINT 'Enter a height in metres'
5   INPUT Height
6   Total = Total + Height
7   PRINT Total / 30
8   Count = Count + 1
9 NEXT Count
```

(a) There are three errors in this code. State the line numbers that contain the errors and describe how to correct each error. **[3]**
(b) State the purpose of this program. **[1]**

(a) 1 mark for each error identified plus suggested correction

Line 1 or `Total = 100.00`: **correction** Total = `0(.00)`

Line 8 or `Count = Count + 1`: **correction** This line should be removed (not required in a FOR loop) // use of `REPEAT...UNTIL` or `WHILE...DO...ENDWHILE`

Line 7 or `PRINT Total /30`: **correction** This line should be outside the loop (or it will print each iteration)

(b) 1 mark for correct purpose:
Find/output average height

5 The algorithm allows a number to be entered. It then calculates and outputs the next number in the mathematical series.

```
Fib ← 1
Prev2 ← 0
Prev1 ← 1
INPUT Number
IF Number = 0
    THEN Fib ← 0
ENDIF
WHILE Number > 2
    Fib ← Prev2 + Prev1
    Prev2 ← Prev1
    Prev1 ← Fib
    Number ← Number - 1
ENDWHILE
OUTPUT Fib
```

(a) Complete the trace table for the input data: **7**

Fib	Prev2	Prev1	Number	OUTPUT

[4]

(b) Complete the trace table for the input data: **2**

Fib	Prev2	Prev1	Number	OUTPUT

[2]

(a)

Fib	Prev2	Prev1	Number	OUTPUT
1	0	1	7	
1	1	1	6	
2	1	2	5	
3	2	3	4	
5	3	5	3	
8	5	8	2	8

(b)

Fib	Prev2	Prev1	Number	OUTPUT
1	0	1	2	1

NOVEMBER 2018 (VARIANT 2)

2 (a) Write an algorithm, using pseudocode, to input three different numbers, multiply the two larger numbers together and output the result. Use the variables: Number1, Number2 and Number3 for your numbers and Answer for your result. [5]

(b)Give two sets of test data to use with your algorithm in part (a) and explain why you chose each set. [4]

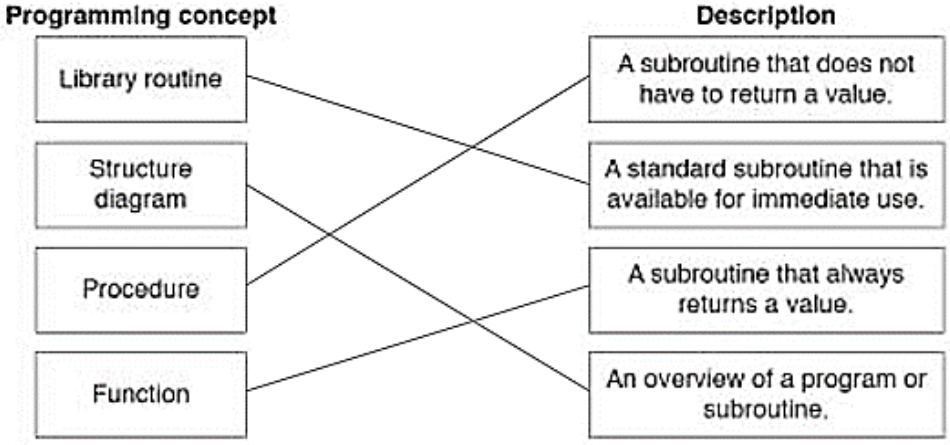
(a)	`REPEAT`
	`  OUTPUT "Enter three different numbers"`
	`  INPUT Number1, Number2, Number3`
	`UNTIL Number1 <> Number2 AND Number2 <> Number3 AND Number3 <> Number1`
	`IF Number3 < Number2 AND Number3 < Number1`
	`  THEN Answer ← Number1 * Number2`
	`ENDIF`
	`IF Number2 < Number3 AND Number2 < Number1`
	`  THEN Answer ← Number1 * Number3`
	`ENDIF`
	`IF Number1 < Number2 AND Number1 < Number3`
	`  THEN Answer ← Number2 * Number3`
	`ENDIF`
	`OUTPUT "Answer = ", Answer`

(b)	There are many correct answers. E.g.: 7, 7, 7 … should be rejected as numbers are equal 7, 8, 9 … normal data answer should be 72

3 Four programming concepts and four descriptions are shown. Draw a line to connect each programming concept to the most appropriate description.

Programming concept	Description
Library routine	A subroutine that does not have to return a value.
Structure diagram	A standard subroutine that is available for immediate use.
Procedure	A subroutine that always returns a value.
Function	An overview of a program or subroutine.

[3]



4 A programmer wants to test that the readings from 2000 electricity meters are greater than 400 units and less than 900 units. The programmer uses selection and repetition statements as part of the program. Explain, using programming statements, how selection and repetition could be used in this program.

Selection

Repetition **[4]**

Selection use of `IF` statement to check the values of the meter readings

```
IF Reading > 400 and Reading < 900 THEN …
```

Repetition use of `FOR` loop to check all 2000 meter readings

```
FOR Meter = 1 TO 2000 … NEXT
```

JUNE 2019 (VARIANT 1)

3 (a) Give an example of a conditional statement using pseudocode. [2]

(b) Describe the purpose of a conditional statement [2]

(a)

- IF
- Condition and outcome

Example answer:

```
IF X < 0
    THEN
        PRINT "Negative"
    ELSE
        PRINT "Not negative"
ENDIF
```

OR

- CASE
- Condition and outcome

Example answer:

```
CASE X OF
    1: PRINT ("ONE")
    2: PRINT ("TWO")
    OTHERWISE PRINT ("Less than ONE or more than TWO")
ENDCASE
```

(b)

- To allow different routes through a program
- dependent on meeting certain criteria

4 This section of program code may be used as a validation check.

```
1   PRINT "Input a value between 0 and 100 inclusive"
2   INPUT Value
3   WHILE Value < 0 OR Value > 100
4     PRINT "Invalid value, try again"
5     INPUT Value
6   ENDWHILE
7   PRINT "Accepted: ", Value
```

(a) Give a name for this type of validation check. [1]

(b) Describe what is happening in this validation check. [2]

(c) Complete the trace table for this program code using the test data: 200, 300, –1, 50, 60 [3]

Value	OUTPUT

(a)	Range check
(b)	**Two** from: • The entered number (`Value`) is being checked to see that it is not < 0 or not > 100 • If it is, it is rejected and the user has to enter another number / an error message is displayed • Otherwise the number is accepted, the word 'Accepted' is output along with the `Value`

(c)

Value	OUTPUT
	`Input a value between 0 and 100 inclusive`
200	`Invalid value, try again`
300	`Invalid value, try again`
–1	`Invalid value, try again`
50	`Accepted: 50`

JUNE 2019 (VARIANT 2)

2 (a) An algorithm has been written in pseudocode to input 100 numbers, select and print the largest number and smallest number.

```
Count ← 1
INPUT Number
High ← Number
Low ← Count
REPEAT
  INPUT Number
  IF Number > High
    THEN
      High ← Number
  ENDIF
  IF Number > Low
    THEN
      Low ← Number
  ENDIF
  Count ← Count + 1
UNTIL Count > 99
PRINT "Largest Number is ", Number
PRINT "Smallest Number is ", Low
```

Find the four errors in the pseudocode and suggest a correction for each error. [4]

(b) Show how you would change the corrected algorithm to total the numbers and print the total. Use a variable Total. [4]

(a)
- `Low ← Count` should be `Low ← Number`
- `Number > Low` should be `Number < Low`
- `UNTIL Count = 99` should be `UNTIL Count > 99` or `UNTIL Count = 100` or `UNTIL Count >= 100` // `Count ← 1` should be `Count ← 0`
- `PRINT "Largest Number is ", Number` should be `PRINT "Largest Number is ", High`

(b)
```
Count ← 1
INPUT Number
High ← Number
Low ← Number
Total ← Number
REPEAT
    INPUT Number
    Total ← Total + Number
    IF Number > High
    THEN
        High ← Number
    ENDIF
    IF Number < Low
    THEN
        Low ← Number
    ENDIF
    Count ← Count + 1
UNTIL Count > 99
PRINT "Largest Number is ", High
PRINT "Smallest Number is ", Low
PRINT "Total is ", Total
```

4 For each of the four groups of statements in the table, place a tick in the correct column to show whether it is an example of Selection or Repetition. **[4]**

Statements	Selection	Repetition

`FOR A ← 1 TO 100`
`  B ← B + 1`
`NEXT A`		

`CASE A OF`
`  100: B ← A`
`  200: C ← A`
`ENDCASE`		

`IF A > 100`
`THEN`
`  B ← A`
`ENDIF`		

`REPEAT`
`  A ← B * 10`
`UNTIL A > 100`		

Statements	Selection	Repetition

`FOR A ← 1 TO 100`
`  B ← B + 1`
`NEXT A`
		✓

`CASE A OF`
`  100: B ← A`
`  200: C ← A`
`ENDCASE`
	✓	

`IF A > 100`
`  THEN`
`  B ← A`
`ENDIF`
	✓	

`REPEAT`
`  A ← B * 10`
`UNTIL A > 100`
		✓

Oct/Nov 2019 (VARIANT 2)

2 An algorithm has been written in pseudocode to select a random number using the function `RandInt(n)`, which returns a whole number between 1 and the argument n. The algorithm then allows the user to guess the number.

```
Number ← RandInt(100)
TotalTry ← 1
REPEAT
  PRINT "Enter your guess now, it must be a whole number"
  INPUT Guess
  IF TotalTry > Number
    THEN
      PRINT "Too large try again"
  ENDIF
  IF Guess > Number
    THEN
      PRINT "Too small try again"
  ENDIF
  TotalTry ← Guess + 1
UNTIL Guess <> Number
TotalTry ← TotalTry - 1
PRINT "Number of guesses ", TotalTry
```

Find the **four** errors in the pseudocode and suggest a correction to remove each error. [4]

Solution:

2	▯ `IF TotalTry > Number` should be `IF Guess > Number` ▯ `IF Guess > Number` should be `IF Guess < Number` ▯ `TotalTry ← Guess + 1` should be `TotalTry ← TotalTry + 1` ▯ `UNTIL Guess <> Number` should be `UNTIL Guess = Number`

5 A programmer writes a program to weigh baskets of fruit in grams, keeping a total of the weight and counting the number of baskets. The total weight is stored in a variable `Total` and the number of baskets is stored in a variable `BasketCount`.

Explain, including examples of programming statements, how totalling and counting could be used in this program.

Totalling .....

Counting ..... [4]

Solution:

5	Totalling: ▯ Adding the weight of each basket to the total weight as each weight is entered ▯ `Total = Total + Weight` Counting: ▯ Adding one to/incrementing the number of baskets as each weight is entered ▯ `BasketCount = BasketCount + 1`

Oct/Nov 2019 (VARIANT 1)

3 Name the **three** types of loop structure used in pseudocode. [3]

Solution:

- `FOR (… TO … NEXT)` loop
- `WHILE (… DO … ENDWHILE)` loop
- `REPEAT (… UNTIL)` loop

4 The following pseudocode algorithm uses nested IF statements.

```
IF Response = 1
  THEN
    X ← X + Y
  ELSE
    IF Response = 2
      THEN
        X ← X - Y
      ELSE
        IF Response = 3
          THEN
            X ← X * Y
          ELSE
            IF Response = 4
              THEN
                X ← X / Y
              ELSE
                OUTPUT "No response"
            ENDIF
        ENDIF
    ENDIF
ENDIF
```

(a) Name the type of statement demonstrated by the use of `IF ... THEN ... ELSE ... ENDIF` [1]

(b) Re-write the pseudocode algorithm using a `CASE` statement. [4]

Solution:

4(a)	• Conditional / selection statement

4(b)	**Four** from:
	MP1 CASE statement with identifier Response
	MP2 Correct structure used for choices…
	MP3 …. correct statements used for choices
	MP4 OTHERWISE and correct statement
	MP5 Single ENDCASE included
	e.g.
	`CASE OF Response // CASE Response OF`
	`  1 : X ← X + Y`
	`  2 : X ← X - Y`
	`  3 : X ← X * Y`
	`  4 : X ← X / Y`
	`  OTHERWISE OUTPUT "No response"`
	`ENDCASE`

5 The algorithm performs an operation on the array named `MyData`
`DIV` means integer division, so only the whole number part of the result is returned
e.g. `7 DIV 2` returns a value of `3`

```
First ← 0
Last ← 16
Found ← FALSE
INPUT UserIn
WHILE (First <= Last) AND (Found = FALSE) DO
  Middle ← (First + Last) DIV 2
  IF MyData[Middle] = UserIn
    THEN
      Found ← TRUE
    ELSE
      IF UserIn < MyData[Middle]
        THEN
          Last ← Middle - 1
        ELSE
          First ← Middle + 1
      ENDIF
  ENDIF
ENDWHILE
OUTPUT Found
```

This table shows the contents of the array: `MyData` e.g. `MyData[2]` stores the value `5`

	MyData																
Index	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Value	2	3	5	6	8	10	12	13	14	16	18	20	25	27	29	34	36

(a) Complete the trace table for the input data: 10

First	Last	UserIn	Middle	Found	OUTPUT

[6]

(b) Describe the function being performed by the algorithm. [2]

Solution:

5(a)

First	Last	UserIn	Middle	Found	OUTPUT
0	16			FALSE	
0	16	10	8	FALSE	
0	7	10	3	FALSE	
4	7	10	5	TRUE	TRUE

5(b)

Two from:
- Search for the value input …
- … using an array…
- … of sorted data

TURTLE GRAPHICS 1993-2019

May/June 1993 P1:

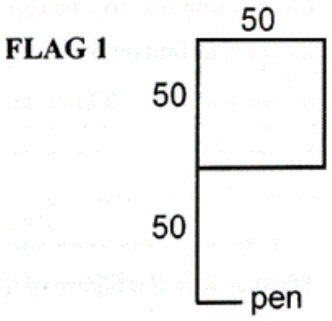
Question 12:

A programming language gives instructions for moving a pen on a piece of paper.
Examples are.

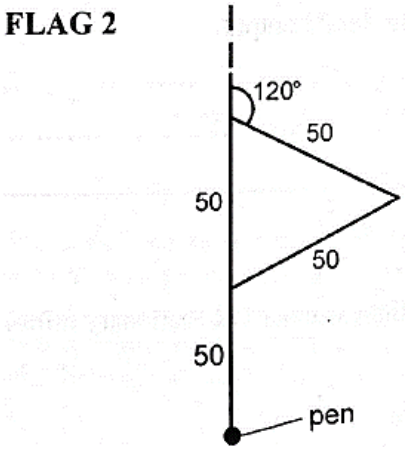
F20	**Move forward 20 cm**
B30	**Move backwards 30 cm**
R90	**Turn right 90 degrees**
L120	**Turn left 120 degrees**

The following program called FLAG 1 draws the shape shown returning the pen to the starting point.

```
F 100
R 90
F 50
R 90
F 50
R 90
F 50
R 90
B 50
```

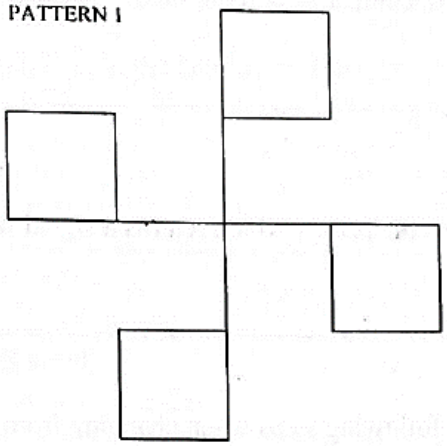


(a)Write a program, called FLAG 2, to draw the shape shown, returning the pen to the starting point. [3]



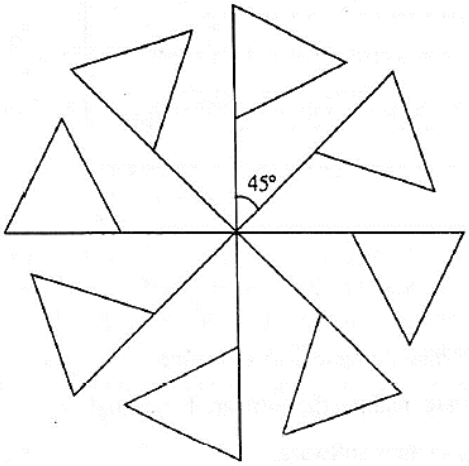
(b)The program below, called PATTERN 1, draws the pattern shown.

```
REPEAT 4 TIMES
        FLAG 1
        R 90
ENDREPEAT
```



Write a program, called PATTERN 2, to draw the pattern shown below.

PATTERN 2



[3]

Solution:

a) F100
R120
F50
R60
F50
R60
B50

b) REPEAT 8 TIMES
FLAG 2
R 45
END REPEAT

Oct/Nov 2000 P1

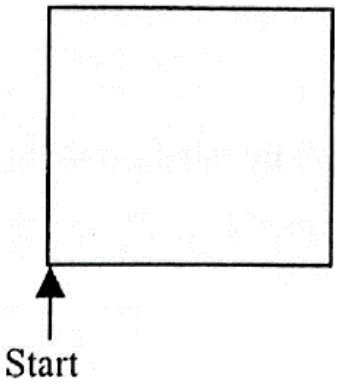
Question 10:

This set of instructions can be used to draw shapes

Forward n	**Move forward n steps**
Backward n	**Move backward n steps**
Right d	**Turn clockwise d degrees**
Left d	**Turn anti-clockwise d degrees**

The following set of instructions will produce the square below

Forward 40
Right 90
Forward 40
Right 90
Forward 40
Right 90
Forward 40
Right 90



(a)Sketch the shape produced by this set of instuctions.

Forward 30
Left 120
Forward 30

Left 120
Forward 30
Left 120 **[2]**

(b)The set of instructions in (a) can be shortened to

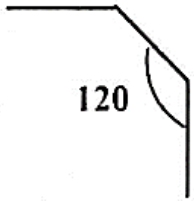
Repeat 3 [Forward 30, Left 120]

Write a shortened set of instructions to draw the square.…… [2]

(c)Explain how the instructions for drawing the square can be turned into a procedure to draw a square of any specified side. [2]

Solution:

a)



b) Repeat 4 [forward 40, Right 90]

c) Value of x can be inserted which will provide the square with the required dimension Repeat 4 [forward x, Right 90]

May/June 2002 P1:

Question 8:

The following set of instructions can be used to control a robot, which moves heavy boxes.

Forward n	**Move forward n steps**
Backward n	**Move backward n steps**
Right d	**Turn clockwise d degrees**
Left d	**Turn anti-clockwise d degrees**
Up n	**Move the robots arms up n cm**
Down n	**Move the robots arms down n cm**

a) Write three more instructions so that the robot will return to its original state. [3]

b) A procedure (subroutine) called BELT exists to take one box and put it on a conveyor belt. Write an algorithm, using the procedure, to put 50 boxes on the conveyor belt. [3]

Solution:

(a)Down 40
Right 90
Backward 20

(b) Set box = 0
Set counter = 0
If box is <= 50
Input box
box = box + 1
Else
End

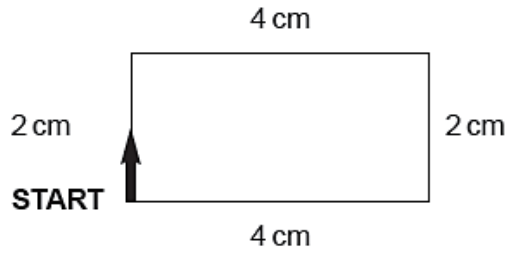
May/June 2004 P1

7 A programming language has instructions for moving a pen on a piece of paper. Examples are:

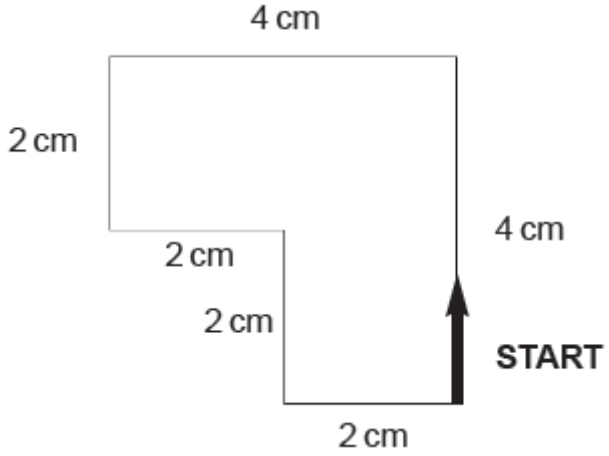
F10	**Move forward 10 cm**
B20	**Move backwards 20 cm**
R90	**Turn right 90 degrees**
L90	**Turn left 90 degrees**

Read the following set of instructions which makes the pen draw the rectangle below and study the drawing that is produced.

```
F2
R90
F4
R90
F2
R90
F4
R90
```



Write a set of instructions that would produce the following drawing:



[3]

Solution:

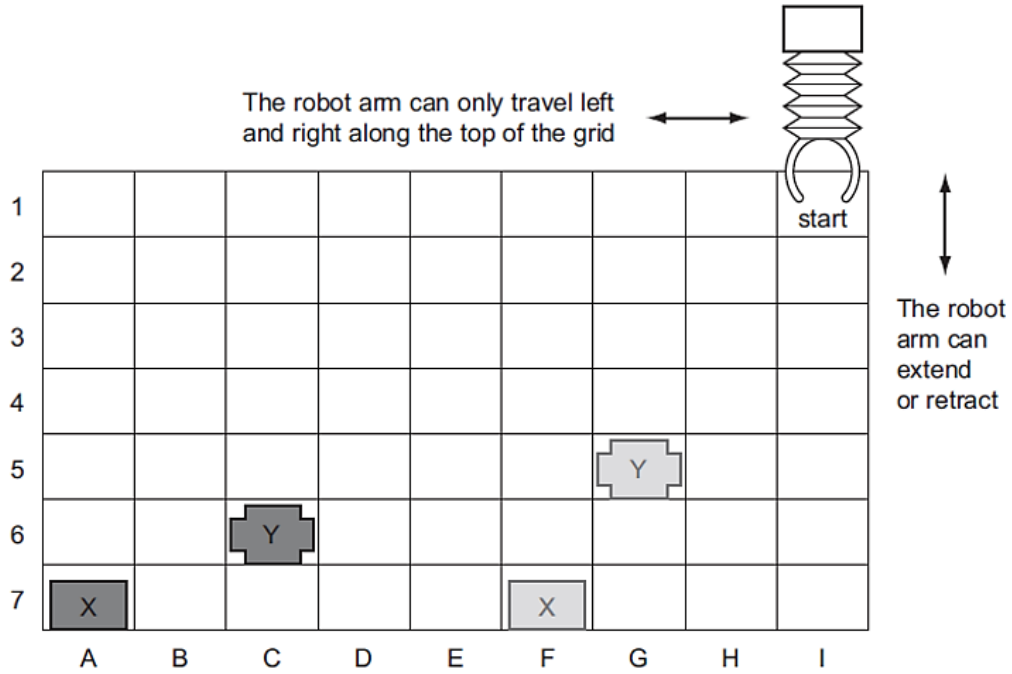
F4
L90/R270
F4
L90/R270
F2
L90/R270
F2 one mark

R90/L270
F2 one mark

L90/R270
F2
(any L/R, B1, B2) one mark

Oct/Nov 2006 P1

10 A robot arm is to be used to move some objects which are positioned on the grid shown. Object "X" is located at A7 and is to be moved to F7. Object "Y" is located at C6 and is to be moved to G5.
The START position for the robot arm is shown. The robot arm can travel left and right along the top of the grid, and the robot arm can extend (lengthen) and retract (shorten) so that the gripper at the end of the arm can reach any grid square.



The following commands must be used:

Instructions for Robot Arm	
Right *n*	Moves *n* squares to the right
Left *n*	Moves *n* squares to the left

Instructions for Robot Arm	
Down *n*	Moves *n* squares down (extend)
Up *n*	Moves *n* squares up (retract)
Close	Closes the gripper
Open	Opens the gripper

For example, to move block "X" from square A7 to F7 (beginning at START) would require the following instructions:

Left 8
Down 6
Close
Up 6
Right 5
Down 6
Open

Write a set of instructions to transfer block "Y" from C6 to G5 (beginning at START). [3]

Solution:

LEFT 6
DOWN 5
CLOSE

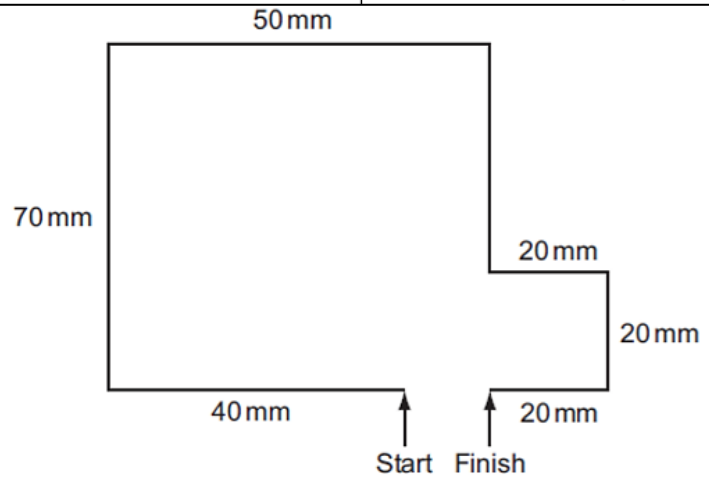
UP 5
RIGHT 4

DOWN 4
OPEN

May/June 2008 P1

7 A floor turtle can use the following instructions: [4]

Instruction	Meaning
FORWARD ***n***	Move ***n*** mm forward
BACKWARD ***n***	Move ***n*** mm backward
LEFT ***d***	Turn left ***d*** degrees
RIGHT ***d***	Turn right ***d*** degrees
PENUP	Lift the pen
PENDOWN	Lower the pen
REPEAT ***n***	Repeat the following instructions *n* times
ENDREPEAT	Finish the REPEAT loop



Complete the set of instructions to draw the above shape **[4]**

Solution:

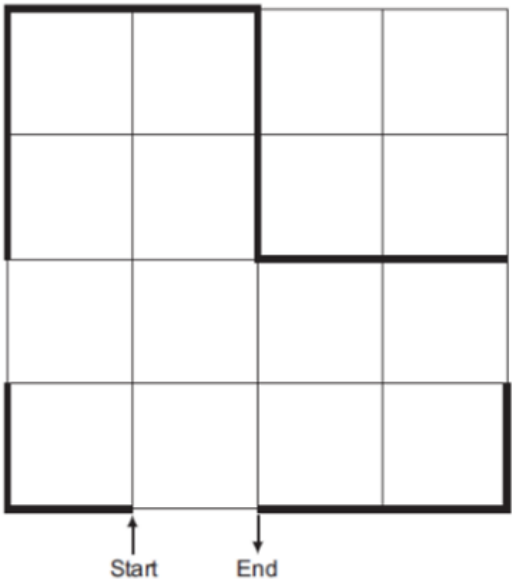
PENDOWN
LEFT 90
FORWARD 40
RIGHT 90
FORWARD 70
RIGHT 90
FORWARD 50
RIGHT 90
FORWARD 50
LEFT 90
FORWARD 20
RIGHT 90
FORWARD 20
RIGHT 90
FORWARD 20
RIGHT 90
PENUP

May/June 2010 P12

15 A floor turtle can use the following instructions:

Instruction	Meaning
FORWARD *d*	Move *d* cm forward
BACKWARD *d*	Move *d* cm backward
LEFT *t*	Turn left *t* degrees
RIGHT *t*	Turn right *t* degrees
REPEAT *n*	Repeat the next set of instructions *n* times
ENDREPEAT	End of REPEAT loop
PENUP	Raise the pen
PENDOWN	Lower the pen

(In the following grid, each square is 10 cm by 10 cm.)



Complete the set of instructions to draw the shape (shown in bold lines) by filling in the blank lines. [5]

Solution:

LEFT 90
PENDOWN
FORWARD 10
RIGHT 90
FORWARD 10
PENUP
FORWARD 10
PENDOWN
FORWARD 20
RIGHT 90
FORWARD 20
RIGHT 90
FORWARD 20
RIGHT 90
FORWARD 20
RIGHT 90
PENUP

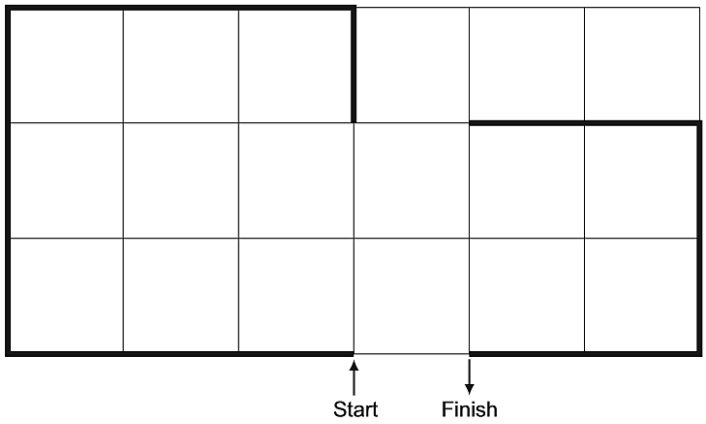
FORWARD 10
PENDOWN
FORWARD 10
RIGHT 90
FORWARD 20

May/June 2011 P12

16 A floor turtle can use the following instructions:

Instruction	Meaning
FORWARD ***d***	Move ***d*** cm forward
BACKWARD ***d***	Move ***d*** cm backward
LEFT ***t***	Turn left ***t*** degrees
RIGHT ***t***	Turn right ***t*** degrees
REPEAT ***n***	Repeat the next set of instructions ***n*** times
ENDREPEAT	End of REPEAT loop
PENUP	Raise the pen
PENDOWN	Lower the pen

(Each square in the drawing below is 10 cm by 10 cm.)



Complete the set of instructions to draw the above shape (shown in bold lines).

Solution:

PENDOWN
LEFT 90
REPEAT 3
FORWARD 30
RIGHT 90
ENDREPEAT
FORWARD 10
LEFT 90
PENUP
FORWARD 10
PENDOWN
REPEAT 2
FORWARD 20
RIGHT 90
ENDREPEAT
FORWARD 20
LEFT 90

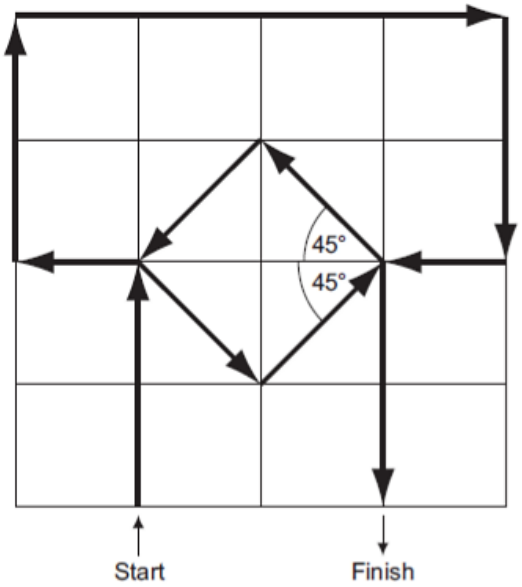
May/June 2012 P11

5 A floor turtle can use the following instructions.

Instruction	Meaning
FORWARD ***x***	Move ***x*** cm forwards
LEFT ***t***	Turn left ***t*** degrees
RIGHT ***t***	Turn right ***t*** degrees
REPEAT ***n***	Repeat next set of instructions ***n*** times
ENDREPEAT	Finish repeated instructions
PENUP	Lift the pen
PENDOWN	Lower the pen

Each square = 10 cm by 10 cm

Each diagonal line = 14 cm



Complete the set of instructions to draw the above shape in the direction shown by the arrows. [5]

Solution:

pendown
forward 20
left 90
- - - - - - - - - - - -
forward 10
right 90
forward 20
- - - - - - - - - - - -
right 90
forward 40
right 90
forward 20
right 90
- - - - - - - - - - - -
forward 10
right 45
forward 14
- - - - - - - - - - - -

```
repeat 3        or      left 90
left 90         or      forward 14
forward 14      or      left 90
endrepeat       or      forward 14
                        left 90
                        forward 14
```

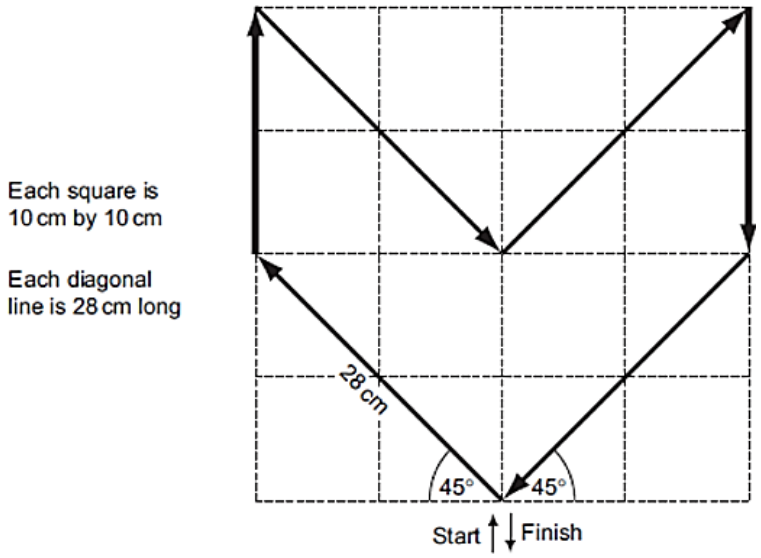
- - - - - - - - - - - -

```
right 135
forward 20
(PENUP)
```

May/June 2014 P11

5 A floor turtle can use the following instructions.

Instruction	Meaning
FORWARD *x*	Move *x* cm forwards
BACKWARD *x*	Move *x* cm backwards
LEFT *t*	Turn left *t* degrees
RIGHT *t*	Turn right *t* degrees
REPEAT *n*	Repeat next set of instructions *n* times
ENDREPEAT	Finish repeated instructions
PENUP	Lift the pen
PENDOWN	Lower the pen



Complete the following set of instructions to draw the shape in the direction shown by the arrows. [5]

Solution:

pendown

left 45

- - - - - - - - -

```
forward 28
right 45
```

- - - - - - - - -

forward 20
right 135
- - - - - - - - -
forward 28
left 90
- - - - - - - - -

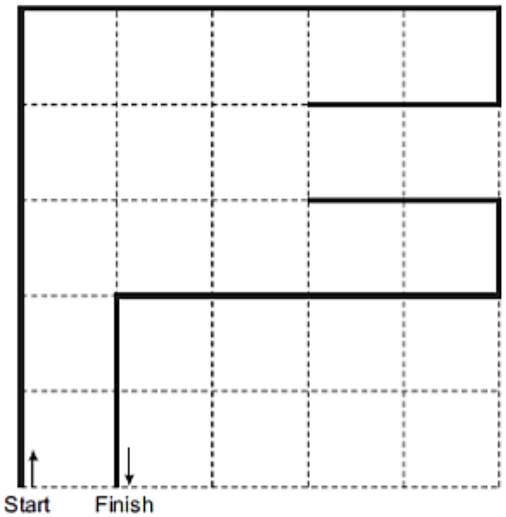
forward 28
right 135
- - - - - - - - -
forward 20
right 45
forward 28
- - - - - - - - -
(penup)
(left 45)

May/June 2014 P12

7 A floor turtle uses the following commands:

command	description
FORWARD ***n***	Move ***n*** cm in a forward direction
BACKWARD ***n***	Move ***n*** cm in a backward (reverse) direction
RIGHT ***t***	Turn right through ***t*** degrees
LEFT ***t***	Turn left through ***t*** degrees
PENUP	Lift the drawing pen up
PENDOWN	Lower the drawing pen
REPEAT ***x***	Repeat the next set of instructions ***x*** times
ENDREPEAT	Finish the REPEAT loop

In the following grid, each of the squares measures 10 cm by 10 cm:



Complete the set of instructions to draw the shape shown above (in bold lines). [5]

Solution:

1. **PENDOWN**
2. **REPEAT 2**

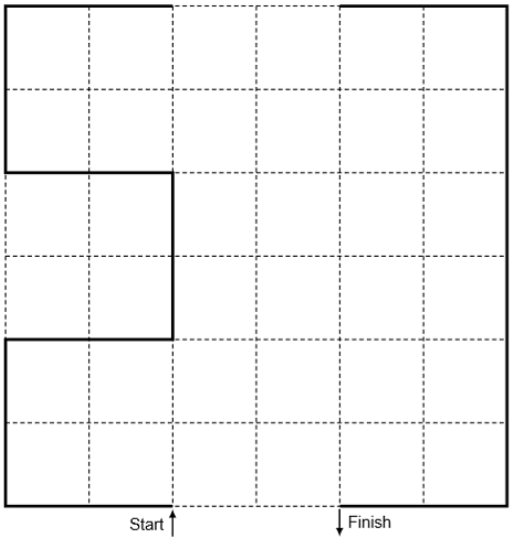
3. FORWARD 50
4. RIGHT 90
5. ENDREPEAT
6. FORWARD 10
7. RIGHT 90
8. FORWARD 20
9. PEN UP
10. LEFT 90
11. FORWARD 10
12. PEN DOWN
13. LEFT 90
14. FORWARD 20
15. RIGHT 90
16. FORWARD 10
17. RIGHT 90
18. FORWARD 40
19. LEFT 90
20. FORWARD 20
21. PENUP

Oct/Nov 2014 P12

9 A floor turtle uses the following commands:

Command	Description
FORWARD ***n***	Move *n* cm in a forward direction
BACKWARD ***n***	Move *n* cm in a backward (reverse) direction
RIGHT ***t***	Turn right through *t* degrees
LEFT ***t***	Turn left through *t* degrees
PENUP	Lift the drawing pen up
PENDOWN	Lower the drawing pen
REPEAT ***x***	Repeat the next set of instructions *x* times
ENDREPEAT	Finish the REPEAT loop

In the following grid, each of the squares represents 10 cm by 10 cm:



Complete the set of instructions to draw the shape shown on the left: **[6]**

Solution:

1. **PENDOWN**
2. **LEFT 90**

3. **REPEAT 2**
4. FORWARD 20
5. RIGHT 90
6. END REPEAT
7. FORWARD 20
8. LEFT 90
9. FORWARD 20
10. LEFT 90
11. FORWARD 20
12. RIGHT 90
13. FORWARD 20
14. RIGHT 90
15. FORWARD 20
16. PEN UP
17. FORWARD 20
18. PEN DOWN
19. FORWARD 20
20. RIGHT 90
21. FORWARD 60
22. RIGHT 90
23. FORWARD 20

Oct/Nov 2017 P12

1 A robot arm in a factory is programmed to move products.

The binary instructions to operate the robot arm are:

Operation	Binary Instruction
UP	1 1 1 1
DOWN	0 0 0 1
LEFT	1 0 0 1
RIGHT	0 1 1 0
OPEN	1 1 0 0
CLOSE	0 0 1 1

The instructions are entered as hexadecimal values.

An operator enters the values:

9 1 C 3 F

Convert the values and write down the operation (e.g. RIGHT) carried out by the robot arm. [5]

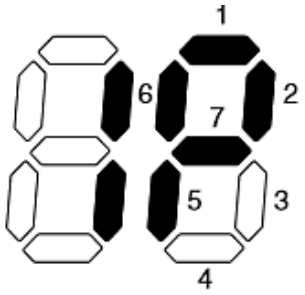
Solution:

9 – LEFT
1 – DOWN
C – OPEN
3 – CLOSE
F – UP

DATA REPRESENTATION
2003-2019

Oct/Nov 2003:

12 Two 7 segment displays are used on a car dashboard to give information to the driver. Each segment is numbered as shown.



(1) (2)

For example, the information 1P shown above is represented by:

	7	6	5	4	3	2	1	0
(1)	0	0	0	0	1	1	0	0

and by:

(2)	1	1	1	0	0	1	1	0

Bit 0 is always zero

(a) What is being displayed to the driver if bytes (1) and (2) are showing?

(1)	1	1	0	0	1	1	0	0
(2)	1	1	1	0	0	0	1	0

....

[2]

(b) What bit patterns must be used to show the information **0L**?

(0)								
(L)								

[2]

Solution:

(a) 4
F

(b) (1) 01111110
(2) 01110000

(c) **(i)** any **one** from:
drivers used to analogue instruments
readings are steadier
more accurate (because of infinite number of positions)
easier to see "trends" in read outs/easier to understand

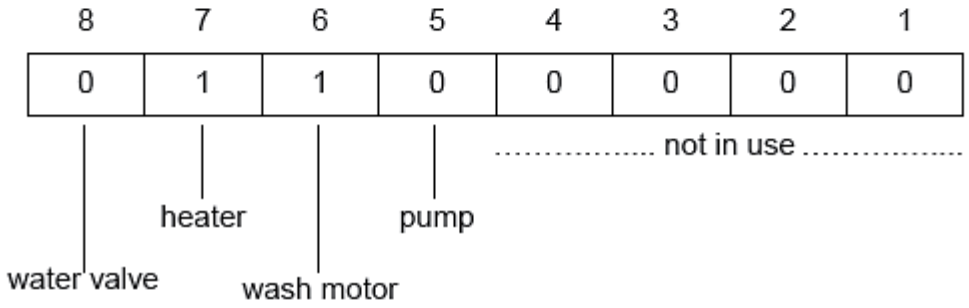
(ii) any **one** from:
not as easy to read as digital
needs to be interpreted by user
mechanical device more likely to break down/fail

May/June 2005:

8 A microprocessor controls the washing cycle of an automatic washing machine and gives output to the following devices:

- water valve
- heater
- wash motor
- pump

Control bits are sent to turn parts of the system on or off, i.e. 1 is on and 0 is off.



(a) State what is happening when the above bit pattern is set.

.....[1]

(b) Write down the bit pattern that would be set if the water has reached the correct level, the temperature is the required temperature, the clothes have been washed and the pump is now pumping the water out of the machine.

8	7	6	5	4	3	2	1

[1]

(c) State **one** other process that the microprocessor could control. [1]

Solution:

(a) heater on and motor on/hot wash

(b)

8	7	6	5	4	3	2	1
0	0	0	1	0	0	0	0

(c) Any **one** from:
release door – via door switch
releasing powder at set intervals/fabric conditioner
drying/spinning
give error messages/beeps
stored programs for different washes e.g. cottons/woollens

Oct/Nov 2005:

7 A company keeps details of all its employees on a file. The record format for each employee is:

Field:	Name	Sex	Department	Location	Years in company
Size:	15 characters	1 character	1 character	10 characters	2 digits

The following codes are used:

Sex:	F = female	M = male
Department:	A = administration	F = finance
	M = management	S = sales

One typical record is:

P		D	E	M	E	T	R	A	K	I	S				M	F	C	Y	P	R	U	S				0	5

(a) In which **Department** does P Demetrakis work?

.....[1]

(b) Complete the record for Miss K Schroder, who is in the sales department in Austria. She has worked in the company for 8 years.

[3]

(c) Give **two** advantages of using codes when storing data.

1 .....

.....

2 .....

.....[2]

(d) **(i)** Why is it **not** a good idea to use the field **Years in company** to store information about how long an employee has worked for the company?

.....

.....

(ii) What would be a more suitable field?

.....

.....

[2]

Solution:

(a) Finance/Management

(b) (NOTE: Accept FS AUSTRIA one box to the left)

K		S	C	H	R	O	D	E	R					F	S	A	U	S	T	R	I	A				0	8

< - - - - - - - - - - - - - - 1 mark - - - - - - - - - - - - - -><- - - - - - - - - - -1 mark - - - - - - ><1 mk>

(c) Any **two** advantages from
shorter, therefore less memory/storage used
shorter, therefore less typing required/faster input
less chance of errors being made
easier/faster to carry out searches/process data
easier/faster to do validation checks

(d) **(i)** Any **one** from
changes every year
files would need to be updated every year

(ii) date/year employee joined the company

May/June 2007:

9 A 7-segment display is used to indicate which floor a lift is on. Each segment is numbered as shown:

A byte is used to hold the data needed to light the correct segments. Bit 0 is always zero. For example, 3 is represented by

and by

1	0	0	1	1	1	1	0
7	6	5	4	3	2	1	0

Bit Number

(a) If the lift is to stop at more than one floor, the data is held in successive bytes. For example:

FIRST BYTE:	0	0	0	0	1	1	1	0
SECOND BYTE:	1	1	0	1	1	0	1	0

Which floor numbers are stored in each byte?

First byte floor number .....

Second byte floor number ..... [2]

(b) What bit pattern is used to indicate Floor 2?

[1]

(c) The lift is travelling down to stop at Floors 5, 3 and 1. When it stops at Floor 5, a passenger gets in and presses the button for Floor 2.

How does the system ensure that the lift stops at Floors 3, 2 and 1 **in that order**?

.....

..... [3]

Solution:

(a) 7
5

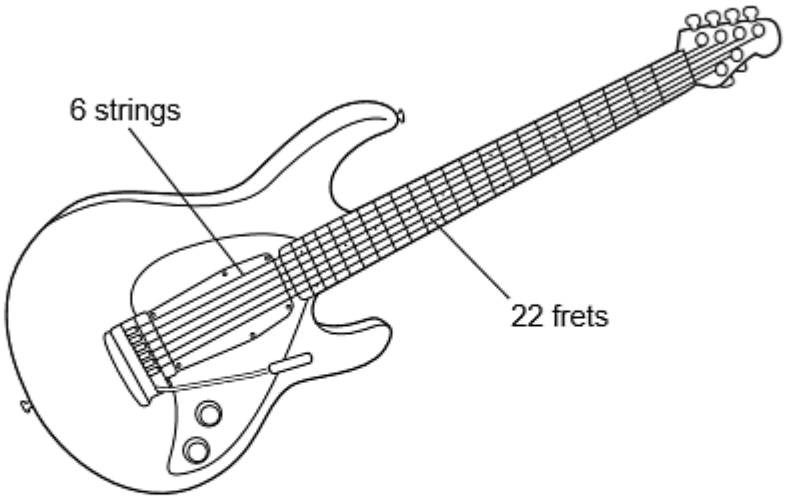
(b) 10110110

(c) Any **three** points from:

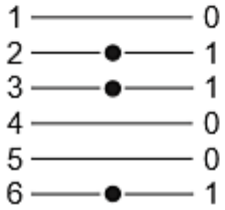
Notes lift is going down
Notes required floor is less than present floor
Sorts remaining numbers into descending order of floors

Oct/Nov 2009:

15 Electric guitars consist of strings and frets.



Musical notes on the guitar can be represented using the TAB notation:



Each line represents a string; the dots indicate which strings must be held down with the fingers. These are shown with a binary value of 1; otherwise the binary value is 0.

Thus, the above note would be shown as:

6	5	4	3	2	1
1	0	0	1	1	0

TAB notation

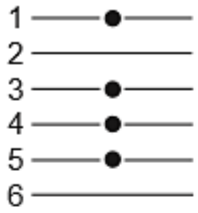
It is also important to indicate **where** the strings should be held down. This is shown on the FRET. If the fingers are to be held down at the 20th FRET, this is shown in binary as:

32	16	8	4	2	1
0	1	0	1	0	0

FRET position

(NOTE: add up the numbers in the headings where binary 1s appear, i.e. 16 + 4 = 20)

(a) A note is being played according to the TAB notation:



The strings are being held down on the 18th FRET.

Write down the binary notation for the TAB and for the FRET position:

TAB notation:

6	5	4	3	2	1

FRET position:

32	16	8	4	2	1

[2]

(b) **(i)** Show on the diagram below which note corresponds to TAB notation: 000010.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

(ii) What FRET position corresponds to 010011? [2]

(c) Describe **two** advantages of storing musical notes in this format.

1 .....

2 ..... [2]

Solution:

(a) TAB: 0 1 1 1 0 1

FRET: 0 1 0 0 1 0

(b) **(i)**

(ii) 19

(c) Any **two** from:

can store music directly onto digital, optical media/mp3 players
easy to modify music by simply changing binary values
easy to teach somebody how to play an instrument
easy to convert music for other instruments
allows auto play back through interfaces
uses less memory

Oct/Nov 2013 P13:

16 A customer logs on to a secure website using a code and a password. The first stage is to key in a code which is his date of birth (DDMMYY) followed by 1234. The second stage is to type in the first, third, fourth and seventh character of his password.

The customer last logged on to the website on 15th March 2010.

(a) (i) The customer's date of birth is 15th November 1985. What is the customer's code?

(ii) Why is this code not unique?

(iii) Suggest how this coding system could be improved. [3]

(b) (i) The customer's password is PAULO168.

What does the customer need to type at the second stage?

(ii) Why are passwords used? [2]

(c) If the customer gets through the two stages above he is then directed to a new security page which states:

"You were last logged on to this website on 14th April 2010. Is this correct?"

What could have happened to make the customer concerned about this statement? [1]

Solution:

(a) (i)

1	5	1	1	8	5	1	2	3	4

(ii) more than one person can have same date of birth

(iii) Any **one** from:
- give different 4-digit codes to people
- increase the number of digits in code (e.g. 10 instead of 4)

(b) (i)

1st	3rd	4th	7th
P	U	L	6

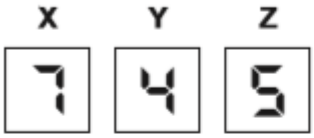
(ii) to prevent illegal access to the website

(c) Any **two** from:
- he last logged on on 16th March 2010 and system shows 14th April 2010
- there is evidence of illegal access

May/June 2014 P11:

12 A digital light meter has a 3-digit LCD. The value of each digit on the instrument display is stored as a 4-bit binary number in a register.

For example:



is represented by:

	8	4	2	1	
X	0	1	1	1	X
Y	0	1	0	0	Y
Z	0	1	0	1	Z

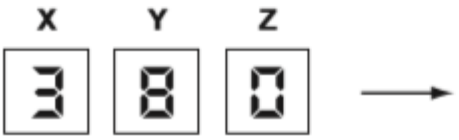
(a) What value is shown on the display if the 4-bit binary registers contain:

	8	4	2	1
X	0	0	1	0
Y	1	0	0	1
Z	0	0	0	1

→ X Y Z

[3]

(b) What would be stored in the 4-bit binary registers if the display shows:



→

	8	4	2	1	
X					X
Y					Y
Z					Z

[3]

(c) If any of the 4-bit binary registers X, Y or Z contain the value **1 1 1 1** this indicates an error.

(i) How could this error be shown on the instrument display? [1]

(ii) What could cause an error to occur? [1]

Solution:

(a)

(b)

0	0	1	1	X

1	0	0	0	Y
0	0	0	0	Z

(c) (i) E, E, E
Flashing display/digits
ERR

(or the equivalent answer)

(ii) Any **one** from:
– a fault in the system
– reading exceeded the value 999

May/June 2014 P12:

16 An encryption system gives each letter of the alphabet a value:

A = 1, B = 2, C = 3, ..., Y = 25, Z = 26.

Each letter is stored in a 12-bit binary register. The letter "**S**" (19th letter) is stored as:

2048	1024	512	256	128	64	32	16	8	4	2	1
0	0	0	0	0	0	0	1	0	0	1	1

A 4-bit register is used to store the encryption key. This register shows how many places the bits are shifted to the left in the 12-bit register when it is encrypted. So,

8	4	2	1
0	1	0	1

means each bit in the 12-bit register is shifted 5 places to the left and the register now becomes:

2048	1024	512	256	128	64	32	16	8	4	2	1
0	0	1	0	0	1	1	0	0	0	0	0

Therefore, the letter "**S**" would be transmitted with the 4-bit register and the 12-bit register as follows:

0	1	0	1	0	0	1	0	0	1	1	0	0	0	0	0

(a) "**W**" is the 23rd letter of the alphabet.

(i) Show how this letter would be stored in the 12-bit register before encryption:

(ii) The 4-bit register contains the following value:

8	4	2	1
0	1	1	0

Show how the letter "**W**" is now stored in the 12-bit register in encrypted form:

[2]

(b) Find which letter of the alphabet has been encrypted here. (Show all your working.)

0	0	1	1	0	0	0	0	1	1	0	0	1	0	0	0

[2]

(c) (i) What is the largest encryption key that can be stored in the 4-bit register?

8	4	2	1

(ii) Convert this into denary (base 10). [3]

Solution:

(a) (i)

0	0	0	0	0	0	0	**1**	**0**	**1**	**1**	**1**

(ii)

0	**1**	**0**	**1**	**1**	1	0	0	0	0	0	0

(b) one mark
– letter "Y" or 25th letter

One mark
– the binary number 0 0 0 0 1 1 0 0 1 0 0 0 has been shifted (to the left) 3 places
– so the binary number becomes 0 0 0 0 0 0 0 1 1 0 0 1
– 1+8+16

(c) (i) 1 1 1 1
(ii) 15 *(allow follow through from (i))*
(iii) – try to move 15 places to the left which is not possible
– only 12 bits in register to store letter; 15 is too large
– you would end up with 12 0s in the register

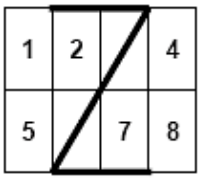
Oct/Nov 2014 P12:

12 An advertising sign uses large LED characters controlled by a microprocessor.

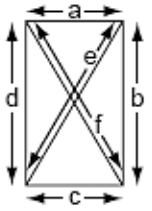
Each letter is formed from a grid made up of eight rectangles numbered 1 to 8:

1	2	3	4
5	6	7	8

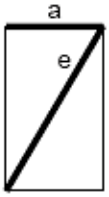
For example, the letter "Z" is formed as follows:



Each rectangle has six LEDs that can light up; these LEDs are labelled "a" to "f":



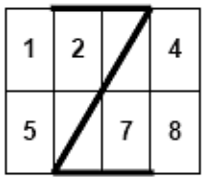
The LEDs in a rectangle can be represented in a 6-bit register. For example, rectangle 3 of the letter "Z":



can be represented as:

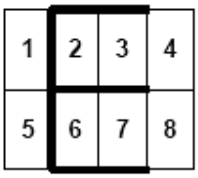
f	e	d	c	b	a
0	1	0	0	0	1

Thus the letter "Z" can be represented by the 8 registers:



	f	e	d	c	b	a
1	0	0	0	0	0	0
2	0	0	0	0	0	1
3	0	1	0	0	0	1
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	1	0	1	0	0
7	0	0	0	1	0	0
8	0	0	0	0	0	0

(a) Show how the letter "E" can be represented by the eight 6-bit registers (four registers have been done for you).

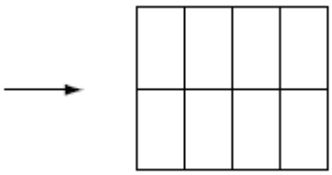


	f	e	d	c	b	a	
	0	0	0	0	0	0	1
							2
							3
	0	0	0	0	0	0	4
	0	0	0	0	0	0	5
							6
							7
	0	0	0	0	0	0	8

[4]

(b) State which letter of the alphabet is represented by the following eight 6-bit registers.

f	e	d	c	b	a	
0	0	0	0	0	0	1
0	0	1	0	0	0	2
0	0	0	0	1	0	3
0	0	0	0	0	0	4
0	0	0	0	0	0	5
0	0	1	0	0	1	6
0	0	0	0	1	1	7
0	0	0	0	0	0	8



letter ..... [2]

Solution:

(a) 1 mark for each of four rows shown in bold below; there are two possible ways of doing this – one set of answers is shown on the left and the alternative is shown on the right in brackets. Don't allow mix and match; answers must either be as shown on the left OR as shown on the right

0 0 0 0 0 0

0 0 1 0 0 1 **(OR 0 0 1 1 0 1)**

0 0 0 0 0 1 **(OR 0 0 0 1 0 1)**

0 0 0 0 0 0

0 0 0 0 0 0

0 0 1 1 0 1 **(OR 0 0 1 1 0 0)**

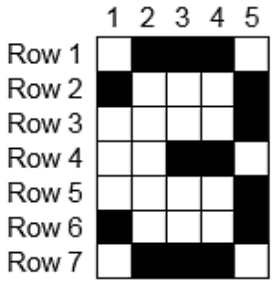
0 0 0 1 0 1 **(OR 0 0 0 1 0 0)**

0 0 0 0 0 0

(b) 2 marks for identifying the letter
letter: H

Oct/Nov 2014 P13:

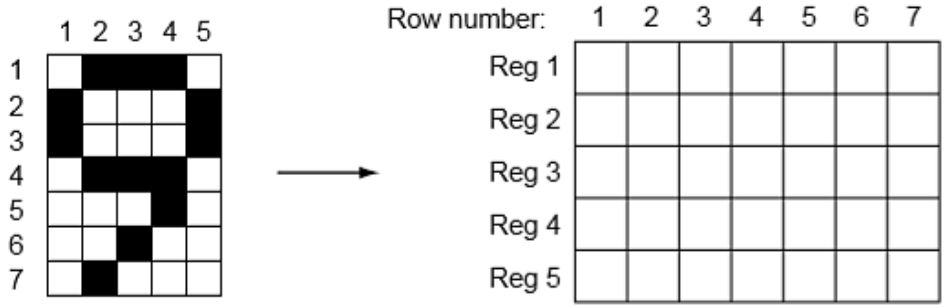
14 Digits on an electronic display board can be represented on a 7 × 5 grid. For example, the digit 3 is represented as:



Each column in the grid is represented in a computer as a 7-bit register. Five registers are required to represent the state of the whole digit. The value 1 represents a shaded square and the value 0 represents an unshaded square. For example, the digit 3 is represented as:

Row number:	1	2	3	4	5	6	7
Register 1	0	1	0	0	0	1	0
Register 2	1	0	0	0	0	0	1
Register 3	1	0	0	1	0	0	1
Register 4	1	0	0	1	0	0	1
Register 5	0	1	1	0	1	1	0

(a) Show the contents of the five 7-bit registers when representing the digit 9:



[4]

(b) In order to prevent errors, an 8-bit register is used. The 8th bit will contain:

- 0 – if the first 7 bits add up to an even number
- 1 – if the first 7 bits add up to an odd number

Complete the 8th bit for each register. The first register has been completed for you.

	1	2	3	4	5	6	7	8
Reg 1	0	1	0	0	0	1	0	0
Reg 2	1	0	0	0	0	0	1	
Reg 3	1	0	0	1	0	0	1	
Reg 4	1	0	0	1	0	0	1	
Reg 5	0	1	1	0	1	1	0	

[3]

Solution:

(a)

Row number:	1	2	3	4	5	6	7
Reg 1:	0	1	1	0	0	0	0
Reg 2:	1	0	0	1	0	0	1
Reg 3:	1	0	0	1	0	1	0
Reg 4:	1	0	0	1	1	0	0
Reg 5:	0	1	1	0	0	0	0

Reg 1 + Reg 5 = 1 mark
Reg 2 = 1 mark
Reg 3 = 1 mark
Reg 4 = 1 mark

(b)

	8
Reg 1:	0
Reg 2:	0
Reg 3:	1
Reg 4:	1
Reg 5:	0

Reg 2 + Reg 5 = 1 mark
Reg 3 = 1 mark
Reg 4 = 1 mark

May/June 2015 P11:

8 An alarm clock is controlled by a microprocessor. It uses the 24 hour clock. The hour is represented by an 8-bit register, **A**, and the number of minutes is represented by another 8-bit register, **B**.

(a) Identify what time is represented by the following two 8-bit registers.

A

128	64	32	16	8	4	2	1
0	0	0	1	0	0	1	0

:

B

128	64	32	16	8	4	2	1
0	0	1	1	0	1	0	1

Hours ..... Minutes ..... [2]

(b) An alarm has been set for 07:30. Two 8-bit registers, **C** and **D**, are used to represent the hours and minutes of the alarm time.

Show how 07:30 would be represented by these two registers:

C

Hours

:

D

Minutes

[2]

(c) Describe how the microprocessor can determine when to sound the clock alarm. [3]

(d) The LCD (liquid crystal display) on the clock face is back-lit using blue LEDs (light emitting diodes). The brightness of the clock face is determined by the level of light in the room. The amount of light given out by the LEDs is controlled by a control circuit.

Describe how the sensor, microprocessor and LEDs are used to maintain the correct brightness of the clock face. [3]

(e) Modern LCD monitors and televisions use LED back-lit technology.

Give **two** advantages of using this new technology compared to the older cold cathode fluorescent lamp (CCFL) method.

1 .....

2 .....[2]

Solution:

(a) hours: **18**
minutes: **53**

(b)

hours ("C")									minutes ("D")								
0	0	0	0	0	1	1	1	:	0	0	0	1	1	1	1	0

(c) Any **three** from:
- reads values in registers "C" and "D"
- and checks the values against those stored in registers "A" and "B"
  (**NOTE**: the first two statements can be interchanged, i.e. "A" and "B" read first)
- If values in corresponding registers are the same
- the microprocessor sends a signal to sound alarm/ring

(d) Any **three** from:
- uses a light sensor
- sends signal/data back to microprocessor
- signal/data converted to digital (using ADC)
- value compared by microprocessor with pre-set/stored value
- if value < stored value, signal sent by microprocessor …
- … to the voltage supply (unit)
- … "value" of signal determines voltage supplied/brightness of LED

(e) Any **two** from:
- no need to warm up
- whiter tint/more vivid colours/brighter image
- higher resolution
- much thinner monitors possible/lighter weight
- more reliable technology/longer lasting
- uses much less power/more efficient

May/June 2015 P12:

5 Parity checks are often used to check for errors that may occur during data transmission.

(a) A system uses **even parity**.

Tick (✓) to show whether the following three bytes have been transmitted correctly or incorrectly.

Received byte	Byte transmitted correctly	Byte transmitted incorrectly
11001000		
01111100		
01101001		

[3]

(b) A parity byte is used to identify which bit has been transmitted incorrectly in a block of data.

The word "F L O W C H A R T" was transmitted using nine bytes of data (one byte per character). A tenth byte, the parity byte, was also transmitted.

The following block of data shows all ten bytes received after transmission. The system uses **even parity** and column 1 is the parity bit.

	letter	column 1	column 2	column 3	column 4	column 5	column 6	column 7	column 8
byte 1	F	1	0	1	0	0	1	1	0
byte 2	L	1	0	1	0	1	1	0	0
byte 3	O	1	0	1	0	1	1	1	1
byte 4	W	1	0	1	1	0	1	1	1
byte 5	C	1	0	1	0	0	0	1	1
byte 6	H	0	0	1	0	1	0	0	0
byte 7	A	0	0	1	0	0	1	0	1
byte 8	R	1	0	1	1	0	0	1	0
byte 9	T	1	0	1	1	0	1	0	0
parity byte		1	0	1	1	1	1	1	0

(i) **One** of the bits has been transmitted incorrectly.
Write the byte number and column number of this bit:
Byte number .....
Column number ..... [2]

(ii) Explain how you arrived at your answer for **part (b)(i)**. [2]

(c) Give the denary (base 10) value of the byte: **1 0 1 1 1 1 1 0** [1]

(d) A parity check may not identify that a bit has been transmitted incorrectly.

Describe **one** situation in which this could occur. [1]

Solution:

(a) 1 mark per correctly placed tick

Received byte	Byte transmitted correctly	Byte transmitted incorrectly
1 1 0 0 1 0 0 0		✓
0 1 1 1 1 1 0 0		✓
0 1 1 0 1 0 0 1	✓	

(b) (i) byte number: **7**
column number: **6**

(ii) Any **two** from:
- letter "A"(byte 7) transmitted as odd parity (three 1s)
- column 6 has odd parity (seven 1s)
- intersection of byte 7 and column 6 indicates incorrect bit value

(c) 190

(d) Any **one** from:
- 2 bits interchanged (e.g. 1 → 0 and 0 → 1) that won't change parity value
- even number of bits/digits are transposed
- If there are multiple errors in the same byte/column, that still produce the same parity bit, the error will not be detected

10 Letters from the alphabet are represented in a computer by the following denary (base 10) values:

A = 97
G = 103
I = 105
L = 108
N = 110

The word "**A L I G N**" is stored as: 97 108 105 103 110

(a) Convert each of the five values to binary. The first one has been done for you.

Letter	Denary value							
A (97):	0	1	1	0	0	0	0	1
L (108):								
I (105):								
G (103):								
N (110):								

[2]

(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

								hexadecimal
L:								.....
G:								.....

[4]

Solution:

(a)

L (108):	0	1	1	0	1	1	0	0
I (105):	0	1	1	0	1	0	0	1
G (103):	0	1	1	0	0	1	1	1
N (110):	0	1	1	0	1	1	1	0

(b)

									hexidecimal
L:	1	1	0	1	1	0	0	0	D8
G:	1	1	0	0	1	1	1	0	CE

Oct/Nov 2015 P12:

4 (a) (i) Convert the following **two** hexadecimal numbers into binary:

F A 7
D 3 E

F A 7 | | | | | | | | | | | |

D 3 E | | | | | | | | | | | |

[4]

(ii) Now perform the AND (logic) operation on each corresponding pair of binary bits in the two numbers from **part (i)**.

| | | | | | | | | | | | |

[2]

(iii) Convert your answer in **part (ii)** into hexadecimal. [2]

(b) (i) The following code shows HTML 'tag' pairs on either side of the text stating the colour that each creates.

```
<font color " # F F 0 0 0 0 " > RED </font>
<font color " # 0 0 F F 0 0 " > GREEN </font>
<font color " # 0 0 0 0 F F " > BLUE </font>

<font color " #      X      " > YELLOW </font>
<font color " #      Y      " > MAGENTA </font>
<font color " #      Z      " > CYAN </font>
```

Yellow is a combination of red and green, magenta a combination of red and blue and cyan a combination of green and blue.

State what 6-digit hexadecimal values should replace X, Y and Z in the above code.

X .....

Y .....

Z .....[3]

(ii) Describe how other colours, such as a darker shade of blue, are created. [2]

(c) 1A – 16 – C5 – 22 – FF – FF is an example of a MAC address.

(i) Identify what the first six and last six hexadecimal digits represent.

First six digits .....

Last six digits .....[2]

(ii) State why MAC addresses are used. [1]

Solution:

(a) (i)

F A 7:	1	1	1	1		1	0	1	0		0	1	1	1
D 3 E:	1	1	0	1		0	0	1	1		1	1	1	0

(ii)

1	1	0	1		0	0	1	0		0	1	1	0

(iii) D 2 6

(b) (i) (X) FF FF 00

(Y) FF 00 FF

(Z) 00 FF FF

(ii) – hex values between 0 to F are combined together to create a hex code
– different combinations in hex codes will create different shades/tones/colours

(c) (i) First six digits: manufacturer code/manufacturer ID

Last six digits: serial number/serial ID of device/product

(ii) Allows all devices to be uniquely identified

7 (a) Check digits are used to ensure the accuracy of input data.

A 7-digit code number has an extra digit on the right, called the check digit.

Digit position	1	2	3	4	5	6	7	8
Digit	–	–	–	–	–	–	–	–

The check digit is calculated as follows:

- each digit in the number is multiplied by its digit position
- the seven results are then added together
- this total is divided by 11
- the remainder gives the check digit (if the remainder = 10, the check digit is X)

(i) Calculate the check digit for the following code number. Show all your working.

4 2 4 1 5 0 8 …

Check digit ..... [2]

(ii) An operator has just keyed in the following code number:

3 2 4 0 0 4 5 X

Has the operator correctly keyed in the code number?

(b) When data are transmitted from one device to another, a parity check is often carried out on each byte of data. The parity bit is often the leftmost bit in the byte.

(i) If a system uses even parity, give the parity bit for each of the following bytes:

parity bit							
	1	**1**	**0**	**0**	**1**	**1**	**0**

parity bit							
	0	**0**	**0**	**0**	**0**	**0**	**1**

[2]

(ii) A parity check can often detect corruption of a byte.
Describe a situation in which it **cannot** detect corruption of a byte. [1]

Solution:

(a) **(i)** (4 × 1) + (2 × 2) + (4 × 3) + (1 × 4) + (5 × 5) + (0 × 6) + (8 × 7)

= 4 + 4 + 12 + 4 + 25 + 0 + 56 = 105

105/11 = 9 remainder 6
check digit is: **6**

(ii) **1 mark**
- No/incorrect check digit

2 marks
- Total is 78
- 78/11 …
- … gives 7 remainder 1
- check digit should be 1

(b) **(i)** parity bit

0	**1**	**1**	**0**	**0**	**1**	**1**	**0**

parity bit

1	**0**	**0**	**0**	**0**	**0**	**0**	**1**

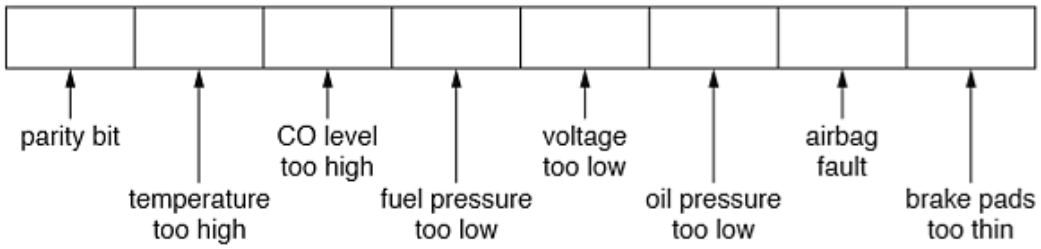
(ii) Any **one** from:
- an even number of digits are changed
- a transposition error(s) has occurred

Oct/Nov 2015 P13:

2 Sensors and a microprocessor monitor a car exhaust for high temperature and high carbon monoxide (CO) levels.

(a) Describe how the sensors and microprocessor are used to monitor the temperature and CO levels and warn the driver if either is out of range. [5]

(b) The information from seven sensors is sent to an engine management system in the car. The status of each sensor is stored in an 8-bit register; a value of 1 indicates a fault condition:



For example, a register showing **0 1 0 1 1 0 0 0** indicates:
- temperature too high
- fuel pressure too low
- voltage too low

(i) Identify the fault condition(s) that the following register indicates:

0	**0**	**1**	**0**	**0**	**1**	**0**	**1**

[2]

(ii) The system uses **odd** parity.
Write the correct parity bit in each register.

	1	**1**	**1**	**0**	**0**	**1**	**0**

	0	0	0	1	1	1	0

[2]

(iii) A car has a faulty airbag and the CO level is too high.
Write what should be contained in the 8-bit register.

[2]

(iv) Give the hexadecimal value of the binary number shown in **part (iii)**. [1]

Solution:

(a) Any **five** from:
- sensors send signals / data to microprocessor
- signal / data converted to digital (by an ADC)
- microprocessor compares temperature / carbon monoxide level / value with stored level / value
- if CO level > stored value, microprocessor sends signal…
- if temperature > stored value, microprocessor sends signal…
- …to light warning bulb on dashboard / sounds alarm

(b) **(i)** CO (carbon monoxide) level too high
oil pressure too low
brake pads too thin

(ii)

1	1	1	1	0	0	1	0

0	0	0	0	1	1	1	0

(iii)

1	0	1	0	0	0	1	0

(iv) A 2 (allow follow through from part (iii))

3 A section of computer memory is shown below:

Address	Contents
1000 0000	0110 1110
1000 0001	0101 0001
1000 0010	1000 1101
1000 0011	1000 1100
1000 1100	
1000 1101	
1000 1110	
1000 1111	

(a) **(i)** The contents of memory location 1000 0001 are to be read.
Show the contents of the Memory Address Register (MAR) and the Memory Data Register (MDR) during this read operation:

MAR								
MDR								

[2]

(ii) The value 0111 1001 is to be written into memory location 1000 1110.
Show the contents of the MAR and MDR during this write operation:

MAR								
MDR								

[2]

(iii) Show any changes to the computer memory following the read and write operations in **part (a)(i)** and **part (a)(ii)**.

Address	Contents
1000 0000	0110 1110
1000 0001	0101 0001
1000 0010	1000 1101
1000 0011	1000 1100
1000 1100	
1000 1101	
1000 1110	
1000 1111	

[1]

(b) Name **three** other registers used in computers. [3]

(c) The control unit is part of a computer system.
What is the function of the control unit? [3]

Solution:

(a) (i)

MAR	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
MDR	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**1**

(ii)

MAR	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**0**
MDR	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**

(iii)

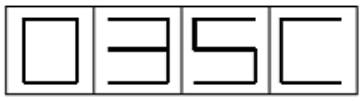
Address	Contents
1000 0000	0110 1110
1000 0001	0101 0001
1000 0010	1000 1101
1000 0011	1000 1100
1000 1100	
1000 1101	
1000 1110	**0111 1001**
1000 1111	

(b) – CIR (Current Instruction Register)
– PC (Program Counter)
– Acc (Accumulator)

(c) – Controls operation of memory, processor and input/output
– Instructions are interpreted
– Sends signals to other components telling them "what to do"

May/June 2016 P11:

7 Each seat on a flight is uniquely identified on an LCD above the seat. For example, seat 035C is shown as:



The first three characters are digits that represent the row.
The fourth character is the seat position in that row. This is a single letter, A to F, that is stored as a hexadecimal value.

Each of the four display characters can be stored in a 4-bit register. For example, 0 and C would be represented as:

	8	4	2	1
0:	0	0	0	0
C:	1	1	0	0

(a) Show how the 4-bit registers would store the remaining two characters, 3 and 5.

3				
5				

[2]

(b) Identify which seat is stored in the following 4-bit registers.

0	0	0	1	→ .....
1	0	0	1	→ .....
0	1	0	0	→ .....
1	1	1	0	→ .....

[2]

Solution:

(a)

3	0	0	1	1
5	0	1	0	1

(b)

0	0	0	1	→ 1
1	0	0	1	→ 9
0	1	0	0	→ 4
1	1	1	0	→ E

9 Check digits are used to ensure the accuracy of entered data.
A 7-digit number has an extra digit on the right, called the check digit.

digit position:	1	2	3	4	5	6	7	8
digit:	–	–	–	–	–	–	–	–
								↑
								check digit

The check digit is calculated as follows:

- each digit in the number is multiplied by its digit position
- the seven results are then added together
- this total is divided by 11
- the remainder gives the check digit (if the remainder = 10, the check digit is X)

(a) Calculate the check digit for the following number. Show all your working.

4 2 4 1 5 0 8 ...

Check digit .....[2]

(b) An operator has just keyed in the following number:

3 2 4 0 0 4 5 X

Circle below **correct** if the check digit is correct **OR incorrect** if the check digit is incorrect.

correct **incorrect**

Explain your answer. [3]

Solution:

(a) (4 × 1) + (2 × 2) + (4 × 3) + (1 × 4) + (5 × 5) + (0 × 6) + (8 × 7)
= 4 + 4 + 12 + 4 + 25 + 0 + 56 = 105
105/11 = 9 remainder 6
check digit is: **6**

(b) **incorrect** check digit
- check digit should be 1
- (3*1) + (2*2) + (4*3) + (0*4) + (0*5) + (4*6) + (5*7) // 3 + 4 + 12 + 0 + 0 + 24 + 35 //
  Total = 78
- 78/11 gives 7 remainder 1

12 **(a)** Name the following type of barcode:

.....[1]

(b) The barcode in **part (a)** contains the denary value **2 6 4 0**

Convert this value to hexadecimal.

Write the value as a 12-bit binary number.

[4]

(c) An airport uses the type of barcode shown in **part (a)** to advertise local places of interest.
Describe how a visitor landing at the airport could use these barcodes to help plan their visit.

.....[3]

Solution:

(a) **QR (quick response) Code**

(b) – **A 5 0** (1 mark)

1	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**

(c) Any **three** from:
- visitor scans the QR code with (the camera on) the mobile device
- App is used to read/interpret the QR code
- links to a website/opens a document …
- … to access local tourist information
- can store the QR code to refer to again for the information

---

May/June 2016 P12:

3 **(a)** Convert the following hexadecimal number into 12-bit binary:

4 A F

[3]

(b) The 2016 Olympic Games will be held in Rio de Janeiro. A timer that counts down to the opening of the Games is shown on a microprocessor-controlled display.
The number of hours, minutes and seconds until the Games open are held in three 8-bit registers.
The present register values are:

0	1	1	0	1	0	0	1	105 hours
0	0	1	0	0	0	0	0	32 minutes
0	0	0	1	0	1	0	0	20 seconds

The timer will count **down** in seconds.

(i) Show the values in each 8-bit register **30 seconds** after the time shown above:

								hours
								minutes
								seconds

[3]

(ii) Write the hexadecimal value of the **minutes** register from **part (b)(i)**. [1]

Solution:

(a) 0100 1010 1111

(b) **(i)**

0 1 1 0 1 0 0 1	105 hours
0 0 0 1 1 1 1 1	31 minutes
0 0 1 1 0 0 1 0	50 seconds

(ii) 1F

9 In the following barcode, each binary number is made up of seven bars.
Each bar is black or grey.
A black bar is interpreted as a "1" and a grey bar is interpreted as a "0".

(a) Write the binary numbers that would be produced from this barcode:

Binary number A **Binary number B**

Binary number A:							
Binary number B:							

[2]

(b) This barcode system uses odd parity.
Write the parity bit for each of the binary numbers in **part (a)**:

	Parity bit
Binary number A:	
Binary number B:	

[2]

Solution:

(a)

Binary number A:	**1**	**1**	**1**	**0**	**0**	**1**	**0**

Binary number B:	1	0	0	1	1	1	0

(b)

	Parity Bit
Binary number A	1
Binary number B	1

Oct/Nov 2016 P12:

4 Nine bytes of data are transmitted from one computer to another. Even parity is used. An additional parity byte is also sent.

The ten bytes arrive at the destination computer as follows:

	parity bit	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7	bit 8
byte 1	1	1	1	0	1	1	1	0
byte 2	0	0	0	0	0	1	0	1
byte 3	0	1	1	1	1	0	0	0
byte 4	1	1	0	0	0	0	0	0
byte 5	1	0	1	1	1	1	1	0
byte 6	0	1	0	1	1	0	0	1
byte 7	0	1	1	1	0	0	1	1
byte 8	0	0	1	1	0	1	1	0
byte 9	1	1	0	0	0	0	1	1
parity byte	0	0	1	0	0	0	1	0

One of the bits was corrupted during the data transmission.

(a) **Circle** the corrupt bit in the corrupt byte in the table above. [1]

(b) Explain how the corrupted bit was found. **[2]**

Solution:

(a) Intersection of Row 7 and column 4 circled

(b) – Row (byte number) 7 has an odd number of 1s (five 1s)
– Column (bit number) 4 has an odd number of 1s (five 1s)

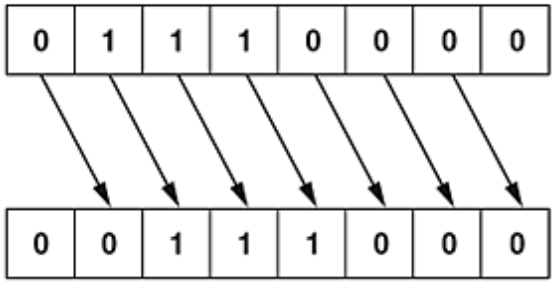
5 A computer uses an 8-bit register.
The 8-bit register contains binary integers.

(a) Write the denary (base 10) value represented by:

128	64	32	16	8	4	2	1
0	1	1	1	0	0	0	0

[1]

(b) All the bits in the register are shifted **one** place to the **right** as shown below.



[1]

Write the denary number that is represented after this shift.

(c) State the effect the shift to the right had on the original denary number from **part (a)**. [1]

(d) The original number in **part (a)** is shifted **three** places to the **right**.

(i) Show the new binary number:

[1]

(ii) Write the equivalent denary number. [1]

Solution:

(a) 112

(b) 56

(c) divided by 2 // value 112 was halved // multiplied by 0.5

(d) **(i)**

0	**0**	**0**	**0**	**1**	**1**	**1**	**0**

(ii) 14

(e) Any **two** from:

- run out of places to the right of register / at the end of register
- right-most 1 would be lost
- number would become 3 instead of 3.5
- loss of precision

11 A security system is installed in a house. A hexadecimal number is entered to activate or deactivate the alarm.

(a) The alarm code is set to hexadecimal number **2 A F**
Show how this number would be stored in a 12-bit binary register.

[3]

(b) Identify **two** sensors that the security system could use to detect intruders.
Describe how each sensor could be used in the security system.

Sensor 1 .....
Description .....
Sensor 2 .....
Description ..... [6]

Solution:

(a) 0010 1010 1111

(b) Infrared/motion sensor

- Receives infrared rays/heat
- Sends data to microprocessor
- Receives microwaves
- Placed in the corner of a room, across a doorway
- Used to detect the heat of an intruder // used to detect if an infrared beam has been broken by an intruder

Pressure sensor

- Receives current if circuit created // stops receiving current if circuit is broken
- Sends data to microprocessor
- Placed on a window/door, at the entrance
- Used to detect a change in pressure

5 (c) A microprocessor regularly samples the output, X. Each sample value is stored in an 8-bit register as shown below. One bit of this register is reserved as a parity bit.

Five consecutive output values of 1 indicate a fault condition.
Identify which of the following registers shows a fault condition.

Parity bit

1	1	1	1	1	1	0	0	1	**Register Y**
0	1	0	1	1	1	1	1	**Register Z**

Register .....[1]

(d) When eight bytes of data have been collected, they are transmitted to a computer 100 km away. Parity checks are carried out to identify if the data has been transmitted correctly. The system uses **even parity** and column 1 is the parity bit.

The eight bytes of data are sent together with a ninth parity byte:

	parity bit	column 2	column 3	column 4	column 5	column 6	column 7	column 8
byte 1	1	0	0	0	0	1	0	0
byte 2	1	1	1	1	0	0	1	1
byte 3	0	1	0	0	1	0	0	0
byte 4	0	1	1	1	0	0	0	1
byte 5	1	0	0	0	1	1	1	1
byte 6	0	0	0	0	0	0	0	0
byte 7	1	1	1	0	1	0	0	0
byte 8	1	0	0	0	1	1	1	0
parity byte	1	0	1	1	0	1	1	1

(i) Identify which of the eight bytes contains an error.

byte .....[1]

(ii) Identify which column contains an error.

column .....[1]

(iii) The incorrect bit is indicated where the byte number and column cross.
Give the corrected byte.

[1]

(iv) Calculate the denary value of the corrected byte. [1]

(v) Considering the fault condition given in **part (c)**, explain why it is very important that the incorrect bit is located and corrected. [2]

Solution:

(c) Register Z

(d) **(i)** (byte) 5

(ii) (column) 4

(iii) corrected byte is: **1 0 0 1 1 1 1 1**

(iv) that gives the value: **1 5 9**
(follow through applies)

(v) Any **two** from:
- The byte would be transmitted without having 5 consecutive 1's
- The fault condition would not be recognised

10 **(a)** A manufacturer of aeroplane engines assigns a denary identification number (ID) to each engine.

One engine has the ID: 0431

(i) Convert this denary number to a 12-bit binary format.

[2]

(ii) Show how this number would be represented in hexadecimal. [3]

(b) The current status of the engine is sent to a computer in the aeroplane.
Each piece of data collected is 8 bytes in size. Data collection occurs every 30 seconds.
Calculate the number of kilobytes that would be needed to store the data collected during a 10-hour flight. Show your working.

..... kilobytes [3]

Solution:

(a) **(i)**

0	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**

(ii) **1 A F**

(b) Working
- 1200 × 8 = 9600 (bytes)
- 9600/1024 or 9600/1000

Answer
- 9.4 or 9.6 kilobytes

Specimen paper 2016:

1 A company selling CDs uses a unique 6-digit identification number for each CD title. The right-most digit (position 1) is a *check digit*.

For example,

6 5 4 3 2 1 ← digit position
3 0 6 1 4 9 ← identification number
↑
check digit

The validity of the number and check digit is calculated as follows:
- multiply **each** digit by its digit position
- add up the results of the multiplications
- divide the answer by 11
- if the remainder is 0, the identification number and check digit are valid.

(a) Show whether the following identification numbers are valid or not. You **must** show how you arrived at your answer.

Identification number 1: 4 2 1 9 2 3
working: .....
valid or not valid? .....

Identification number 2: 8 2 0 1 5 6
working: .....
valid or not valid? ..... [3]

(b) Find the check digit for this identification number.

5 0 2 4 1 __
working: .....
check digit: ..... [2]

(c) Describe, with examples, **two** different types of data entry errors that a check digit would detect.

1 .....
2 ..... [2]

Solution:

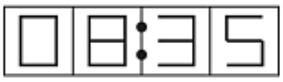
(a) Identification number 1: working
= (4 × 6) + (2 × 5) + (1 × 4) + (9 × 3) + (2 × 2) + (3 × 1)
= 24 + 10 + 4 + 27 + 4 + 3
= 72 ÷ 11
= 6 remainder **6**
valid/not valid: NOT valid

Identification number 2: working
= (8 × 6) + (2 × 5) + (0 × 4) + (1 × 3) + (5 × 2) + (6 × 1)
= 48 + 10 + 0 + 3 + 10 + 6
= 77 ÷ 11
= 7 remainder **0**
valid/not valid: VALID

(b) working
= (5 × 6) + (0 × 5) + (2 × 4) + (4 × 3) + (1 × 2)
= 30 + 0 + 8 + 12 + 2
= 52
need to add **3** to make the total **55** (i.e. exactly divisible by 11)
check digit: **3**

(c) 2 digits transposed
(e.g. 280**41**9 becomes 280**14**9/two digits have been switched)
incorrect digit
(e.g. 2**8**0419 becomes 2**5**0419/one of the digits has been mistyped)

4 A digital alarm clock is controlled by a microprocessor. It uses the 24-hour clock system (i.e. 6 pm is 18:00).
Each digit in a typical display is represented by a 4-digit binary code.
For example:



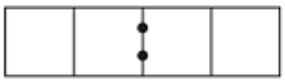
(clock display)

is represented by:

0	0	0	0	1st digit (0)
1	0	0	0	2nd digit (8)
0	0	1	1	3rd digit (3)
0	1	0	1	4th digit (5)

(a) What time is shown on the clock display if the 4-digit binary codes are:

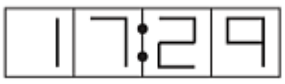
0	0	0	1
0	1	1	0
0	1	0	0
1	0	0	1



(clock display)

[2]

(b) What would be stored in the 4-digit binary codes if the clock display time was:



	1st digit
	2nd digit
	3rd digit
	4th digit

[4]

(c) The clock alarm has been set at 08:00.
Describe the actions of the microprocessor which enable the alarm to sound at 08:00. [2]

Solution:

(a) 1 6 : 4 9

(b)

0 0 0 1	1st digit
0 1 1 1	2nd digit
0 0 1 0	3rd digit
1 0 0 1	4th digit

(c) Any **two** from:
- microprocessor compares present time with stored time
- if the values are the same
- sends signal to sound alarm

5 Bytes of data transferred using a serial cable are checked for errors at the receiving end using an even parity check.
Can these bytes of data pass the even parity check?
(a) 01010101 [1]
(b) 11001000 [1]
(c) How can any errors be corrected? [2]

Solution:
(a) Yes
(b) No
(c) – re-reading the byte that was sent
– request that the byte is resent

13 When a key is pressed on the keyboard, the computer stores the ASCII representation of the character typed into main memory.
The ASCII representation for A is 65 (denary), for B is 66 (denary), etc.
There are two letters stored in the following memory locations:

Location 1	A
Location 2	C

(a) (i) Show the contents of Location 1 and Location 2 as binary using 8 bits.

Location 1								
Location 2								

[2]

(ii) Show the contents of Location 1 and Location 2 as hexadecimal.
Location 1 .....
Location 2 ..... [2]

(b) The following machine code instruction is stored in a location of main memory:

1	1	1	1	1	0	1	0	1	0	0	1	0	1	1	1

Convert this binary pattern into hexadecimal. [4]

(c) Explain why a programmer would prefer to see the contents of the locations displayed as hexadecimal rather than binary, when debugging his program that reads the key presses. [2]

Solution:
(a) (i)

Location 1	0	1	0	0	0	0	0	1
Location 2	0	1	0	0	0	0	1	1

(ii) 41
43
(b) FA97
(c) – easier to identify values
– easier to spot errors

May/June 2017 P11:

1 The memory of a computer contains data and instructions in binary.
The following instruction is stored in a location of the memory.

0	0	1	0	1	0	0	1	1	1	1	1	1	1	0	0

(a) Convert the instruction into hexadecimal. [2]
(b) Explain why a programmer might prefer to read the instruction in hexadecimal rather than in binary. [2]
(c) Give **two** other uses of hexadecimal.
Use 1 .....
Use 2 ..... [2]

Solution:

(a)	29FC
(b)	**Two** from: Easier/quicker to understand/read Easier to debug/identify errors Fewer digits are used / shorter // takes up less space on screen // more can be shown on screen / page
(c)	**Two** from: Notations for colour in HTML // HTML colour (codes) Error messages MAC address // IP address Locations in memory Memory dump

5 **(a)** Parity checks are often used to detect errors that may occur during data transmission.
The received bytes in the table below were transmitted using **odd parity**.
Tick (✓) to show whether each byte has been **corrupted during transmission** or **not corrupted during transmission**.

Received byte	corrupted during transmission (✓)	not corrupted during transmission (✓)
10110100		
01101101		
10000001		

[3]

(b) Another method of error detection is Automatic Repeat reQuest (ARQ). [4]
Explain how ARQ is used in error detection.

Solution:

(a)	<table><tr><th>Received byte</th><th>corrupted during transmission (✓)</th><th>not corrupted during transmission (✓)</th></tr><tr><td>10110100</td><td>✓</td><td></td></tr><tr><td>01101101</td><td></td><td>✓</td></tr><tr><td>10000001</td><td>✓</td><td></td></tr></table>
(b)	**Four** from: Uses acknowledgement and time out Check performed on received data // error is detected by e.g. parity check, check sum If error detected, request sent to resend data // negative acknowledgment is used If no acknowledgement is sent that data is received // positive acknowledgement is used Data is resent / Resend request repeated, till data is resent correctly … … or request times out // limit is reached

---

May/June 2017 P12:

5 **(a)** The denary number 57 is to be stored in two different computer registers.
Convert 57 from denary to binary and show your working.

(b) Show the binary number from **part (a)** as it would be stored in the following registers. [2]

								Register 1

Register 2

[2]

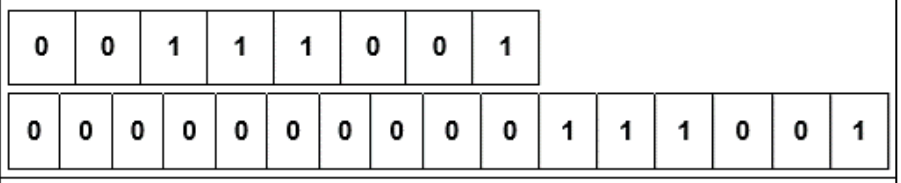
(c) A binary number stored in a register can have many different uses, for example an address in main memory.
Give **two** other uses for a binary number stored in a register.
Use 1 .....
Use 2 ..... [2]

(d) A register in a computer contains binary digits.

0	0	1	1	1	0	1	0

The contents of the register represent a binary integer.
Convert the binary integer to hexadecimal. [1]

Solution:

(a)	32 + 16 + 8 + 1 (00)111001
(b)	
(c)	**Two** from: ▯ data ▯ ASCII value / Unicode value / character ▯ number ▯ part of image / small image ▯ a sound / sound sample / small sound track ▯ instruction
(d)	3A

Oct/Nov 2017 P12:

3 **(a)** Explain the differences between the binary number system and the denary number system. [4]

(b) Explain the process of converting the binary number 1010 into a denary number. [5]

Solution:

(a)	Any **four** from (**Max 2** per number system) : ▯ A binary number system is a base-2 system ▯ A denary number system is a base-10 system ▯ A binary number system uses 0 and 1 values ▯ A denary number system uses 0 to 9 values ▯ A binary number system has units/ placeholders/column headings that increase by the power of 2 ▯ A denary number system has units/ placeholders/column headings that increase by the power of 10 ▯ Binary has more digit <u>for the same value</u>// Denary has less digits <u>for the same value</u>
(b)	**Five** from: ▯ Correct column headings / place holders by example ▯ Correctly place a 1 or a 0 for each column ▯ Identify the columns to be added ▯ Add together the (denary) values identified … ▯ … this will give a total which is the denary number/answer ▯ Answer is 10

8 **(a)** A computer has 2048 MB of RAM.
How many GB of RAM does the computer have?
Show your working.
..... [2]
.....GB

(b) Describe **one** item that is stored in RAM. [2]

(c) Explain **three** ways that RAM is different to ROM.
1 .....
2 .....
3 ..... [3]

Solution:

(a)	▯ 2048/1024 (or 1024 · 2) ▯ 2 GB
(b)	▯ Instructions/programs/data ▯ … currently in use
(c)	Any **three** from: ▯ RAM is volatile, ROM is non-volatile ▯ RAM is temporary, ROM is (semi) permanent ▯ RAM normally has a larger capacity than ROM ▯ RAM can be edited ROM cannot be edited // Data can be read from and written to RAM, ROM can only be read from.

Oct/Nov 2017 P13:

1 A washing machine has a small display screen built into it.
One use of the display screen is to show an error code when a problem has occurred with a washing cycle.

(a) State whether the display screen is an **input**, **output** or **storage device**. [1]

(b) The display screen shows a hexadecimal error code:

E04

This error code means that the water will not empty out of the washing machine.
Convert this error code to binary.

[3]

(c) State why hexadecimal is used to display the error code. [1]

Solution:

(a)	Output
(b)	*E* *0* *4* **1 1 1 0 0 0 0 0 0 1 0 0**
(c)	Any **one** from: – Hexadecimal codes can fit in a smaller display rather than a full text based message – Smaller amount of memory needed to store the hex error messages than text based

---

May/June 2018 P11:

1 Jane answers an examination question about computers and data correctly.
Six different words or numbers have been removed from her answer.
Complete the sentences in Jane's answer, using the list given. Not all items in the list need to be used.

- 2
- 10
- 16
- analogue
- binary
- denary
- digital
- hexadecimal

As humans, we process ..... data, but a computer cannot

process this type of data. For a computer to be able to process data it needs to be

converted to ..... data.

As humans, we mostly use a ..... number system;

this is a base ..... number system.

Computers use a ..... number system;

this is a base ..... number system. [6]

Solution:
- analogue
- digital
- denary
- 10
- binary
- 2

2 Dheeraj identifies **three** hexadecimal numbers.
Write the **denary** number for each of the three hexadecimal numbers:
2A .....
101 .....
21E ..... [3]

Solution:
- 42
- 257
- 542

3 The three binary numbers in the registers A, B and C have been transmitted from one computer to another.

	Parity bit							
Register A	1	0	0	1	1	0	0	0
Register B	0	1	1	0	0	1	1	1
Register C	1	0	0	1	1	0	0	1

One binary number has been transmitted incorrectly. This is identified through the use of a parity bit.
Identify which register contains the binary number that has been transmitted **incorrectly**. Explain the reason for your choice.
The binary number that has been transmitted incorrectly is in **Register** .....
Explanation ..... [4]

Solution:
- Register C

Any **three** from:
- Count the number of 1/0 bits (in each byte/register)
- Two bytes/registers have an odd number of 1/0 bits // Two use odd parity
- Odd parity must be the parity used
- One byte/register has an even number of 1/0 bits // One uses even parity
- One with an even number of one bits/even parity is incorrect // Register C should have odd parity

---

May/June 2018 P12:

1 Different units of data can be used to represent the size of a file, as it changes in size.
Fill in the missing units of data, using the list given:
- byte
- gigabyte (GB)
- megabyte (MB)
- nibble

The units of data increase in size from smallest to largest.

Smallest

bit

kilobyte (kB)

terabyte (TB)

Largest

[4]

Solution:

- nibble
- byte
- megabyte (MB)
- gigabyte (GB)

3 A stopwatch uses six digits to display hours, minutes and seconds.
The stopwatch is stopped at:

0 2 : 3 1 : 5 8
Hours Minutes Seconds

An 8-bit register is used to store each pair of digits.

(a) Write the 8-bit binary numbers that are currently stored for the **Hours**, **Minutes** and **Seconds**.

Hours								
Minutes								
Seconds								

[3]

(b) The stopwatch is started again and then stopped.
When the watch is stopped, the 8-bit binary registers show:

Hours	0	0	0	0	0	1	0	1
Minutes	0	0	0	1	1	0	1	0
Seconds	0	0	1	1	0	1	1	1

Write the denary values that will now be shown on the stopwatch.

: :
Hours Minutes Seconds

[3]

Solution:

(a)

Hours	0	0	0	0	0	0	1	0
Minutes	0	0	0	1	1	1	1	1
Seconds	0	0	1	1	1	0	1	0

(b)

0	5 :	2	6 :	5	5
Hours		Minutes		Seconds	

4 Jafar is using the Internet when he gets the message:

"D03, page is not available"

Jafar remembers that hexadecimal is often used to represent binary values in error codes.
Convert the hexadecimal number in the error message into 12-bit binary.

[3]

Solution:

1	1	0	1	0	0	0	0	0	0	1	1
← 1 mark →				← 1 mark →				← 1 mark →			

5 The three binary numbers in the registers X, Y and Z have been transmitted from one computer to another.

								Parity bit
Register X	1	0	0	1	0	0	1	0
Register Y	1	1	1	0	0	1	1	1
Register Z	1	1	1	0	1	0	0	1

Only **one** binary number has been transmitted correctly. This is identified through the use of a parity bit.

Identify which register contains the binary number that has been transmitted **correctly**. Explain the reason for your choice.

The binary number that has been transmitted correctly is in **Register** .....

Explanation .....[4]

Solution:

– Register Y

Any **three** from:

– Count the number of 1/0 bits (in each byte/register)
– Two bytes/registers have an odd number of 1/0 bits // Two have odd parity
– Even parity must be the parity used
– One byte/register has an even number of 1/0 bits // One uses even parity
– The two with an odd number of one bits/odd parity are incorrect // Register X and Z should have even parity

---

Oct/Nov 2018 P12:

1 Computers use a character set to convert text into binary.
One character set that can be used is ASCII.
Each letter in ASCII can also be represented as a denary value.

(a) The word BUS has the denary values:

B	U	S
66	85	83

Convert the denary values into 8-bit binary.

66								
85								
83								

[3]

(b) Each letter in ASCII can also be represented as a hexadecimal value.
The word KEY has the 8-bit binary values:

K	E	Y
01001011	01000101	01011001

(i) Convert the three 8-bit binary values into hexadecimal.

01001011 .....
01000101 .....
01011001 ..... [3]

(ii) Give **three** other uses of hexadecimal notation in computer science. [3]

(iii) State **two** benefits of using hexadecimal notation to represent binary values.

Benefit 1 .....
Benefit 2 .....[2]

Solution:

(a)	66	0	1	0	0	0	0	1	0
	85	0	1	0	1	0	1	0	1
	83	0	1	0	1	0	0	1	1

(b)(i)
4B
45
59

(b)(ii) **Three** from:
- (HTML) colour codes
- Error messages
- MAC addresses
- IP addresses
- Assembly language
- Memory dump
- Locations in memory

(b)(iii) **Two** from:
- Easier to read/write/understand (for humans)
- Easier to remember (for humans)
- Short way to represent binary // Uses less **screen/display** space
- Fewer errors made (in data transcription)
- Easier to debug (for humans)

Oct/Nov 2018 P13:

2 Parity checks and Automatic Repeat reQuests (ARQ) can be used to check for errors during data transmission and storage.

(a) A system uses **even parity**. Write the appropriate parity bit for each byte.

Parity Bit							
	1	0	1	0	0	1	1
	1	0	1	1	1	1	1
	1	0	1	0	0	0	1

[2]

(b) Explain how Automatic Repeat reQuests (ARQ) are used in data transmission and storage. [2]

(c) State **one** other method that could be used to check for transmission errors. [1]

Solution:

2(a)

Parity Bit							
0	1	0	1	0	0	1	1
0	1	0	1	1	1	1	1
1	1	0	1	0	0	0	1

2(b)

Two from:
- Set of rules for controlling error checking/detection // it's an error detection method // used to detect errors
- Uses acknowledgement and timeout
- Request is sent (with data) requiring acknowledgement
- If no response/acknowledgment within certain time frame data package is resent
- When data received contains an error a request is sent (automatically) to resend the data
- The resend request is repeatedly sent until packet is received error free/limit is reached/acknowledgement received

2(c) Checksum

4 The MAC address of a device is represented using hexadecimal.
A section of a MAC address is shown. Each pair of hexadecimal digits is stored using 8-bit binary.

(a) Complete the table to show the 8-bit binary equivalents for the section of MAC address. The first number has already been converted.

6A	FF	08	93
01101010			

[3]

(b) Explain why data is stored as binary in computers. [2]

Solution:

4(a)	*01101010*	**11111111**	**00001000**	**10010011**
4(b)	Computers use switches / logic gates Only uses 2 states / On or Off / 1 or 0			

May/June 2019 P11:

1 Hexadecimal is used for MAC addresses.
Part of a MAC address is given:

97 – 5C – E1

Each pair of digits is stored as binary in an 8-bit register.

(a) Show what the binary register stores for each pair of the given digits.

97								
5C								
E1								

[6]

(b) Explain what is meant by a MAC address. [4]

(c) Give **two** other examples where hexadecimal can be used.
Example 1 .....
Example 2 .....[2]

Solution:

1(a)									
	97	1	0	0	1	0	1	1	1
	5C	0	1	0	1	1	1	0	0
	E1	1	1	1	0	0	0	0	1

1(b)	**Four** from: • Media Access Control (address) • Used to identify a device • It is a **unique** (address) • It is a static address // It does not change • It is set by the manufacturer • The first part is the manufacturer ID/number/identifies the manufacturer • The second part is the serial number/ID
1(c)	**Two** from e.g.: • Colour **codes** // Colour in **HTML / CSS** • Error messages • Locations in memory • Memory dump // debugging • IP address • ASCII // Unicode • Assembly language • URL

May/June 2019 P12:

9 The contents of three binary registers have been transmitted from one computer to another. **Even parity** has been used as an error detection method.

The outcome after transmission is:
Register A and **Register C** have been transmitted **correctly**.
Register B has been transmitted **incorrectly**.
Complete the **Parity bit** for each register to show the given outcome.

	Parity bit							
Register A		0	1	0	0	1	0	1
Register B		1	0	0	0	0	0	1
Register C		1	0	0	0	0	1	1

[3]

Solution:

	Parity bit							
Register A	**1**	0	1	0	0	1	0	1
Register B	**1**	1	0	0	0	0	0	1
Register C	**1**	1	0	0	0	0	1	1

Oct/Nov 2019 P12:

4 An 8-bit binary register contains the value:

0	0	1	1	0	1	0	0

(a) Convert the binary value to denary. [1]

(b) The contents of the register shifted one place to the right would give the result:

0	0	0	1	1	0	1	0

The contents of the register shown at the start of question 4 are shifted two places to the left.
Show the contents of the register after this shift has taken place.

[1]

(c) State the effect this shift has on the denary value in **part (a)**. [1]

Solution:

4(a)	52
4(b)	1 1 0 1 0 0 0 0
4(c)	It is multiplied by 4

Oct/Nov 2019 P13:

5 The contents of three binary registers have been transmitted from one computer to another. **Odd parity** has been used as an error detection method.
The outcome after transmission is:

- **Register A** and **Register B** have been transmitted **correctly**.
- **Register C** has been transmitted **incorrectly**.

Write the appropriate **Parity bit** for each register to show the given outcome.

	Parity bit							
Register A		0	1	0	0	0	1	1
Register B		0	0	0	0	1	1	1
Register C		0	0	0	0	0	1	1

[3]

Solution:

	Parity bit							
Register A	**0**	0	1	0	0	0	1	1
Register B	**0**	0	0	0	0	1	1	1
Register C	**0**	0	0	0	0	0	1	1

DATABASE
2003-2019

May/June 2003:

12 An estate agent keeps a file of properties for rent in the city. Several records are shown in the following diagram:

REF	AREA	TYPE	FEATURE	RENT($)
H002	South	Detached	Waterfall	21000
H006	South	Bungalow	Pool	19000
H008	West	Bungalow	Pond	15000
H005	South	Detached	Patio	14000
H003	North	Semi-Detached	Pool	12000
H009	North	Detached	Courtyard	11000
H004	West	Bungalow	Pool View	9000
H001	South	Semi-Detached	Fish Pond	8000
H007	North	Terraced	BBQ Pit	2000

(a) Which field in the file should be used as a key field? [1]

(b) State a validation check that should be made on the **AREA** data as it is entered into the file. [1]

(c) Which **RENT($)** data will be listed if the following search condition is input?

(**FEATURE** = "Pool") OR (**TYPE** = "Bungalow") [2]

(d) Write down a search condition to find all the properties in the south which have a rent less than $15000. [3]

(e) Write down the reference numbers if the file is sorted in ascending order on **TYPE** then **AREA**. [3]

Solution:

(a) REF

(b) **One** mark per named check:
presence
type
description

(c) 19000, 15000, 12000, 9000
minus one mark each error; ignore order and dollar if given

Oct/Nov 2003:

9 A mail order company selling hi-fi equipment keeps details of its stock on a database. Part of the database is shown below

Code_Num	Colour	Speakers	Power(W)	Num_of_CDs	Price ($)
13416	Black	4	50	4	650
13425	Silver	2	60	1	500
13504	Silver	4	80	5	750
14001	Black	4	100	3	1100
14005	Black	4	100	10	1200
14010	Silver	2	40	1	350

(a) Which field should be used as the key field? [1]

(b) Which Code_Num data will be listed if the following search condition is input? [2]

(Speakers=4) AND (Num_of_CDs>4)

(c) Write down a search condition to find all the equipment which is silver coloured or has a power rating over 70W. [3]

(d)Write down the order of the Code_Num after the Price($) field has been sorted in ascending order. [2]

Solution:

(a) Code_ Num
(b) 13504
14005
(c) (Power(W) > 70) OR (Colour = "Silver")
(ignore case and quotes; don't accept 70W)
(d) 14010, 13425, 13416, 13504, 14001, 14005

May/June 2004:

16 A music club keeps a file of members on a computer system. Part of the file is shown in the following diagram:

CODE	SURNAME	INITIAL	SEX	PHONE NO	DATE OF BIRTH
M1001	Philips	R	F	3294625	11/12/86
M1011	Patel	P	M	2453674	04/01/88
M1025	Brown	A	F	2756484	15/05/86
M1037	Khan	S. L	M	2759815	18/02/87
M1057	Lee	B. R	M	2456785	21/07/86
M1073	Smith	L	F	3297684	09/02/88
M1096	Chong	M. A	M	2765492	03/09/87
M1102	Schon	G	M	2451843	22/04/88
M1124	Shah	J. A	M	3298746	14/04/86
M1139	Davies	S. L	F	2768798	09/01/88

(a) State how many fields there are in each record. [1]

(b) State the data type that should be used for the CODE data. [1]

(c) State two reasons why the data in the SEX field has been coded. [2]

(d) Which CODE data will be listed if the following search condition is input? [2]

(DATE OF BIRTH< 01/01/87) AND (SEX = "M")

(e) Describe how the file can be sorted in ascending order of SURNAME. [2]

Solution:

(a) 6
(b) text/alphanumeric/string
(c) less errors on input
requires less storage space
validation
quicker to input
quicker to find
(d) M1057, M1124
(e) highlight/select SURNAME field
click on sort A to Z icon/in menu

or query, click on (sort) ascending

Oct/Nov 2004:

17 A database stores details about cars in a showroom. The format of the first three fields is shown below.

Field name	Field description	Data type	Field length
MAKE	name of manufacturer	text	30
NUMPLATE	car registration no.	alphanumeric	8
REG	date car registered	date	6

(a) State two more fields, one numeric and one text, and for each give the field description and the field length.

Field name (numeric) .....
Field description .....
Field length .....[2]
Field name (text) .....
Field description .....
Field length .....[2]

(b) Give a situation, in each case, where data about these cars would need to be amended, deleted and inserted.

amended: .....
deleted: .....
inserted: .....[3]

Solution:

(a) **(i)**

name of field	description	field length
ENGSIZE	engine capacity (litres)	4
NUMDOOR	number of doors	1
FUELCON	economy of vehicle	3
PRICE	cost of vehicle	6
ODOMETER	recorded distance (km or miles)	7

(ii)

name of field	description	field length
COLOUR	colour of vehicle	20
MODEL	make and model of vehicle	20
PREVOWN	details of previous owner	50
OPTION	list of extras on vehicle	30

(b) **amend**
information is incorrect
price of vehicle needs to be changed (e.g. sales)
change of colour

delete (record deleted)
vehicle sold
vehicle scrapped

insert (info into a field)
new vehicle arrived
more information about current vehicle becomes known

May/June 2005:

5 A shop keeps its stock file on a computer system. Part of the file is shown in the diagram below:

STOCK NO	DESCRIPTION	COLOUR	WEIGHT (KG)	IN STOCK	PRICE ($)
L801	Laptop Case	B	1.6	15	100
L802	Beauty case	B	2.6	12	80
L803	Carry-on case	B	2.0	18	160
L807	Day pack	R	0.6	22	90
L808	Rucksack	G	1.8	16	60
L809	Backpack	B	3.8	17	76
L814	Portfolio	B	0.4	20	25
L816	Travel bag	G	4.3	16	70
L817	Roller bag	B	2.7	19	180
L820	Deluxe case	S	2.6	12	165

The following codes have been used.

B = Black G = Green R = Red S = Silver

(a) State how many records are shown in the diagram. [1]

(b) State two advantages of coding the data in the COLOUR field. [2]

(c) State the data type that should be used for the WEIGHT (KG) data. [1]

(d) State one advantage of using fixed-length records for storing the data. [1]

(e) Which STOCK NO data will be listed if the following search condition is input? [2]

(COLOUR NOT "B") AND (WEIGHT (KG) < 2.0)

(f) Write down a search condition that will search for all the items with less than 16 in stock and the price is more than $100. [3]

(g) State which field should be used to link this stock file to a supplier file. Give a reason for your choice of field.

Field .....

Reason.....[2]

Solution:

(a) 10

(b) fewer errors on input
less storage space required/less memory
easier/quicker to input
quicker to find/search/easier to locate
easier/faster validation

(c) number/numeric/decimal/1 d.p.

(d) faster process/easier to program
updated/new records will occupy the same space as the old records
allows accurate estimation of storage required

(e) L807, L808 or 807, 808

(f) (IN STOCK <16) AND (PRICE ($) > 100)
or
(IN STOCK < = 15) AND (PRICE ($) > 100)
1 mark **1** mark **1** mark
NOTE: ignore case
16/15 and 100/101 award the mark with or without speech marks

(g) field – STOCK NO
reason – unique/primary key/key

Oct/Nov 2006:

18 A car dealer uses a database to keep details of cars in stock. Part of the stock file is shown below.

RegNo	Make	Model	Colour	Doors	Engine(cc)	Price($)
AT 15 APC	Renault	Laguna	Black	5	1600	5800
NX 21 TPQ	Opel	Corsa	Green	3	1400	2000
WS 46 ART	VW	Golf	Blue	3	1600	3400
RP 09 NTR	VW	Golf	Red	5	2000	6350
VV 81 KKT	Proton	Wira	White	4	1300	2200
NK 55 ARM	VW	Golf	White	3	1800	4100

(a)(i) State the fieldname that should be used as the key field.
(ii) Explain the purpose of a key field.
(b) The following search condition is input: (Price($) < 5000) AND (Model = Golf) Write down the records that match the above search condition using only RegNo.
(c) Write down a search condition to find cars with an Engine greater than 1400cc or which have less than 5 Doors. (d) When a car is sold, the sale needs to be linked to a customer file. Suggest a new field which could be used to link the stock file to the customer file.

Solution:

(a) **(i)** Reg No
(ii) unique identifier
used to search the database
used to link to other tables of data (foreign data)

(b) WS 46 ART
NK 55 ARM

(c) Either (Engine (cc) > 1400) OR (Doors < 5)
Or (Doors < 5) OR (Engine (cc) > 1400)

(d) customer code
customer ref no
(NOT customer name)

May/June 2007:

7 A hospital has decided to computerise its administration system.
(a) Give three ways this could affect the hospital workers. The hospital will be using a database which holds confidential personal data.
(b) State two precautions that the hospital should take to prevent unauthorised access to the data.
(c) Describe how the database could be recovered if it became corrupted.
(d) Give one example, in each case, of when it would be necessary to amend data, delete data and insert data into the patient database.

Solution:

(a) deskilling
retraining needed
loss of jobs
frees staff from admin jobs
less time wasted looking for lost paperwork

(b) passwords (changed regularly)
use of ids/log on ids/user names
firewalls
physical measures (e.g. locked rooms)
logging off after use
encryption = 0
removal of external memory = 0

(c) use of back up files
generations of files (GFS)

(d) amend - change name/address/doctor etc. change of age = 0
- new illness
- re-admission

delete - patient leaves area/country leaves hospital = 0
- patient dies

insert - new patient arrives
- new baby born

Oct/Nov 2007:

15 A school Science department is going to use a database to record details about its equipment.
(a) Give two advantages of using a computer system rather than a manual filing system.
(b) Part of the database is shown below:

Equipment	Code No	Quantity in Stock	Need to re-order?	Supplier Name	Price ($)	Stock Value ($)
Beaker	01043	25	Y	Labquip	1.04	26.00
Test tube	01051	200	N	Labquip	0.40	80.00
Clamp stand	01065	51	N	Anglera	3.25	165.75
Tongs	01151	23	Y	Anglera	0.55	12.65
Spatula	01222	62	N	Anglera	0.66	40.92
Flask	01341	15	Y	Labquip	1.70	27.50

(i)As data is entered it needs to be verified. Describe one way this could be done.
(ii)Data also needs to be validated. Using fields from the database as examples, describe two different validation checks which could be performed on the data.

Solution:

(a) easier to know when to re-order
automatic re-ordering
easier/faster to update
easier/faster to access information
more up to date stock levels
fewer mistakes
takes up less storage space

(b) **(i)** double entry
visual check/comparison with original

(ii)
equipment – character check, length check
code – length check, character check, check digit
quantity – range check, character check
need to re-order – character check, length check, Boolean check
supplier name – character check, length check
price – format check, range check
stock value – range check, character check

Oct/Nov 2008:

8 To gain access to a database, a user must first type in a user ID and then a password which needs to be verified.
(a) How is a password usually verified?
(b) In spite of these safeguards, unauthorised access to the database is still possible. What could be done:
(i) to prevent data being used by unauthorised people?
(ii) to prevent loss of data once the database has been illegally accessed?

(c) Personal data is protected to some extent by a Data Protection Act. Give two requirements of a Data Protection Act.

Solution:

(a) keyed/typed in twice/compared to stored password

(b) **(i)** encrypt the data

(ii) Any **one** from:
read only access
back up the files regularly
generations of files [1]

(c) Any **two** from:
data must be up to date
data can only be read/used for the purpose for which it was collected
data must be accurate
data must be destroyed/deleted when no longer required/don't keep longer than necessary
data user must register what data is used/stored
data must be used/collected fairly and lawfully
data must be held securely
data must be protected from accidental damage
only authorised people can have access to data
fines imposed for data mis-use
data should not be passed on to a 3rd party without owner's permission
person can view data and have it changes/removed if incorrect
safe harbour [2]

15) A database has been produced showing solar system statistics.

Name of planet	Distance from sun ($x10^6$) (km)	Number of moons	Number of rings	Maximum surface temperature (°C)	Diameter (km)
Mercury	58	0	0	427	4880
Venus	108	0	0	480	12100
Earth	150	1	0	58	12756
Mars	228	2	0	17	6787
Jupiter	778	16	3	-150	143200
Saturn	1427	18	1000	-180	120000
Uranus	2871	15	11	-210	51800
Neptune	4497	8	4	-214	49528
Pluto	5914	1	0	-220	2330

(a) How many records are there in this database?

(b) The following search condition was typed in: (Number of moons > 0) AND (Diameter (km) < 15000) Using Name of planet, write down the results of this search:

(c) Write down a search condition to find out which planets have rings or have a diameter more than 50000 km.

(d) Name a different validation check for each of the following fields.

(i) Maximum surface temperature (^{0}C)

(ii) Name of planet

(e) The data in the database was sorted in descending order using the Number of moons field. Using Name of planet only, write down the results of this sort

Solution:

(a) 9

(b) Earth, Mars, Pluto
(-1 for each error/addition/omission)

(c) (**Number of rings** > 0) OR (**Diameter (km)** > 50 000)

< ------- 1 mark ------- > < ---------- 1 mark ---------- >

or

(**Diameter (km)** > 50 000) OR (**Number** of rings > 0)

< ---------- 1 mark ---------- > < --------- 1 mark --------- >

(d) **(i)** range check
character/type check

(ii) character/type check
length check

NB check in **(ii)** must be different to check in **(i)**

(e) Saturn, Jupiter, Uranus, Neptune, Mars, Earth, Pluto, Mercury, Venus

(any order) (any order)

(1 mark for the correct data – ALL data must be correct for the mark)
(1 mark for all planets in correct order)

May/June 2009:

17 A car sales company uses a database.

Here are three tables from the database:

New Car Sales

Customer Reference	Car Ordered	Specification	Delivery Date
151319	Cancelled order	None	Not applicable
162154	VW Golf	21215168	December 2008
171216	BMW 320i	07981624	February 2009

Customer Details

Customer Reference	Customer Name	Customer Address	Trade In?
141516	J Smith	7 Toll Road	No
151319	M Kyle	14 Coast Road	No
162154	D Khan	19 Main Street	Yes
165196	S Gogic	555 Trabant Road	No
171216	D Marques	21 Lakki Harbour	Yes

Car Manufacturer

Specification	Car Description	List of Extras	Cost Price ($)
07981624	BMW 320i	C N O R V Z	48 500
21151198	VW Golf	A B C E T U	16 200
21215168	VW Golf	B D E F J L	21 000
31311115	Ford Focus	A P R S W	17 000

(a) How many records are shown in the Customer Details table?

(b) (i) Which field connects the New Car Sales table with the Customer Details table?

(ii) Which field connects the New Car Sales table with the Car Manufacturer table?

(c) Give two reasons why List of Extras in the Car Manufacturer table is stored in code form.

(d) A customer goes into the showroom and the salesperson keys in 162154. What fields and information would be shown on the output screen?

(e) Give one advantage to the car sales company of holding customer information on a database.

Solution:

(a) 5

(b) **(i)** Customer Reference

(ii) Specification

(c) any **two** from:
reduces typing errors
uses less memory
faster to type in
quicker to sort
store in one field
easier to validate

(d)

Car Description/Car Ordered	VW Golf	}
Delivery Date	Dec 2008	} New Car Sales
Specification	21215168	}

Customer Name	D Khan	}
Customer Address	19 Main Street	} Customer Details
Trade In	Yes	}

(**1 mark** 1 field name **and** contents from New Car Sales table **plus** 1 field name **and** contents from Customer Details table)

List of Extras	B D E F J L	}
Cost Price ($)	21 000	} Car Manufacturer

(**1 mark** 1 field name **and** contents from Car Manufacturer table)

(e) any **one** advantage from:
later use if customer wants to trade in again in 2 or 3 years' time
can send out new product information
if safety/recall issues from car manufacturers
service/safety check reminders

Oct/Nov 2009:

13 A radio station keeps a database of all its music CDs. Here is part of this database:

Reference Number	CD title	number of tracks	special edition	CD length (mins)	number of hit tracks
1111	Afternoon Glory	12	N	55	1
1112	Stone Tulips	10	N	42	3
1113	Aftermath	8	N	33	0
1114	Major Peppers	15	Y	72	5
1115	Seaside	9	N	40	2
1116	Lookout	12	N	62	2
1117	Future Dreams	11	N	60	3
1118	Moonlight	14	Y	70	2

(a) How many records are there in the database section?
(b) If the following query was input: (CD length (mins) < 60) AND (number of hit tracks > 1) using Reference Number only, write down which data items would be output.
(c) Write down a query to select which CDs are special edition or have more than 10 tracks.
(d) The database is sorted in descending order on CD length (mins). Using Reference Number only, write down the order of the records following this sort.
(e) The radio station has a phone-in service where a listener texts the title of the CD on their mobile phone. The popularity of each CD is then known and which CDs the radio station should play.
(i) How would this information be stored?
(ii) How could this information be linked to the database?

Solution:

(a) 8

(b) 1112, 1115

(c) (**special edition** = "Y") OR (**number of tracks** > 10)

<———1 mark———> <—————1 mark—————>

(**number of tracks** > 10) OR (**special edition** = "Y")

<———1 mark———> <—————1 mark—————>

(d) 1114, 1118, 1116, 1117, 1111, 1112, 1115, 1113

(e) **(i)** Any **one** from:

(auto capture) on the database itself
transaction file
spreadsheet

(ii) link through the reference number/CD title/primary key

May/June 2010 P11:

15 A database has been set up to bring together information about the world's tallest buildings. A section of the database is shown below.

Ref No.	Building Name	City	Country	Year	No. of Floors	Height (m)	Height (ft)
TA1	Taipei 101	Taipei	Taiwan	2004	101	508	1667
MA1	Petronas Towers	Kuala Lumpur	Malaysia	1998	88	452	1483
US1	Sears Tower	Chicago	USA	1974	110	442	1451
CH1	Jiu Mao Building	Shanghai	China	1999	88	421	1381
CH2	Finance Centre	Hong Kong	China	2003	88	415	1362
CH3	CITIC Plaza	Guangzhan	China	1996	80	391	1283
CH4	Shun Hing Square	Shenzhen	China	1996	69	384	1260
US2	Empire State Building	New York	USA	1931	102	381	1250
CH5	Central Plaza	Hong Kong	China	1992	78	374	1227
CH6	Bank of China	Hong Kong	China	1989	70	367	1205
DU1	Emirates Tower	Dubai	Dubai	1999	54	355	1165
TA2	Tuntex Sky Tower	Kaohsiung	Taiwan	1997	85	348	1140

(a) How many records are in the section of the database shown?

(b) (b) Using Ref No. only, which records would be output if the following search condition was entered: (Year < 1990) AND (Height (m) > 375)?

(c) Write down a search condition to find out how many buildings are in China or how many buildings have more than 80 floors.

(d) For each of the following fields give a different validation check. Year Ref No.

(e) The database was sorted in descending order of Year. Using Ref No. only, write down the results of the sort:

Solution:

(a) 12

(b) US1,US2

(c) (Country = "China") OR (No. of Floors > 80)
←------1 mark ----→ ←-------- 1 mark --------→

(No. of Floors > 80) OR (Country = "China")
←------1 mark ----→ ←-------- 1 mark --------→

(d) **(i)** range check, character check, length check

(ii) character check, type check, length check, format check

(e) TA1, CH2, CH1, DU1, MA1, TA2, CH3, CH4, CH5, CH6, US1, US2

(any order) (any order)

May/June 2010 P12:

11 database has been set up showing information about cars:

Car ref	No of doors	Engine (litres)	CO_2 (g/km)	Fuel used (km/litre)	No of cylinders
A	3	1.4	145	15.3	4
B	4	2.0	193	12.β	4
C	5	2.5	231	10.9	6
D	3	2.0	190	11.2	6
E	4	1.3	120	17.5	4
F	5	1.8	180	14.6	4
G	4	3.0	240	9.5	6
H	4	1.2	115	19.7	3

(a)Using Car ref only, write down which cars would be output if the following search condition was used: (No of doors = 4) AND (Fuel used (km/litre) > 15)

(b)Write down a search condition to find out which cars have engines larger than 1.8 litres OR have CO2 emissions higher than 150 g/km.

(c)The database is sorted in ascending order on Fuel used (km/litre). Using Car ref only, write down the results of the sort.

Solution:

(a) E, H

(b) **(Engine (litres)** > 1.8) **OR** **(CO_2 (g/km)** > 150)
← (1 mark) → ← (1 mark) →
Or
(CO_2 (g/km) > 150) **OR** **(Engine (litres)** > 1.8)
← (1 mark) → ← (1 mark) →

(c) G, C, D, B, F, A, E, H
(1 mark for correct order (fuel used)
1 mark for *ascending* order)

Oct/Nov 2010 P11:

10 A database has been set up to store information about aircraft. A section is shown below.

Ref No	Aircraft Name	Max Weight (kg)	Length (m)	Wing Span (m)	Max Speed (kph)
1001	An-225 Cossack	600 000	84	88	850
2001	Airbus A380F	591 950	73	80	951
3001	C-5 Galaxy	381 000	76	68	845
3002	Boeing 777-600	351 500	74	65	930
2002	Airbus A340-600	366 000	75	63	877
3003	Boeing 747	397 000	71	64	967
3004	Boeing 777	660 000	74	61	893
2003	Airbus A330-300	234 000	63	60	800
3005	Boeing 767	204 100	61	52	914
3006	B52 Fortress	221 400	49	56	927
3007	Boeing 757	123 400	54	38	914

(a) How many fields are in each record?

(b) Using Ref No only, what records would be output if the following search condition was entered:
(Max Weight(kg) > 350 000) AND (Wing Span(m) < 66)?
(c) Write down the search condition to find out which aircraft have a length greater than 74 metres or have a maximum speed less than 900 kph.

Solution:

(a) 6 (fields)
(b) 3002, 2002, 3003, 3004
(c) (Length (m) > 74) OR (Max Speed (kph) < 900)

← - (1 mark) - → ← - - - - - - (1 mark) - - - - - - →

OR

(Max Speed (kph) < 900) OR (Length (m) > 74)

← - - - - (1 mark) - - - - → ← - - - (1 mark) - - - →

May/June 2011 P11:

15 A database showing the population of world cities has been produced. A section of the database is shown below.

Ref No	Name of City	Country	Area	City Population (m)	Urban Population (m)	Capital
1	Tokyo	Japan	Asia	33.2	34.1	Yes
2	New York	USA	America	17.8	21.9	No
3	Sao Paulo	Brazil	America	17.7	20.2	No
4	Seoul	S Korea	Asia	17.5	22.3	Yes
5	Mexico City	Mexico	America	17.4	22.7	Yes
6	Osaka	Japan	Asia	16.4	16.8	No
7	Manila	Philippines	Asia	14.8	14.9	Yes
8	Mumbai	India	Asia	14.4	19.7	No
9	Jakarta	Indonesia	Asia	14.3	17.2	Yes
10	Calcutta	India	Asia	12.7	15.6	No

(a) How many records are shown above?
(b) Using Ref No only, which records would be found if the following search condition was typed in
(Country = "India" OR Area = "America") AND (Capital = "No")
(c) Write a search condition to find the cities in Asia with a city population greater than 17 million OR an urban population greater than 20 million.
(d) Give one advantage of using Y or N rather than Yes or No in the Capital column.

Solution:

(a) 10
(b) 2, 3, 8, 10

*1 mark per **two** correct records*
Loose 1 mark for each additional record

(c) (**Area** = "Asia") **AND** (**City Population(m)** > 17 **OR Urban Population(m)** > 20)
<- - - - 1 mark - - - -> < - - - - - - - - - - - - - - - - 1 mark - - - - - - - - - - - - - - - - - ->

OR

(**Area** = "Asia" **AND City Population(m)** > 17) **OR** (**Area** = "Asia" **AND Urban Population(m)** > 20)
< - - - - - - - - - - - - - - - -1 mark - - - - - - - - - - - - - - -> < - - - - - - - - - - - - - - - - 1 mark - - - - - - - - - - - - - ->

(d) Any **one** advantage from:
- less likely for entry/typing errors
- uses less memory to store records
- faster data entry

Oct/Nov 2011 P13:

12A database has been set up to show details about countries. Part of the database is shown below.

Country code	Country	Continent	Area (millions sq km)	Population (millions)	Coastline	Currency
CH	China	Asia	9.6	1320	Yes	yuan
IN	India	Asia	3.8	1150	Yes	rupee
PO	Poland	Europe	0.3	39	Yes	zloty
BO	Bolivia	America	1.1	9	No	boliviano
TI	Tibet	Asia	1.2	2	No	yuan
BR	Brazil	America	8.5	192	Yes	real
RO	Romania	Europe	0.2	22	No	leu
SA	Saudi Arabia	Asia	2.2	28	Yes	riyal
ZA	Zambia	Africa	0.7	12	No	kwacha

(a) How many fields are in each record? [1]

(b) Using Country code only, what would be output if the following search condition was used? [2]
(Population (millions) > 1000) OR (Continent = "Asia")

(c) Write down a search condition to find which countries have a land area less than 3 million square km and also have a coastline. [2]

(d) If the database was sorted in descending order of population size, using Country code only, what would be the order of countries in the database? [2]

Solution:

(a) 7

(b) CH, IN, TI, SA

(c) **(Area (millions sq km)** < 3) **AND** **(Coastline** = "Yes")
< - - - - - - - 1 mark - - - - - - -><- - - - - - 1 mark - - - - - - >

OR

(Coastline = "Yes") **AND** **(Area (millions sq km)** < 3)
< - - - 1 mark - - - - >< - - - - - - - - 1 mark - - - - - - - - - >

(d) CH, IN, BR, PO, SA, RO, ZA, BO, TI

May/June 2012:

14 A database was set up to show the properties of certain chemical elements. Part of the database is shown below.

Name of element	Element Symbol	Atomic Number	Atomic Weight	Melting Point (C)	Boiling Point (C)	State at room temp
oxygen	O	8	16	- 218	- 183	gas
iron	Fe	26	56	1538	2861	solid
mercury	Hg	80	201	- 38	356	liquid
bromine	Br	35	80	- 7	59	liquid
osmium	Os	76	190	3033	5012	solid
caesium	Cs	55	133	28	671	solid
gallium	Ga	31	70	30	2204	solid
argon	Ar	18	40	- 189	- 186	gas
silver	Ag	47	108	961	2162	solid

(a) How many fields are in each record?

(b) The following search condition was entered: (Melting Point (C) < 40) AND (Atomic Weight > 100) Using Element Symbol only, which records would be output?

(c) We need to know which elements have an atomic number greater than 50 and are solid at room temperature. Write down the search condition to find out these elements.

(d) The data are to be sorted in descending order of Boiling Point (C). Write down the new order of records using the Element Symbol only.

Solution:

(a) 7
(b) Hg, Cs
(1) (1) Correct Answer Only
(c) (**Atomic Number** > 50) AND (**State at room temp** = "solid")

< - - - - - 1 mark - - - - - > < - - - - - - - - - - - 1 mark - - - - - - - - - - >

Or

(**State at room temp** = "solid") AND (**Atomic Number** > 50)

< - - - - - - - -1 mark - - - - - - - - > < - - - - - - - - - -1 mark - - - - - - - - >

Must use exact spelling
(d) Os, Fe, Ga, Ag, Cs, Hg, Br, O, Ar

Oct/Nov 2012:

11 A database was set up showing the largest ocean-going liners. Part of the database is shown below.

Liner ID	Year built	Gross Tonnage	Country of Registration	Country of Construction
OA	2009	225282	Norway	Finland
IN	2008	154407	Norway	Finland
QM	2004	148528	UK	France
EX	2000	137308	Norway	Finland
VO	1999	137276	Norway	Finland
GP	1997	108865	UK	Italy
DE	1996	101509	USA	Italy
SP	1995	77499	UK	Italy
SO	1988	73192	Norway	France
FR	1972	66343	France	France
QE	1940	86673	UK	UK
NO	1935	79280	France	France
MJ	1922	56561	UK	Germany
TI	1912	46329	UK	UK
MA	1907	31938	UK	UK

(a) How many records are shown in the above part?
(b) Using Liner ID only, what would be output if the following search condition was typed in:
(Year built < 2000) AND (Country of Registration = Country of Construction)?
(c) Write the search condition to find out which liners have a gross tonnage larger than 80 000 or are registered in the UK.

Solution:

(a) 15 records
(b) FR, QE, NO, TI, MA
(-1 mark for each error or omission)
(c) (**Gross Tonnage** > 80 000) **OR** (**Country of Registration** = "UK")

< - - - - - - - 1mark - - - - - - > < - - - - - - - - - - - 1 mark - - - - - - - - - - >

or

(**Country of Registration** = "UK") **OR** (**Gross Tonnage** > 80 000)

< - - - - - - - - - 1mark - - - - - - - - > < - - - - - - - - - 1 mark - - - - - - - - >

May/June 2013 P11:

12 A database was set up to compare oil companies. A section of the database is shown below:

Code	Name of company	No of employees	No of countries	Head office	Profits (billion $)	Share price ($)
AR	Arrows	60000	30	Americas	8.0	39.00
GZ	Gazjeti	35000	4	Asia	5.0	44.50
KO	Konoco	40000	22	Americas	10.0	18.55
OS	Oilbras	56000	11	Americas	4.0	59.60
SD	Sand Oil	102000	51	Europe	12.0	15.30
SN	Southern Oil	50000	15	Americas	11.0	10.90
ST	Static Oil	80000	31	Americas	10.0	52.05
SU	Summation	70000	40	Europe	9.0	30.40
WP	Wasp Petrol	90000	44	Europe	15.0	92.80

(a) How many fields are there in each record?
(b) The following search condition was entered:
(No of countries < 30) AND (Head office = "Americas")
Using Code only, which records would be output?
(c) What search condition is needed to find out which oil companies have a share price less than $50 or whose profits were greater than 8 billion dollars?

Solution:
(a) 7
(b) KO, OS, SN

(–1 mark for each error)
(c) (**Share price ($)** < 50.00) OR (**Profits (billion $)** > 8.0)

< - - - - - (1 mark) - - - - - > < - - - - - - - (1 mark) - - - - - - - >

(**Profits (billion $)** > 8.0) OR (**Share price ($)** < 50.00)

< - - - - - (1 mark) - - - - > < - - - - - - - (1 mark) - - - - - - - >

May/June 2013:

11 A survey of motorways was carried out and a database was produced. A section of the database is shown below.

Motorway ID	Length (km)	Cars per day	Toll charge per km ($)	Number of lanes
M1	100	50 000	0.60	2
M2	210	75 000	0.40	3
M3	180	60 000	0.50	4
M4	40	20 000	0.30	3
M5	25	15 000	0.10	2
M6	100	40 000	0.70	4
M7	30	10 000	0.40	2
M8	150	60 000	0.60	4

(a) How many fields and how many records are shown?
(i) number of fields
(ii) number of records
(b) Using Motorway ID only, what would be output if the following search condition was used?

(Length (km) > 100) AND (Number of lanes > 3)

(c) What search condition is needed to find the motorways where the number of cars per day exceeds 50 000 or the toll charge per kilometre is greater than $0.50?

Solution:

(a) (i) 5

(ii) 8

(b) M3 and M8 only

(c) **(Cars per day** > 50 000) OR **(Toll charge per km ($)** > 0.50)

< - - - - - (1 mark) - - - - > < - - - - - - - - - - (1 mark) - - - - - - - - - - >

Or

(Toll charge per km ($) > 0.50) OR **(Cars per day** > 50 000)

< - - - - - - - (1 mark) - - - - - - - > < - - - - - - - (1 mark) - - - - - - - >

Oct/Nov 2013 P12:

3 A motor car manufacturer offers various combinations of

- **seatcolours**
- **seat materials**
- **car paint colours**

A database was set up to help customers choose which seat and paint combinations were possible

	seat material			car paint colours						
code	cloth	leather	seat colour	*white*	*red*	*black*	*blue*	*green*	*silver*	*grey*
CB	Y	N	black	Y	Y	Y	Y	Y	Y	Y
LB	N	Y	black	N	Y	N	N	N	Y	Y
CC	Y	N	cream	N	Y	Y	Y	N	N	N
LC	N	Y	cream	N	Y	Y	Y	N	N	Y
CG	Y	N	grey	N	Y	Y	Y	Y	Y	N
LG	N	Y	grey	N	Y	N	Y	N	Y	Y
CR	Y	N	red	Y	N	Y	N	N	Y	Y
LR	N	Y	red	Y	N	Y	N	N	Y	Y
CL	Y	N	lime	N	N	N	Y	N	N	N
LL	N	Y	lime	N	N	Y	Y	Y	N	N

(NOTE: N = no, not a possible combination, Y = yes, combination is possible)

(a) How many records are shown in the database? [1]

(b) The following search condition was entered:

(cloth= "Y") AND (blue = "Y")

Using code only, which records will be found? [2]

(c) A customer wanted to know the possible combinations for a car with leather seats and either silver or grey paint colour.

What search condition would need to be input? [2]

(d) A customer decided to buy a green car. He wanted to know which seat colours and seat materials were not a possible combination with green paint.

What search condition would he need to enter? [1]

(e) Give one advantage of using the codes Y and N in the database rather than using Yes and No. [1]

Solution:

(a) 10/ten

(b) CB, CC, CG, CL

< - 1 mark - > < - 1 mark - >

(–1 mark for each additional item)

(c) (**leather** = "Y") AND (**silver** = "Y" OR **grey** = "Y")

< - 1 mark - > < - - - - - - - - - - 1 mark - - - - - - - - - >

or

(**silver** = "Y" OR **grey** = "Y") AND (**leather** = "Y")

< - - - - - - - 1 mark - - - - - - - > < - - - - 1 mark - - - - >

or

(**leather** = "Y") AND ((**silver** = "Y") OR (**grey** = "Y"))

< - 1 mark - > < - - - - - - - - - - 1 mark - - - - - - - - - >

or

((**silver** = "Y") OR (**grey** = "Y")) AND (**leather** = "Y")

< - - - - - - - 1 mark - - - - - - - > < - - - - 1 mark - - - - >

(d) (**green** = "N")

(e) Any **one** from:

– uses up less memory (NOT space)
– faster to key in data/saves time when keying in data
– **fewer** mistakes made when keying in data

Oct/Nov 2013 P13:

9 A database was set up to keep track of goods in a shop. A section of the database is shown below.

Item code	Number in stock	Re-order level	Price of item ($)	Value of stock ($)	Items ordered
1113	155	200	1.50	232.50	Yes
1124	84	50	2.50	210.00	No
1200	30	60	5.00	150.00	Yes
1422	600	500	1.00	600.00	No
1515	90	100	2.00	180.00	No
1668	58	50	4.00	232.00	No
1801	60	100	8.00	480.00	No
1844	195	200	1.50	292.50	Yes

(a) How many records are shown in this section of database? [1]

(b) (i) Using Item code only, what would be output if the following search was carried out:
(Number in stock <Re-order level) AND (Items ordered = "No") [2]

(ii) What useful information does this search produce? [1]

(c) Write a search condition to locate items costing more than $2.00 or have a stock value exceeding $300.00. [2]

Solution:

(a) 8

(b) (i) 1515
1801
(–1 mark for each error)

(ii) – checks whether new goods have (yet) to be ordered
– to maintain stock levels

(c) (**Price of item ($)** > 2) OR (**Value of stock ($)** > 300)

< - - - - 1 mark - - - - > < - - - - - - - - - 1mark - - - - - - - - >
or

(**Value of stock ($)** > 300) OR (**Price of item ($)** > 2)

< - - - - - - 1 mark - - - - - -> < - - - - - - - 1mark - - - - - - >

May/June 2014 P11:

3 A hospital holds records of its patients in a database. Four of the fields are:

- **date of visit (dd/mm/yyyy)**
- **patient's height (m)**
- **8-digit patient ID**
- **contact telephone number**

The presence check is one possible type of validation check on the data. For each field, give another validation check that can be performed. Give an example of data which would fail your named validation check.

A different validation check needs to be given for each field.

field name	name of validation check	example of data which would fail the validation check
date of visit		
patient's height		
patient ID		
contact telephone number		

Solution:

field name	**name of validation check**	**example of data which would fail validation check**
date of visit	format check	e.g. 2012/12/04 e.g. 3rd March 2012
patient's height	type/character check range check limit check	can't be < 0 or > 2.5m e.g. –5, five e.g. 8, -3,
patient ID	type check length check range check	(can't be < 0 or > 99999999) e.g. 3142ABCD e.g. 2131451, 136498207 e.g. –3, 851341625
contact telephone number	length check type/character check format check	e.g. 0773141621834 e.g. 7H215GD e.g. 01223/123456/8901234

14 A database was set up showing statistics for some states in the USA. Part of the database is shown below.

Ref	Name of state	Population (millions)	Number of houses (millions)	Area (sq miles)	Density	Travel time to work (min)
OR	Oregon	3.8	1.6	96000	39.6	22.3
CO	Colorado	4.9	2.1	104000	47.1	24.3
NJ	New Jersey	8.7	3.5	7400	1175.7	30.0
TX	Texas	24.3	9.4	262000	92.7	25.4
CA	California	36.8	13.3	156000	235.9	27.7
FL	Florida	18.3	8.7	53900	339.5	26.2
AK	Alaska	0.7	0.3	572000	1.2	19.6
NV	Nevada	2.6	1.1	110000	23.6	23.3
NY	New York	19.5	7.9	47000	414.9	31.7

(a) (i) How many records are in this section of the database? [1]

(ii) How many fields are in each record? [1]

(b) The following search condition was entered:

(Population (millions) < 4.0) OR (Number of houses (millions) < 4.0)

Using Ref only, write down which records will be found. [2]

(c) Write down the search condition to find out which states have an area over 100 000 square miles and where it takes less than 25 minutes to get to work. [2]

(d) (i) What should be the key field in this database? [1]

(ii) Give a reason for your choice.

Solution:

(a) (i) 9

(ii) 7

(b) OR, CO, NJ, AK, NV
(–1 mark for each error: i.e. each omission, each incorrect additional item)

(c) **(Area(sq miles)** > 100 000) **AND** **(Travel time to work (min)** < 25)

< - - - - - - - 1 mark - - - - - - > < - - - - - - - - - - - 1 mark - - - - - - - - - - - - >

Or

(Travel time to work (min) < 25) **AND** **(Area(sq miles)** > 100 000)

< - - - - - - - - - 1 mark - - - - - - - - > < - - - - - - - - - 1 mark - - - - - - - - - - >

(i) **Ref** or **Name of State**

(ii) this is unique to for each state

May/June 2015 P21

7 A database, PROPERTY, was set up to show the prices of properties for sale and the features of each property. Part of the database is shown below.

Property Type	Brochure No	Number of Bedrooms	Number of Bathrooms	Garden	Garage	Price in $
Bungalow	B17	7	4	Yes	Yes	750,000
Apartment	A09	2	1	No	No	100,000
House	H10	4	2	Yes	No	450,000
House	H13	3	2	Yes	No	399,000
Apartment	A01	2	2	No	Yes	95,000
Apartment	A16	1	1	No	No	150,000
House	H23	3	1	No	Yes	250,000
House	H46	2	1	Yes	Yes	175,000

(a) Give the number of fields that are in each record. [1]
(b) State which field you would choose for the primary key.
Give a reason for choosing this field. [2]
(c) State the data type you would choose for each of the following fields.
Garage .....
Number of Bedrooms .....
Price in $ .....[3]

(d) The query-by-example grid below selects all houses with more than 1 bathroom and more than 2 bedrooms.

Field:	Property Type	Number of Bedrooms	Number of Bathrooms	Price in $	Brochure No
Table:	PROPERTY	PROPERTY	PROPERTY	PROPERTY	PROPERTY
Sort:				Ascending	
Show:	☐	☐	☐	☑	☑
Criteria:	= 'House'	>2	>1		
or:					

Show what would be output. [2]
(e) Complete the query-by-example grid below to select and show the brochure number, property type and price of all properties with a garage below $200,000.

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[4]

Examiner Report Question 7
(a) Many candidates correctly identified the number of fields in each record.
(b) Most candidates correctly identified the field to choose for the primary key. Better candidates gave a correct reason for their choice.
(c) Nearly all candidates correctly stated at least one data type.

(d) Most candidates correctly showed only the Price in $ and the Brochure No, as identified by the query-by-example grid. Better candidates showed attention to detail, by correctly putting the prices in ascending order and the Price in $ field before the Brochure No field as indicated by the query-by-example grid.
(e) Most candidates correctly identified the fields to include in the query-by-example grid and identified those that were to be shown. A common error was to incorrectly set the criterion for the garage, when the data type had been set as a Boolean field in part (c).

Solution:

7 (a) – 7 [1]

(b) – Brochure No
– Uniquely identifies each property [2]

(c) Garage – Boolean
Number of Bedrooms – Number/Integer/Single
Price in $ – Number/Single/Real/Currency [3]

(d) 399000 H13
450000 H10 [2]

(e)

Field:	Property Type	Garage	Price in $	Brochure No
Table:	PROPERTY	PROPERTY	PROPERTY	PROPERTY
Sort:				
Show:	☑	☐	☑	☑
Criteria:		True	< 200000	
or:				

May/June 2015 P22

6 A database, MARKS, was set up to record the test results for a class of students. Part of the database is shown below.

Student Name	Class ID	Maths	English	Science	History	Geography
Paul Smith	0017	70	55	65	62	59
Ravi Gupta	0009	29	34	38	41	44
Chin Hwee	0010	43	47	50	45	52
John Jones	0013	37	67	21	28	35
Diana Abur	0001	92	88	95	89	78
Rosanna King	0016	21	13	11	27	15

(a) Give the number of fields that are in each record. [1]

(b) State which field you would choose for the primary key.
Give a reason for choosing this field. [2]

(c) The query-by-example grid below selects all students with more than 60 marks in History or more than 60 marks in Geography.

Field:	Student Name	History	Geography
Table:	MARKS	MARKS	MARKS
Sort:	Ascending		
Show:	☑	☐	☐
Criteria:		>60	
or:			>60

Show what would be output. [2]

(d) Complete the query-by-example grid below to select and show the student names only of all students with less than 40 marks in both Maths and English.

Field:			
Table:			
Sort:			
Show:	☐	☐	☐
Criteria:			
or:			

[3]

Examiner's comments on Question 6

(a) Many candidates correctly identified the number of fields in each record.

(b) Most candidates correctly identified the field to choose for the primary key. Better candidates gave a correct reason for their choice.

(c) Better candidates correctly showed only the student names as identified by the query-by-example grid. Some of these candidates correctly ordered the names in ascending order.

(d) Most candidates correctly identified the fields to include in the query-by-example grid and identified those that were to be shown. A common error was to set the Maths or English criteria to OR rather than AND, where both criteria are on the same row.

6 (a) – 7 [1]

(b) – Class ID
– Uniquely identifies each student [2]

(c) Diana Abur, Paul Smith
– both names
– ..... correct order [2]

(d)

Field:	Student Name	Maths	English
Table:	MARKS	MARKS	MARKS
Sort:			
Show:	☑	☐	☐
Criteria:		<40	<40
or:			
	(1 mark)	(1 mark)	(1 mark)

[3]

Oct/Nov 2015 P22

6 A picture gallery owner has decided to set up a database to keep information about the pictures he has for sale. The database table, PICTURE, will contain the following fields:

Title; Artist; Description; Catalogue Number; Size (area in square centimetres); Price; Arrived (date picture arrived at gallery); Sold (whether picture is already sold)

(a) (i) State what data type you would choose for each field.

Title .....

Artist .....

Description .....

Catalogue Number .....

Size .....

Price .....

Arrived .....

Sold .....[4]

(ii) State which field you would choose for the primary key.

.....[1]

(b) Give a validation check that you can perform on each of these fields. Each validation check must be different.

Catalogue Number .....

Size .....

Price .....

Arrived .....[4]

(c) Complete the query-by-example grid below to select and show the Catalogue Number, Title and Price of all unsold pictures by the artist 'Twister'.

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

[5]

Examiners' Comments Question 6

(a) (i) Most candidates correctly identified the correct data type for some of the fields. Candidates who did less well throughout, incorrectly used data types from programming rather than database management.
(ii) Most candidates correctly identified the field to choose for the primary key.
(b) Many candidates correctly identified at least one suitable validation check. Candidates with stronger responses throughout identified four different checks; a few candidates incorrectly repeated a validation check.
(c) Many candidates correctly identified the fields to include in the query-by-example grid; stronger responses identified
those fields that were to be shown. A common error was to not include the table name.

Solution:

6 **(a)** **(i)** **One** mark for every **two** correct types

Title	– text
Artist	– text
Description	– text/memo
Catalogue Number	– text/(auto)number
Size	– number
Price	– currency/number
Arrived	– date
Sold	– "yes/no"/text/Boolean

0, 1 no marks
2, 3 one mark
4, 5 two marks
6, 7 three marks
8 four marks [4]

(ii) Catalogue Number [1]

(b) **One** mark for each correct **different** check

Catalogue Number	Format check/Presence Check/Check Digit/Length check/uniqueness check
Size	Type check/Presence Check/Range Check
Price	Type check/Presence Check/Range Check
Arrived	Type check/Presence Check/Range Check/Format check/Select from calendar length check

[4]

(c)

Field:	Catalogue Number	Title	Price	Artist	Sold
Table:	PICTURE	PICTURE	PICTURE	PICTURE	PICTURE
Sort:					
Show:	☑	☑	☑	☐	☐
Criteria:				='Twister'	False
or:					
	(1 mark)	(1 mark)	(1 mark)	(1 mark)	(1 mark)

[5]

Oct/Nov 2015 P23

5 A motor boat hire company decides to set up a database to keep information about boats that are available for hire. The database table, BOAT, will contain the following fields:

Boat Name; Model; Engine Power (in hp); Number of Seats; Life Raft (whether there is a life raft kept on the boat); Day Price (price for a day's hire).

(a) Give the data type you would choose for each field.

Boat Name .....

Model .....

Engine Power .....

Number of Seats .....

Life Raft .....

Day Price .....[3]

(b) State a validation check that you can perform on each of these fields. Each validation check must be different.

Boat Name .....

Model .....

Number of Seats .....

Day Price .....[4]

(c) Complete the query-by-example grid below to select and show the Boat Name, Model and Day Price of a day's hire for all boats with 4 seats and an Engine Power of more than 100 hp.

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

[5]

Solution:

5 **One** mark for every **two** correct types

Boat Name – text
Model – text
Engine Power – number
Number of Seats – number
Life Raft – "yes/no"/text/Boolean
Day Price – currency/number

0, 1 no marks
2, 3 one mark
4, 5 two marks
6 three marks [3]

(b) **One** mark for each correct **different** check

Boat Name	Presence Check/Type Check/Character Check
Model	Format check/Type check/Presence Check/Length check/ Use of Drop-down box to select
Number of Seats	Type check/Presence Check/Range Check/ Use of Drop-down box to select
Day Price	Type check/Presence Check/Range Check [4]

(c)

Field:	Boat Name	Model	Day Price	Number of Seats	Engine Power
Table:	BOAT	BOAT	BOAT	BOAT	BOAT
Sort:					
Show:	☑	☑	☑	☐	☐
Criteria:				= 4	> 100
or:					
	(1 mark)	(1mark)	(1 mark)	(1 mark)	(1 mark)

[5]

May/June 2016 P21

6 A database, STAFFPHONE, was set up to show the telephone extension numbers for members of staff working in a department store.

Name	Department	Extension number
Jane Smith	Toys	129
Sue Wong	Books	124
David Chow	Toys	129
Amy Tang	Household	123
Joe Higgs	Books	124
Jane Smith	Shoes	125
Adel Abur	Shoes	125
Peter Patel	Toys	129

(a) Explain why none of the fields in the database can be used as a primary key. [2]

(b) State a field that could be added as a primary key.
Give a reason for choosing this field. [2]

(c) Use the query-by-example grid below to provide a list of all members of staff, in alphabetical order, grouped by department. [5]

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

Solution:

(a) – all (fields) have (1 mark) duplicate entries (1 mark)

– none (of the fields) (1 mark) have unique entries(1 mark)

(b) – e.g. StaffNumber ....

– ..... Uniquely identifies each member of staff//no duplicates//different for each member of staff

(c)

Field:	Department	Name		
Table:	STAFFPHONE	STAFFPHONE		
Sort:	Ascending	Ascending		
Show:	☑	☑	☐	☐
Criteria:				
or:				

(2 marks) (2 marks) (1 mark for correct order and number of fields shown)

[5]

May/June 2016 P22

7 A database, SOFASELECT, was set up to show the prices of suites, sofas and chairs for sale from an online furniture warehouse. Part of the database is shown below.

Description	Brochure Number	Number of Seats	Number of Pieces	Material	Colour	Price in $
Sofa	SF17	2	1	Leather	Red	950
Sofa	SF19	3	1	Vinyl	Black	1,000
Suite	SU10	4	3	Velvet	Green	1,500
Suite	SU23	5	3	Leather	Brown	950
Recliner chair	RC01	1	1	Leather	Cream	600
Chair	CH16	1	1	Vinyl	Red	250
Recliner sofa	RS23	4	1	Leather	Cream	1,200
Chair	CH10	1	1	Velvet	Red	175

(a) How many fields are in each record? [1]

(b) State which field you would choose for the primary key. [2]

Give a reason for choosing this field.

(c) State the data type you would choose for each of the following fields.

Number of Seats.....

Price in $.....[2]

(d) The query-by-example grid below selects all the furniture in cream leather.

Field:	Description	Material	Colour	Price in $	Brochure Number
Table:	SOFASELECT	SOFASELECT	SOFASELECT	SOFASELECT	SOFASELECT
Sort:				Descending	
Show:	☑	☐	☐	☑	☑
Criteria:		= 'Leather'	= 'Cream'		
or:					

Show the output from the query-by-example. [3]

(e) Complete the query-by-example grid below to select and show the brochure number, material, colour and price of all the furniture with 3 or more seats. [5]

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

Solution:

7 (a) – 7 [1]

(b) – Brochure Number……..
– ….. Uniquely identifies each record/each Brochure Number different/no duplicates [2]

(c) – Number of Seats – number/integer
– Price in $ – currency/real [2]

(d) **1** mark for each correct result, **1** mark for the results in descending order of price

– Recliner sofa 1,200 RS23
– Recliner chair 600 RC01 [3]

(e)

Field:	Brochure Number	Material	Colour	Price in $	Number of Seats
Table:	SOFASELECT	SOFASELECT	SOFASELECT	SOFASELECT	SOFASELECT
Sort:					
Show:	☑	☑	☑	☑	☐
Criteria:					>2
or:					

Oct/Nov 2016 P22

5 A database, PLAYPRODUCTION, was set up to show the performance dates, prices and number of seats available at a theatre specialising in Shakespeare productions.

Play	Performance Date	Number Seats Stalls	Number Seats Circle	Price Stalls Seats $	Price Circle Seats $
As You Like It	01/07/2016	120	90	20.00	30.00
As You Like It	02/07/2016	85	45	30.00	40.00
As You Like It	09/07/2016	31	4	30.00	40.00
Macbeth	14/07/2016	101	56	25.00	35.00
Macbeth	15/07/2016	50	34	25.00	35.00
Macbeth	16/07/2016	12	5	35.00	50.00
Julius Caesar	22/07/2016	67	111	20.00	20.00
Julius Caesar	23/07/2016	21	24	15.00	15.00
A Comedy of Errors	30/07/2016	45	36	35.00	45.00

(a) Give the number of fields that are in each record. [1]

(b) State the data type you would choose for each of the following fields.

Play.....

Number Seats Stalls.....

Price Stalls Seats $ ..... [3]

(c) The query-by-example grid below selects all the productions with more than 100 seats left in either the stalls or the circle.

Field:	Play	Performance Date	Number Seats Stalls	Number Seats Circle
Table:	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION
Sort:	Ascending			
Show:	☑	☑	☐	☐
Criteria:			> 100	
or:				> 100

Show what would be output from the query-by-example. [3]

(d) Complete the query-by-example grid below to select all the productions with at least six seats left in the circle and show the Play, Performance Date and Price Circle Seats $ in Performance Date order.

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[5]

Solution:

5 (a) – 6 [1]

(b)

– Play text
– No Seats Stalls number
– Price Stalls Seats $ currency [3]

(c) **1 mark** for **correct plays**, **1 mark** for **correct dates** with each play and no extra fields or text, **1 mark** for the **order**

As You Like It 01/07/2016
Julius Caesar 22/07/2016
Macbeth 14/07/2016

(d)

Field:	Play	Performance Date	Number Seats Circle	Price Circle Seats $
Table:	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION
Sort:		Ascending/ Descending		
Show:	☑	☑	☐	☑
Criteria:			>=6	
or:				
	(1 mark)	(1 mark)	(2 marks) 1 for Criteria 1 for correct Field & Table & Sort & Show & or	(1 mark)

[5]

Oct/Nov 2016 P23

6 A database, THEATRETOURS, was set up to show the tour dates, towns, number of seats and prices in local currency for a Shakespeare play.

Town	Tour Date	Number of Seats	Price Local Currency
Wigan	18/08/2016	120	15.00
Dumfries	20/08/2016	160	12.50
Turin	25/08/2016	200	17.00
Macon	27/08/2016	75	18.00
Bordeaux	29/08/2016	170	20.00
Algiers	01/09/2016	125	1350.00
Windhoek	05/09/2016	65	90.00
Windhoek	06/09/2016	65	90.00
Port Elizabeth	10/09/2016	200	110.00

(a) Explain why none of the fields in the database can be used as a primary key. [2]

(b) State a field that could be added as a primary key.
Give a reason for choosing this field. [2]

(c) Use the query-by-example grid below to provide a list of tour dates and seat prices in alphabetical order of town. [4]

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

6 **(a)** – Town has duplicate entries/all fields can have duplicate entries
– fields other than Town not suitable identifiers [2]

(b) – Performance number …
– … uniquely identifies each performance [2]

(c)

Field:	Town	Tour Date	Price Local Currency	
Table:	THEATRETOURS	THEATRETOURS	THEATRETOURS	
Sort:	Ascending			
Show:	☑	☑	☑	☐
Criteria:				
or:				

1 mark for each column + 1 mark for correct fields only [4]

May/June 2017 P21

7 A television (TV) store has a database table, TVSTOCK, for its new range of televisions. The table stores the screen size of each TV, whether it will show 3D, whether the screen is curved or flat, if the internet is available on the TV, if it has a built-in hard disk drive and the price. Part of the database table is shown below.

TVID	ScreenSize	3D	CurvedFlat	Internet	HDD	Price
TV80CVINT	80	YES	CV	YES	YES	$7,000.00
TV65CVINT	65	YES	CV	YES	YES	$5,000.00
TV60CVINT	60	YES	CV	YES	YES	$4,500.00
TV60FTINT	60	YES	FT	YES	YES	$4,000.00
TV55CVINT	55	YES	CV	YES	NO	$3,000.00
TV55FTINT	55	YES	FT	YES	NO	$3,500.00
TV55FTNIN	55	YES	FT	NO	NO	$3,000.00
TV50CVINT	50	YES	CV	YES	NO	$2,500.00
TV50FTINT	50	YES	FT	YES	NO	$2,000.00
TV50FTNIN	50	YES	FT	NO	NO	$1,750.00
TV42FTINT	42	YES	FT	YES	NO	$1,500.00
TV37FTINT	37	NO	FT	YES	NO	$1,200.00
TV20FTNIN	20	NO	FT	NO	NO	$800.00
TV15FTNIN	15	NO	FT	NO	NO	$400.00

(a) State the type of the field TVID and give a reason for your choice. [1]

(b) Complete the table with the most appropriate data type for each field. [3]

Field name	Data type
ScreenSize	
3D	
CurvedFlat	
Internet	
HDD	
Price	

(c) Use the query-by-example grid below to provide a list of all of the curved screen TVs that have a built-in hard disk drive. Make sure the list only displays the TVID, the price and the screen size in ascending order of price.

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

Solution:

7(a)

Any **one** from:
- It is the primary key/key field with unique data
- (Fixed length) text field with alphanumeric data

7(b)

Field name	Data type
ScreenSize	Number
3D	Boolean
CurvedFlat	Text
Internet	Boolean
HDD	Boolean
Price	Currency

1 mark for every two correct data types

7(c)

Field:	TVID	ScreenSize	CurvedFlat	HDD	Price
Table:	TVSTOCK	TVSTOCK	TVSTOCK	TVSTOCK	TVSTOCK
Sort:					Ascending
Show:	☑	☑	☐	☐	☑
Criteria:			="CV"	YES	
or:					

May/June 2017 P22

5 A database table, SHEEP, is used to keep a record of the sheep on a farm. Each sheep has a unique ear tag, EARnnnn; n is a single digit. The farmer keeps a record of the date of birth, the gender and the current weight of each sheep in kilograms.

(a)Identify the four fields required for the database. Give each field a suitable name and data type. Provide a sample of data that you could expect to see in the field.

Field 1 name .....
Data type .....
Data sample .....
Field 2 name .....
Data type .....
Data sample .....
Field 3 name .....
Data type .....
Data sample .....

Field 4 name .....
Data type .....
Data sample ..... [8]

(b) State the field that you would choose as the primary key. [1]
(c) Using the query-by-example grid below, write a query to identify the ear tags of all male sheep weighing over 10 kilograms. Only display the ear tags. [3]

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

Solution:

5(a)	for each field name (1), data type and sample (1) The following are examples there are many different correct answers. - EarTag (1), text, EAR1011 (1) - DOB (1), date, 4/3/2017 (1) - Gender (1), text, M (1) - Weight (1), number, 5.9 (1)
5(b)	EarTag

5(c)

Field:	EarTag	Gender	Weight	
Table:	SHEEP	SHEEP	SHEEP	
Sort:				
Show:	☑	☐	☐	☐
Criteria:		='M'	> 10	
or:				

Oct/Nov 2017 P22

6 A database table, TRAIN, is to be set up for a railway company to keep a record of the engines available for use. Each engine has a unique number made up of 5 digits, nnnnn. The engines are classified as freight (F) or passenger (P) together with a power classification that is a whole number between 0 and 9, for example F8. The railway company keeps a record of the date of the last service for each engine.
(a)Identify the three fields required for the database. Give each field a suitable name and data type. Provide a sample of data that you could expect to see in the field.
Field 1 Name .....
Data type .....
Data sample .....
Field 2 Name .....
Data type .....
Data sample .....
Field 3 Name .....
Data type .....

Data sample .....[6]

(b) State the field that you should choose as the primary key. [1]

(c) Using the query-by-example grid below, write a query to identify all passenger engines that have not been serviced in the past 12 months. Only display the engine numbers. [3]

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

Solution:

6(a)	– 1 mark for each field suitable name, 1 mark for appropriate data type and appropriate data sample The following are examples there are many different correct answers. – Engine Number, text, 21012 – Class, text, P6 – Service Date, date, 4/3/2017
6(b)	– Engine Number // Correct field number
6(c)	

Field:	Engine Number	Class	Service Date	
Table:	TRAIN	TRAIN	TRAIN	
Sort:				
Show:	☑	☐	☐	☐
Criteria:		Like 'P*' // Like 'P?'	<10/11/2016	
or:				

Oct/Nov 2017 P23

6 A wildlife park has a database table, called LIVESTOCK, to classify and record its animal species. Part of the database table is shown.

Species	Classification	Diet	Legs
Giraffe	Mammal	Herbivore	4
Elephant	Mammal	Herbivore	4
Crocodile	Reptile	Carnivore	4
Ostrich	Bird	Omnivore	2
Gorilla	Mammal	Herbivore	2
Bear	Mammal	Omnivore	4
Rhinoceros	Mammal	Herbivore	4
Hippopotamus	Mammal	Herbivore	4
Flamingo	Bird	Omnivore	2
Lion	Mammal	Carnivore	4
Turtle	Reptile	Omnivore	4
Penguin	Bird	Carnivore	2

(a)Suggest another appropriate field that could be added to this database by stating its name and data type. State its purpose and give an example of the data it could contain.

Field name .....

Data Type .....

Purpose .....

Example of data ..... **[2]**

(b) Use the query-by-example grid below to provide a list of all four-legged mammals that are herbivores, sorted alphabetically by species, with only the species displayed. [4]

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

Solution:

6(a)	1 mark for any **sensible appropriate** field name 1 mark for data type, purpose + example data Example 1: Field Name: SPECIESID Data Type: Alphanumeric Purpose: Primary key Example Data: SP06583 Example 2: Field name: NUMBER Data Type: Integer Purpose: To record how many of that species there are at the park Example Data: 30
6(b)	

Field:	Species	Classification	Diet	Legs	
Table:	LIVESTOCK	LIVESTOCK	LIVESTOCK	LIVESTOCK	
Sort:	Ascending/ Descending				
Show:	☑	☐	☐	☐	☐
Criteria:		"Mammal"	"Herbivore"	4	
or:					

May/June 2018 P21

6 A database table, PERFORMANCE, is used to keep a record of the performances at a local theatre.

Show Number	Type	Title	Date	Sold Out
SN091	Comedy	An Evening at Home	01 Sept	Yes
SN102	Drama	Old Places	02 Oct	No
SN113	Jazz	Acoustic Evening	03 Nov	No
SN124	Classical	Mozart Evening	04 Dec	Yes
SN021	Classical	Bach Favourites	01 Feb	Yes
SN032	Jazz	30 Years of Jazz	02 Mar	Yes
SN043	Comedy	Street Night	03 Apr	No
SN054	Comedy	Hoot	04 May	No

(a)State the number of fields and records in the table.

Fields .....

Records ..... [2]

(b) Give two validation checks that could be performed on the Show Number field. [2]

(c) Using the query-by-example grid, write a query to identify jazz performances that are not sold out. Only display the date and the title. [4]

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

Solution:

6(a)	Fields 5 Records 8				
6(b)	Any **two** from: Length check Type check Presence check Format check				
6(c)	Field:	Type	Sold Out	Date	Title
	Table:	PERFORMANCE	PERFORMANCE	PERFORMANCE	PERFORMANCE
	Sort:				
	Show:	☐	☐	☑	☑
	Criteria:	Like "Jazz"	False		
	or:				

May/June 2018 P22

6 A database table, TREES, is used to keep a record of the trees in a park. Each tree is given a unique number and is examined to see if it is at risk of dying. There are over 900 trees; part of the database table is shown.

Tree Number	Type	Map Position	Age in Years	At Risk
TN091	Acacia	A7	250	Y
TN172	Olive	C5	110	N
TN913	Cedar	B9	8	N
TN824	Banyan	A3	50	Y
TN021	Pine	D5	560	Y
TN532	Teak	C8	76	Y
TN043	Yew	B1	340	N
TN354	Spruce	D4	65	N
TN731	Elm	B10	22	Y
TN869	Oak	C9	13	N
TN954	Pine	E11	3	N

(a) State the number of fields in the table. [1]

(b) The tree numbering system uses TN followed by three digits. The numbering system will not work if there are over 1000 trees.

Describe, with the aid of an example, how you could change the tree numbering system to allow for over 1000 trees. Existing tree numbers must not be changed. [2]

(c) Using the query-by-example grid, write a query to identify at risk trees over 100 years old. Display only the type and the position on the map. [4]

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

Solution:

6(a)	Fields 5
6(b)	**One** mark description of new code that will allow more than 1000 values **One** mark for example matching candidate's description Example Use a new character instead of N TT345
6(c)	

Field:	At Risk	Age in Years	Type	Map Position
Table:	TREES	TREES	TREES	TREES
Sort:				
Show:	☐	☐	☑	☑
Criteria:	True	>100		
or:				

Oct/Nov 2018 P23

6 An online fruit tree specialist sells fruit trees in various sizes. A database table, TREETAB, shows the tree type and, for each size, the price and whether they are in stock.

Tree Type	Size1	Size1 In	Size2	Size2 In	Size3	Size3 In
Apple	10.95	Yes	14.95	Yes	29.95	Yes
Apple	12.95	Yes	14.95	Yes	29.95	Yes
Cherry	24.95	No	34.95	No	59.95	Yes
Fig	19.95	Yes	29.95	No	49.95	Yes
Guava	19.95	No	29.95	No	59.95	No
Nectarine	8.50	Yes	11.95	Yes	19.95	Yes
Olive	19.95	No	39.95	Yes	59.95	Yes
Peach	9.25	No	11.95	Yes	19.95	Yes
Pear	10.95	Yes	14.95	Yes	29.95	Yes
Plum	8.95	Yes	11.95	Yes	19.95	Yes
Pomegranate	12.95	No	18.95	Yes	34.95	No
Quince	34.95	Yes	44.95	Yes	84.95	No

(a)State whether any of the fields shown would be suitable as a primary key.
Explain your answer [2]

(b) Complete the table to show the most appropriate data type for each of the fields based on the data shown in the table at the start of question 6.

Field	Data type
Tree Type	
Size3	
Size2 In	

[3]

(c) Show the output that would be given by this query-by-example.

Field:	Tree Type	Size1	Size1 In		
Table:	TREETAB	TREETAB	TREETAB		
Sort:		Descending			
Show:	☑	☑	☑	☐	☐
Criteria:		<10.00			
or:					

[4]

(d) Using the following query-by-example grid, write a query to identify all types of the fruit trees that are out of stock for all three sizes. Make sure the type of the tree and the various 'in stock' fields are shown. The trees should be listed in alphabetical order by type.

Field:					
Table:					
Sort:					
Show:	☐	☐	☐	☐	☐
Criteria:					
or:					

[4]

Solution:

6(a) 1 mark for correct answer:
No

1 mark for correct explanation:
No field in this table contains unique identifier

6(b) 1 mark for each correct answer

Field	Data type
Tree Type	Text
Size3	Number
Size2 In	Boolean/Text

6(c) 1 mark for each correct row (max 3) and
1 mark for the correct order

Peach 9.25 No
Plum 8.95 Yes
Nectarine 8.50 Yes

6(d)

1 mark correct Fields included
1 mark correct Table and Show on all the four fields required
1 mark for correct Sort, must be ascending
1 mark for correct Criteria for the four fields

Field:	Tree Type	Size1 In	Size2 In	Size 3 In	
Table:	TREETAB	TREETAB	TREETAB	TREETAB	
Sort:	Ascending				
Show:	☑	☑	☑	☑	☐
Criteria:		=No	=No	=No	
or:					

Oct/Nov 2018 P22

6 A database table, PORTRAIT, is used to keep a record of the portraits available from a photographic studio. Each portrait has a unique reference number PICnnn, where n is a single digit, for example PIC123. The studio keeps a record of the size (for example 20 × 15), the type (black and white or colour), and the price in dollars.

(a) Complete the table to show the most appropriate data type for each of the fields.

Field	Data type
Reference Number	
Size	
Type	
Price in $	

[4]

(b) The results from the query-by-example grid should show the reference number, price, type and size of all portraits under $50. Identify the three errors in the query-by-example grid.

Field:	Reference No	Price in $	Type	Size
Table:	PORTRAIT	PORTRAIT	PORTRAIT	PORTRAIT
Sort:				
Show:	☑	☑	☐	☑
Criteria:		>50.00		
or:				

[3]

Solution:

6(a) Many correct answers, an example is given. 1 mark for each correct row (max 4).

Field	Data type
Reference Number	Text
Size	Text
Type	Text/Boolean
Price in $	Number/Currency

6(b) 1 mark per bullet:

- Incorrect field name for Reference Number
- Incorrect criteria for Price in $ should be <
- Type not checked

May/June 2019 P21

5 The table, BEVERAGES, shows the number of calories in 100 ml of a range of popular beverages. It also shows the availability of these drinks in a can, a small bottle and a large bottle.

BevNo	BevName	Calories	Can	Small Bottle	Large Bottle
Bev01	Cola	40	Yes	Yes	Yes
Bev02	Lime	45	Yes	No	Yes
Bev03	Energy Drink 1	52	Yes	Yes	No
Bev04	Energy Drink 2	43	Yes	No	No
Bev05	Mango	47	Yes	No	Yes
Bev06	Lemon Iced Tea	38	Yes	No	Yes
Bev07	Lemonade	58	Yes	Yes	Yes
Bev08	Orange Juice	46	Yes	Yes	No
Bev12	Apple Juice	50	Yes	Yes	No
Bev15	Chocolate Milk	83	Yes	Yes	No

(a) Give a reason for choosing BevNo as the primary key for this table. [1]

(b) State the number of records shown in the table BEVERAGES. [1]

(c) List the output that would be given by this query-by-example.

Field:	BevNo	BevName	Can	Small Bottle	Large Bottle	
Table:	BEVERAGES	BEVERAGES	BEVERAGES	BEVERAGES	BEVERAGES	
Sort:		Descending				
Show:	☑	☑	☐	☐	☐	☐
Criteria:			= "Yes"	= "Yes"	= "Yes"	
or:						

[3]

(d) Complete the query-by-example grid to output a list showing just the names and primary keys of all the beverages with a calorie count greater than 45. The list should be in alphabetical order of names.

Field:						
Table:						
Sort:						
Show:	☐	☐	☐	☐	☐	☐
Criteria:						
or:						

[4]

Solution:

5(a)	Each data value is unique
5(b)	10 records

5(c)	Bev07 Lemonade Bev01 Cola 1 mark for each correct content 1 mark for each correct format 1 mark for correct order
5(d)	<table><tr><td>Field:</td><td>BevNo</td><td>BevName</td><td>Calories</td><td></td><td></td><td></td></tr><tr><td>Table:</td><td>BEVERAGES</td><td>BEVERAGES</td><td>BEVERAGES</td><td></td><td></td><td></td></tr><tr><td>Sort:</td><td></td><td>Ascending</td><td></td><td></td><td></td><td></td></tr><tr><td>Show:</td><td>☑</td><td>☑</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr><tr><td>Criteria:</td><td></td><td></td><td>>45</td><td></td><td></td><td></td></tr><tr><td>or:</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> 1 mark for correct Field row 1 mark for Table and Sort rows 1 mark for correct Show row 1 mark for correct Criteria rows

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May/June 2019 P22

6 A database table, FLIGHT, is used to keep a record of flights from a small airfield. Planes can carry passengers, freight or both. Some flights are marked as private and only carry passengers.

Flight number	Plane	Notes	Departure time	Passengers
FN101	Caravan 1	Private passenger flight	08:00	Y
CN101	Caravan 2	Freight only	08:30	N
CN102	Piper 1	Freight only	09:00	N
FN104	Piper 2	Passengers only	09:20	Y
FN105	Piper 1	Freight and passengers	10:00	Y
FN106	Caravan 1	Passengers only	10:30	Y
CN108	Caravan 2	Freight only	08:00	N
CN110	Lear	Private passenger flight	08:00	Y

(a)State the field that could have a Boolean data type. [1]

(b) A query-by-example has been written to display just the flight numbers of all planes leaving after 10:00 that only carry passengers.

Field:	Flight number	Passengers	Departure time	
Table:	FLIGHT	FLIGHT	FLIGHT	
Sort:				
Show:	☐	☑	☐	☐
Criteria:		= Y	= 10:00	
or:				

Explain why the query-by-example is incorrect, and write a correct query-by-example.

Explanation

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[7]

Solution:

6(a)	Passengers
6(b)	Explanation **Three** from: • Flight number not displayed • Passengers displayed when should not be • Departure time = not > • "Freight and passengers" flight not excluded Revised QBE – answers shown are examples only 1 mark per bullet • correct field and table names (either 3 or 4 columns) must include Notes, Flight number and Departure time • correct show • correct time criteria for the candidate's QBE grid • use of criteria to select planes with passengers only

Field:	Flight number	Passengers	Departure time	Notes
Table:	FLIGHT	FLIGHT	FLIGHT	FLIGHT
Sort:				
Show:	☑	☐	☐	☐
Criteria:		=Y	>10:00	<> "Freight and passengers"
or:				

OR

Field:	Flight number	Departure time	Notes
Table:	FLIGHT	FLIGHT	FLIGHT
Sort:			
Show:	☑	☐	☐
Criteria:		>10:00	= "Passengers only"
or:		>10:00	="Private passenger flight"

Oct/Nov 2019 P22

7 A database table, SALES, is used to keep a record of items made and sold by a furniture maker.

Item number	Order number	Notes	Amount	Status
CH001	1921	Smith – six dining chairs	6	Delivered
TB003	1921	Smith – large table	1	In progress
CH001	1924	Hue – extra chairs	4	In progress
CH003	1925	For stock	2	Cancelled
BN001	1927	Patel – replacement bench	1	Not started
ST002	1931	Sola – small table	1	Delivered
CH003	1927	Patel – eight dining chairs with arms	8	Not started
TB003	1927	Patel – large table	1	Not started

(a) Explain why the field Item number could not be used as a primary key. [1]

(b) A query-by-example has been written to display only the order number and item numbers of any items in progress or not started.

Field:	Item number	Order number	Amount	Status
Table:	SALES	SALES	SALES	SALES
Sort:				
Show:	☐	☑	☑	☐
Criteria:				Not Like "Delivered"
or:				

Explain why the query-by-example is incorrect, and write a correct query-by-example.

Explanation

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[5]

Solution:

7(a)	▯ Number is repeated/not unique
7(b)	▯ Item number not displayed/Amount column not required ▯ Not Like 'Delivered' will also show cancelled items

Field:	Item number	Order number	Status	
Table:	SALES	SALES	SALES	
Sort:				
Show:	☑	☑	☐	☐
Criteria:			Like "Not started"	
or:			Like "In progress"	

▯ Correct Item number column
▯ Correct Order number column and any additional column not shown
▯ Correct status column

Oct/Nov 2019 P23

7 A teacher has decided to use a database table as her mark book for her Computer Science class, which she has called MARKBOOK. For each student, the following data will be recorded: first name, last name, their year 10 test score and their year 11 test score. The class has 32 students.

(a)State the number of fields and records required for this database.

Number of Fields .....

Number of Records ..... [2]

(b) The data in MARKBOOK is stored under category headings: LastName, FirstName, Y10TestScore and Y11TestScore.

State, with a reason, whether any of these headings would be suitable as a primary key. [2]

(c) Complete the query-by-example grid to only display the first name, last name and year 10 test score of each student who achieved 50 or more in their year 10 test. The output should be in test score order with the highest marks at the top of the list.

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

Solution:

7(a)	• Number of Fields: 4 • Number of Records: 32
7(b)	• No field is suitable as a primary key … • … because none of the data would be unique // duplicates could occur
7(c)	Field: FirstName | LastName | Y10TestScore | Table: MARKBOOK | MARKBOOK | MARKBOOK | Sort: | | Descending | Show: ☑ | ☑ | ☑ | ☐ Criteria: | | >=50 | or: | | | **One** mark for each completely correct column down to and including 'Show' row (maximum three marks) **One** mark for correct search criteria rows