

## 2.2 Programming

Saturday, 26 December 2020 3:11 PM



2.2

Program...



**Computer Science 2210**  
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### Topic: 2.2 Programming

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]

#### May/June 2010. P11

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]

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
```

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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]

May/June 2011 P12

7 (a) Read the following section of code that inputs twenty (20) numbers and then outputs the largest number input.

```
1 h = 0
2 c = 0
3 REPEAT
4 READ x
5 IF x > h THEN x = h
6 c = c + 1
7 PRINT h
8 UNTIL c < 20
```

There are THREE errors in this code.

Locate these errors and suggest a corrected piece of code.

[3]

### Oct/Nov 2013. P12

8 A piece of pseudocode was written to input 1000 positive numbers and then output the highest and lowest numbers.

```
10 highest = 0
20 lowest = 0
30 for count = 1 to 1000
40   input number
50   if number > highest then number = highest
60   if number < lowest then number = lowest
70   count = count + 1
80 next count
90 print highest, lowest
```

There are errors in the code.

Locate these errors and suggest a correction.

[8]

### May/June 2014 P12

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
```



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```
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.

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### Topic: 2.2 Programming

#### Array

**Question 01:** Input and store the names and marks for 30 students who have sat three computer science tests. Test 1 is out of 20 marks, Test 2 is out of 25 marks, Test 3 is out of 35 marks. You must store the names in a one-dimensional array and the marks and total score for each student in one-dimensional arrays. All the marks must be validated on entry and any invalid marks rejected. You may assume that the students' names are unique.

**Question 02:** Calculate and store the total score for each student and calculate the average score for the whole class. Output each student's name followed by their total score, then output the average score for the class.

**Question 03:** Select the student with the highest score and output their name and score. Your program must include appropriate prompts for the entry of data. Error messages and other output need to be set out clearly and understandably. All variables, constants and other identifiers must have meaningful names. Each task must be fully tested.

**Question 04:** Write a pseudocode using array, asks user to input 10 numbers, then calculates the average of those numbers. Loop is used in this problem.

**Question 05:** Write a pseudocode to swap first and last element of an integer 1-d array.

**Question 06:** Write a pseudocode to find the largest and smallest element of an array.

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### Topic: 2.2 Programming

#### Practice Questions:

Questions 1 to 3 contain sections of pseudocode which contain errors. Locate the errors and suggest the correct coding. Questions 4 to 10 are problems which require an algorithm to be written in pseudocode – there is "no right answer" here; as long as the pseudocode works then the solution is acceptable.

(1) The following section of pseudocode inputs 1000 numbers and then outputs how many were negative, how many were positive and how many were zero.  
Locate the 3 errors and suggest a corrected piece of code.

```

1 negative ← 1: positive ← 1
2 for x ← 0 to 1000
3   input number
4   if number < 0 then negative ← negative + 1
5   if number > 0 then positive ← positive + 1
6   endif
7   endif
8 next
9 print negative, positive

```

(2) The following section of pseudocode inputs rainfall (in cm) for 500 days and outputs the average rainfall and the highest rainfall input.  
Locate the 3 errors and suggest a corrected piece of code.

```

1 highest ← 1000
2 days ← 1
3 while days > 0
4   input rainfall
5   if rainfall > highest then highest ← rainfall
6   endif
7   total ← total + rainfall
8   days ← days + 1
9   average ← total/500
10 endwhile
11 print average, highest

```

(3) The following section of pseudocode inputs a number, n, multiplies together  $1 \times 2 \times 3 \times \dots \times n$ , calculates input number/sum and outputs result of the calculation.  
Locate the 3 errors and suggest a corrected piece of code.

```

1 input n
2 for mult← 1 to n
3   sum ← 0
4   sum ← sum * mult
5   result ← n/sum
6 next
7 print result

```

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### Topic: 2.2 Programming

(4) Regis lives in Brazil and often travels to USA, Europe and Japan. He wants to be able to convert Brazilian Reais into US dollars, European euros and Japanese yen. The conversion formula is:

currency value = number of Reais X conversion rate  
For example, if Regis is going to USA and wants to take 1000 Reais (and the exchange rate is 0.48) then he would input USA, 1000 and 0.48 and the output would be: 480 US dollars.

Write an algorithm, using pseudocode, which inputs the country he is visiting, the exchange rate and the amount in Brazilian Reais he is taking. The output will be value in foreign currency and the name of the currency.

(5) As part of an experiment, a school measured the heights (in metres) of all its 500 students.  
Write an algorithm, using pseudocode, which inputs the heights of all 500 students and outputs the height of the tallest person and the shortest person in the school.

(6) A geography class decide to measure daily temperatures and hours of sunshine per day over a 12 month period (365 days)

Write an algorithm, using pseudocode, which inputs the temperatures and hours of sunshine for all 365 days, and finally outputs the average (mean) temperature for the year and the average (mean) number of hours per day over the year.

(7) A small shop sells 280 different items. Each item is identified by a 3 – digit code. All items that start with a zero (0) are cards, all items that start with a one (1) are sweets, all items that start with a two (2) are stationery and all items that start with a three (3) are toys.

Write an algorithm, using pseudocode, which inputs the 3 – digit code for all 280 items and outputs the number of cards, sweets, stationery and toys.

(8) A company are carrying out a survey by observing traffic at a road junction. Each time a car, bus, lorry or other vehicle passed by the road junction it was noted down.

10 000 vehicles were counted during the survey.

Write an algorithm, using pseudocode, which:

- inputs all 10000 responses
- outputs the number of cars, buses and lorries that passed by the junction during the survey
- outputs the number of vehicles that **weren't** cars, buses or lorries during the survey

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**Topic: 2.2 Programming**

(9) Speed cameras read the time a vehicle passes a point (A) on the road and then reads the time it passes a second point (B) on the same road (points A and B are 100 metres apart). The speed of the vehicle is calculated using:

The maximum allowed speed is 100 kilometres per hour. 500 vehicles were monitored using these cameras over a 1 hour period.

Write an algorithm, using pseudocode, which:

- inputs the start time and end time for the 500 vehicles that were monitored
- calculate the speed for each vehicle using the formula above
- outputs the speed for each vehicle and also a message if the speed exceeded 100 km/hour
- output the highest speed of all the 500 vehicles monitored

(10)

$$\text{speed} = \frac{100}{(\text{time at point B} - \text{time at point A})} \text{ (meters/second)}$$

The maximum allowed speed is 100 kilometres per hour. 500 vehicles were monitored using these cameras over a 1 hour period.

Write an algorithm, using pseudocode, which:

- inputs the start time and end time for the 500 vehicles that were monitored
- calculate the speed for each vehicle using the formula above
- outputs the speed for each vehicle and also a message if the speed exceeded 100 km/hour
- output the highest speed of all the 500 vehicles monitored

(10) There are ten stations on a railway line:

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8 ----- 9 ----- 10

The train travels in both directions (i.e. from 1 to 10 and then from 10 to 1). The fare between each station is \$2.

A passenger inputs the number of the station at the start of his journey and the number of the destination station and the fare is calculated (e.g if a passenger gets on a station 3 and his destination is station 9 his fare will be \$12). The calculation must take into account the direction of the train (e.g. a passenger getting on at station 7 and getting off at station 1 will also pay \$12 and not a negative value!!).

A discount of 10% is given if 3 or more passengers are travelling together.

Write an algorithm, using pseudocode, which:

- inputs the number of passengers travelling
- inputs the station number of the starting point and the station number of the destination
- calculates the total fare taking into account the direction of travel
- calculates any discount due
- outputs the cost of the tickets and prints the tickets

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## Topical Past Papers

**Topic: 2.2 Programming****Past Papers Questions:**

**May/June 2006**

16 (a) A formula for calculating the body mass index (BMI) is:

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

Calculate the BMI for a person whose weight is 80kg and height is 2 metres. [1]

FOR COUNT  $\leftarrow 1$  TO 30  
INPUT ID, W, H  
BMI  $\leftarrow W / (H \times H)$   
OUTPUT ID, BMI  
IF BMI  $\geq 25$  THEN OUTPUT "OVERWEIGHT"  
IF BMI  $< 19$  THEN OUTPUT "UNDERWEIGHT"  
IF BMI  $\geq 19$  AND BMI  $\leq 25$  THEN OUTPUT "NORMAL" Format -1

Initialisation  
For Count  $\leftarrow 1$  TO n  
INPUT ..

Formula Calculation  
OUTPUT Formula Result

Totalising (Total  $\leftarrow$  Total + ...)  
Counting with decision (c1)

✓ A BMI greater than 25 will get the comment 'OVER WEIGHT', a BMI between 25 and 19 (inclusive) will get 'NORMAL' and a BMI less than 19 will get 'UNDER WEIGHT'. [6]

Range ( $BMI \geq 19$  AND  $BMI \leq 25$ ) ✓

- 20 Temperatures ( $^{\circ}\text{C}$ ) 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  $20^{\circ}\text{C}$
  - how many of the temperatures were below  $10^{\circ}\text{C}$
  - the lowest temperature that was input

[5]

#### May/June 2007

- 19 A company has 5000 CDs, DVDs, videos and books in stock. Each item has a unique 5-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.

```
Count ← 0, Code ← 0, C ← 0,
A ← 0, D ← 0, V ← 0, B ← 0
For Count ← 1 To 5000
    INPUT Code
    X ← INT (Code / 10000)
    IF X = 1 Then C ← C + 1
    IF X = 2 Then D ← D + 1
    IF X = 3 Then V ← V + 1
    IF X = 4 Then B ← B + 1
Next
OUTPUT C, D, V, B
```

[5]

9999  
10000

Output with decision.

Extreme Values

Next Count

Avg ← Total/n

Per ← (C1/n) \* 100

Output ...

Count ← 0, Temp ← 0, a ← 0,
b ← 0, Low ← +1000

For Count ← 1 To 200

INPUT Temp

IF Temp > 20 Then a ← a + 1
IF Temp < 10 Then b ← b + 1
IF Temp < low Then low ← Temp

Next Count

OUTPUT a, b, low



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## Computer Science 2210

### Topical Past Papers



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### Topic: 2.2 Programming

#### 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?

$$40/10 = 4$$

[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]

#### 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.
- repeat ... until
  - for ... to
  - Name another loop structure.

[2]

[2]

[1]

- 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]

Count ← 0, DT ← 0, Fuel ← 0
Total ← 0, Highest ← -1000, Lowest ← 1000
Avg ← 0

For Count ← 1 To 1000

INPUT DT, Fuel

FE ← DT/Fuel

OUTPUT FE

Total ← Total + FE

IF FE > Highest Then Highest ← FE

IF FE < Lowest Then Lowest ← FE

Next Count

Avg ← Total / 1000

OUTPUT Avg, Highest, Lowest



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**Topic: 2.2 Programming****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]

**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]

**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:

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

$\frac{200}{2} = 100$

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

[1]

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**Topic: 2.2 Programming**

- (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]

**May/June 2010. P11**

- 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]

Format -1

- ✓ Initialization
- ✓ For Count ← 1 TO n
- ✓ INPUT ...
- ✓ Formula Calculation
- ✓ OUTPUT Formula Result
- ✓ Totalising (Total ← Total + ...)
- ✗ Counting with decision (c1)
- ✗ Output with decision ..
- ✓ Extreme Values
- ✓ Next Count
- Arg ← Total/n
- Per ← (c1/n) \*100
- Output ...

count ← 0, Time ← 0, FS ← 0,  
 Total ← 0, H ← -1000, S ← 1000, Arg ← 0  
**FOR** Count ← 1 TO 500  
 INPUT Time  
 FS ← 200/Time  
 OUTPUT FS

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

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

- inputs 100 numbers
- finds the average of the input numbers ✓
- outputs the average

Oct/Nov 2010. P12

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]

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

(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)



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INPUT WN  
 $\underline{x} \leftarrow \text{INT}(\log(WN)) + 1$   
 OUTPUT X, WN [4]



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Validations after  
Algorithms.

```
Count ← 0, Num ← 0
For Count ← 1 To 100
  INPUT Num
  Total ← Total + Num
Next Count
Avg ← Total / 100
OUTPUT Avg
```

Total ← Total + FS

IF FS > H THEN H ← FS  
 IF FS < S THEN S ← FS

Next Count

Avg ← Total / 500  
 OUTPUT S, H, Avg

Count ← 0, Height ← 0, Weight ← 0, TotalH ← 0  
 TotalW ← 0, AvgH ← 0, AvgW ← 0

For Count ← 1 To 1000
 INPUT Height, Weight
 TotalH ← TotalH + Height
 TotalW ← TotalW + Weight

Next Count
 AvgH ← TotalH / 1000
 AvgW ← TotalW / 1000
 OUTPUT AvgH, AvgW

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### Topic: 2.2 Programming

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]

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]

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)

Count ← 0, Number ← 0  
 Lan ← -1000  
 For Count ← 1 To 3  
 INPUT Num  
 If Num > Lan Then Lan ← Num  
 Next  
 OUTPUT Lan.

Count ← 0, N ← 0, X ← 0,

a ← 0

For Count ← 1 To 1000

INPUT N

$\underline{x} \leftarrow \text{INT}(N)$

If  $x = N$  Then a ← a + 1

Next

OUTPUT a

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### Topic: 2.2 Programming

#### Oct/Nov 2011. P13

16 The weather conditions in a town are being monitored over a year (365 days). The values recorded 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

#### May/June 2012. P11

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

- inputs the population and land area for 500 countries,
- calculates the population density (i.e. population/land area) for every country,
- outputs the largest and smallest population density.
- outputs the average population for all 500 countries.

[6]

#### 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 enquires 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.

[6]

#### 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]

Count  $\leftarrow 0$ , POP  $\leftarrow 0$ , LA  $\leftarrow 0$ ,

PD  $\leftarrow 0$ , Total  $\leftarrow 0$ , Lar  $\leftarrow -1000$ ,

Small  $\leftarrow 1000$ , Avg  $\leftarrow 0$ .

For Count  $\leftarrow 1$  To 500  
INPUT POP, LA

PD  $\leftarrow$  POP/LA  
OUTPUT PD

Total  $\leftarrow$  Total + POP

IF PD  $>$  Lar THEN Lar  $\leftarrow$  PD  
IF PD  $<$  Small THEN Small  $\leftarrow$  PD

Next Count  
Avg  $\leftarrow$  Total/500  
OUTPUT Lar, Small, Avg



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# Computer Science 2210

## Topical Past Papers

### Topic: 2.2 Programming

#### 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]

#### May/June 2013. P11

2 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

a b c d | e  
0 1 2 3 2 4

Count  $\leftarrow 0$ , a  $\leftarrow 0$ , b  $\leftarrow 0$ , c  $\leftarrow 0$ , d  $\leftarrow 0$ , e  $\leftarrow 0$   
d  $\leftarrow$  even, r  $\leftarrow 0$ , q  $\leftarrow 0$ , n  $\leftarrow 0$ , r  $\leftarrow 0$

- 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]

#### 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

### Digit Extraction.

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.

[6]



## Computer Science 2210

### Topical Past Papers



#### Topic: 2.2 Programming

##### 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]

##### 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]

15 5000 numbers are being input which should have either 1 digit (e.g. 5), 2 digits (e.g. 36), 3 digits (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]

##### May/June 2014. P11

$x > 4$

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:
  - o average sound level
  - o highest recorded sound level.

03-111-222-ZAK

OlevelComputer  
AlevelComputer

@zakonweb

zak@zakonweb.com

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## Computer Science 2210



For Count ← 1 TO 100  
INPUT a,b,c,d,e  
 $x \leftarrow (a \times 3) + (c \times 3)$   
 $y \leftarrow (b \times 2) + (d \times 2)$   
 $n \leftarrow x+y$   
 $r \leftarrow n \bmod 10$   
IF  $r = e$  Then correct ← correct + 1  
Next  
OUTPUT correct.

Count ← 0, Num ← 0, X ← 0, One ← 0,  
Two ← 0, Three ← 0, Four ← 0, n ← 0, per ← 0.  
For Count ← 1 TO 5000  
INPUT Num  
 $X \leftarrow \text{INT}(\log(\text{Num})) + 1$   
IF  $X = 1$  THEN One ← One + 1  
IF  $X = 2$  THEN Two ← Two + 1  
IF  $X = 3$  THEN Three ← Three + 1  
IF  $X = 4$  THEN Four ← Four + 1  
IF  $X > 4$  THEN  $n \leftarrow n + 1$   
Next  
 $per \leftarrow (n / 5000) \times 100$   
OUTPUT One, Two, Three, Four, per

## Topic: 2.2 Programming

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

```

Count<=0, Name<="" m "", Choice<=0,
y<=0, S<=0
For Count<=1 To 1500
  INPUT Name, Choice
  IF Choice = 1 THEN Z<=Y+1
  IF Choice = 2 THEN S<=S+1
  IF Choice = 3 THEN P<=P+1
  IF Choice = 4 THEN J<=J+1
  IF Choice = 5 THEN C<=C+1
  IF Choice = 5 THEN OUTPUT Name

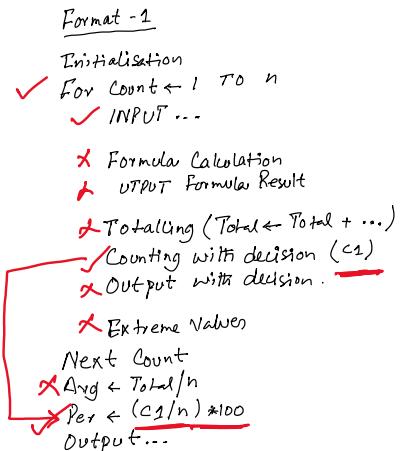
```

Next Count

```

PerR<(S/1500)*100
PerS<(S/1500)*100
PerP<(P/1500)*100
PerJ<(J/1500)*100
PerC<(C/1500)*100
OUTPUT PerR, PerS, PerP, PerJ, PerC

```



17-1-21

  
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 OlevelComputer  
 AlevelComputer


@zakonweb



zak@zakonweb.com



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**Computer Science 2210**

Topical Past Papers



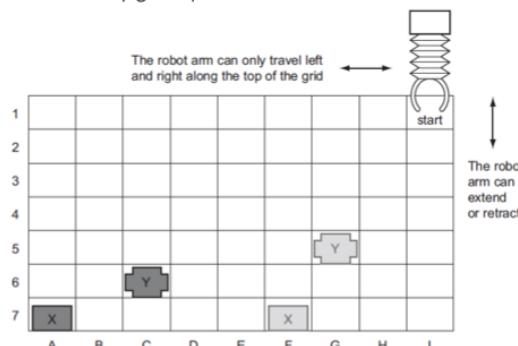
## Topic: 2.2 Programming

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 |