

- 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

Computer Science 2210

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:

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

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

- (b) Using pseudocode or otherwise, write an algorithm that will input the ID, weight (kg) and height (m) of 30 students, calculate their body mass index (BMI) and output their ID, BMI and a comment as follows:

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]

- 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°C
- how many of the temperatures were below 10°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 ✓

$$x \leftarrow \text{INT} \left(\frac{15642}{10000} \right) = 1$$

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, X ← 0
CD ← 0, DVD ← 0, Video ← 0, Books ← 0

For Count ← 1 To 5000
    INPUT Code
    X ← INT(Code / 10000)
    IF X = 1 Then CD ← CD + 1
    IF X = 2 Then DVD ← DVD + 1
    IF X = 3 Then Video ← Video + 1
    IF X = 4 Then Books ← Books + 1
Next
OUTPUT CD, DVD, Video, Books

```

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Topical Past Papers

**Topic: 2.2 Programming****Oct/Nov 2007**

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

$$\text{Fuel Economy} = \frac{\text{Distance Travelled (km)}}{\text{Fuel Used (litres)}} \frac{10}{10} = 4$$

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]

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]

- 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

Count ← 0, DT ← 0, FU ← 0, Lowest ← 1000
FE ← 0, Total ← 0, Highest ← -1000, Avg ← 0

For Count ← 1 To 1000

INPUT DT, FU

FE ← DT/FU

OUTPUT FE ✓

Total ← Total + FE

IF FE > Highest Then Highest ← FE

IF FE < Lowest Then Lowest ← FE

Next Count

Avg ← Total / 1000

OUTPUT Highest, Lowest, Avg ✓

- Withdrawal is refused if amount entered > current balance
 - 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]

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Topical Past Papers



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).

Count ← 0, $E1 \leftarrow "", E2 \leftarrow "", E3 \leftarrow "", S \leftarrow 0, P1 \leftarrow 0, P2 \leftarrow 0, P3 \leftarrow 0$.
 [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

For Count ← 1 To 400
 INPUT FI
 IF FI = "FA" Then E1←FI
 IF FI = "SJ" Then E2←FI
 IF FI = "KA" Then E3←FI
 Next
 $PE \leftarrow PE + 1$
 $PB \leftarrow PB + 1$

$PE \leftarrow KM$

OUT PE, PB, KM

[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:

$$\text{Final Speed} = \frac{200}{\text{Time (hours)}} = 100$$

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

[1]

Format - 1

Initialisation

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

Avg ← Total/n

(avg/n) × 100

Computer Science 2210

Topical Past Papers



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 lowest temperature taken over the year
- outputs the average temperature per day
- outputs the average temperature for the whole year

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 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

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)

```
Count ← 0, Num ← 0,
For Count ← 1 To 50
    INPUT Num
    If Num > 100 Then Count ← Count + 1
Next
OUTPUT Count [3]
```

```
Count ← 0, Num ← 0, Total ← 0
For Count ← 1 To 100
    INPUT Num [3]
    Total ← Total + Num
Next
Avg ← Total / 100
OUTPUT Avg.
```

```
Count ← 0, H ← 0, W ← 0,
For Count ← 1 To 1000
    INPUT H [5]
    TH ← H + H
    TW ← TW + W
    Next Count
    Avg ← TH / 1000
    Avg ← TW / 1000
    OUTPUT Avg, Avg [4]
```

Per ← (C1/N) * 100

Output...

Count ← 0, Time ← 0, FS ← 0, Total ← 0,
Highest ← -1000, Lowest ← 1000, Avg ← 0

For Count ← 1 To 500

INPUT Time

FS ← 200 / Time

OUTPUT FS

Total ← Total + FS

If FS > Highest Then Highest ← FS

If FS < Lowest Then Lowest ← FS

Next Count

Avg ← Total / 500

OUTPUT Lowest, Highest, Avg

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Topical Past Papers



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

```
Count ← 0, Num ← 0,
Highest ← -1000
For Count ← 1 To 3
    INPUT Num
    If Num > Highest Then Highest ← Num
Next
OUTPUT Highest
```

- (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, Num ← 0, n ← 0
For Count ← 1 To 1000
    INPUT Num
    Z ← INT(Num)
    If Num = Z Then n ← n + 1
Next
OUTPUT n
```

Count ← 0, WT ← "", C ← 0, S ← 0,

R ← 0, Highest ← -1000,
Lowest ← 1000.

For Count ← 1 To 365

INPUT WT, Temp

If WT = "CLOUDY" THEN C ← C + 1

If WT = "SUNNY" THEN S ← S + 1

If WT = "FOGGY" THEN F ← F + 1

If WT = "RAINING" THEN R ← R + 1

If Temp > Highest Then Highest ← Temp

If Temp < Lowest Then Lowest ← Temp

Next

C = 0, S = 0, F = 0, R = 0, I = 0

Computer Science 2210

Topical Past Papers



Topic: 2.2 Programming

Oct/Nov 2011. P12

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

- 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.

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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 ← "", Choice ← 0,
r ← 0, s ← 0, p ← 0, j ← 0,
Pr ← 0, Ps ← 0, Pp ← 0, PJ ← 0, Pj ← 0.

```

For Count ← 1 To 1500

 INPUT Name, Choice

```

    IF Choice = 1 THEN r ← r + 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 Pr ← Pr + 1

```

 IF Choice = 5 THEN OUTPUT Name

Next

Pr ← (r / 1500) * 100

Ps ← s / 15

Pp ← p / 15

PJ ← j / 15

Pj ← l / 15

OUTPUT Pr, Ps, Pp, PJ, Pj