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 (°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 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 the3 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. [5]

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? [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]

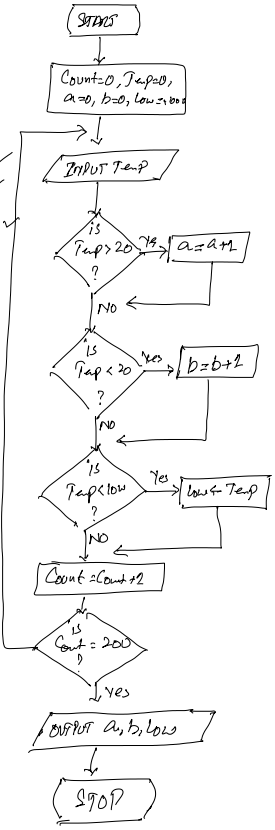
May/June 2008

12 Algorithms and programs use loops to control the number of times a particular procedure isused.
Two methods are repeat … until and for … to.
(a) Write a procedure using both these loop methods to input 20 numbers into a variablecalled 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
- 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]



Computer Science 2210
Topical Past Papers

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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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(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]

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]

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 ✓

Format - 1
✓ Initialisation
✓ For Count ← 1 TO n
✓ INPUT ...
✓ Formula Calculation
✓ OUTPUT Formula Result
✓ Totalling (Total ← Total + ...)
✗ Counting with decision (C1)
✗ Output with decision.
✓ Extreme Values
✓ Next Count
Avg ← Total/n
Per ← (C1/n) * 100
Output...

Count ← 0, Time ← 0, FS ← 0,
Total ← 0, H ← -1000, S ← 1000, AVG ← 0
FOR Count ← 1 TO 500
INPUT Time
FS ← 200/Time
OUTPUT FS
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, Num ← 0,
Avg ← 0, Total ← 0
FOR Count ← 1 TO 100
INPUT Num
Total ← Total + Num
Next Count
Avg ← Total/100
OUTPUT Avg

Count ← 0, Height ← 0, Weight ← 0, TotalH ← 0,
TotalW ← 0, AvgH ← 0, AvgW ← 0
FOR Count ← 1 TO 1000

- 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 [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]

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)

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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

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 workingweek 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 costingmore than $500 000. [6]

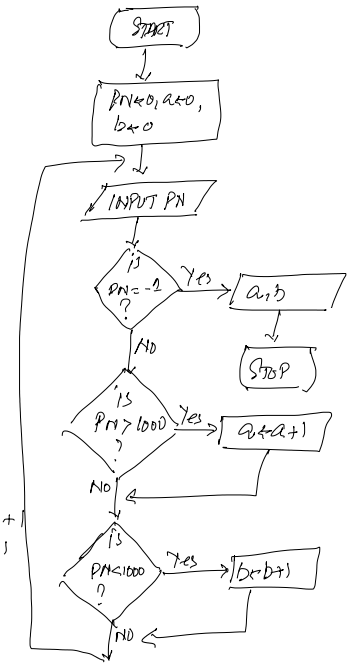
Oct/Nov 2012. P12

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 isa palindrome but 1541 is not).
Use separate variables to store the separate digits of a number (for example D1, D2, D3, D4). [4]

IF PD > Small Then ...
Next Count
Avg ← Total/500
OUTPUT Lar, Small, Avg

PN←0, a←0, b←0.
INPUT PN
WHILE PN <> -1
IF PN >1000 Then a←a+1
IF PN <1000 Then b←b+1
INPUT PN
ENDWHILE
OUTPUT a, b



PN←0, a←0, b←
REPEAT
INPUT PN
IF PN>1000 THEN a←a+1
IF PN<1000 THEN b←b+1
Until PN = -1
OUTPUT a, b

2/4/21

Computer Science 2210
Topical Past Papers

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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

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)

a	b	c	d	e
0	1	2	3	4
x	x	x	x	
3	2	3	2	
=	=	=	=	
0	2	6	6	14

14 ÷ 10 = 1 remainder 4

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]

Count←0, a←0, b←0, c←0, Correct←0
d←0, e←0, x←0, y←0, n←0, r←0
For Count ← 1 TO 100
INPUT a, b, c, d, e
x ← (a*3)+(c*3)
y ← (b*2)+(d*2)
n ← x+y
r ← n MOD 10
IF r = e Then Correct ← Correct +1
Next
OUTPUT Correct.

May/June 2013. P12

17 A country has four mobile phone network operators. Each mobile phone number has eightdigits. 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-digitmobile phone calls made during the day and outputs the number of calls made on each ofthe four networks. [6]

Digit Extraction.

Computer Science 2210 Topical Past Papers Topic: 2.2 Programming Oct/Nov 2013. PIZ Zak AFAR ALI KHAN 16 (al A greenhouse is being monitored by a computer using 2 sensors. SENSORI measuresthe temperature and SENSOR2 measures oxygen levels. If the temperature exceeds 450C or oxygen tan below O. 19, then an errormessage is output by the compu'er. Write an algorithm, using pseudocode or flowchart only, which • inputs both sensor readings • checks the sensor input van_jes and outputs a warning message it either are out Of range • continues monitoring until the key is pressed (You may assume that READ SENSORn will take a readng from SENSORn and that READ KEY inputs a key press from the keyboard). Oct/Nov 2013. P13 10 (al The following pseudocode was Mitten to input 'COO dates. 1 Count = 1 2 repeat 3 input day, year 4 count count • 1000 5 until (i) Describe why the loop only inputs 999 dates instead Of 1000. 151 (i) What needs to be changed Or added to the above Code to make sure dates are input? 1b) Errors in code can be found using test data. Name three different types of test data. Using month from the pseudocode abcwe, give an example Of each type Of test data. 15 SOOO numbers cre being input Which should have either I 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 numbers • outputs how many numbers had digit. 2 digits. 3 digits and 4 dgits • outputs the % Of numbers hput which were Outside the range May/June 2014. PI 1 15 A survey is being carried out which involves reading and recording sound near a busy roadiunction_ Once all the data are collected. they are input manually into a computer. A sound levelof O decibels (O dB) is input to indicate the end of the data. Write an algorithm, using pseudocode or a flouchart. which: • inputs all the sound levels • after a sound level of O is input, outputs the following: o average sound level o highest recorded sound level. n 03-111-222-ZAK @zakmweb Page IS of