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# Decision 1: Pseudo Code

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Past Exam Questions  
2006 - 2013

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Name:

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6 Two algorithms are shown.

**Algorithm 1**

Line 10    Input  $P$   
Line 20    Input  $R$   
Line 30    Input  $T$   
Line 40    Let  $I = (P * R * T)/100$   
Line 50    Let  $A = P + I$   
Line 60    Let  $M = A/(12 * T)$   
Line 70    Print  $M$   
Line 80    Stop

**Algorithm 2**

Line 10    Input  $P$   
Line 20    Input  $R$   
Line 30    Input  $T$   
Line 40    Let  $A = P$   
Line 50     $K = 0$   
Line 60    Let  $K = K + 1$   
Line 70    Let  $I = (A * R)/100$   
Line 80    Let  $A = A + I$   
Line 90    If  $K < T$  then goto Line 60  
Line 100   Let  $M = A/(12 * T)$   
Line 110   Print  $M$   
Line 120   Stop

In the case where the input values are  $P = 400$ ,  $R = 5$  and  $T = 3$ :

- (a) trace **Algorithm 1**; *(3 marks)*
- (b) trace **Algorithm 2**. *(4 marks)*

5 A student is using the following algorithm with different values of  $A$  and  $B$ .

Line 10	Input $A, B$
Line 20	Let $C = 0$ and let $D = 0$
Line 30	Let $C = C + A$
Line 40	Let $D = D + B$
Line 50	If $C = D$ then go to Line 110
Line 60	If $C > D$ then go to Line 90
Line 70	Let $C = C + A$
Line 80	Go to Line 50
Line 90	Let $D = D + B$
Line 100	Go to Line 50
Line 110	Print $C$
Line 120	End

- (a) (i) Trace the algorithm in the case where  $A = 2$  and  $B = 3$ . *(3 marks)*
- (ii) Trace the algorithm in the case where  $A = 6$  and  $B = 8$ . *(3 marks)*
- (b) State the purpose of the algorithm. *(1 mark)*
- (c) Write down the final value of  $C$  in the case where  $A = 200$  and  $B = 300$ . *(1 mark)*

6 A student is solving cubic equations that have three different positive integer solutions.

The algorithm that the student is using is as follows:

```

Line 10      Input  $A, B, C, D$ 
Line 20      Let  $K = 1$ 
Line 30      Let  $N = 0$ 
Line 40      Let  $X = K$ 
Line 50      Let  $Y = AX^3 + BX^2 + CX + D$ 
Line 60      If  $Y \neq 0$  then go to Line 100
Line 70      Print  $X$ , "is a solution"
Line 80      Let  $N = N + 1$ 
Line 90      If  $N = 3$  then go to Line 120
Line 100     Let  $K = K + 1$ 
Line 110     Go to Line 40
Line 120     End
  
```

(a) Trace the algorithm in the case where the input values are:

(i)  $A = 1, B = -6, C = 11$  and  $D = -6$ ; (4 marks)

(ii)  $A = 1, B = -10, C = 29$  and  $D = -20$ . (4 marks)

(b) Explain where and why this algorithm will fail if  $A = 0$ . (2 marks)

5 A student is using the algorithm below to find an approximate value of  $\sqrt{2}$ .

```

Line 10      Let  $A = 1, B = 3, C = 0$ 
Line 20      Let  $D = 1, E = 2, F = 0$ 
Line 30      Let  $G = B/E$ 
Line 40      Let  $H = G^2$ 
Line 50      If  $(H - 2)^2 < 0.0001$  then go to Line 130
Line 60      Let  $C = 2B + A$ 
Line 70      Let  $A = B$ 
Line 80      Let  $B = C$ 
Line 90      Let  $F = 2E + D$ 
Line 100     Let  $D = E$ 
Line 110     Let  $E = F$ 
Line 120     Go to Line 30
Line 130     Print ' $\sqrt{2}$  is approximately',  $B/E$ 
Line 140     Stop
  
```

Trace the algorithm.

(6 marks)

6 A student is finding a numerical approximation for the area under a curve.

The algorithm that the student is using is as follows:

```

Line 10      Input  $A, B, N$ 
Line 20      Let  $T = 0$ 
Line 30      Let  $D = A$ 
Line 40      Let  $H = (B - A)/N$ 
Line 50      Let  $E = H/2$ 
Line 60      Let  $T = T + A^3 + B^3$ 
Line 70      Let  $D = D + H$ 
Line 80      If  $D = B$  then go to line 110
Line 90      Let  $T = T + 2D^3$ 
Line 100     Go to line 70
Line 110     Print 'Area = ',  $T \times E$ 
Line 120     End
  
```

Trace the algorithm in the case where the input values are:

(a)  $A = 1, B = 5, N = 2;$  (4 marks)

(b)  $A = 1, B = 5, N = 4.$  (4 marks)

7 A student is testing a numerical method for finding an approximation for  $\pi$ .

The algorithm that the student is using is as follows.

```

Line 10      Input  $A, B, C, D, E$ 
Line 20      Let  $A = A + 2$ 
Line 30      Let  $B = -B$ 
Line 40      Let  $C = \frac{B}{A}$ 
Line 50      Let  $D = D + C$ 
Line 60      Let  $E = (D - 3.14)^2$ 
Line 70      If  $E < 0.05$  then go to Line 90
Line 80      Go to Line 20
Line 90      Print 'π is approximately',  $D$ 
Line 100     End
  
```

Trace the algorithm in the case where the input values are

$A = 1, B = 4, C = 0, D = 4, E = 0$  (6 marks)

**8** A student is tracing the following algorithm with positive integer values of  $A$  and  $B$ .

The function INT gives the integer part of a number, eg  $\text{INT}(2.3) = 2$  and  $\text{INT}(3.8) = 3$ .

Line 10	Let $X = 0$
Line 20	Input $A, B$
Line 30	If $\text{INT}(A/2) = A/2$ then go to Line 50
Line 40	Let $X = X + B$
Line 50	If $A = 1$ then go to Line 90
Line 60	Let $A = \text{INT}(A/2)$
Line 70	Let $B = 2 \times B$
Line 80	Go to Line 30
Line 90	Print $X$
Line 100	End

**(a)** Trace the algorithm in the case where the input values are  $A = 20$  and  $B = 8$ . *(4 marks)*

**(b)** State the purpose of the algorithm. *(1 mark)*

**(c)** Another student changed Line 50 to

Line 50	If $A = 1$ then go to Line 80
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Explain what would happen if this algorithm were traced. *(2 marks)*

**6** A student is tracing the following algorithm.

Line 10	Let $A = 6$
Line 20	Let $B = 7$
Line 30	Input $C$
Line 40	Let $D = (A + B)/2$
Line 50	Let $E = C - D^3$
Line 60	If $E^2 < 1$ then go to Line 120
Line 70	If $E > 0$ then go to Line 100
Line 80	Let $B = D$
Line 90	Go to Line 40
Line 100	Let $A = D$
Line 110	Go to Line 40
Line 120	Stop

(a) Trace the algorithm in the case where the input value is  $C = 300$ . (4 marks)

(b) The algorithm is intended to find the approximate cube root of any input number.

State two reasons why the algorithm is unsatisfactory in its present form. (3 marks)

**8** The following algorithm finds an estimate of the value of the number represented by the symbol  $e$ :

Line 10      Let  $A = 1, B = 1, C = 1$   
Line 20      Let  $D = A$   
Line 30      Let  $C = C \times B$   
Line 40      Let  $D = D + (1/C)$   
Line 50      If  $B = 4$  then go to Line 80  
Line 60      Let  $B = B + 1$   
Line 70      Go to Line 30  
Line 80      Print 'An estimate of  $e$  is',  $D$   
Line 90      End

**(a)** Trace the algorithm. *(6 marks)*

**(b)** A student miscopied Line 70.

His line was

Line 70      Go to Line 10

Explain what would happen if his algorithm were traced. *(2 marks)*



**6** A student is tracing the following algorithm. The function INT gives the integer part of any number, eg  $\text{INT}(2.3) = 2$  and  $\text{INT}(6.7) = 6$ .

Line 10	Input $A, B$
Line 20	Let $C = \text{INT}(A \div B)$
Line 30	Let $D = B \times C$
Line 40	Let $E = A - D$
Line 50	If $E = 0$ then go to Line 90
Line 60	Let $A = B$
Line 70	Let $B = E$
Line 80	Go to Line 20
Line 90	Print $B$
Line 100	Stop

**(a)** Trace the algorithm when the input values are:

**(i)**  $A = 36$  and  $B = 16$ ; *(3 marks)*

**(ii)**  $A = 11$  and  $B = 7$ . *(5 marks)*

**(b)** State the purpose of the algorithm. *(1 mark)*