

Question 1

a. 1980: $36 - 17 = 19$ (1 mark) 2000: $41 - 18 = 23$ (1 mark)

b. Using the stat button on your graphics calculator, standard deviation = 5.60 (1 mark)

c. The range and standard deviation are greater for the 2000 group of first time mothers. (1 mark)
Hence, there is a greater spread in the ages of the 2000 group of first time mothers as compared to the ages of the 1980 group of first time mothers. (1 mark)

Question 2

a. 1980: 17, 19, 21, 21, 22, 22, 24, 25, 26, 27, 31, 33, 36

Median = 24 ($\frac{1}{2}$ mark)

2000: 18, 24, 24, 26, 27, 28, 29, 32, 33, 35, 36, 40, 41

Median = 29 ($\frac{1}{2}$ mark)

b. 1980: $UQ = \frac{27 + 31}{2} = 29$

$LQ = \frac{21 + 21}{2} = 21$

$IQR = 29 - 21 = 8$ (1 mark)

2000: $UQ = \frac{35 + 36}{2} = 35.5$

$LQ = \frac{24 + 26}{2} = 25$

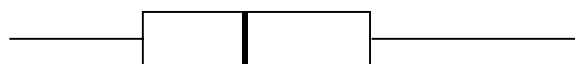
$IQR = 35.5 - 25 = 10.5$ (1 mark)

c.

2000



1980



(2 marks)

d. The median of the 2000 first time mothers equals the upper quartile of the 1980 first time mothers which means that 50% of the 2000 first time mothers are older than 29 but only 25% of the 1980 first time mothers are older than 29. The 2000 first time mothers have a greater range than the 1980 first time mothers. In general, the 2000 first time mothers are older than the 1980 first time mothers.

(2 marks)

Question 3

a. There is no linear trend

(1 mark)

b. The weight is increasing at a rate of 2kg weight change/ weight at start of pregnancy

(1 mark)

c. $\sqrt{0.36} = 0.6$

(1 mark)

End of Core

Module 1 Number patterns and applications. Suggested Solutions

Question 1

a. $2(40 + 40) = 160$ m (1 mark)	b. $2(40 \times 10) = 800$ m (1 mark)
c. $2(40 \times n) = 80n$ metres (1 mark)	d. Arithmetic sequence: 80, 160, 240.... $a = 80, d = 80$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $18,480 = \frac{n}{2}[160 + (n-1)80]$ (1 mark) $36,960 = n[160 + 80n - 80]$ $36,960 = n[80 + 80n]$ $80n^2 + 80n - 36,960 = 0$ $n^2 + n - 462 = 0$ (1 mark) $(n+22)(n-21) = 0$ $n = -22$ or $n = 21$ $n > 0$ $\therefore n = 21$ (1 mark)

Question 2

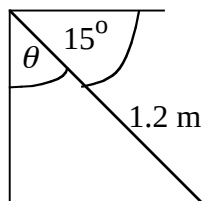
a. $t_{15} = 80 \times 15 = 1200$ $t_5 = 80 \times 5 = 400$ (1 mark) Ratio money raised by Tam : Tess = 600 : 200 Ratio money raised by Tam : Tess = 3 : 1 (1 mark)	b. Tess takes 6 minutes to run 400 m (1 mark) $\therefore$ Tam takes $6 \div 2 = 3$ minutes to run 400 m $\therefore$ Tam takes $3 \times 3 = 9$ minutes to run 1200 m (1 mark)
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Question 3

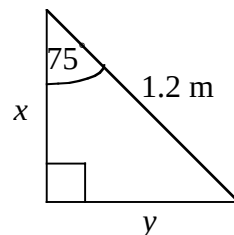
a. $40 \times (0.3)^5 = 0.0972$ (1 mark) $= 0.10$ metres to 2 decimal places (1 mark)	b. $2(40) + 2[40 + 40(0.3)] +$ $2[40 + 40(0.3) + 40(0.3)^2] +$ $2[40 + 40(0.3) + 40(0.3)^2 + 40(0.3)^3]$ (1 mark) $S_n = \frac{a(1-r^n)}{1-r}$ $a = 40, r = 0.3$ $S_n = 80 + 2 \times S_2 + 2 \times S_3 + 2 \times S_4$ (1 mark) $S_n = 80 + 2 \times \frac{40(1-0.3^2)}{0.7} + 2 \times \frac{40(1-0.3^3)}{0.7} + 2 \times \frac{40(1-0.3^4)}{0.7}$ $S_n = 80 + 104 + 111.2 + 113.36$ $S_n = 408.56$ (1 mark)
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End of Module 1

Module 2 Geometry and trigonometry. Suggested solutions.

Question 1**a.**

$$\theta = 90^\circ - 15^\circ = 75^\circ \quad (1 \text{ mark})$$

b.

$$\cos 75^\circ = \frac{x}{1.2}$$

$$x = 1.2 \times \cos 75^\circ = 0.31\text{m} \quad (1 \text{ mark})$$

c.

From the diagram in 1(b)

$$\sin 75^\circ = \frac{y}{1.2}$$

$$y = 1.2 \times \sin 75^\circ = 1.16\text{m} \quad (1 \text{ mark})$$

Question 2

a. (i) 6 equal angles at the centre add to 360°
 $\angle AOB = 360 \div 6 = 60^\circ \quad (1 \text{ mark})$

a. (ii)

In triangle AOB

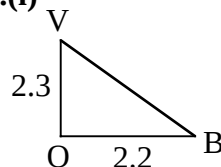
$$\text{Sum of the base angles} = 180^\circ - 60^\circ = 120^\circ$$

But base angles are equal since triangle AOB is isosceles (1 mark)

$$\therefore \text{base angles} = 60^\circ$$

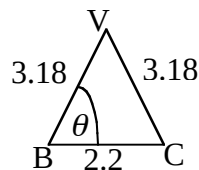
$\therefore$ AOB is an equilateral triangle

$$\therefore AO = 2.2\text{m} \quad (1 \text{ mark})$$

b.(i)

$$VB^2 = 2.2^2 + 2.3^2 = 10.13$$

$$VB = \sqrt{10.13} = 3.18 = 3.2 \text{ to one decimal place} \quad (1 \text{ mark})$$

b.(ii)

$$3.18^2 = 3.18^2 + 2.2^2 - 2 \times 3.18 \times 2.2 \cos \theta \quad (1 \text{ mark})$$

$$\cos \theta = 0.3459$$

$$\theta = 69.7^\circ = 70^\circ \text{ to the nearest degree} \quad (1 \text{ mark})$$

Module 2 Geometry and trigonometry. Suggested solutions.

Question 2**b.(iii)**

$$\text{Area of triangle} = \frac{1}{2}bc \sin \theta$$

$$= \frac{1}{2} \times 3.18 \times 2.2 \sin 69.7^\circ$$

$$= 3.28 \text{m}^2$$

$$= 3 \text{ m}^2 \text{ to the nearest square metre}$$

(1 mark)

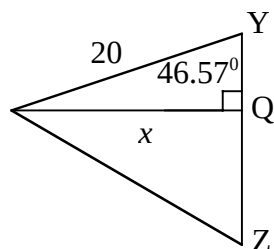
Question 3**a.**

$$30^2 = 20^2 + 40^2 - 2 \times 20 \times 40 \cos \theta \quad (1 \text{ mark})$$

$$900 = 400 + 1600 - 1600 \cos \theta$$

$$16 \cos \theta = 11$$

$$\theta = 46.57^\circ = 47^\circ \text{ to nearest degree} \quad (1 \text{ mark})$$

b.

$$\sin 46.57^\circ = \frac{x}{20}$$

$$x = 20 \sin 46.57^\circ = 14.5 \text{m}$$

(1 mark)

c.

From the diagram in 3b

$$\cos 46.57^\circ = \frac{YQ}{20}$$

$$YQ = 20 \cos 46.57^\circ = 13.749 \quad (1 \text{ mark})$$

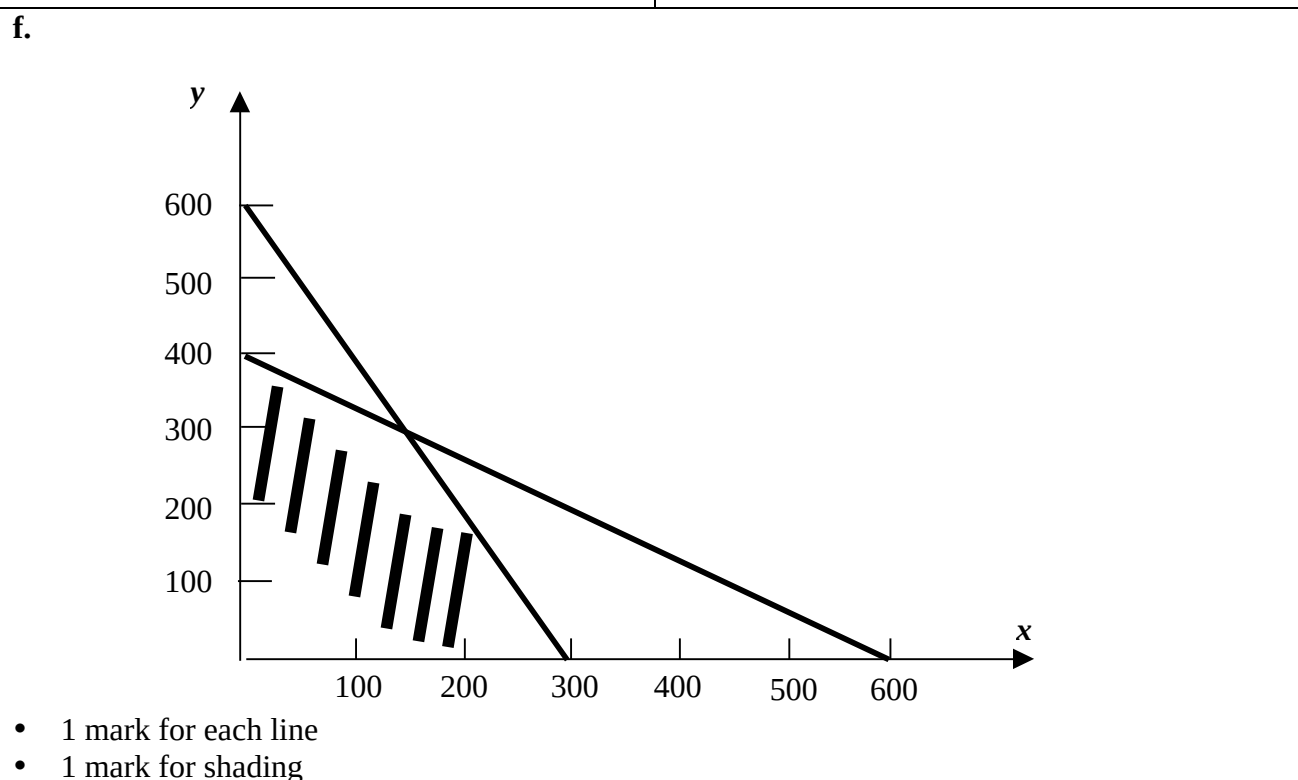
$$QZ = 40 - 13.749$$

$$QZ = 26.251$$

$$QZ = 26.3 \text{ m} \quad (1 \text{ mark})$$

End of Module 2

Question 1 a. $x \geq 0$ (1 mark)	b. $y \geq 0$ (1 mark)
c.(i) $15 \times 40 = 600$ hours (1 mark)	c.(ii) $30 \times 40 = 1200$ hours (1 mark)
d. $2x + y \leq 600$ (1 mark)	e. $2x + 3y \leq 1200$ (1 mark)



g. $2x + 3y = 1200$
 $2x + y = 600$

 $2y = 600$ (1 mark)
 $y = 300$
When $y = 300$, $2x = 300$
 $x = 150$
Point of intersection: (150,300) (1 mark)

Question 2 a. $P = 60x + 40y$ (1 mark)	b. Critical points are (0,0), (0,400), (150,300), (300,0) (1 mark) Profit at (0,0) = 0 Profit at (0,400) = \$16,000 ($\frac{1}{2}$ mark) Profit at (150,300) = 9,000 + 12,000 = \$21,000 Profit at (300,0) = \$18,000 ($\frac{1}{2}$ mark) He should make 150 dresses and 300 pairs of slacks (1 mark)
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Question 1 a. $\frac{7}{100} \times 35,000 = \\$2,450$ (1 mark)	b.(i) $A = PR^n = 2,450 \times (1.1)^2 = \\$2,964.50$ (1 mark)
b.(ii) $A = PR^n = 2,450 \times (1.1)^{20} = \\$16,482.37$ (1 mark)	c.(i) 2 years (1 mark)
c.(ii) 1 year (1 mark)	c.(iii) $2450(1.1)^3 + 2450(1.1)^2 + 2450(1.1)^1$ (1 mark) $= 2450[(1.1)^3 + (1.1)^2 + 1.1]$ $= \\$8920.45$ (1 mark)
Question 2 a. $8 \div 4 = 2\%$ (1 mark)	b. $A = \\$6000, R = 1.02, n = 16$ (1 mark) $A = PR^n$ $6000 = P(1.02)^{16}$ $P = \\$4,370.68$ (1 mark)
c. Let the amount be \$P Interest on first amt. invested = $P \times 0.1 \times 4 = 0.4P$ Interest on 2nd amt. invested = $P \times 0.1 \times 3 = 0.3P$ (1 mark) Interest on 3rd amt. invested = $P \times 0.1 \times 2 = 0.2P$ Interest on 4th amt. invested = $P \times 0.1 \times 1 = 0.1P$ (1 mark) Total interest = $0.4P + 0.3P + 0.2P + 0.1P = \\P (1 mark)	d. Puts \$P in each year for 4 years = $4P$ (1 mark) Total interest = \$P Interest + principal = $5P = 6000$ $P = 6000 \div 5$ $P = \\$1,200$ (1 mark)

End of Module 4

Module 5 Networks and decision mathematics. Suggested solutions.

Question 1**a.**

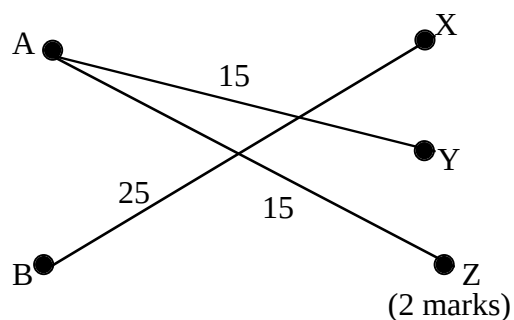
$$25 + 5 = 30$$

(1 mark)

b.

$$5 + 10 = 15$$

(1 mark)

c.

(2 marks)

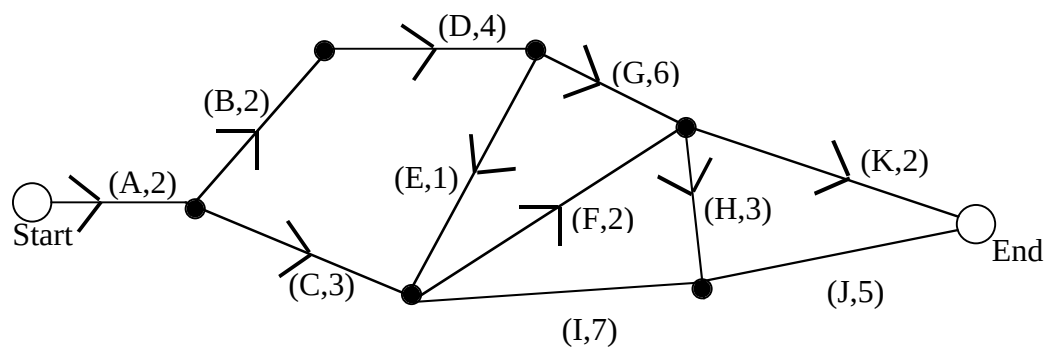
d.

Minimum cost

$$= 10 \times 15 + 3 \times 15 + 8 \times 25 = 150 + 45 + 200$$

$$= \$395$$

(1 mark)

Question 2**a.**

(1 mark)

Module 5 Networks and decision mathematics. Suggested solutions.

Question 2(continued) b. $2 + 2 + 4 + 1 = 9$ days After 9 days i.e. on the 10 th day (1 mark)	c. Total time for project = 22 days Latest time for K to start = $22 - 2 =$ after 20 days K could start on the 21 st day (1 mark)																																				
d. Float time = latest starting time – earliest starting time $= 20 - 14 = 6$ or $21 - 15 = 6$ days (1 mark)	e. Critical Path is A B D G H J (1 mark)																																				
Question 3 a. 1 st team plays 9 others 2 nd team plays 8 others and so on (1 mark) Total number of games = $9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 45$ (1 mark)																																					
b. <table><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr><tr><td>A</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>B</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>C</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>D</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>E</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table> (1 mark)			A	B	C	D	E	A	0	0	1	0	1	B	1	0	1	0	1	C	0	0	0	1	0	D	1	1	0	0	1	E	0	0	1	0	0
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C	0	0	0	1	0																																
D	1	1	0	0	1																																
E	0	0	1	0	0																																
c. Matrix row sum: A 2 B 3 C 1 D 3 E 1 B and D best, then A then C and E (1 mark) But D beat B and E beat C Hence, order of performance is D,B,A,E, C (1 mark)																																					

End of Module 5

End of suggested solutions 2002 Further Mathematics Trial Examination 2

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