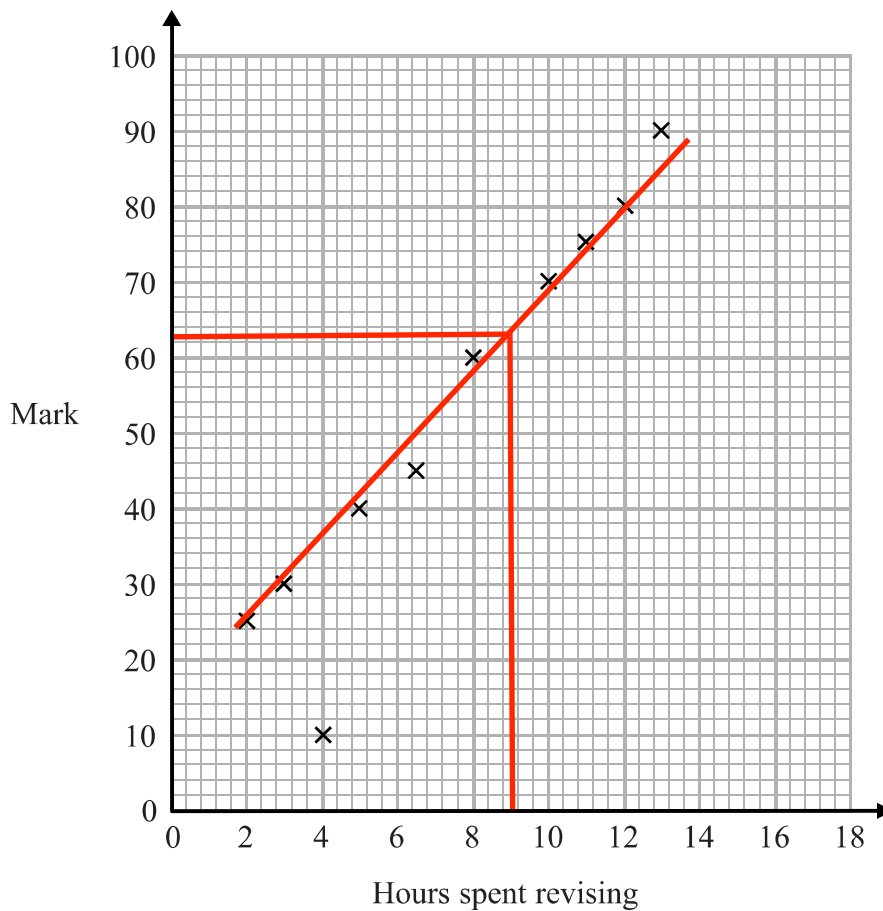




- 1 The scatter diagram shows information about 10 students.

For each student, it shows the number of hours spent revising and the mark the student achieved in the Spanish test.



One of the points is an outlier.

- (a) Write down the coordinates of the outlier.

(4, 10)

(1)

For all the **other** points

- (b) (i) draw the line of best fit,
(ii) describe the correlation.

positive correlation

(2)

A different student studies for 9 hours.

- (c) Estimate the mark gained by this student.

63
(60 to 70)

The Spanish test was marked out of 100

Lucia says,

“I can see from the graph that had I revised for 18 hours I would have got full marks.”

- (d) Comment on what Lucia says.

The point would be outside the range of data

(1)

(Total for Question 1 is 5 marks)

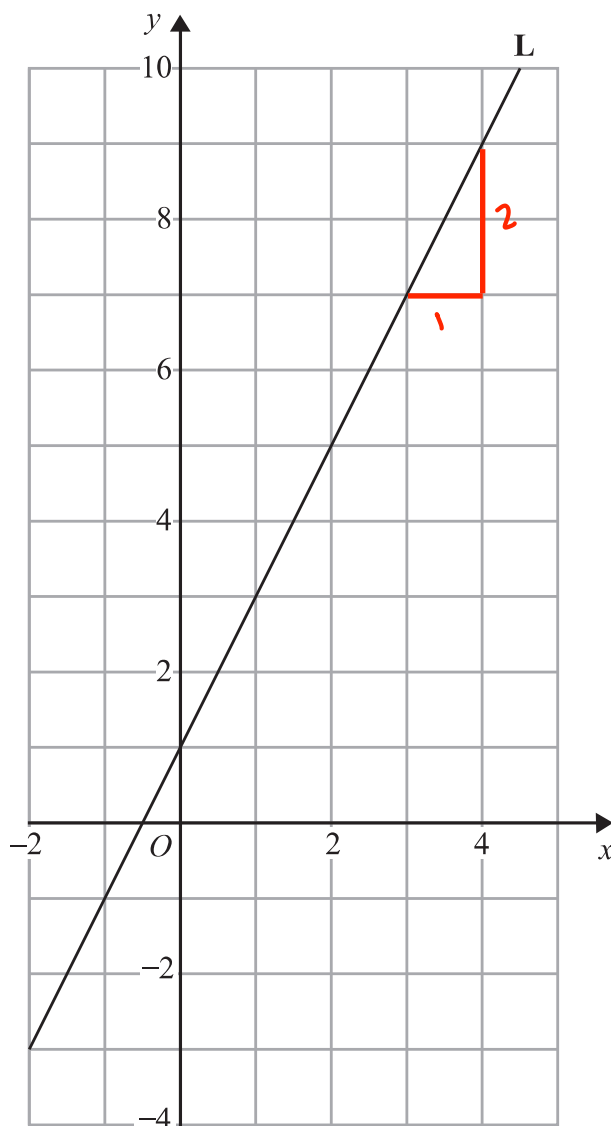
- 2 The length, L cm, of a line is measured as 13 cm correct to the nearest centimetre.

Complete the following statement to show the range of possible values of L

$$\underline{12.5} \leq L < \underline{13.5}$$

(Total for Question 2 is 2 marks)

3 Line L is drawn on the grid below.



Find the equation for the straight line L.
Give your answer in the form $y = mx + c$

$$\text{Gradient} = \frac{2}{1} = 2$$

$$y\text{-intercept} = 1$$

$$y = 2x + 1$$

(Total for Question 3 is 3 marks)

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- 4 Jenny works in a shop that sells belts.

The table shows information about the waist sizes of 50 customers who bought belts from the shop in May.

Belt size	Waist (w inches)	Frequency
Small	$28 < \overset{30}{w} \leq 32$	24
Medium	$32 < \overset{34}{w} \leq 36$	12
Large	$36 < \overset{38}{w} \leq 40$	8
Extra Large	$40 < \overset{42}{w} \leq 44$	6

720
408
304
252

1684

50

- (a) Calculate an estimate for the mean waist size.

$$1684 \div 50 = 33.68$$

33.68 inches
(3)

Belts are made in sizes Small, Medium, Large and Extra Large.

Jenny needs to order more belts in June.

The modal size of belts sold is Small.

Jenny is going to order $\frac{3}{4}$ of the belts in size Small.

The manager of the shop tells Jenny she should **not** order so many Small belts.

- (b) Who is correct, Jenny or the manager?

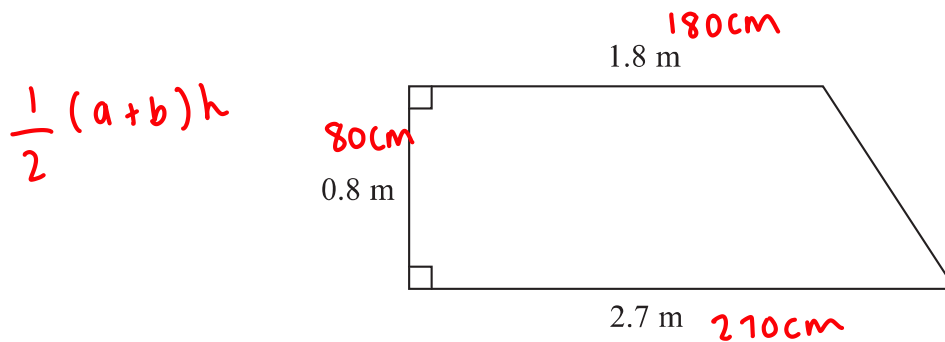
You must give a reason for your answer.

In May, less than $\frac{1}{2}$ sold were small.
The manager is correct

(2)

(Total for Question 4 is 5 marks)

- 5 The diagram shows a wall in the shape of a trapezium.



Karen is going to cover this part of the wall with tiles.

Each tile is rectangular, 15 cm by 7.5 cm

Tiles are sold in packs.

There are 9 tiles in each pack.



$$15 \times 7.5 = 112.5 \text{ cm}^2$$

Karen divides the area of this wall by the area of a tile to work out an estimate for the number of tiles she needs to buy.

- (a) Use Karen's method to work out the estimate for the number of packs of tiles she needs to buy.

$$\frac{1}{2}(270 + 180) \times 80 = 18,000 \text{ cm}^2$$

$$18,000 \div 112.5 = 160 \text{ tiles}$$

$$160 \div 9 = 17.7$$

18 packs

(5)

Karen is advised to buy 10% more tiles than she estimated.

Buying 10% more tiles will affect the number of the tiles Karen needs to buy.

She assumes she will need to buy 10% more packs of tiles.

(b) Is Karen's assumption correct?

You must show your working.

$$160 \text{ tiles} + 10\% = 166 \text{ tiles} \div 9 = 18.4 = 19 \text{ packs}$$

NO, she needs 1 more pack and

$$10\% \text{ of } 18 \text{ packs} = 1.8$$

(2)

(Total for Question 5 is 7 marks)

6 Factorise $x^2 + 3x - 4$

$$(x + 4)(x - 1)$$

$$(x + 4)(x - 1)$$

(Total for Question 6 is 2 marks)

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7 Here are the equations of four straight lines.

Line A $y = 2x + 4$

Line B $2y = x + 4$

Line C $2x + 2y = 4$

Line D $2x - y = 4$

Two of these lines are parallel.

Write down the two parallel lines?

Line B : $2y = x + 4$
 $y = \frac{x}{2} + 2$

Line C : $2x + 2y = 4$
 $2y = -2x + 4$
 $y = -x + 2$

Line A and line D

(Total for Question 7 is 1 mark)

Line D : $2x - y = 4$
 $2x = y + 4$
 $2x - 4 = y$
 $y = 2x - 4$

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- 8 Ian invested an amount of money at 3% per annum compound interest. At the end of 2 years the value of the investment was £2652.25

(a) Work out the amount of money Ian invested.

$$\begin{array}{r|l} x \times 1.03^2 & = 2652.25 \\ \div 1.03^2 & \div 1.03^2 \\ \hline x & = 2500 \end{array}$$

£ 2500
(3)

Noah has an amount of money to invest for five years.

Saver Account

4% per annum
compound interest.

Investment Account

21% interest paid at the
end of 5 years.

Noah wants to get the most interest possible.

- (b) Which account is best?

You must show how you got your answer.

$$\begin{aligned} x \times 1.04^5 \\ = 1.217x \end{aligned}$$

21.7 %

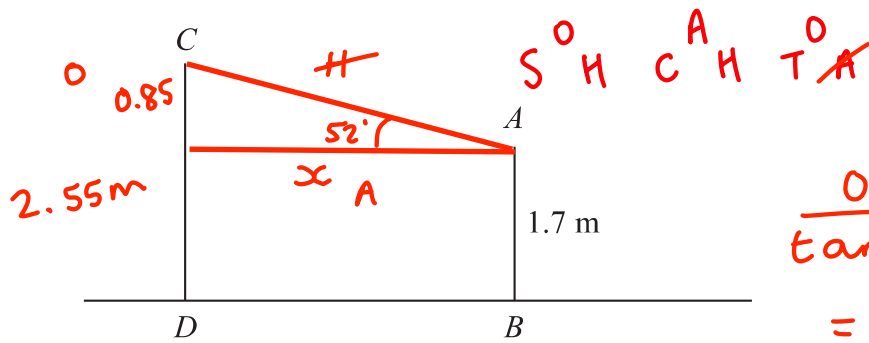
$$\begin{aligned} x \times 1.21 \\ = 1.21x \end{aligned}$$

Saver is
better

(2)

(Total for Question 8 is 5 marks)

- 9 The diagram shows two vertical posts, AB and CD , on horizontal ground.



$$AB = 1.7 \text{ m}$$

$$CD : AB = 1.5 : 1$$

The angle of elevation of C from A is 52°

Calculate the length of BD .

Give your answer correct to 3 significant figures.

$$\begin{array}{l}
 CD : AB \\
 1.5 : 1 \\
 \times 1.7 \quad \left(\begin{array}{l} \rightarrow 2.55 : 1.7 \end{array} \right) \times 1.7
 \end{array}$$

$$0.664 \text{ m}$$

(Total of Question 9 is 4 marks)

10 On the grid, shade the region that satisfies all these inequalities.

$$x + y < 4$$

$$y > x - 1$$

$$y < 3x$$

Label the region **R**.

x	0	1	2
y	4	3	2

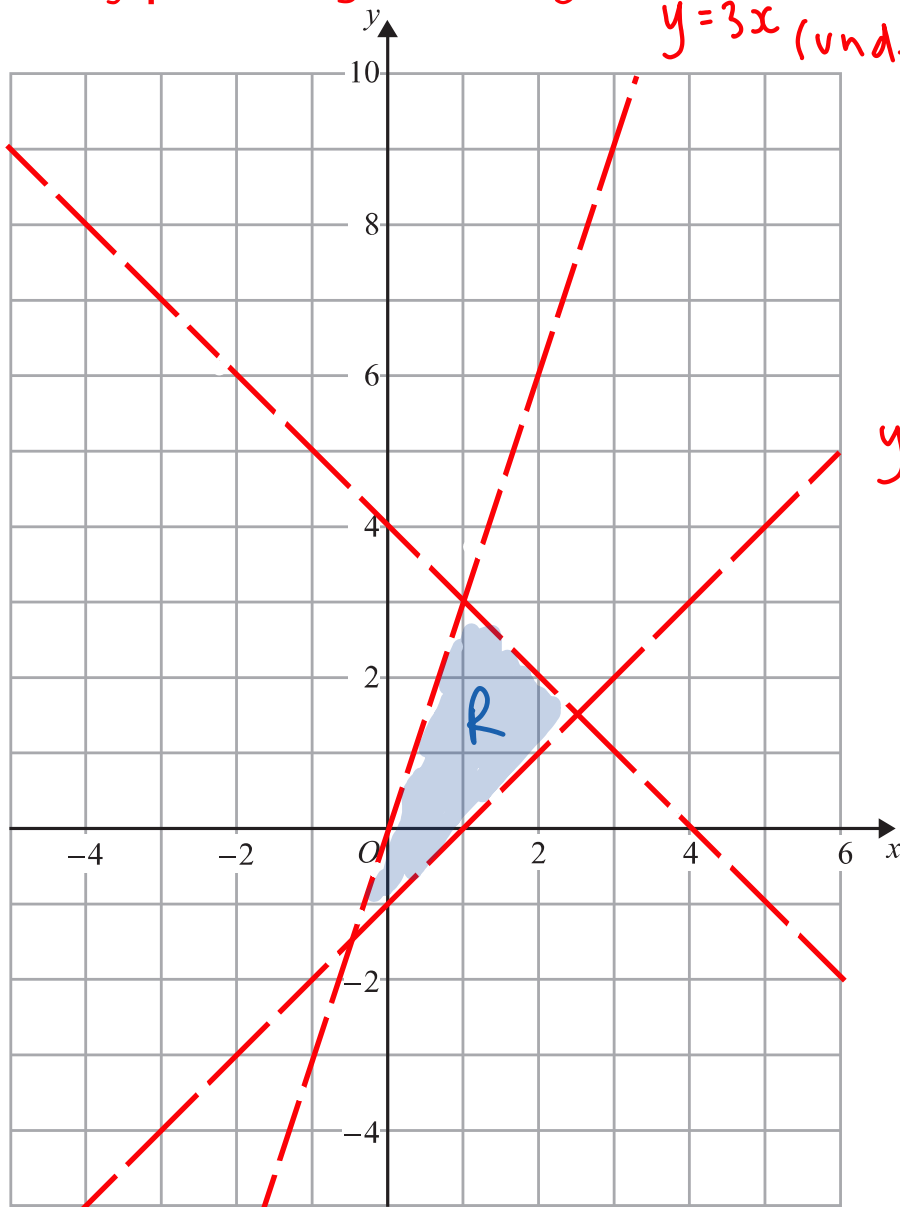
x	0	1	2
y	-1	0	1

x	0	1	2
y	0	3	6

$$y = 3x \text{ (under)}$$

$$x + y = 4 \text{ (under)}$$

$$y = x - 1 \text{ (over)}$$



(Total for Question 10 is 4 marks)

- 11 Write $x^2 + 2x - 8$ in the form $(x + m)^2 + n$
where m and n are integers.

$$(x + 1)^2 - 9$$

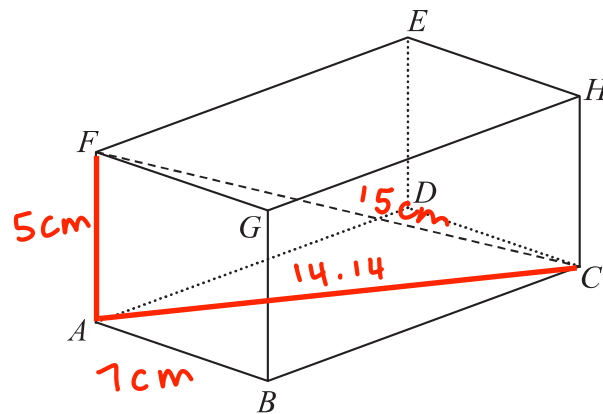
(Total for Question 11 is 2 marks)

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12 The diagram shows a cuboid $ABCDEFGH$.



$AB = 7$ cm, $AF = 5$ cm and $FC = 15$ cm.

Calculate the volume of the cuboid.

Give your answer correct to 3 significant figures.

$$AC = 15^2 - 5^2 = 200$$

$$\sqrt{200} = 14.142...$$

$$BC = 14.14^2 - 7^2 = 151$$

$$\sqrt{151} = 12.288...$$

$$\text{Volume} = 7 \times 5 \times 12.288$$

$$= 430.081..$$

430 cm³

(Total for Question 12 is 4 marks)

13 There are 14 boys and 12 girls in a class.

Work out the total number of ways that 1 boy and 1 girl can be chosen from the class.

$$14 \times 12 = 168$$

168

(Total for Question 13 is 2 marks)

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14 Write

$$4 - \left[(x+3) \div \frac{x^2 + 5x + 6}{x-2} \right]$$

as a single fraction in its simplest form.

You must show your working.

$$4 - \left[(x+3) \div \frac{(x+3)(x+2)}{x-2} \right]$$

$$4 - \left[\frac{(x+3)}{1} \times \frac{(x-2)}{(x+3)(x+2)} \right]$$

$$4 - \left[\frac{\cancel{(x+3)}(x-2)}{\cancel{(x+3)}(x+2)} \right]$$

$$\frac{4}{1} - \frac{(x-2)}{(x+2)}$$

$$\frac{4(x+2)}{x+2} - \frac{(x-2)}{x+2}$$

$$\frac{4x+8-x+2}{x+2} = \frac{3x+10}{x+2}$$

Tip: Be careful here, don't let the -- 2 catch you out!

(Total for Question 14 is 4 marks)

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- 15 A virus on a computer is causing errors.
An antivirus program is run to remove these errors.

An estimate for the number of errors at the end of t hours is $10^6 \times 2^{-t}$

- (a) Work out an estimate for the number of errors on the computer at the end of 8 hours.

$$t = 8$$

$$10^6 \times 2^{-8} = 3906.25$$

3906

(2)

- (b) Explain whether the number of errors on this computer ever reaches zero.

No as 2^{-t} will never be 0

(1)

(Total for Question 15 is 3 marks)

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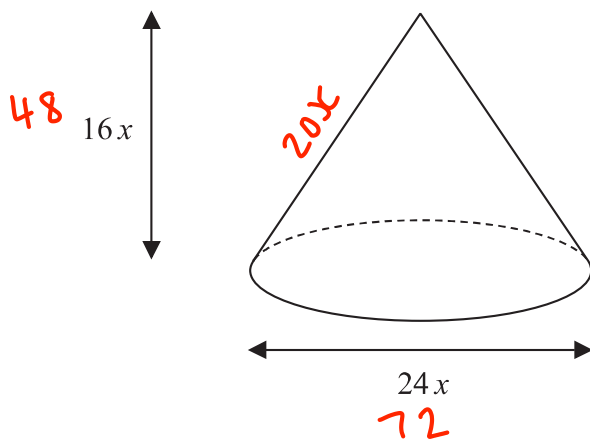
- 16 The graph of $y = f(x)$ is transformed to give the graph of $y = -f(x + 3)$
The point A on the graph of $y = f(x)$ is mapped to the point P on the
graph of $y = -f(x + 3)$

The coordinates of point A are $(9, 1)$
Find the coordinates of point P .

(6 , -1)

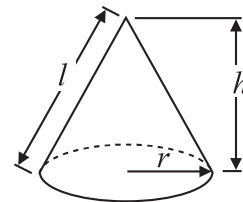
(Total for Question 16 is 2 marks)

17 The diagram shows a solid cone.



$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$



The diameter of the base of the cone is $24x$ cm.
The height of the cone is $16x$ cm.

The curved surface area of the cone is 2160π cm².
The volume of the cone is $V\pi$ cm³, where V is an integer.

Find the value of V .

$$\begin{aligned} \text{Curved SA: } \pi(12x) \times 20x \\ = 240\pi x^2 \end{aligned}$$

$$\begin{array}{r|l} 240\pi x^2 & = 2160\pi \\ 240x^2 & = 2160 \\ \div 240 & \div 240 \\ x^2 & = 9 \\ x & = 3 \end{array}$$

$$\text{Volume} = \frac{1}{3}\pi(36)^2 \times 48 = 20736\pi \text{ cm}^3$$

$$\begin{aligned} L^2 &= (12x)^2 + (16x)^2 \\ &= 400x^2 \\ \sqrt{\quad} \\ L &= 20x \end{aligned}$$

20736

(Total for Question 17 is 5 marks)

18 Thelma spins a biased coin twice.

The probability that it will come down heads both times is 0.09

Calculate the probability that it will come down tails both times.

$$P(H, H) = H \times H = 0.09$$

$$H^2 = 0.09$$

$$H = 0.3$$

$$\therefore T = 0.7$$

$$P(T, T) = 0.7 \times 0.7 = 0.49$$

0.49

(Total for Question 18 is 3 marks)

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19 (a) Write 0.000423 in standard form.

$$4.23 \times 10^{-4}$$

(1)

(b) Write 4.5×10^4 as an ordinary number.

$$45000$$

(1)

(Total for Question 19 is 2 marks)

20 Mark has made a clay model.

He will now make a clay statue that is mathematically similar to the clay model.

The model has a base area of 6cm^2

The statue will have a base area of 253.5cm^2 $\rightarrow \times 42.25$ (Area SF)

Mark used 2kg of clay to make the model. (volume)

Clay is sold in 10kg bags.

Mark has to buy all the clay he needs to make the statue.

How many bags of clay will Mark need to buy?

$$\text{Area SF} = 42.25$$

$$\text{Length SF} = 6.5$$

$$\text{Volume SF} = 6.5^3$$

$$2 \times 6.5^3 = 549.25$$

$$549.25 \div 10 = 54.925$$

55

(Total for Question 20 is 3 marks)

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- 21 (a) Show that the equation $3x^2 - x^3 + 3 = 0$ can be rearranged to give

$$x = 3 + \frac{3}{x^2}$$

$$\begin{array}{r|l} 3x^2 - x^3 + 3 = 0 & \\ + x^3 & + x^3 \\ \hline 3x^2 + 3 = x^3 & \\ \div x^2 & \div x^2 \\ \hline 3 + \frac{3}{x^2} = x & \end{array}$$

(2)

- (b) Using

$$x_{n+1} = 3 + \frac{3}{x_n^2} \quad \text{with } x_0 = 3.2,$$

find the values of x_1 , x_2 and x_3

$$x_1 = 3 + \frac{3}{(3.2)^2} = 3.21296\dots$$

$$x_2 = 3.276659786$$

$$x_3 = 3.27942$$

(3)

- (c) Explain what the values of x_1 , x_2 and x_3 represent.

Estimates to the solution of the equation $3x^2 - x^3 + 3 = 0$

(1)

(Total for Question 21 is 6 marks)

6 12 18 25 31

7 13 19

+6 +6

$$n^{\text{th}} \text{ term : } 6n + 1$$

$$(6n+1)^2 - (6m+1)^2$$

$$= (6n+1)(6n+1) - (6m+1)(6m+1)$$

$$= 36n^2 + 12n + 1 - (36m^2 + 12m + 1)$$

$$= 36n^2 - 36m^2 + 12n - 12m$$

$$= 12(3n^2 - 3m^2 + n - m)$$

$$n \text{ odd}, m \text{ odd} = \text{odd} - \text{odd} + \text{odd} - \text{odd} = \text{even}$$

$$n_{\text{even}}, m_{\text{even}} = \text{even} - \text{even} + \text{even} - \text{even} = \text{even}$$

$$n \text{ odd, } m \text{ even} = \text{odd} - \text{even} + \text{odd} - \text{even} = \text{even}$$

$$n \text{ even, } m \text{ odd} = \text{even} - \text{odd} + \text{even} - \text{odd} = \text{even}$$

$\therefore$ always even

12 multiplied by an even number will always be a multiple of 24

(Total for Question 22 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS