Section A (Paper 2)

1. Here are the first 5 terms of an arithmetic sequence.

17, 14, 11, 8, 5

−3

Find an expression, in terms of n, for the nth term of the sequence.

$-3n + 20$

(Total 3 marks)

2. Loft insulation reduces annual heating costs by 20%.
After she insulated her loft, Amy's annual heating cost was £592.

Work out Amy's annual heating cost would have been, if she had not insulated her loft.

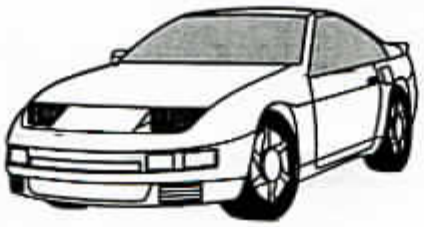
×0.8 → 592

÷0.8 ← 80

£ 740

(Total 3 marks)

3. Rashid bought a car for £15 000.



Each year the value of the car **depreciated** by 8%.

Work out the value of the car two years after he bought it.

$15000 \times 0.92^2 =$ £12696

£ .....

(Total 3 marks)

4. (a) (i) Solve the inequality

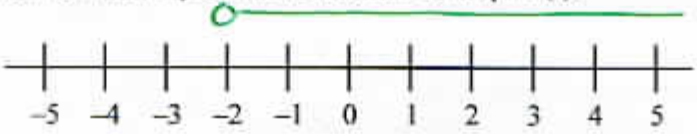
$$4x - 5 < 5x - 3$$

$-2 < x$

$x > -2$

.....

(ii) On the number line, represent the solution set to part (i).



(4)

n is an **integer** such that $-6 \leq 3n < 5$. $-2 \leq n < 5/3$

(b) Write down the possible values of n.

$-2, -1, 0, 1$

.....

(3)
(Total 7 marks)

5. The size of each **exterior** angle of a regular polygon is 15°.

Work out the number of sides of the polygon.

$360 \div 15 =$

24

.....

(Total 2 marks)

6. Mario invests £4500 for 3 years at 4% per annum **compound** interest.

Calculate the value of the investment at the end of 3 years, rounding your answer appropriately

$4500 \times 1.04^3 = 5061.888$

5061.89

£.....

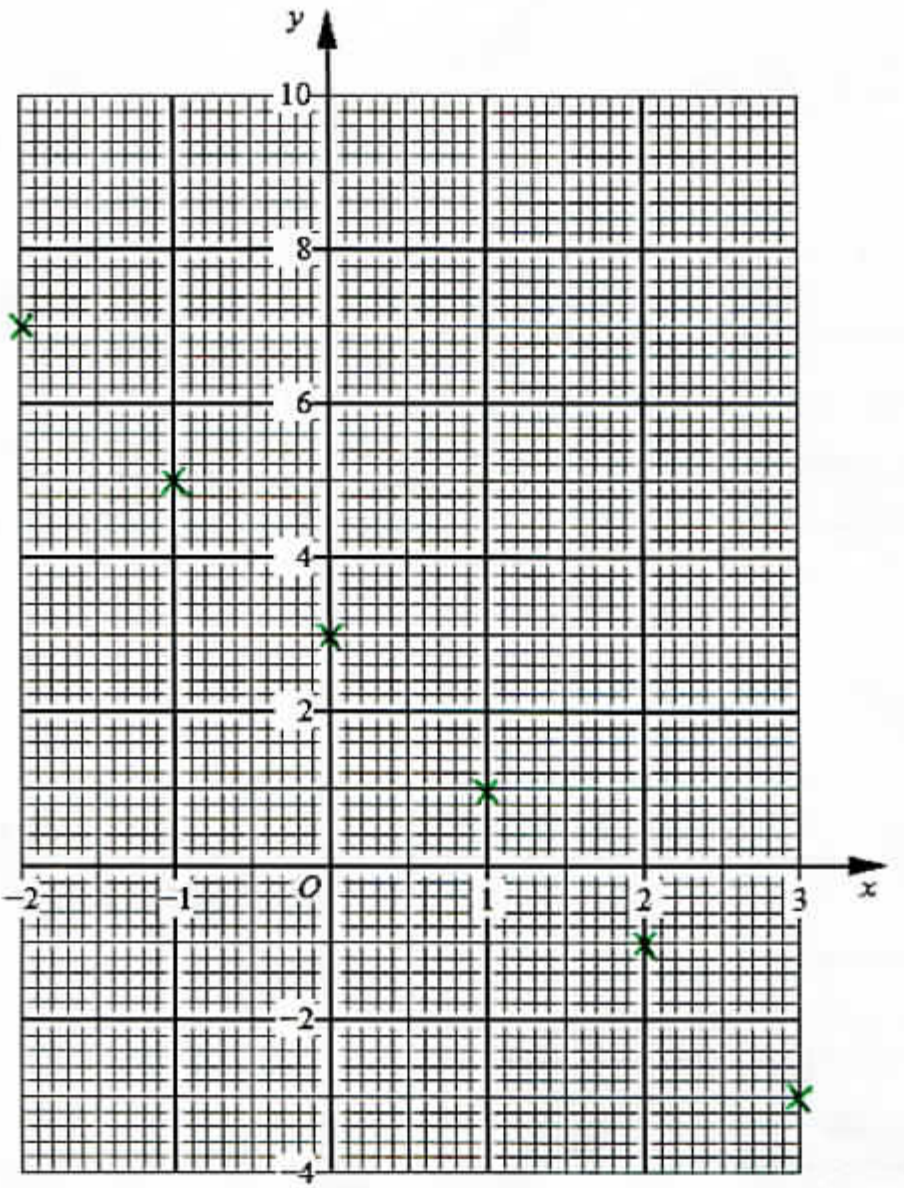
(Total 3 marks)

7. (a) Complete the table of values for $y = 3 - 2x$

x	−2	−1	0	1	2	3
y	7	5	3	1	−1	−3

(2)

(b) On the grid, draw the graph of $y = 3 - 2x$



(2)

(c) Use your graph, or otherwise, to find

(i) the value of y when $x = -1.3$

$y = 3 - 2x(-1.3)$

$y =$ 5.6

(ii) the value of x when $y = -1.8$

$-1.8 = 3 - 2x$

$2x = 4.8$

$x = 2.4$

$x =$ 2.4

(2)
(Total 6 marks)

8.

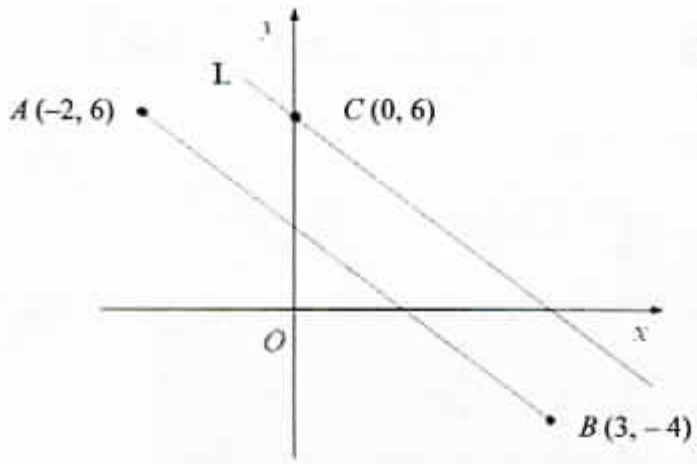


Diagram NOT accurately drawn

The diagram shows three points A (–2, 6), B (3, – 4) and C (0, 6).

A line **L** is **parallel** to AB and passes through C.

Find the equation of the line **L**.

$m = \frac{6 - -4}{-2 - 3} = \frac{10}{-5} = -2$

$y = -2x + 6$

(Total 4 marks)

9. A field is in the shape of a rectangle.

The length of the field is 171 m, to the nearest metre.
The width of the field is 83 m, to the nearest metre.

Calculate the upper bound for the perimeter of the field.

$2 \times 171.5 + 2 \times 83.5 = 510$

510. m

(Total 3 marks)

10. *ABCDE* is a **regular** pentagon.
AEF and *CDF* are straight lines.

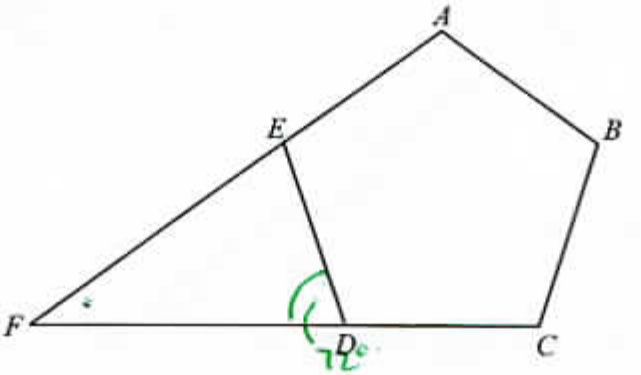


Diagram **NOT** accurately drawn

a) What sort of triangle is triangle DEF?

Isosceles.

(1)

b) Work out the size of angle *DFE*.

360 ÷ 5 = 72 = FDE and FED.

180 − 2×72 =

36°

(3)
(Total 4 marks)

11. (i) Convert the recurring decimal $0.\dot{4}\dot{2}$ to a fraction.

$x = 0.424242$

$100x = 42.424242$

$99x = 42$

$x = \frac{42}{99} = \frac{14}{33}$

(ii) Convert the recurring decimal $2.1\dot{4}\dot{2}$ to a mixed number.
Give your answer in its simplest form.

$0.0\dot{4}\dot{2} = \frac{14}{330}$

$2.1 = 2\frac{1}{10}$

$2.1\dot{4}\dot{2} = 2\frac{1}{10} + \frac{14}{330}$

$2\frac{33}{330} + \frac{14}{330} = 2\frac{47}{330}$

(Total 5 marks)

12. The diagram shows a sketch of triangle ABC.

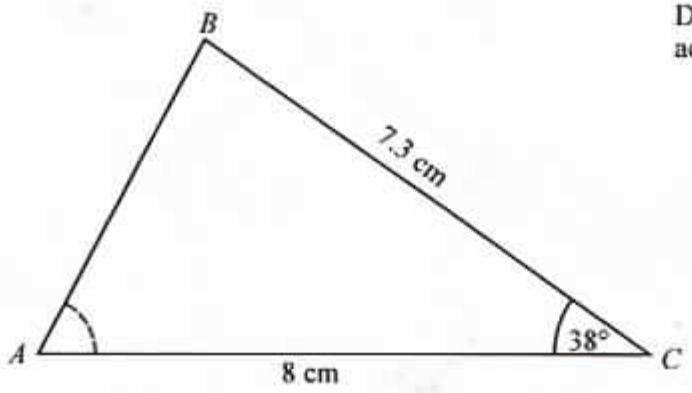
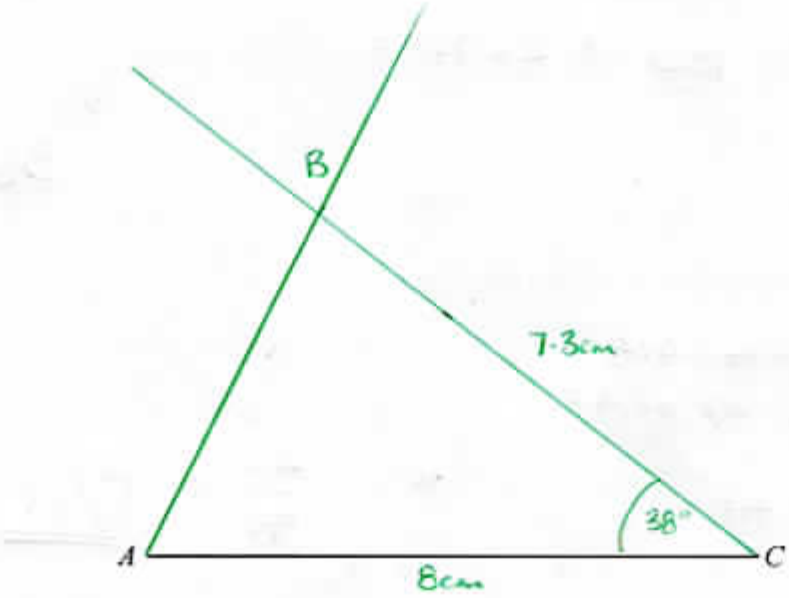


Diagram **NOT** accurately drawn

$BC = 7.3$ cm.
$AC = 8$ cm.
Angle $C = 38°$.

(a) Make an accurate drawing of triangle ABC. The line AC has been accurately drawn.



(3)

(b) Measure the size of angle A on your diagram.

$\frac{\sin 38}{5.02} = \frac{\sin A}{7.3}$ $A = \sin^{-1}\left(\frac{7.3 \sin 38}{5.02}\right)$

63/64

63·43 .....°

(1)

(c) Measure the length of the side AB on your diagram.

$x^2 = 8^2 + 7.3^2 - 2 \times 8 \times 7.3 \cos 38$

$= 25.25\ldots$

$x =$

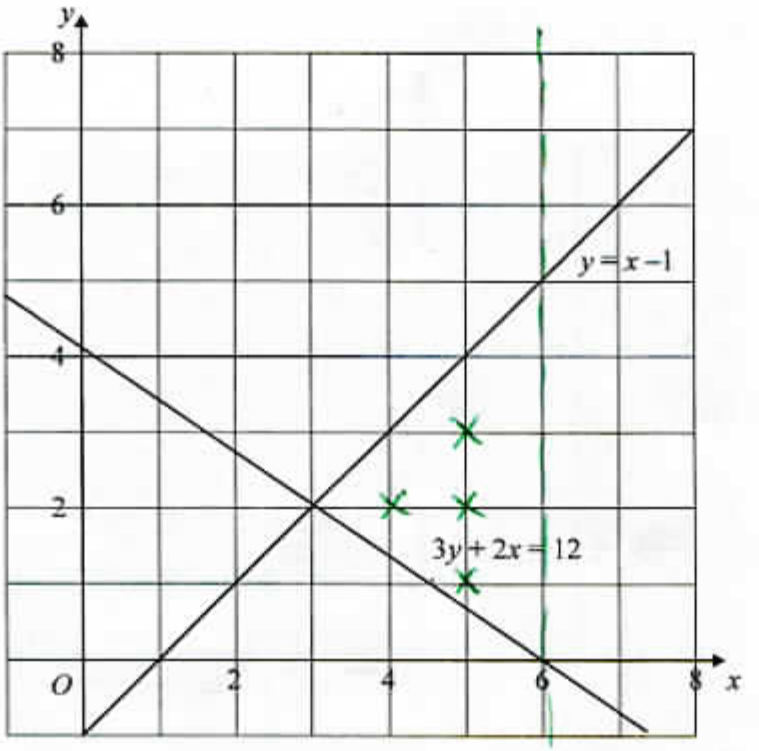
≈5cm

5·02 .....cm

(1)

(Total 5 marks)

13. The graphs of the straight lines with equations $3y + 2x = 12$ and $y = x - 1$ have been drawn on the grid.



(a) Use the graphs to solve the simultaneous equations

$3y + 2x = 12$
$y = x - 1$

$x =$ 3

$y =$ 2

(1)

(b) $3y + 2x > 12$ $\quad y < x - 1$ $\quad x < 6$

x and y are integers.

On the grid, mark with a cross (×) each of the **four** points which satisfies **all** these 3 inequalities.

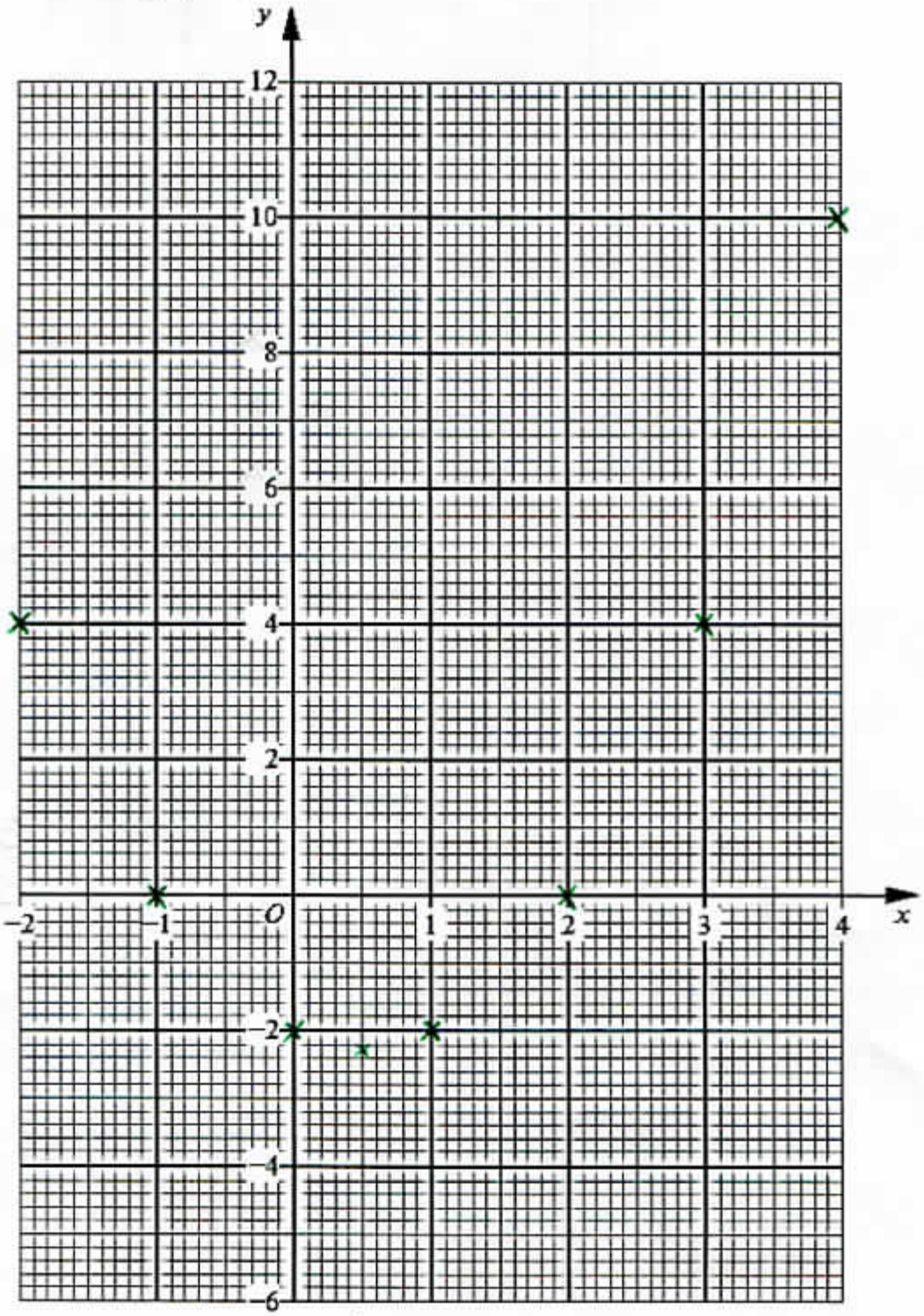
(3)
(Total 4 marks)

14. (a) Complete the table for $y = x^2 - x - 2$

x	−2	−1	0	1	2	3	4
y	4	0	−2	−2	0	4	10.

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x - 2$



(2)

(c) Use your graph to find an estimate for the minimum value of y.

$\frac{dy}{dx} = 2x - 1 \quad x = 1/2$

$y = 1/2^2 - 1/2 - 2$

$y =$ −2.25 ans.

(1)

(Total 5 marks)

15.

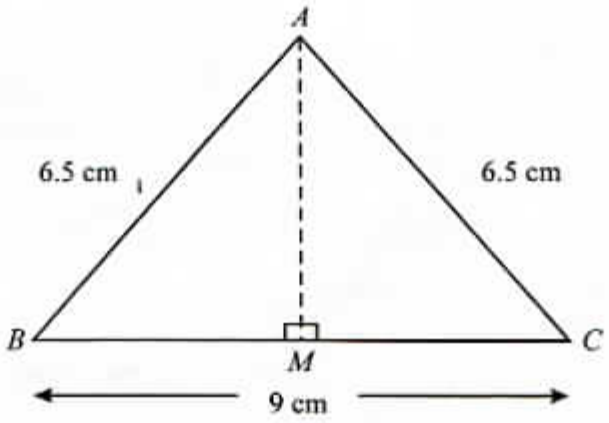


Diagram **NOT** accurately drawn

Work out the length, in centimetres, of *AM*. Give your answer correct to 2 decimal places.

$x = \sqrt{6.5^2 - 4.5^2}$

$= 4.6904$

4.69 ..... cm

(Total 3 marks)

16. a) Express 90 as the product of its prime factors.

$2 \times 3^2 \times 5$

.....

(2)

b) Express 252 as the product of its prime factors.

$2^2 \times 3^2 \times 7$

.....

(2)

c) Find the highest common factor of 54 and 72.

18

.....

(2)

(Total 6 marks)

17.

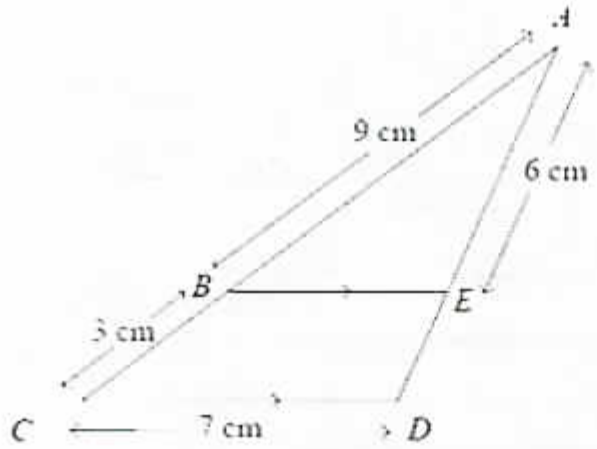


Diagram NOT accurately drawn

BE is parallel to *CD*.

AB = 9 cm, *BC* = 3 cm, *CD* = 7 cm, *AE* = 6 cm.

(a) Calculate the length of *ED*.

$\frac{AD}{6} = \frac{12}{9}$

$AD = \frac{12 \times 6}{9} = 8$

$8 - 6 = 2$

2 ..... cm

(2)

(b) Calculate the length of *BE*.

$\frac{BE}{7} = \frac{9}{12}$

$BE = \frac{9 \times 7}{12} =$

5.25 ..... cm

(2)

(Total 4 marks)

End of section A

Section B (Paper 2) A* Sets

1. Solve the equation.

$$\frac{2}{4-3x} = \frac{1}{x^2+2x}$$

$2x^2 + 4x = 4 - 3x$

$2x^2 + 7x - 4 = 0$

$(2x - 1)(x + 4) = 0$

$x = \frac{1}{2}$ or $x = -4$

(4 marks)

2. Find the equation of the line which passes through point (6,2) and which is perpendicular to the line with equation $y = 3x - 5$.

$m = -\frac{1}{3}$ $\quad y - 2 = -\frac{1}{3}(x - 6)$

~~$3y - 6 = -x + 6$~~

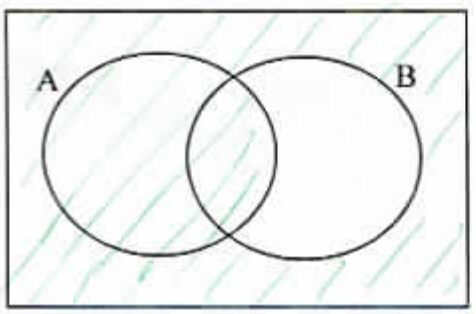
$y = -\frac{1}{3}x + 4$

$y =$ .....

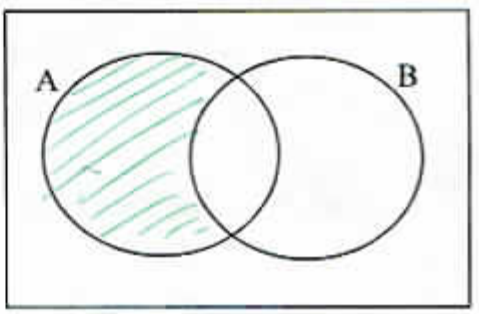
(3 marks)

3. One the diagrams below shade the regions that represent
a) $A \cup B'$ and b) $A \cap B'$

a)

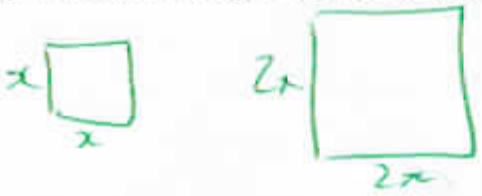


b)



(4 marks)

4. A piece of wire 50cm long is cut into two parts. Each part is then bent to form a square. If the area of the large square is four times the area of the small square, find the length of a side of the small square.



$4x + 4x\,2x = 50$

$x = \frac{50}{12} = 4.16$

.....

(5 marks)

5. M is inversely proportional to the square of P. When M = 5, P = 3.

c) Find a rule linking M and P

$M = \frac{K}{P^2}$ $K = 45$

M = $45/P^2$

d) Calculate M when P = 2

$M = \frac{45}{2^2} =$

M = 11.25

e) Calculate P when M = 15

$15 = \frac{45}{P^2}$

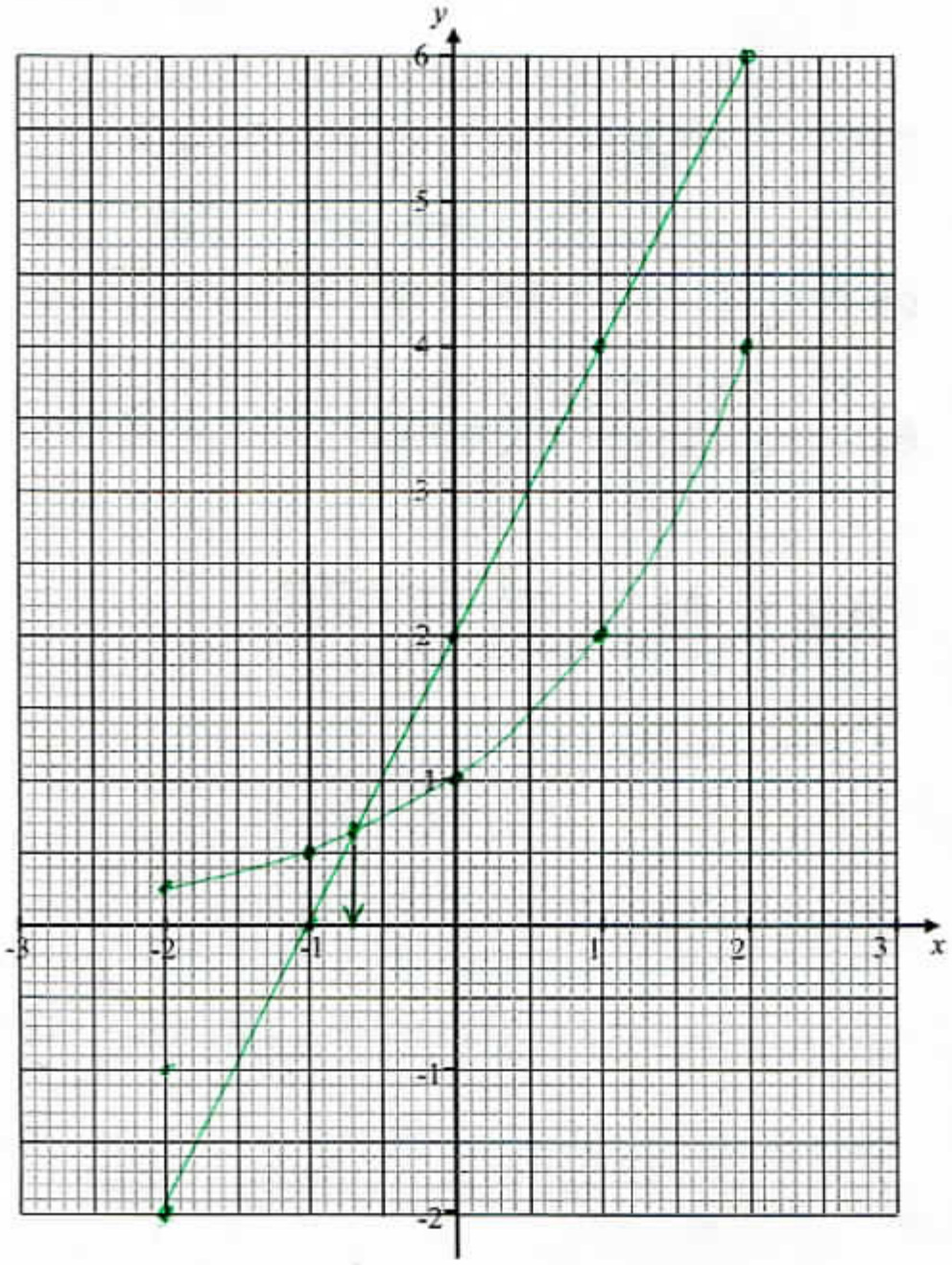
$P^2 = \frac{45}{15}$

$P = \sqrt{3} =$

P = 1.732

(5 marks)

6. a) Draw the graphs of $y = 2^x$ and $y = 2x + 2$ for $-2 \leq x \leq 2$



b) Use the graphs to solve the equation $2^x = 2x + 2$

$\ln 2^x = \ln(2x + 2)$

$x \ln 2 = \ln(2x + 2)$

$x = -0.7$

(5 marks)

A B C

7. Show, by calculation, that the triangle whose vertices are (1,1), (3,2), (2,-1) is isosceles.

(4 marks)

$$AB = \sqrt{(3-1)^2+(2-1)^2} = \sqrt{5}$$

$$BC = \sqrt{(3-2)^2+(2--1)^2} = \sqrt{10}$$

$$AC = \sqrt{(2-1)^2+(-1-1)^2} = \sqrt{5}$$

$AB = AC \Rightarrow$ isosceles.