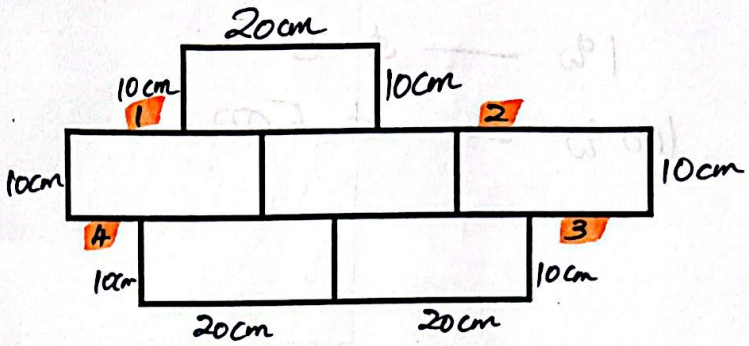
Answer **all** the questions.

1



The shape above is formed by stacking 6 congruent rectangular boxes.
Each rectangle box has a length of 20cm and breadth of 10cm. Find the perimeter of the shape.

1+2 = 40 cm

3+4 = 20 cm

Perimeter = 20+10+10+10+20+20+10+10+10+(40+20)

= 180 cm

Answer: .....180.....cm [2]

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2 **(a)** 4 boys take 12 hours to completely paint 3 rooms.
How long would it take 12 boys to completely paint 3 rooms?

×3 ↓ 4b 12hrs 3rooms

12b ?? 3rooms

12 ÷ 3 = 4hrs

Answer: .....4.....hours [1]

(b) A girl takes 8 hours to paint 1 room.
How long would it take for a boy and a girl to paint completely 1 room together?

4 boys 12hrs 3rooms

4 boys 4hrs 1room

1 boy 16hrs 1room

1 boy 1hr $\frac{1}{16}$ room

1G 8hrs 1room

1G 1hr $\frac{1}{8}$ of room

1 boy + 1 girl = $\frac{3}{16}$ room in 1hr

1 room = $\frac{16}{3}$ = 5 1/3

Answer: .....5 1/3.....hours [2]

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3 **(a)** Javed sold a watch for \$900. He made a profit of 80% of the cost price. Calculate the cost price.

180% — \$900
1% — \$ 5
100% — \$ 500

Answer \$500 [2]

(b) Ching Boi borrowed a sum of money from XYZ Bank, which charges 2.75% per annum, compounded quarterly. At the end of the first year, he needs to pay an interest charge of \$78.50. Find the original sum of money Ching Boi borrowed, giving your answer correct to the nearest cent.

$$P\left(1+\frac{r}{100}\right)^n - P = 78.50$$

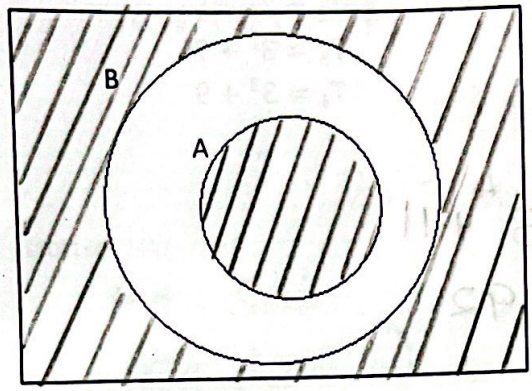
$$P\left(1+\frac{\left(\frac{2.75}{4}\right)}{100}\right)^4 - P = 78.50$$

$$P = \$2825.28 //$$

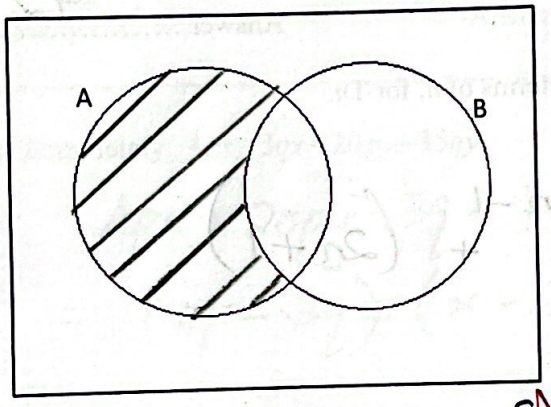
Answer \$2825.28 [2]

4 **(a)** Shade the region representing [2]

(i) $A \cup B'$,



(ii) $(A' \cup B)'$.



(b) ε = {integers: $4 \leq x < 20$}
A = {factors of 30}
B = {multiples of 4}

A = {1, 30, 5, 6, 3, 10, 2, 15}
B = {4, 8, 12, 16, 20}

(i) List the elements in $A \cap B$.

Answer { } ∅ [1]

(ii) Find $n(A \cup B)$.

$n(A \cup B) = 13$

Answer 8 13 12 [1]

5 The first four terms in a sequence is given as such

$$T_1 = 3^0 + 3$$
$$T_2 = 3^1 + 5$$
$$T_3 = 3^2 + 7$$
$$T_4 = 3^3 + 9$$

(a) Find the value of T_5.

$T_5 = 3^4 + 11$

$= 92$

Answer 92 [1]

(b) Find, an expression, in terms of n, for Tn.

$T_n = 3^{n-1} + (2n+1)$

Answer $T_n = 3^{n-1} + (2n+1)$ [2]

6 (a) Simplify $2(7x+5)-11$.

$14x+10-11 = 14x-1$

Answer $14x-1$ [1]

(b) Factorise $10a-5ab$.

$10a-5ab$

$= 5a(2-b)$

Answer $5a(2-b)$ [1]

---

7 Factorise completely $4px-3qx-20py+15qy$.

$4px-20py-3qx+15qy = 4p(x-5y)+3p(-x+5y$

$= (4p-3q)(x-5y)$

Answer $(4p-3q)(x-5y)$ [2]

---

8 The area of triangle ABC is 47.9 cm^2. AB = 17.5 cm and BC = 11.6 cm.
Find the two possible sizes of angle ABC.

$\frac{1}{2} \times 17.5 \times 11.6 \times \sin B = 47.9$

$\sin B = 0.4719211$

$B = 28.16^\circ$ or 151.84°

$= 28.2^\circ$ or 151.8°

Answer 28.2° or 151.8° [2]

---

9 **(a)** Express 676 as a product of its prime factors.

$676 = 52 \times 13$

$= 13 \times 4 \times 13$

$= 13 \times 2^2 \times 13$

$= 13^2 \times 2^2$

Answer $13^2 \times 2^2$ [2]

(b) Given that $676n$ is a perfect cube, find the smallest possible integer value of n.

$676n = 13^2 \times 2^2$

$n = 13 \times 2$

$= 26$

Answer $n = 26$ [2]

10 Two cards are drawn at random one at a time with replacement from a pack of 10 cards, numbered 1 to 10. Find the probability that the two numbers on the cards drawn are

(a) both even,

$$\frac{5}{10} \times \frac{5}{10} = \frac{25}{100} = \frac{1}{4}$$

Answer $\frac{1}{4}$ [2]

(b) multiples of 2 but not multiples of 4.

$$\frac{3}{10} \times \frac{3}{10} = \frac{9}{100}$$

Answer $\frac{9}{100}$ [2]

11 The data below shows the marks scored by 10 students in a Mathematics test.

24, 28, 82, 38, 45, 46, 54, 58, 80, 64. Find the

(a) median, 24, 28, 38, 45, 46, 54, 58, 64, 80, 82

$$\frac{46+54}{2} = 50$$

Answer 50 [2]

(b) interquartile range.

$64 - 38 = 26$

Answer 26 [2]

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12 In a regular polygon, the ratio interior angle: exterior angle = 5:1

Calculate the number of sides of the polygon.

6 units $\longrightarrow 180^\circ$

1 unit $\longrightarrow 30^\circ$

5 units $\longrightarrow 150^\circ$

$$\frac{360}{30} = 12$$

Answer 12 [3]

13 (a) Compute A^2, A^3 and A^4 if $A = \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix}$.

$A^2 = A \times A$, $A^3 = A \times A \times A$, $A^4 = A \times A \times A \times A$. [4]

Answer

$$A = \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix}$$

$$A^2 = \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 2a \\ 0 & 1 \end{pmatrix}$$

$$\therefore A^3 = \begin{pmatrix} 1 & 3a \\ 0 & 1 \end{pmatrix}$$

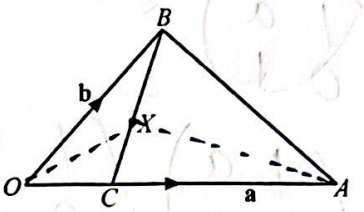
$$A^4 = \begin{pmatrix} 1 & 4a \\ 0 & 1 \end{pmatrix}$$

(b) Hence, deduce A^n, where n is a positive integer.

$$A^n = \begin{pmatrix} 1 & na \\ 0 & 1 \end{pmatrix}$$

Answer $A^n = \begin{pmatrix} 1 & na \\ 0 & 1 \end{pmatrix}$ [1]

14 In the diagram, C is a point on the side OA of ΔOAB such that $3OC = OA$.
$\overrightarrow{OA}$ and $\overrightarrow{OB}$ are $\boldsymbol{a}$ and $\boldsymbol{b}$ respectively and the point X on BC is such that
$\overrightarrow{OX} = \frac{1}{5}\mathrm{a} + \frac{2}{5}\mathrm{b}$.



(a) Find, in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$,
(i) $\overrightarrow{BC}$,

(i) $\overrightarrow{BC} = -\underset{\sim}{b} + \frac{1}{3}\underset{\sim}{a}$

Answer $\frac{1}{3}\underset{\sim}{a} - \underset{\sim}{b}$ [1]

(ii) $\overrightarrow{BX}$.

(ii) $\overrightarrow{BX} = \overrightarrow{BO} + \overrightarrow{OX}$

$= -\underset{\sim}{b} + \frac{1}{5}\underset{\sim}{a} + \frac{2}{5}\underset{\sim}{b}$

$= \frac{1}{5}\underset{\sim}{a} - \frac{3}{5}\underset{\sim}{b}$

Answer $\overrightarrow{BX} = \frac{1}{5}\underset{\sim}{a} - \frac{3}{5}\underset{\sim}{b}$ [1]

(b) Find the value of k if $\overrightarrow{BX} = k\overrightarrow{BC}$.

$\overrightarrow{BC} = \frac{1}{3}\left(\underset{\sim}{a} - 3\underset{\sim}{b}\right) = \frac{5}{15}\left(\underset{\sim}{a} - 3\underset{\sim}{b}\right)$

$\overrightarrow{BX} = \frac{1}{5}\left(\underset{\sim}{a} - 3\underset{\sim}{b}\right) = \frac{3}{15}\left(\underset{\sim}{a} - 3\underset{\sim}{b}\right)$

Answer $K = 3/5$ [2]

(c) Hence, find and simplify $\frac{\text{area of } \Delta OAX}{\text{area of } \Delta OAB}$.

Sharing same height, Similar, ~~Use Similar △s~~, $\frac{CX}{CB} = \frac{2}{5}$

$\therefore \frac{\Delta\ OAX}{\Delta\ OAB} = \frac{2}{5}$

Answer 2/5 [2]

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15 (a) Express $x^2 - 2x + 4$ in the form $(x-h)^2 + k$.

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

$x^2 - 2x = -4$

$x^2 - 2x + \left(\frac{-2}{2}\right)^2 = -4 + \left(\frac{-2}{2}\right)^2$

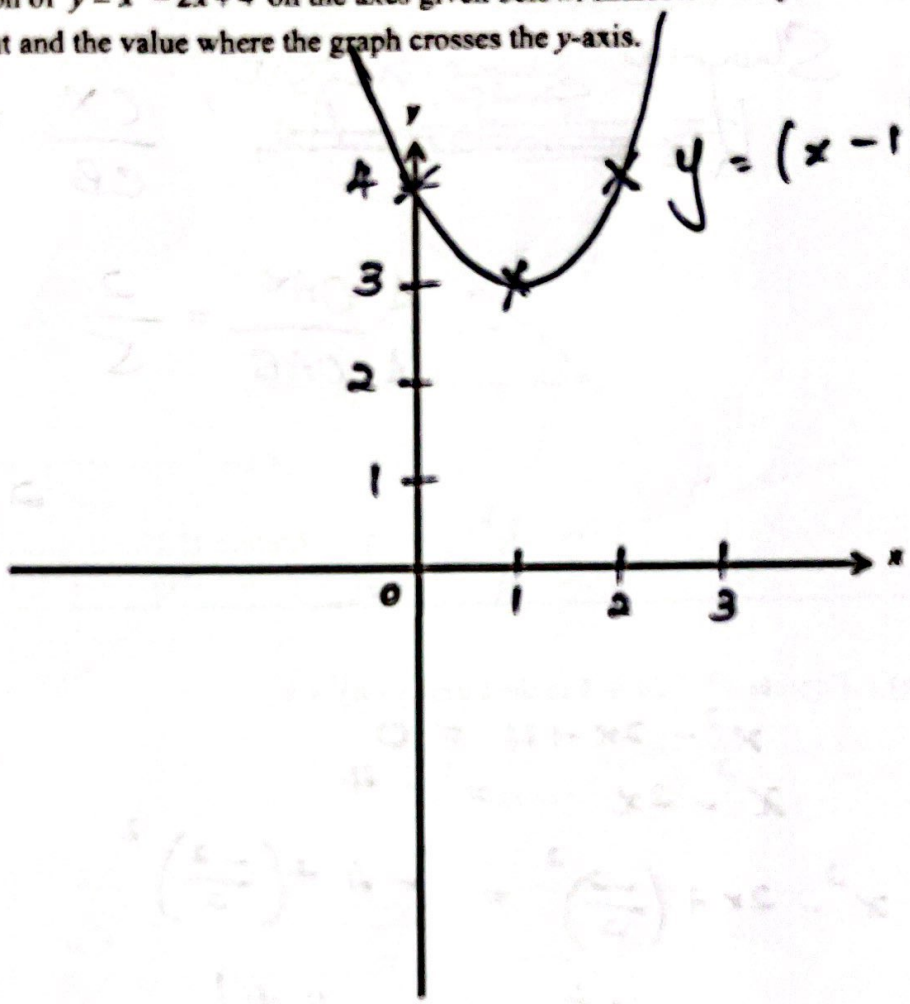
$(x-1)^2 = -4 + 1$

$(x-1)^2 = -3$

$(x-1)^2 + 3 = 0$

Answer $(x-1)^2 + 3$ [2]

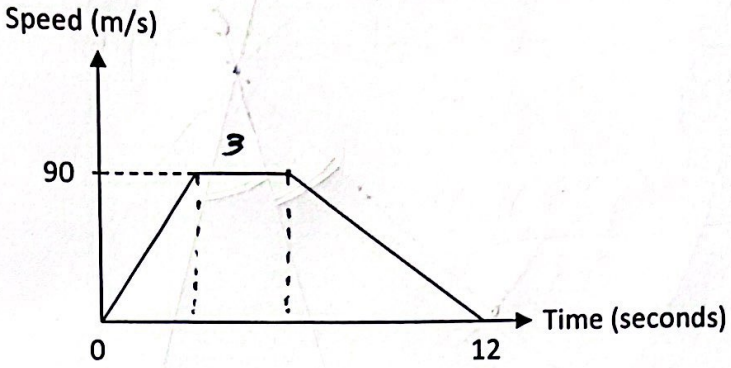
(b) Sketch the graph of $y = x^2 - 2x + 4$ on the axes given below. Indicate clearly the coordinates of the turning point and the value where the graph crosses the y-axis. [3]



(c) Write down the equation of the line of symmetry of the function $y = x^2 - 2x + 4$.

Answer x = 1 [1]

16 The diagram shows the speed-time graph of a moving particle over a period of 12 seconds. The particle accelerated, and then travelled at a constant speed of 90 m/s for 3 seconds before decelerating.



Find

(a) the distance travelled in the 12 seconds,

$$\text{Dis} = \frac{1}{2} \times (12+3) \times 90$$

$$= 675 \text{ m}$$

Answer ..... 675 m ..... [1]

(b) the time taken for the particle to decelerate if its deceleration is 12 m/s^2.

$$12 = \frac{0-90}{t}$$

$$t = 7.5 \text{ sec}$$

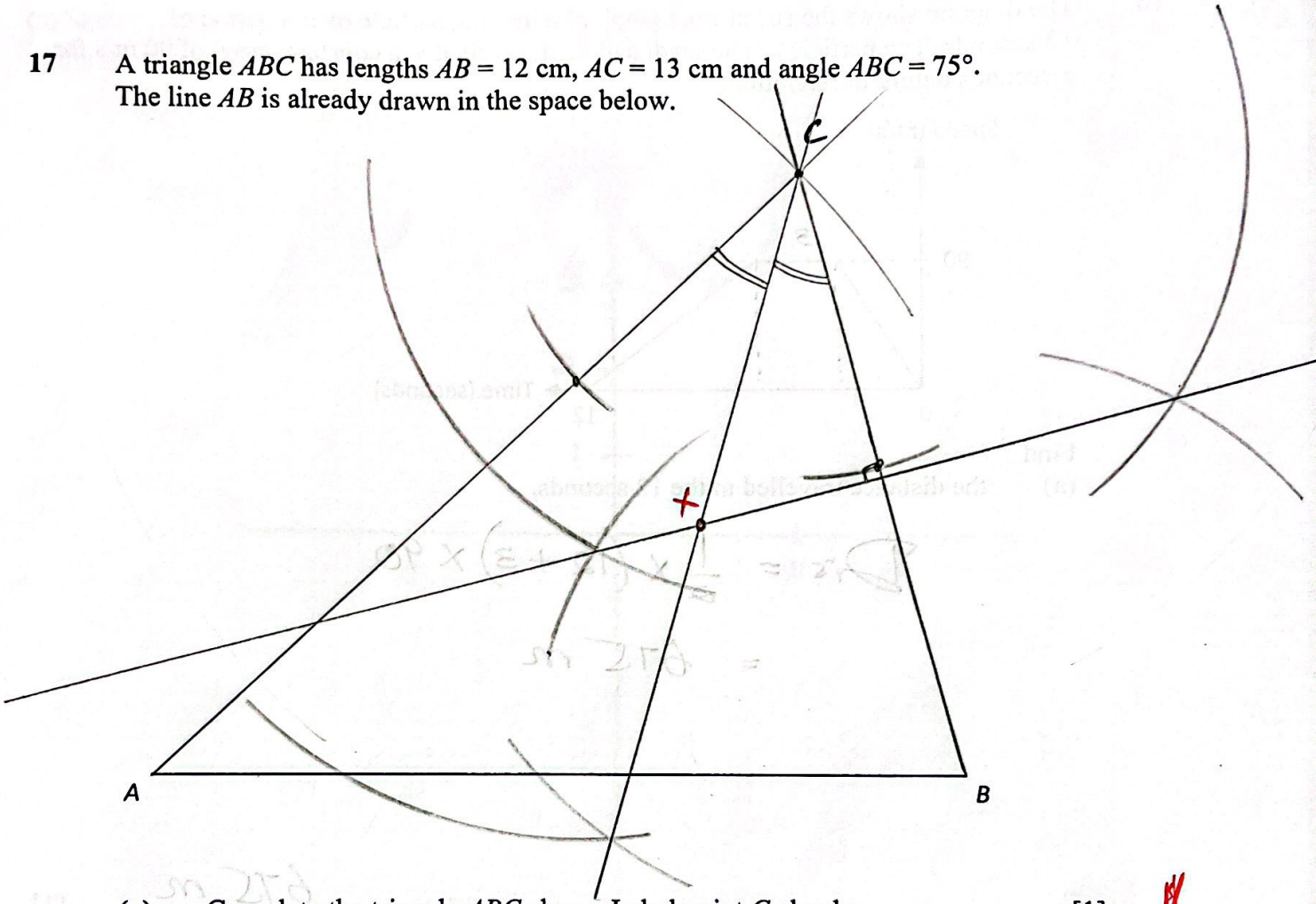
$$\frac{0-90}{t} = -12$$

$$-12t = -90$$

$$t = 7.5$$

Answer ..... 7.5 ..... seconds [2]

17 A triangle ABC has lengths $AB = 12$ cm, $AC = 13$ cm and angle $ABC = 75°$.
The line AB is already drawn in the space below.



(a) Complete the triangle ABC above. Label point C clearly. [1]

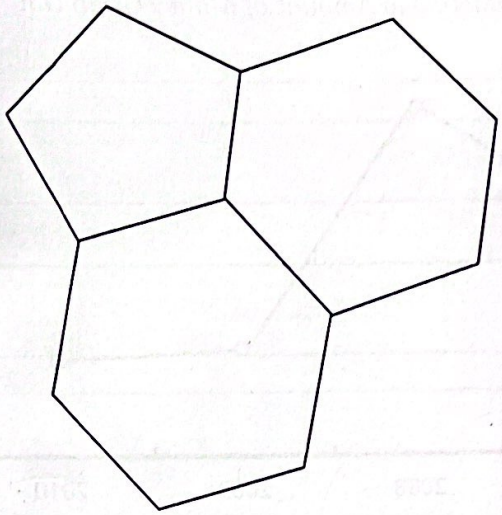
(b) Construct the perpendicular bisector of the line segment BC. [1]

(c) Construct the angle bisector of the angle BCA. [1]

(d) The point X lies equidistant from the point B and C and is also equidistant to the lines AC and BC. Measure the length of AX.

Answer $AX =$ 8.7 cm [1]

18 The diagram below shows two hexagons and one pentagon joined together.



(a) Calculate the sum of the interior angles of a pentagon.

$\frac{(n-2)\times 180^\circ}{} = 540^\circ$

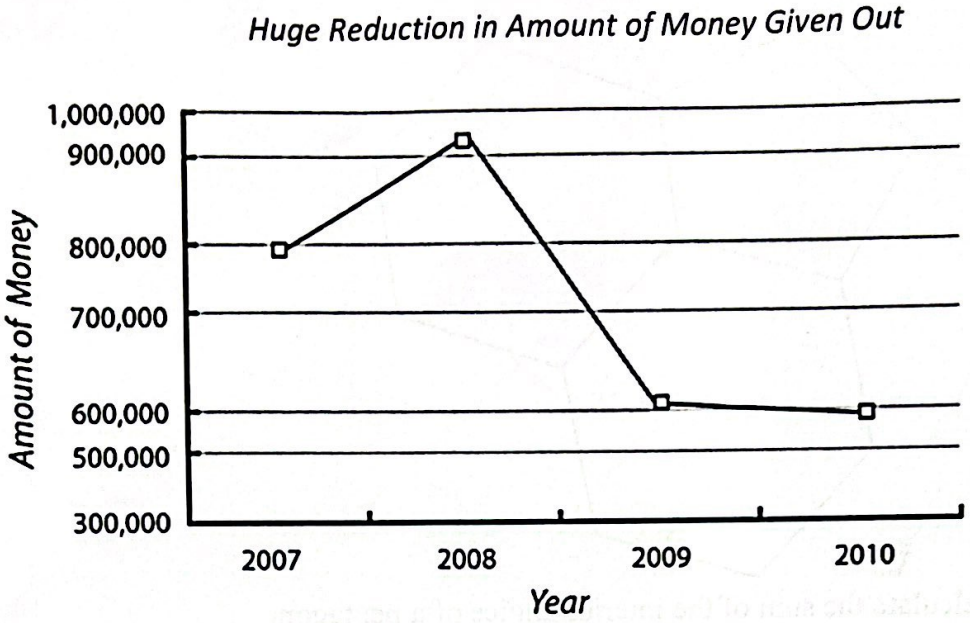
Answer ..... 540° [1]

(b) If we assume the hexagon to be regular, what is the size of each of its' interior angle?

$\frac{(6-2)\times 180^\circ}{6} = 120^\circ$

Answer ..... 120° [2]

19 State one feature of the line graph below that may be misleading and explain why.



Answer : The spacing intervals for the amount of money is not regular and equal.

This is misleading because it makes us believe there is a huge drop in the amount of money between 2008 and 2009. Also, the [2]
title is also misleading as there was an increase in 2007 to 2008.

20 **(a)** Evaluate $4+2a^0$.

$4+2=6$

Answer ..... 6 ..... [1]

(b) Simplify $(3h)^3 \times 2g^2h^4$.

$27h^3 \times 2g^2h^4$

$= 54g^2h^7$

Answer ..... $54g^2h^7$ ..... [2]

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21 Solve the simultaneous equations.

$3x+8y=11$

$x+4y=3$

$3x+8y = 11$

$2x+8y = 6$

$\therefore x = 5$

$y = \frac{11-3x}{8} = -1/2$

Answer $x =$ ..... 5 .....

$y =$ ..... $-1/2$ .....[3]

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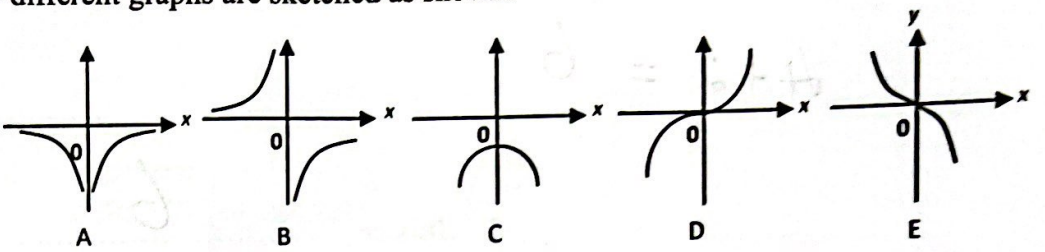
22 5 different graphs are sketched as shown.



Which of the above sketches could be the graph of the followings?

(a) $y = -\frac{7}{x^2}$,

Answer A [1]

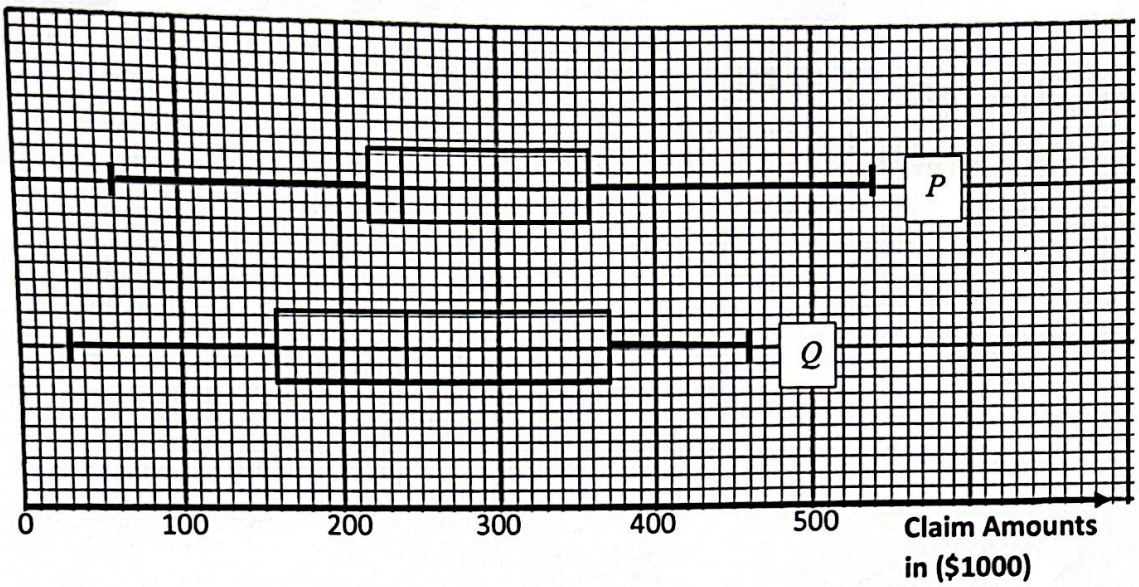
*(b) $y = -4x^2 - 2$,

Answer C [1]

(c) $y = 3x^3$.

Answer D [1]

23 The first 300 claims for insurance companies P and Q are shown in the box and whiskers plot below.



(a) State the median of the claims from company P.

Answer $240 000 [1]

(b) Find the inter-quartile range of claims from company Q.

370 - 160 = 210

370 000 − 160 000 = 210 000

Answer $210 000 [2]

(c) Compare the claims of companies P and Q. Comment on the distribution of claims for both companies.

Answer Interquartile Range is larger for Q than P. Therefore, the standard deviation of claims is wider for Company Q. [2]

End of Paper

The claims are more consistent and stable for Company P than Company Q.