

Mid Year Examination Paper 2

INSTRUCTION TO CANDIDATES:

1. Answer **all** questions.
2. Write your answers and working in the spaces provided.
3. Omission of essential working will result in loss of marks.
4. Calculators may be used in this paper.
5. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer correct to three significant figures. Give answers in degrees correct to one decimal place.

Marks Obtained
50

Duration: 1h 30 min

- 1** (a) A man jogs 2400 m in 12 min. Express his average speed in kilometres per hour. [2]
(b) Express the ratio 40 cm : 1.5 m in its simplest form. [1]
(c) The temperature inside a cold storage room was -3°C when the cooling unit was switched off. The temperature then increases at a constant rate of 0.2°C per minute. Find the temperature of the room after 6.5 minutes. [2]

- 2** (a) Two quantities, m and n , are in inverse proportion such that $m = 7$ when $n = 8$. Find the value of m when $n = 14$. [2]
(b) Two quantities, x^2 and $(y - 2)$, are in direct proportion. Selected values of x and y are shown in the table below.

x	3	2	q
y	20	p	100

- (i) Express y in terms of x . [2]
(ii) Hence, find the values of p and q , where $p, q > 0$. [2]

3 Simplify the following expressions.

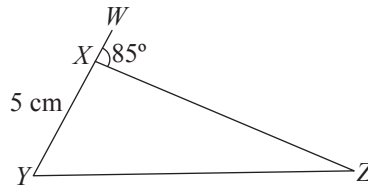
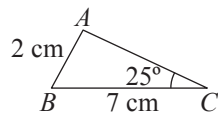
(a) $2(p + 3q) - [p - 3q - 4(2p - q)]$

[2]

(b) $(y^2 - 4y + 4) \div \frac{3y - 6}{6y}$

[3]

4 $\triangle ABC$ is enlarged to become $\triangle XYZ$.



Find

(a) the length YZ,

[2]

(b) $\angle ABC$.

[2]

- 5 On the straight line shown, construct four equal angles of 45° each using a ruler and a pair of compass. The use of a protractor is not allowed. [4]



- 6 There are x spiders and y ants. The total number of legs is 158. There are 11 more spiders than ants.
- (a) Express y in terms of x . [1]
- (b) Hence, find the number of ants and spiders. [3]

- 7** An actual distance of 4.8 km is represented by 6 cm on a map.
- (a) Express the scale in the form 1 : r . [2]
 - (b) Find the actual area of a reservoir represented by 14 cm² on the map. [2]
 - (c) A jogging track is 2 km long. Find its length on the map. [2]

- 8** The monthly subscription cost, \$ C , of Starry Internet Service is given by the formula $C = 25 + \frac{t^2}{100}$ where t is the number of hours used.
- (a) Find the amount payable if a customer uses the internet for 16 hours. [1]
 - (b) What is the minimum cost that a customer must pay every month? [1]
 - (c) Find the number of hours used that month if the subscription paid is \$27.89. [3]

- 9 (a) Construct a triangle ABC such that $AB = 6$ cm, $BC = 9$ cm and $AC = 7$ cm. [3]
- (b) Using your diagram, find
- (i) $\angle BAC$, [1]
- (ii) the area of $\triangle ABC$. [2]

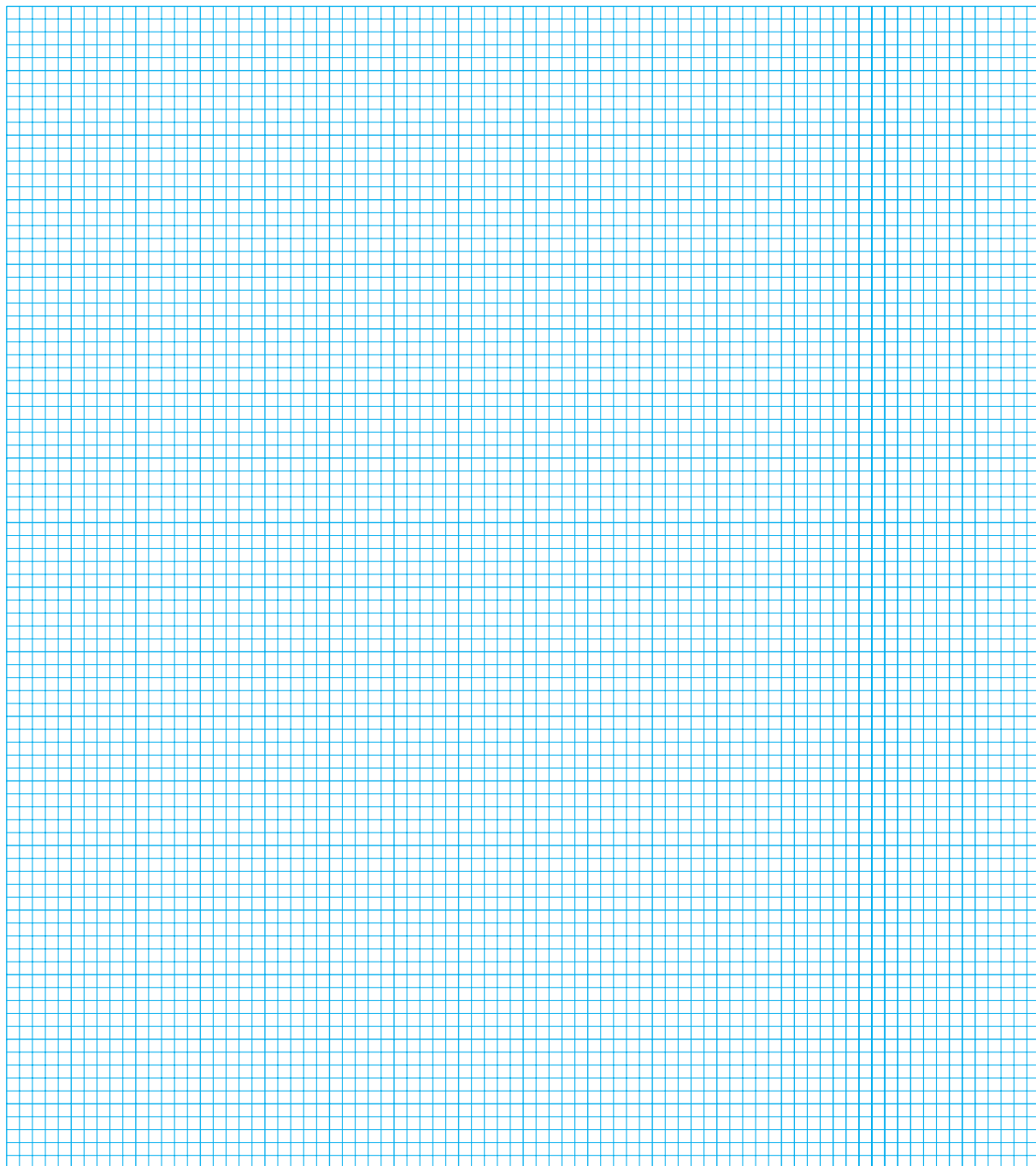
10 Answer the following question on the graph paper provided.

(a) Using a scale of 2 cm to represent 1 unit on both the x and y axes, draw the graphs of the following equations for $-1 \leq x \leq 3$.

(i) $y = -2x + 2$ [2]

(ii) $x - 2y = 6$ [2]

(b) Hence, solve the following simultaneous equations $y = -2x + 2$ and $x - 2y = 6$ graphically. [1]



End of Paper 2

Solutions to:

Mid Year Examination Paper 2

$$\begin{aligned}
 1. \quad (a) \quad \text{Speed} &= \frac{2400 \text{ m}}{12 \text{ min}} \\
 &= \frac{200 \text{ m}}{1 \text{ min}} \\
 &= \frac{0.2 \text{ km}}{\frac{1}{60} \text{ h}} \\
 &= 12 \text{ km/h}
 \end{aligned}$$

$$(b) \quad 40 \text{ cm} : 1.5 \text{ m} = 40 \text{ cm} : 150 \text{ cm} \\ = 4 : 15$$

$$(c) \quad \text{Final temperature} = -3 + 6.5(0.2) \\ = -1.7^\circ\text{C}$$

2. (a) **Method 1**

Since m and n are in inverse proportion, mn is a constant.

$$\begin{aligned}
 \therefore 7(8) &= m(14) \\
 56 &= 14m \\
 m &= 4
 \end{aligned}$$

Method 2

$m = \frac{k}{n}$, where k is a constant.

$$7 = \frac{k}{8}$$

$$k = 56$$

$$\therefore m = \frac{56}{n}$$

When $n = 14$,

$$m = \frac{56}{14} = 4$$

$$(b) \quad (i) \quad y - 2 = kx^2$$

When $x = 3$, $y = 20$,

$$20 - 2 = k(3^2)$$

$$18 = 9k$$

$$k = 2$$

$$\therefore y - 2 = 2x^2$$

$$\Rightarrow y = 2x^2 + 2$$

(ii) When $x = 2$, $y = p$

$$p = 2(2^2) + 2$$

$$= 10$$

When $x = q$, $y = 100$,

$$100 = 2q^2 + 2$$

$$2q^2 = 98$$

$$q^2 = 49$$

$$q = \pm\sqrt{49}$$

$$= 7 \text{ or } -7 \text{ (rej.)}$$

$$\begin{aligned}
 3. \quad (a) \quad &2(p + 3q) - [p - 3q - 4(2p - q)] \\
 &= 2(p + 3q) - (p - 3q - 8p + 4q) \\
 &= 2p + 6q - (-7p + q) \\
 &= 2p + 6q + 7p - q \\
 &= 9p + 5q
 \end{aligned}$$

$$(b) \quad (y^2 - 4y + 4) \div \frac{3y-6}{6y}$$

$$= (y^2 - 4y + 4) \times \frac{6y}{3y-6}$$

$$A \div \frac{C}{D} = A \times \frac{D}{C}$$

$$= (y-2)^2 \times \frac{6y}{3(y-2)}$$

factorise the denominator

$$= (y-2)^2 \times \frac{2y}{3(y-2)}$$

$$= (y-2) \times 2y$$

$$= 2y^2 - 4y$$

4. (a) $\triangle ABC$ is similar to $\triangle XYZ$.

$$\therefore \frac{YZ}{BC} = \frac{XY}{AB}$$

corr. sides of similar triangles

$$\frac{YZ}{7} = \frac{5}{2}$$

$$2YZ = 35$$

$$YZ = 17.5 \text{ cm}$$

(b) $\angle ABC = \angle XYZ$

corr. \angle s of similar triangles

$$= 85^\circ - \angle XZY$$

(ext. \angle s of \triangle)

$$= 85^\circ - 25^\circ$$

$\therefore \angle XZY = \angle ACB$

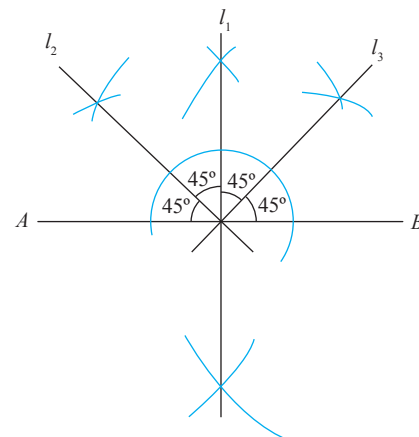
$$= 60^\circ$$

5. **Construction steps:**

Step 1: Construct perpendicular bisector l_1 .

Step 2: Construct angle bisector l_2 (using l_1 and AB).

Step 3: Construct angle bisector l_3 (using l_1 and AB).



6. (a) $y = x - 11$ — ①
 (b) Since spiders have 8 legs and ants have 6 legs,

$$8x + 6y = 158 \quad \text{--- ②}$$

Sub. ① into ②,

$$8x + 6(x - 11) = 158$$

$$8x + 6x - 66 = 158$$

$$14x - 66 = 158$$

$$14x = 158 + 66$$

$$14x = 224$$

$$x = 16$$

Sub. $x = 16$ into ①,

$$y = 16 - 11$$

$$= 5$$

\therefore There are 16 spiders and 5 ants.

7. (a) Scale = 6 cm : 4.8 km
 = 1 cm : 0.8 km
 = 1 : 80 000

- (b) Area scale = $1^2 \text{ cm}^2 : 0.8^2 \text{ km}^2$
 = $1 \text{ cm}^2 : 0.64 \text{ km}^2$

$$\text{Actual area of reservoir} = 0.64 \times 14 \\ = 8.96 \text{ km}^2$$

- (c) Length of map = $2 \div 0.8$
 = 2.5 cm

8. (a) $C = 25 + \frac{16t^2}{100}$
 = \$27.56

- (b) When $t = 0$, $C = 25 + \frac{0^2}{100}$
 = 25

The minimum cost is \$25.

- (c) When $C = \$ 27.89$,

$$27.89 = 25 + \frac{t^2}{100}$$

$$27.89 - 25 = \frac{t^2}{100}$$

$$2.79 = \frac{t^2}{100}$$

$$279 = t^2$$

$$t = \pm\sqrt{279}$$

$$= 17 \text{ or } -17 \text{ (rej.)}$$

\therefore The number of hours used is 17 hours.

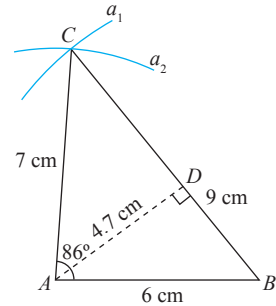
9. (a) **Construction steps:**

Step 1: Draw line AB 6 cm long.

Step 2: Draw an arc a_1 of radius 9 cm from point B .

Step 3: Draw an arc a_2 of radius 7 cm from point A .

Step 4: Label the intersection of a_1 and a_2 as 'C'.



- (b) (i) By measurement,
 $\angle BAC = 86^\circ$ ($\pm 1^\circ$)
 (ii) Height of triangle, $AD = 4.7 \text{ cm}$ ($\pm 1 \text{ cm}$)

$$\begin{aligned} \text{Area of } \triangle ABC & \quad \text{by measurement} \\ &= \frac{1}{2} \times 9 \times 4.7 \\ &= 21.15 \text{ cm}^2 \end{aligned}$$

10. (a) (i) $y = -2x + 2$

x	-1	0	3
$y = -2x + 2$	4	2	-4

- (ii) $x - 2y = 6$

$$\Rightarrow 2y = x - 6$$

$$\Rightarrow y = \frac{1}{2}x - 3$$

x	-1	0	3
$y = \frac{1}{2}x - 3$	-3.5	-3	-1.5

(See diagram 10. (a)(i), (ii) on page S3.)

- (b) Hence, $x = 2, y = -2$.

10. (a)(i), (ii)

