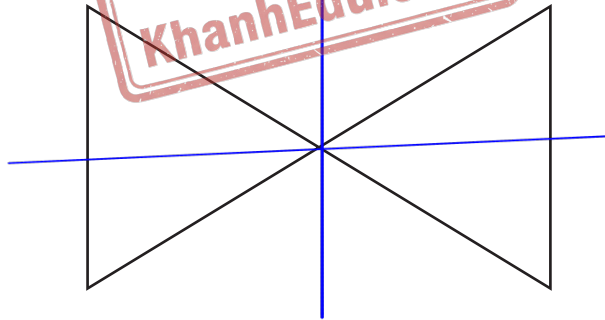


0580/22

February/March 2021

1
R



(a) Complete this statement.

The diagram has rotational symmetry of order 2 [1]

(b) On the diagram, draw all the lines of symmetry. [2]

2 Sahil and Anika share \$78 in the ratio 5 : 8.

R

Calculate the amount each receives.

Sahil: $\frac{78}{5+8} \times 5$

Anika: $\frac{78}{5+8} \times 8$

Sahil \$ 30

Anika \$ 48 [2]

3 The number of passengers on a bus is recorded each day for 14 days.

R

15 18 22 17 35 38 24
19 19 24 25 31 36 29

(a) Complete the stem-and-leaf diagram.

1	<u>5 7 8 9 9</u>
2	<u>2 4 4 5 9</u>
3	<u>1 5 6 8</u>

Key: 1 | 5 represents 15 passengers

[2]

(b) Find the median.

..... 24 [1]

- 4 By writing each number correct to 1 significant figure, find an estimate for the value of

\mathcal{R}

$$\frac{2.8 \times 82.6}{27.8 - 13.9}$$

$$\frac{3 \times 80}{30 - 10} = \frac{240}{20} = \frac{24}{2} = 12$$

.....12..... [2]

- 5 The number of bowls of hot soup sold decreases when the temperature rises.

\mathcal{R}

What type of correlation does this statement describe?

.....Negative..... [1]

- 6 Joseph spends $\frac{5}{24}$ of one week's earnings to buy a jacket.

\mathcal{R}

The cost of the jacket is \$56.50 .

Calculate the amount Joseph earns in a week.

$$\begin{aligned} \frac{5}{24} x &= 56.5 \\ x &= 56.5 : \frac{5}{24} \end{aligned}$$

\$271.2..... [2]

- 7 **Without using a calculator**, work out $2\frac{1}{4} \times 3\frac{2}{3}$.

\mathcal{R}

You must show all your working and give your answer as a mixed number in its simplest form.

$$\begin{aligned} &\frac{9}{4} \times \frac{11}{3} \\ &= \frac{3 \times 3 \times 11}{4 \times 3} \\ &= \frac{33}{4} = 8 \frac{1}{4} \end{aligned}$$

.....8 $\frac{1}{4}$ [3]

8 Write $0.\dot{3}7$ as a fraction.

\mathcal{R}

$$\begin{aligned} x &= 0.373737\dots \\ 100x &= 37.3737\dots \\ 99x &= 37 - 0 = 37 \\ x &= \frac{37}{99} \end{aligned}$$

$$\frac{37}{99} \dots\dots\dots [1]$$

9 Calculate $4.8 \times 10^6 + 3.7 \times 10^7$.

\mathcal{R}

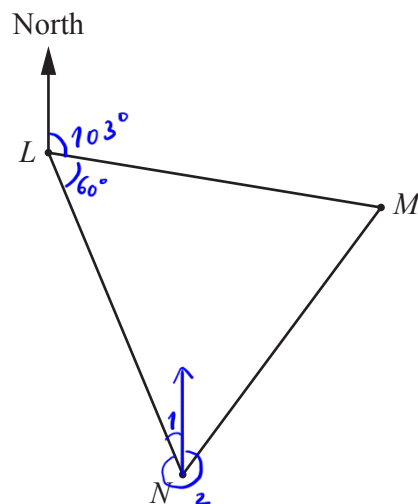
Give your answer in standard form.

$$\begin{aligned} &4.8 \times 10^6 + 37 \times 10^6 \\ &= (4.8 + 37) \times 10^6 \\ &= 41.8 \times 10^6 \end{aligned}$$

$$\dots\dots\dots 4.18 \times 10^7 \dots\dots\dots [1]$$

10

\mathcal{R}



NOT TO
SCALE

On a map, the positions of the towns L , M and N form an equilateral triangle. The bearing of M from L is 103° .

Work out the bearing of L from N .

$$\begin{aligned} &\Delta LMN \text{ is an equilateral triangle} \\ &\Rightarrow \widehat{NLM} = 60^\circ \\ &\widehat{N_1} = 180^\circ - 103^\circ - 60^\circ = 17^\circ \\ &\Rightarrow \text{Bearing}_{N \rightarrow L} = \widehat{N_2} = 360^\circ - 17^\circ = 343^\circ \end{aligned}$$

$$\dots\dots\dots 343^\circ \dots\dots\dots [2]$$

- 11 Find the highest common factor (HCF) of 36 and 84.

(K)

$$36 = 2^2 \times 3^2$$

$$\begin{array}{c} 36 \\ \swarrow \searrow \\ 3 \quad 12 \\ \quad \swarrow \searrow \\ \quad 3 \quad 4 \\ \quad \quad \swarrow \searrow \\ \quad \quad 2 \quad 2 \end{array}$$

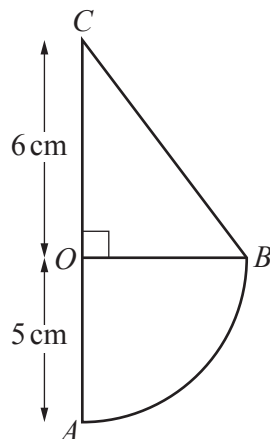
$$84 = 2^2 \times 3 \times 7$$

$$\begin{array}{c} 84 \\ \swarrow \searrow \\ 4 \quad 21 \\ \swarrow \searrow \quad \swarrow \searrow \\ 2 \quad 2 \quad 3 \quad 7 \end{array}$$

$$2^2 \times 3 = 12 \dots\dots\dots [2]$$

- 12

(K)



NOT TO SCALE

The diagram shows a shape made from a quarter-circle, OAB , and a right-angled triangle OBC . The radius of the circle is 5 cm and $OC = 6$ cm.

Calculate the area of the shape.

$$A_{\Delta OBC} = \frac{1}{2} \times 6 \times 5 = 15$$

$$A_{\text{sector } OAB} = \frac{1}{4} \times \pi \times 5^2 = 6.25\pi$$

$$\Rightarrow \text{Area}_{\text{shape}} = 15 + 6.25\pi$$

$$\approx 34.6$$

$$\dots\dots\dots 34.6 \dots\dots\dots \text{cm}^2 [3]$$

- 13 The population of one variety of butterfly is decreasing exponentially at a rate of 34% per year. At the end of 2014, the population was 125.9 million.

(K)

Calculate the population at the end of 2019.

$$125.9 \left(1 - \frac{34}{100} \right)^5 \approx 15.8$$

$$\dots\dots\dots 15.8 \dots\dots\dots \text{million} [2]$$

- 14 (a) These are the first four terms of a sequence.

R

29 22 15 8

Write down the next two terms.

.....1.....,-6..... [2]

- (b) These are the first five terms of another sequence.

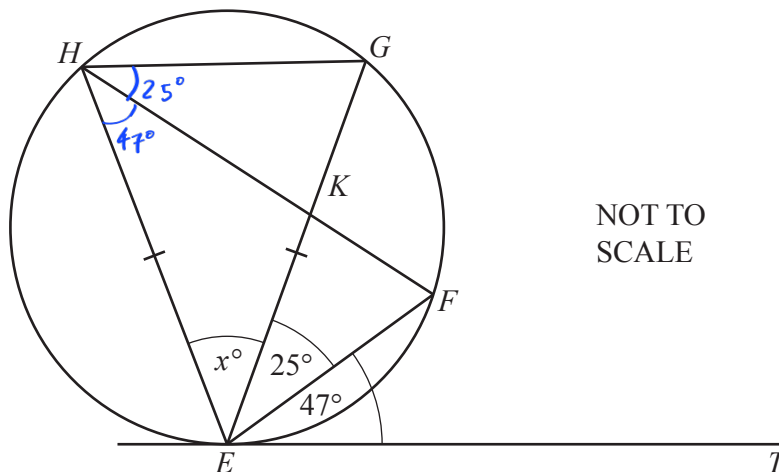
4 7 12 19 28

Find the n th term.

..... $n^2 + 3$ [2]

15

R



Points E, F, G and H lie on the circle and $EG = EH$.

HF and EG intersect at K .

ET is a tangent to the circle at E .

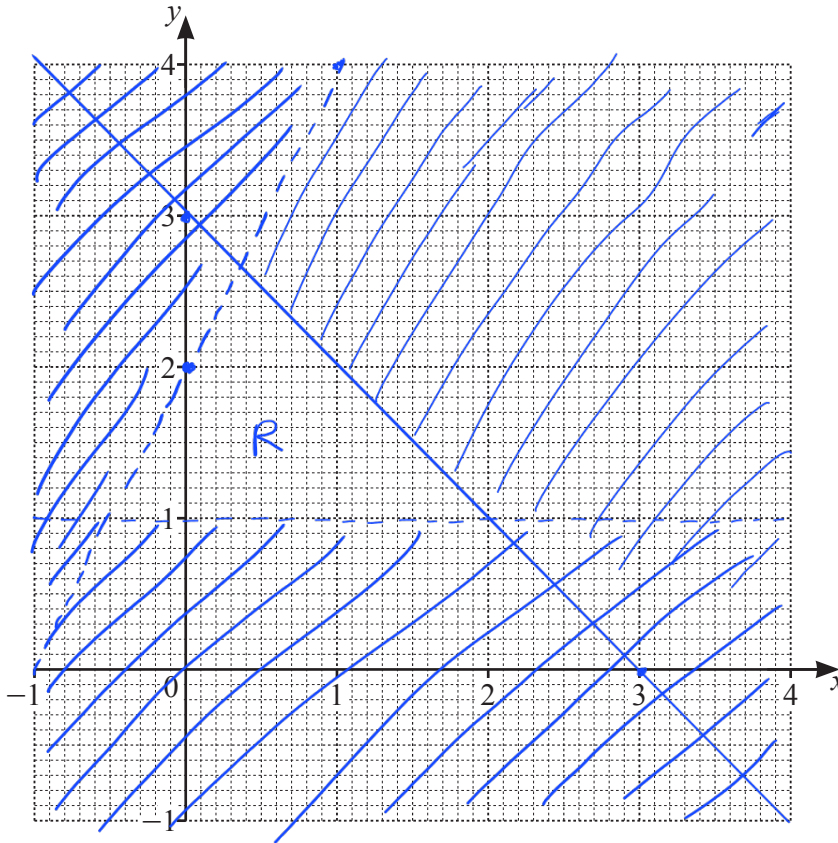
Angle $FET = 47^\circ$ and angle $FEG = 25^\circ$.

Find the value of x .

$$\begin{aligned} \widehat{GHF} &= \widehat{GEF} = 25^\circ \text{ (subtend the same arc)} \\ \widehat{EHF} &= \widehat{FET} = 47^\circ \text{ (alternate segment theorem)} \\ \widehat{GHE} &= 25^\circ + 47^\circ = 72^\circ \\ x &= 180^\circ - 2 \times 72^\circ = 36^\circ \end{aligned}$$

$x =$ 36°..... [2]

16

The region R satisfies these three inequalities.

$$y > 1 \quad y < 2x + 2 \quad x + y \leq 3$$

By drawing three suitable lines, and shading unwanted regions, find and label the region R . [5]

17 Some students were asked how many books they each had in their school bags.



The table shows some of this information.

Number of books	5	6	7	8	9	10
Frequency	4	5	x	11	7	5

The mean number of books is 7.6.

Calculate the value of x .

$$\frac{5 \times 4 + 6 \times 5 + 7x + 8 \times 11 + 9 \times 7 + 10 \times 5}{4 + 5 + x + 11 + 7 + 5} = 7.6$$

$$\frac{251 + 7x}{x + 32} = 7.6$$

$$251 + 7x = 7.6x + 243.2$$

$$7.8 = 0.6x$$

$$x = \dots\dots\dots 13 \dots\dots\dots [3]$$

18 Simplify $(343x^9)^{\frac{2}{3}}$.

R

$$343^{\frac{2}{3}} \times (x^9)^{\frac{2}{3}}$$

$$\left(\sqrt[3]{343}\right)^2 \times x^{9 \times \frac{2}{3}}$$

$$7^2 \times x^6$$

..... $49x^6$ [2]

19 Solve the simultaneous equations.

R

You must show all your working.

$$x - y = 7$$

$$x^2 + y = 149$$

$$y = x - 7$$

$$x^2 + x - 7 = 149$$

$$x^2 + x - 156 = 0$$

$$(x - 12)(x + 13) = 0$$

$$x = 12 \quad \text{or} \quad x = -13$$

When $x = 12$, $y = 12 - 7 = 5$

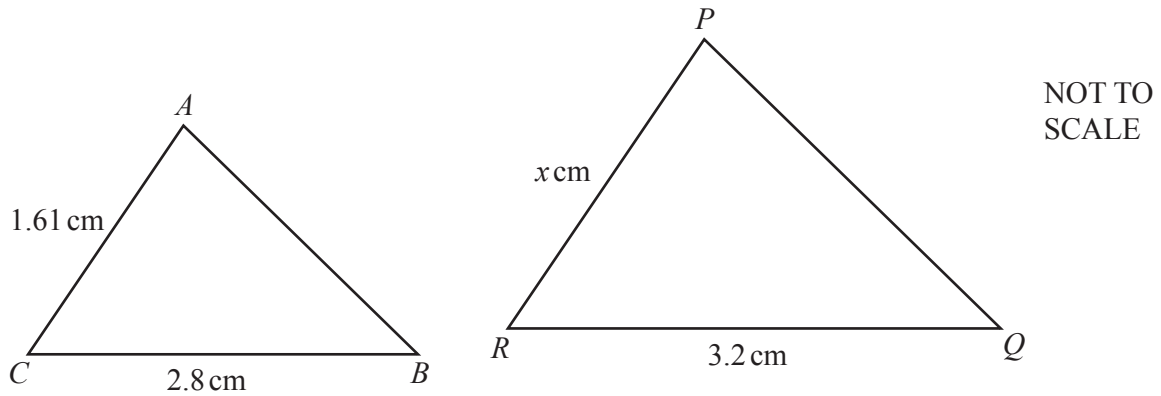
When $x = -13$, $y = -13 - 7 = -20$

$x = \dots 12 \dots y = \dots 5 \dots$

$x = \dots -13 \dots y = \dots -20 \dots$ [5]

20 (a)

7



Triangle ABC is mathematically similar to triangle PQR .

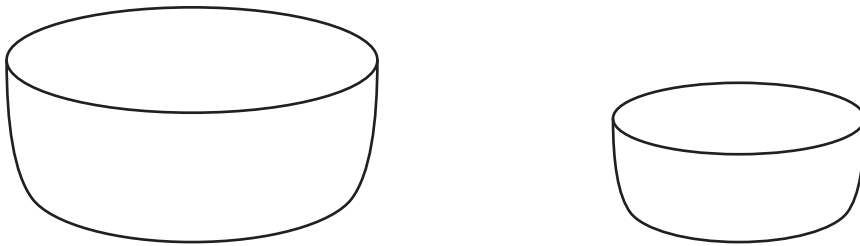
Find the value of x .

$$\frac{AC}{PR} = \frac{BC}{QR}$$

$$\frac{1.61}{x} = \frac{2.8}{3.2} \Rightarrow x = \frac{1.61 \times 3.2}{2.8} = 1.84$$

$$x = \dots 1.84 \dots [2]$$

(b)



The diagram shows two mathematically similar bowls.
The larger bowl has capacity 7.8 litres and height 11.5 cm.
The smaller bowl has capacity 4 litres.

Calculate the height of the smaller bowl. $\rightarrow h$

$$\text{Ratio of volume} = (\text{Ratio of height})^3$$

$$\frac{7.8}{4} = \left(\frac{11.5}{h}\right)^3$$

$$\Rightarrow \sqrt[3]{\frac{7.8}{4}} = \frac{11.5}{h}$$

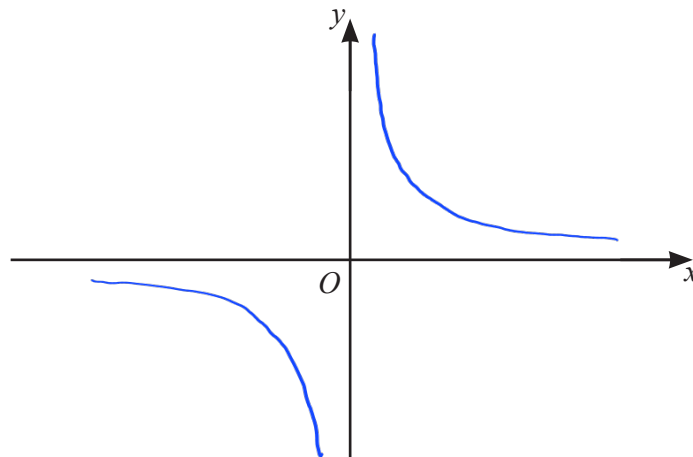
$$h = 11.5 \div \sqrt[3]{\frac{7.8}{4}} \approx 9.20$$

$$\dots 9.20 \dots \text{ cm } [3]$$

21 On the axes, sketch the graph of each of these functions.

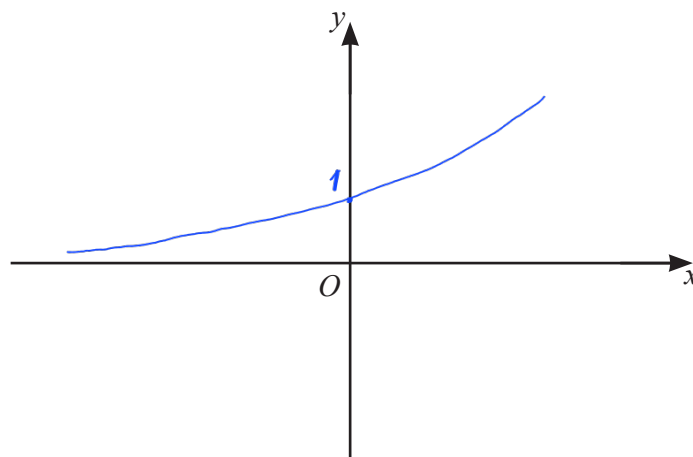
7

(a) $y = \frac{1}{x}$



[2]

(b) $y = 4^x$



[2]

22 (a) A bag of rice has a mass of 25 kg, correct to the nearest kilogram. 1

7

Calculate the lower bound of the total mass of 10 of these bags.

$$10\left(25 - \frac{1}{2}\right)$$

..... 24.5 kg [1]

(b) Virat has 200 metres of wire, correct to the nearest metre. 1
He cuts the wire into n pieces of length 3 metres, correct to the nearest 20 centimetres.

Calculate the largest possible value of n .

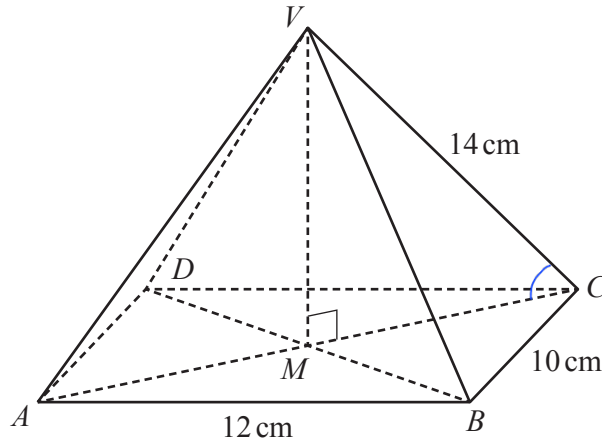
$$n = \frac{200}{3}$$

$$n_{\max} = \frac{200 + \frac{1}{2}}{3 - \frac{0.2}{2}} \approx 69.1$$

n is natural so $n = 69$

$n =$ 69 [3]

23

NOT TO
SCALE

The diagram shows a pyramid $VABCD$ with a rectangular base. V is vertically above M , the intersection of the diagonals AC and BD . $AB = 12$ cm, $BC = 10$ cm and $VC = 14$ cm. Calculate the angle that VC makes with the base $ABCD$.

$$AC = \sqrt{12^2 + 10^2} = 2\sqrt{61}$$

$$MC = \frac{1}{2} AC = \sqrt{61}$$

$$\cos \widehat{VCM} = \frac{MC}{VC} = \frac{\sqrt{61}}{14}$$

$$\Rightarrow \widehat{VCM} = 56.1^\circ$$

..... 56.1° [4]

24 A curve has equation $y = x^3 - 2x^2 + 5$.

Find the coordinates of its two stationary points.

$$\frac{dy}{dx} = 3x^2 - 4x = 0$$

$$\Rightarrow x(3x - 4) = 0$$

$$x = 0 \quad \text{or} \quad x = \frac{4}{3}$$

$$\text{When } x = 0, \quad y = 0^3 - 2 \times 0^2 + 5 = 5$$

$$\text{When } x = \frac{4}{3}, \quad y = \left(\frac{4}{3}\right)^3 - 2 \times \left(\frac{4}{3}\right)^2 + 5 = \frac{103}{27}$$

(..... 0, 5) and (..... $\frac{4}{3}$, $\frac{103}{27}$) [5]