



BEDOK VIEW SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2024

CANDIDATE
NAME

REGISTER
NUMBER

CLASS

MATHEMATICS

Secondary 3 Express / 3 Normal Academic (Express Syllabus)

4052/01

2 October 2024

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 80.

Total	
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Setter: Ms S Ang

Parent's / Guardian's Signature:

This document consists of **19** printed pages.

[Turn over

Mathematical Formulae

Compound Interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

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

$$\text{Surface area of a sphere} = 4\pi r^2$$

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

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$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** the questions.

- 1 (a) Express $3.4 \times 10^7 - 5 \times 10^6$ in standard form.

Answer [1]

- (b) A radio station broadcasts on a frequency of 92.4 megahertz.
The wavelength, λ , of radio waves in metres, is calculated using the formula,

$$\lambda = \frac{3 \times 10^8}{f},$$

where f is the frequency in hertz.

Calculate the wavelength, in metres, that the radio station uses for its broadcast.

[1 megahertz = 1×10^6 hertz]

Answer m [2]

- 2 Given that $\sqrt{\frac{a^2 - b}{b}} = \frac{2}{3}$, express b in terms of a .

Answer $b =$ [3]

3

Express, as a single fraction, in its simplest form $\frac{5-7x-x^2}{6x^2-11x+4} - \frac{x-1}{2x-1}$.

4

Answer [3]

4 Factorise fully $3uv - 3uw - v + w$.

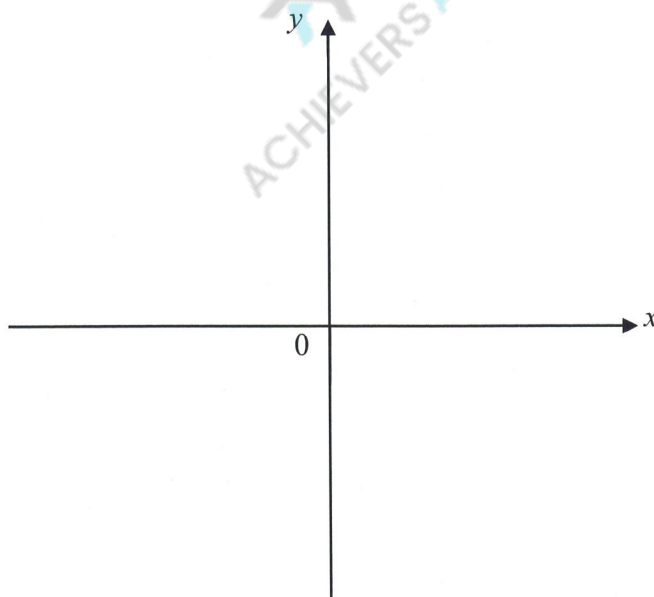
Answer [2]

- 5 (a) Express $y = x^2 - 5x - 4$ in the form $y = (x + a)^2 + b$.

Answer $y = \dots\dots\dots$ [2]

- (b) Sketch the graph of the function $y = x^2 - 5x - 4$, indicating clearly the y -intercept, and the coordinates of the turning point.

Answer



[2]

- (c) Using your graph from part (b), explain why you agree or disagree with the statement below.

“There is no solution when solving $x^2 - 5x = -8$.”

Answer

I with the statement because

..... [2]

- 6 The scale of Map A is given as 1: 200 000 and the scale of Map B is given as 1: 250 000.

The area of a reservoir on Map B is 3.6 cm^2 . Calculate the area of the same reservoir, in cm^2 , on Map A.

Answer cm^2 [2]

- 7 (a) Express each of the numbers 14, 21 and 49 as a product of its prime factors.

Answer 14 =

21 =

49 = [1]

- (b) Three train services operate from the same station. The first service leaves at 14-minute intervals, the second at 21-minute intervals and the third at 49-minute intervals. All three services leave the station together at 19 30 hours on Thursday. When will the three train services next leave the station together?

Answer

The three train services next leave the station together at hours

on (day).

[2]

- 8 Simplify $\left(\frac{2xy^2}{x^{-\frac{1}{2}}}\right)^{-2}$, leaving your answer in positive indices.

Answer [3]

- 9 (a) The straight line l has the same gradient as the line $2x + 3y = 17$ and passes through the point $(6, -2)$. Find the equation of line l .

Answer [3]

- (b) Point $(2, b)$ lies on this straight line l . Find the value of b .

Answer $b =$ [1]

10 Study the number pattern below.

Row	X	Y	Sum of digits of Y
1	2^2	4	4
2	32^2	1 024	7
3	332^2	110 224	10
4	$3\ 332^2$	11 102 224	13
\vdots	\vdots	\vdots	\vdots
7	$3\ 333\ 332^2$	P	22

(a) Underline the correct answer from the list below.

$$P = 1\ 111\ 022\ 224$$

$$P = 11\ 111\ 102\ 222\ 224$$

$$P = 1\ 111\ 110\ 222\ 224$$

[1]

(b) Find an expression, in terms of n , for the sum of digits of Y in the n^{th} row.

Answer [1]

(c) A student found the sum of digits of Y in a particular row to be 110.
Give a reason why his answer is not acceptable.

Answer

.....

..... [2]

- 11 The table shows the number of goals scored in the soccer matches played by a group of boys in S League. The boys scored 4 goals in $(x - 4)$ number of matches.

Number of Goals	1	2	3	4
Number of Matches	4	2	7	$x - 4$

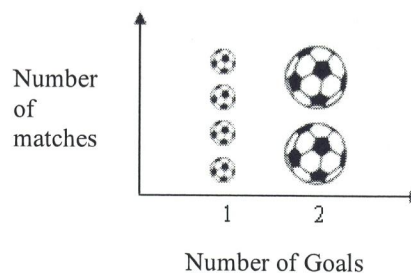
- (a) Given that the modal number of goals is 3, find the greatest possible number of matches played by the boys during the league.

Answermatches [1]

- (b) Given that the smallest possible mean number of goals is 3, find the smallest integer value of x .

Answer $x =$ [2]

- (c) Part of the above table is represented in a pictogram.



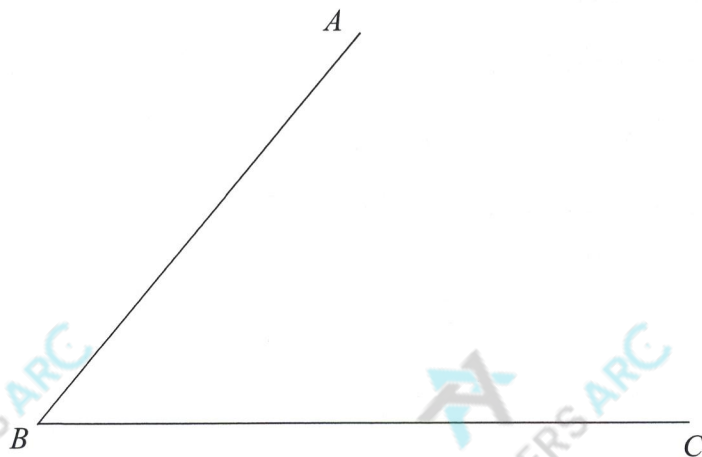
State one aspect of the graph that may be misleading and explain how this may lead to a misinterpretation of the pictogram.

Answer

.....

 [2]

- 12 The diagram shows the position of 3 soccer players, A , B and C in a soccer field during a training session.



- (a) The coach placed the soccer ball equidistant from the 3 players, A , B and C .
By constructing perpendicular bisectors, find and label the position of the ball P . [2]
- (b) Construct the bisector of angle BAC . [1]
- (c) The coach then instructed Player D to position himself such that the four players make the parallelogram $ABCD$. Find and label the position of player D . [1]
-

- 13 The total cost of renting a minibus from Company A is summarised in the table as shown below.

Minibus Charges	Fuel Charges	Driver Charges
\$75 per day	$\left(\frac{x}{40} - \frac{3}{2}\right)$ litres per hour at \$2.50 per litre	$\$ \left(\frac{x}{12}\right)$ per day

Mr Teo rented the minibus and hired a driver from the company for three days to bring his family to Kuala Lumpur. The total distance of the whole trip is x km.

- (a) If the driver drove at an average speed of 90 km/h for x km, find and simplify, in terms of x , the
- (i) time taken in hours to travel x km,

Answer h [1]

- (ii) cost of fuel charges for the minibus for the whole trip.

Answer \$ [2]

- (b) If Mr Teo paid a total of \$390 for the whole trip, form an equation and show that it reduces to $x^2 + 300x - 237600 = 0$.

Answer

- (c) Solve the equation $x^2 + 300x - 237600 = 0$.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [2]

- (d) Find the cost of the fuel charges for the whole trip.

Answer \$ $\dots\dots\dots$ [1]

- 14 If a laptop is sold at \$ m , the store will suffer a loss of 17%.
Find, in terms of m , the selling price of the laptop so that the store will make a profit of 35%.

Answer \$ $\dots\dots\dots$ [2]

- 15 In a pentagon, one of the interior angles is 204° while the other four interior angles are in the ratio of 2 : 3 : 3 : 4. Find
- (a) the sum of interior angles in the pentagon,

Answer $^\circ$ [1]

- (b) the largest angle of the pentagon.

Answer $^\circ$ [2]

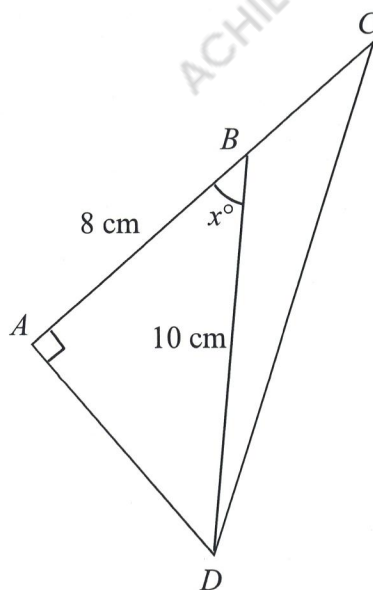
- 16 The ratio of the surface areas of two geometrically similar cuboids made of the same material is 49 : 81. Both cuboids are fully filled with sand.
- (a) If the height of the larger cuboid is 27 cm, find the height of the smaller cuboid.

Answer cm [2]

- (b) If the mass of sand in the smaller cuboid is 3.43 kg, find the mass of sand in the larger cuboid.

Answer kg [2]

- 17 In the diagram, $AB = 8$ cm, $BD = 10$ cm, ABC is a straight line and angle $BAD = 90^\circ$.



- (a) Find the exact value of $\cos(180 - x)^\circ$, express your answer as a fraction in the lowest term.

Answer [1]

- (b) Given that $BC = 4$ cm, find the area of triangle BDC .

Answer cm^2 [2]

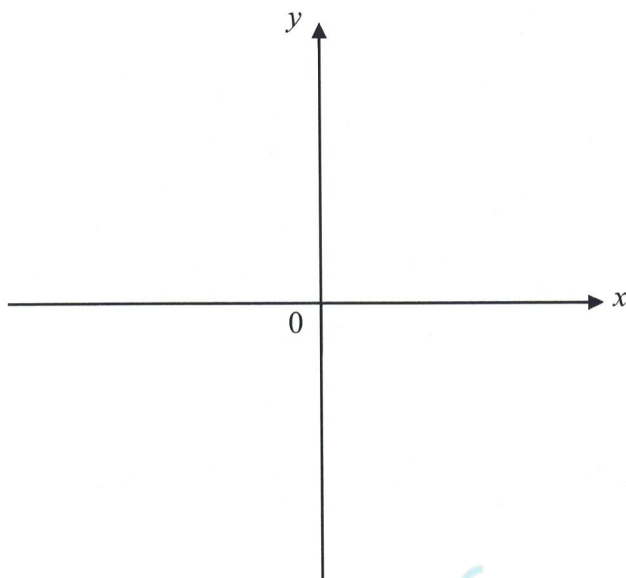
(c) Find the shortest distance from B to CD .

Answer cm [4]

- 18 Sketch, in the answer space provided, the graph of $y = -x^b + a$ for the given value of a and of b . Show clearly the intercepts on the axes where applicable.

(a) $a = -2$ and $b = 3$.

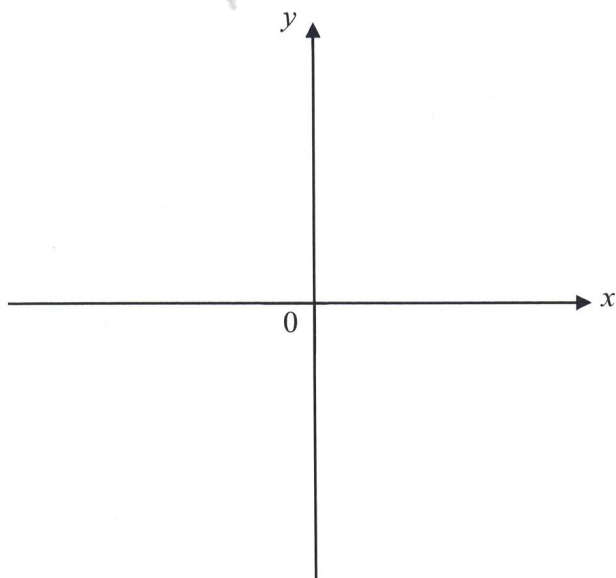
Answer



[2]

(b) $a = 0$ and $b = -2$.

Answer



[1]

- 19 (a) Solve the inequality $7 - 2k < 2k + 9 \leq 10k - 7$.

Answer [3]

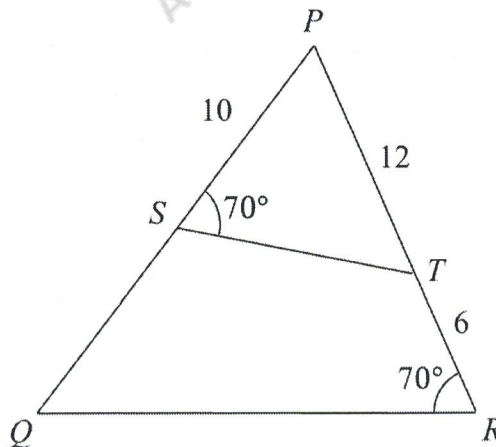
- (b) Represent your solution in part (a) on the number line below.

Answer



[1]

- 20 In the diagram, S and T are points on PQ and PR respectively. It is given that $\angle PST = \angle PRQ = 70^\circ$. The lengths of PS , PT and TR are 10 cm, 12 cm and 6 cm respectively.



- (a) Prove that triangle PTS is similar to triangle PQR .

Answer

[2]

- (b) Hence, calculate the length of QS .

Answer cm [2]

- (c) Find $\frac{\text{area of triangle } PST}{\text{area of } STRQ}$.

Answer [2]





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Secondary 3 Express/ 3 Normal Academic
(Express Syllabus)
Paper 2

4052/02
4 October 2024
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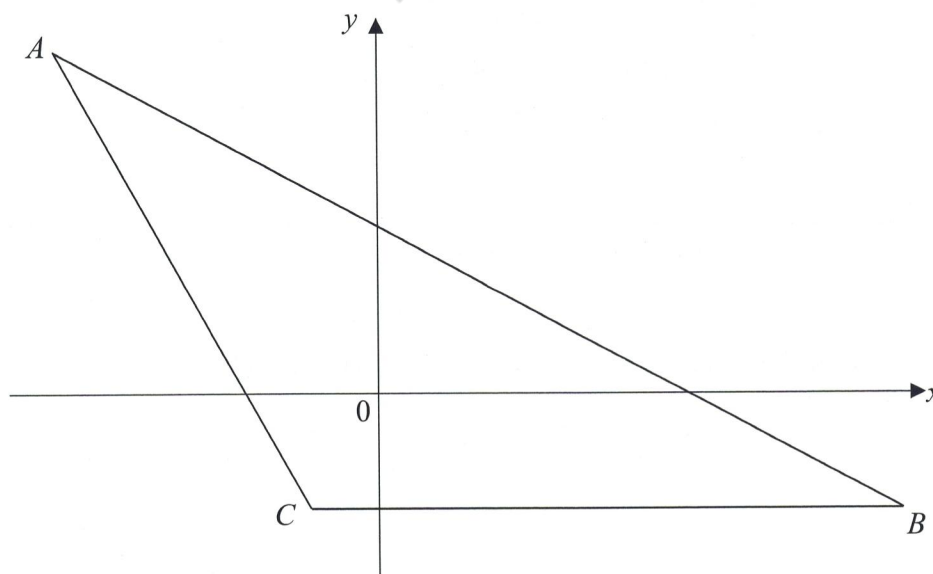
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Answer **all** the questions.

- 1 The diagram below shows points $A(-4,3)$, $B(7,-1)$ and $C(-1,-1)$.



Find each of the following.

- (a) Length of AC

Answerunits [1]

- (b) Gradient of AB

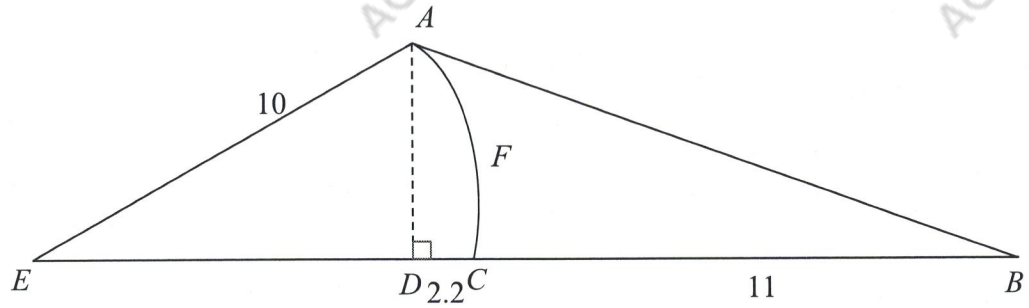
Answer [1]

- (c) Area of triangle ABC

Answerunits² [1]

2

The diagram below shows a sector AEC of a circle with centre E and radius 10 cm. Given that D is on the line EB where angle $ADE = 90^\circ$, $CD = 2.2$ cm and $CB = 11$ cm.



- (a) Show that angle $AED = 38.739^\circ$, corrected to 5 significant figures. [2]

Answer

- (b) Find the area of $AFCD$.

Answercm² [3]

- (c) Find the perimeter of $AFCB$.

Answercm [4]

3

Mr Kumar wants to take a bank loan of \$50 000. He wants to repay his loan in two years. The bank offers two loan plans, A and B.

- (a) Plan B charges a simple interest of r % per annum. If he takes up plan B, the amount of interest charged is \$8000. Find the value of r .

Answer $r = \dots\dots\dots$ [2]

- (b) Plan A charges an interest of 7 % per annum compounded half-yearly. Calculate the amount of interest charged in two years if he takes up plan A.

Answer \$..... [3]

- (c) Which plan should he take? Explain your answer.

Answer He should take planbecause.....

..... [1]

4

(a) Solve $4^{2x+3} = \sqrt[4]{2^x}$.

7

Answer $x = \dots\dots\dots$ [3](b) Solve $\frac{4x^2 - 2}{x^2 + 2x + 1} - \frac{1}{x + 1} = 0$.Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

[Turn Over]

- 5 The table below shows the values of x and the corresponding values of y , corrected to one decimal place for $y = 0.3(2^x)$.

x	-1.5	-0.5	0	0.5	1	2	2.5	3	4
y	p	0.2	0.3	0.4	0.6	1.2	1.7	2.4	4.8

- (a) Calculate the value of p .

Answer $p = \dots\dots\dots$ [1]

- (b) On the grid on the next page, draw the graph of $y = 0.3(2^x)$ for $-1.5 \leq x \leq 4$. [3]

- (c) By drawing a tangent on the same grid, find the gradient of the curve at the point $(2, 1.2)$.

Answer $\dots\dots\dots$ [2]

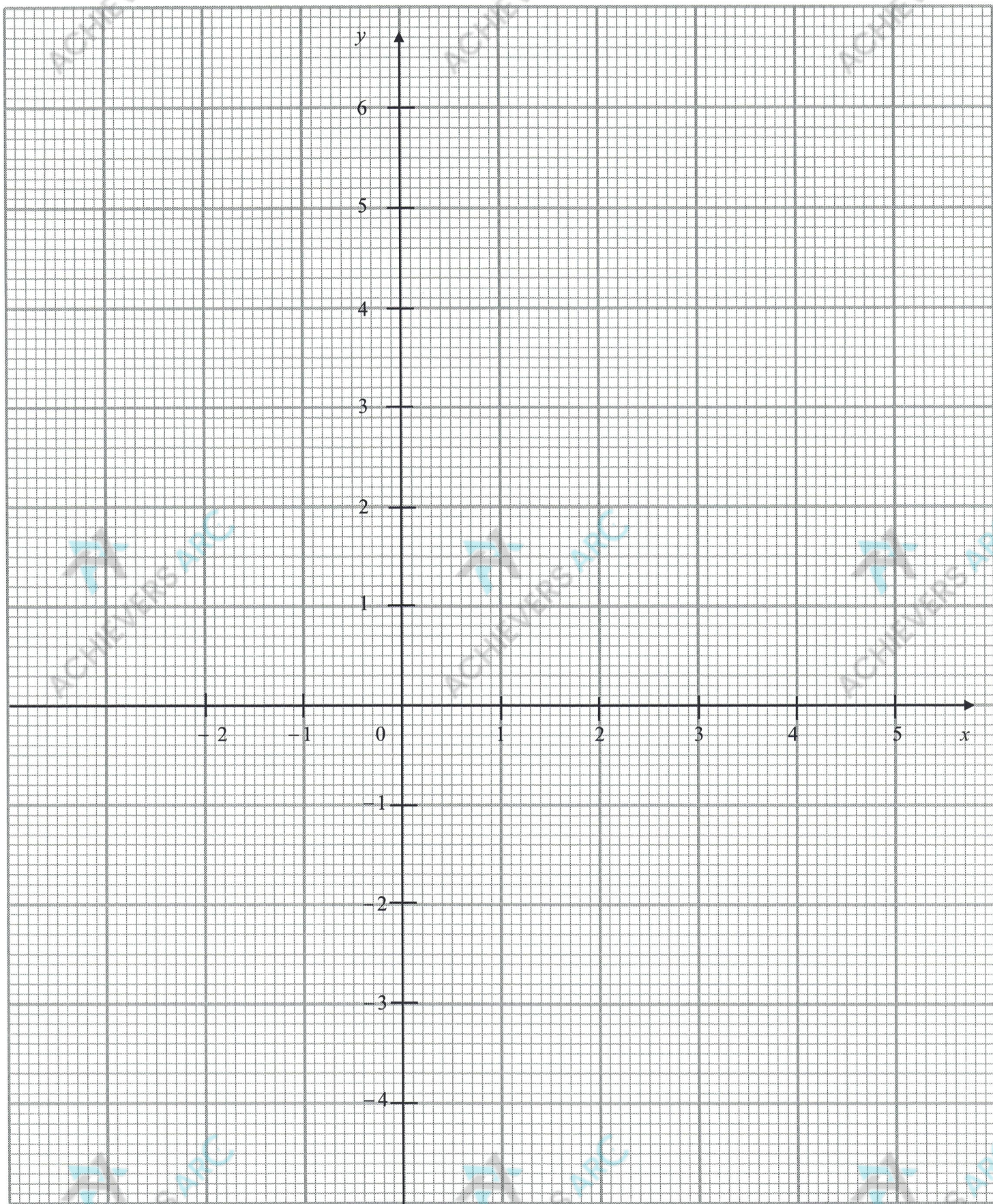
- (d) By drawing a suitable line on the same grid, solve $1.2(2^x) = 2x + 3$.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

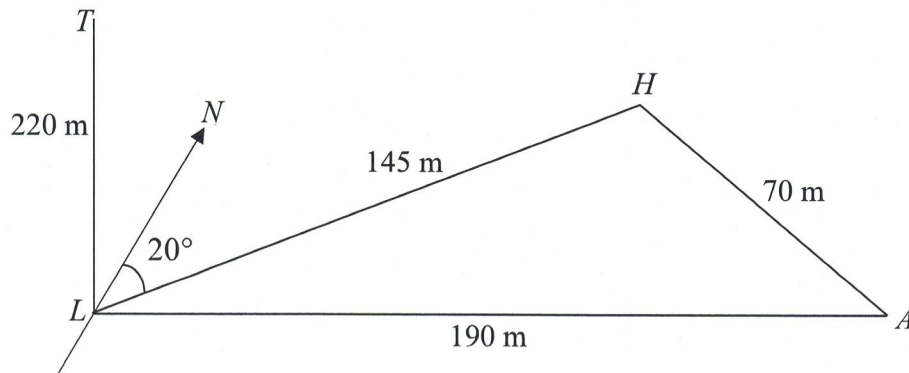
- (e) (i) On the same grid, draw a line that passes through $(4, 1)$ with a gradient of -1 . [1]

- (ii) Hence, write down the coordinates of the point where the line intersects the curve.

Answer $(\dots\dots\dots, \dots\dots\dots)$ [1]



- 6 The diagram below shows the position of a harbour H , a vertical lighthouse TL and a boat at A . The bearing of H from L is 020° . H is 145 m from L and A is 190 m from L . The distance of A to H is 70 m and the height of the lighthouse is 220 m.



- (a) Calculate the
- (i) bearing of L from H ,

Answer $^\circ$ [2]

- (ii) bearing of A from L ,

Answer $^\circ$ [4]

- (iii) angle of depression of A from T ,

Answer $^{\circ}$ [2]

- (iv) shortest distance from L to HA produced.

Answerm [3]

- (b) The boat sailed along AL at a speed of 2.8 m/s and stopped at a point D along AL where $HD = AD$. Find the time taken for the boat to reach D .

Answers [4]

- 7 (a) Given that y is directly proportional to the square root of x and $y = 18$ when $x = 9$, find the value of y when $x = 64$.

Answer $y = \dots\dots\dots$ [2]

- (b) 3 workers take 12 days to paint 4 houses. Assuming all the workers work at the same rate, find the number of days required for 8 workers to paint 8 houses.

Answer $\dots\dots\dots$ days [2]

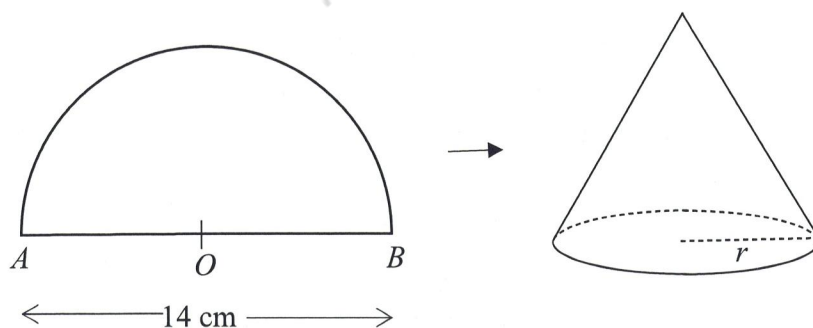
- (c) Pairs of corresponding values of x and y are given in the table below.

x	3	11	21
y	33	9	4

Determine if x is inversely proportional to y . Show your workings.

Answer $\dots\dots\dots$ [2]

- 8 (a) The semicircle shown below is folded to form a cone such that arc AB of the semicircle forms the base of the cone.



Given that the diameter of the semicircle is 14 cm ,

- (i) show that the radius of the base of the cone, $r = 3.5\text{ cm}$,

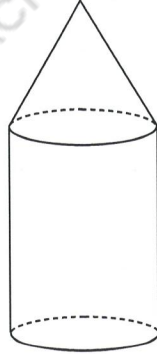
Answer

[2]

- (ii) find the curved surface area of the cone.

Answer cm^2 [1]

- (b) The cone in part (a) is placed on top of a solid cylinder whose height is twice the height of the cone.



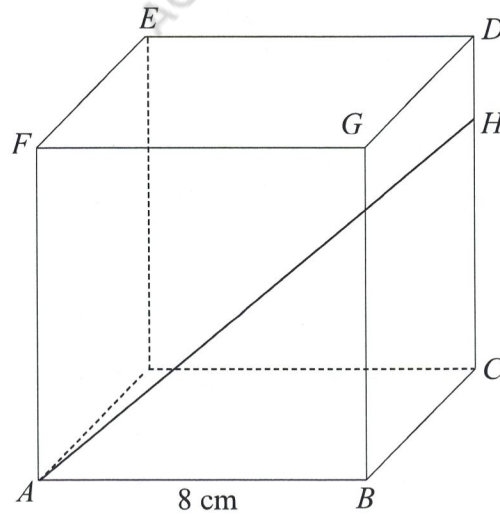
- (i) Find the total external surface area of the figure.

Answercm² [4]

- (ii) Using a paint that costs \$4.50 per square metre, find the cost of painting 200 such figures.

Answer \$..... [3]

- 9 The diagram below shows a cube $ABCDEFGH$ of length 8 cm. H is a point on CD such that $CH = 3HD$.



Find

- (a) the length of AH ,

Answercm [4]

- (b) the ratio of the area of triangle DFH : area of triangle HAC .

Answer : [1]

- 10 Joash came across the following information while trying to learn more about electricity consumption of home appliances.

$$\text{Monthly electricity consumption of each home appliance} \\ = \frac{\text{power rating (watts)} \times \text{hours used in a day} \times \text{number of days}}{1000} \text{ kWh}$$

$$\text{Monthly electricity cost of appliance} \\ = \text{Monthly electricity consumption} \times \text{electricity tariff per kWh}$$

Tariff information:

Electricity	Gas	Water
32.47 ¢ per kWh	25.20 ¢ per kWh	\$1.41 per m ³ or \$1.78 per m ³ (<40 m ³ or >40 m ³)

- (a) Joash switches on his gas heater which is rated at 2125 watts for two hours daily for July. Show that the bill for gas is \$33.20.

Answer

- (b) Joash was deciding between the two models of refrigerator to purchase. Some specifications are given below.

Refrigerator	A	B
Capacity	500 litres	500 litres
Dimensions (width by depth by height)	790 mm by 720 mm by 1785 mm	850 mm by 720 mm by 1659 mm
Power rating	47W	60W
Mass	83 kg	83 kg
Estimated life span	15 years	15 years
Purchase cost	\$1888	\$1483

By considering the purchase cost and electricity cost of the refrigerator over its estimated life span, which model will help Joash save more money? State one assumption made in your calculation.

Answer Assuming.....

.....,

Joash should choose model

[6]

