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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

J512/04

MATHEMATICS SYLLABUS A

Paper 4 (Higher Tier)

MONDAY 16 JANUARY 2012: Morning

DURATION: 2 hours

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator

Geometrical instruments

Tracing paper (optional)

This paper has been pre modified for carrier language

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

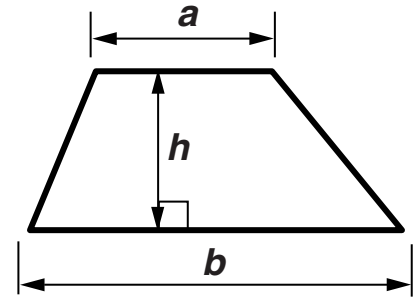
- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer ALL the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

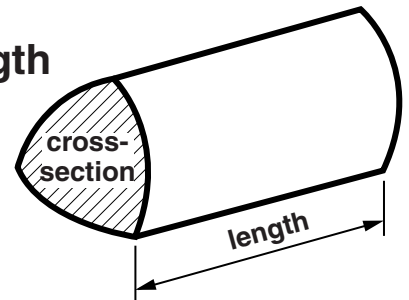
- The number of marks is given in brackets [] at the end of each question or part question.
- You are expected to use an electronic calculator for this paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is 100.

FORMULAE SHEET: HIGHER TIER

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) × length

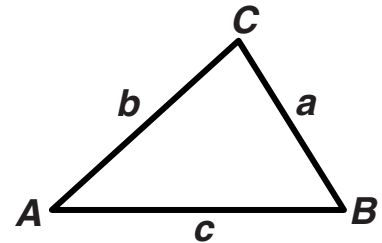


In any triangle ABC

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

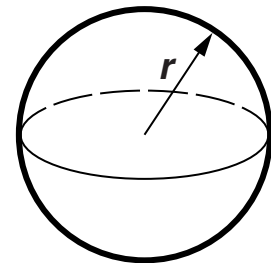
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} absin C$



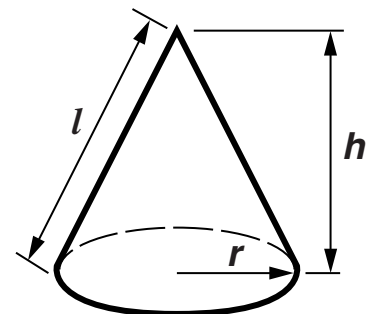
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$



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

Curved surface area of cone = πrl

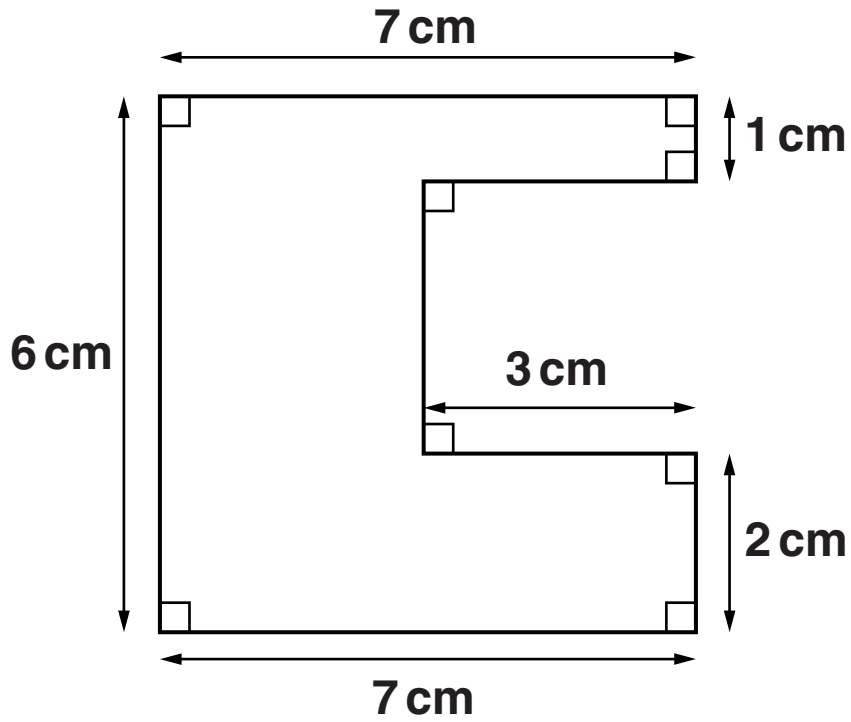


The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

1 Find the perimeter and area of this shape.



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Perimeter _____ cm

Area _____ cm² [4]

2 Calculate.

(a) $\frac{19.7 - 3.64}{5.2 + 3.85}$

Give your answer correct to one decimal place.

(a) _____ [2]

(b) $\sqrt{5.92 + 7.2^2}$

(b) _____ [2]

- 3 A lifeboat, B, is 9 km from a lighthouse, L, on a bearing of 320° .
A dinghy, D, is 5 km from the lighthouse, L, on a bearing of 075° .**

- (a) Make a scale drawing to show the positions of the lifeboat and the dinghy.
Use a scale of 1 cm represents 1 km.**



[4]

(b) How far, and on what bearing, is the dinghy from the lifeboat?

(b) _____ km and _____ ° [2]

- 4 Hank, an American shopping in London, wishes to buy a T-shirt.
The price of the T-shirt is either £28 or €32.**

The exchange rates for American dollars are:

$$\text{\$1} = \text{\pounds}0.606$$

$$\text{\$1} = \text{\text{€}}0.697$$

Which currency represents the lower price for the T-shirt?

Show your calculations.

[5]

- 5 Mr Patel walked for 3 hours.
During that time he took 7800 steps.
The length of each step was 90 cm.**

**Work out Mr Patel's average speed.
Give your answer in kilometres per hour.**

_____ **km/h [4]**

6 Here is a sequence of diagrams.

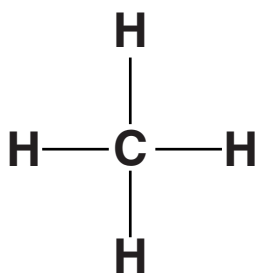


Diagram 1

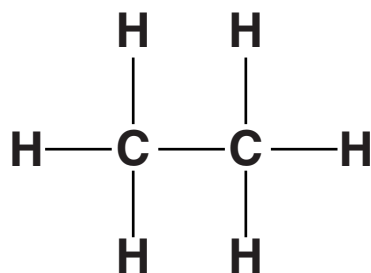


Diagram 2

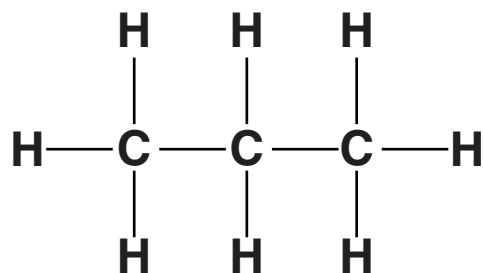


Diagram 3

(a) Draw Diagram 4.

[1]

(b) How many Cs and how many Hs will be in Diagram 7?

(b) C _____

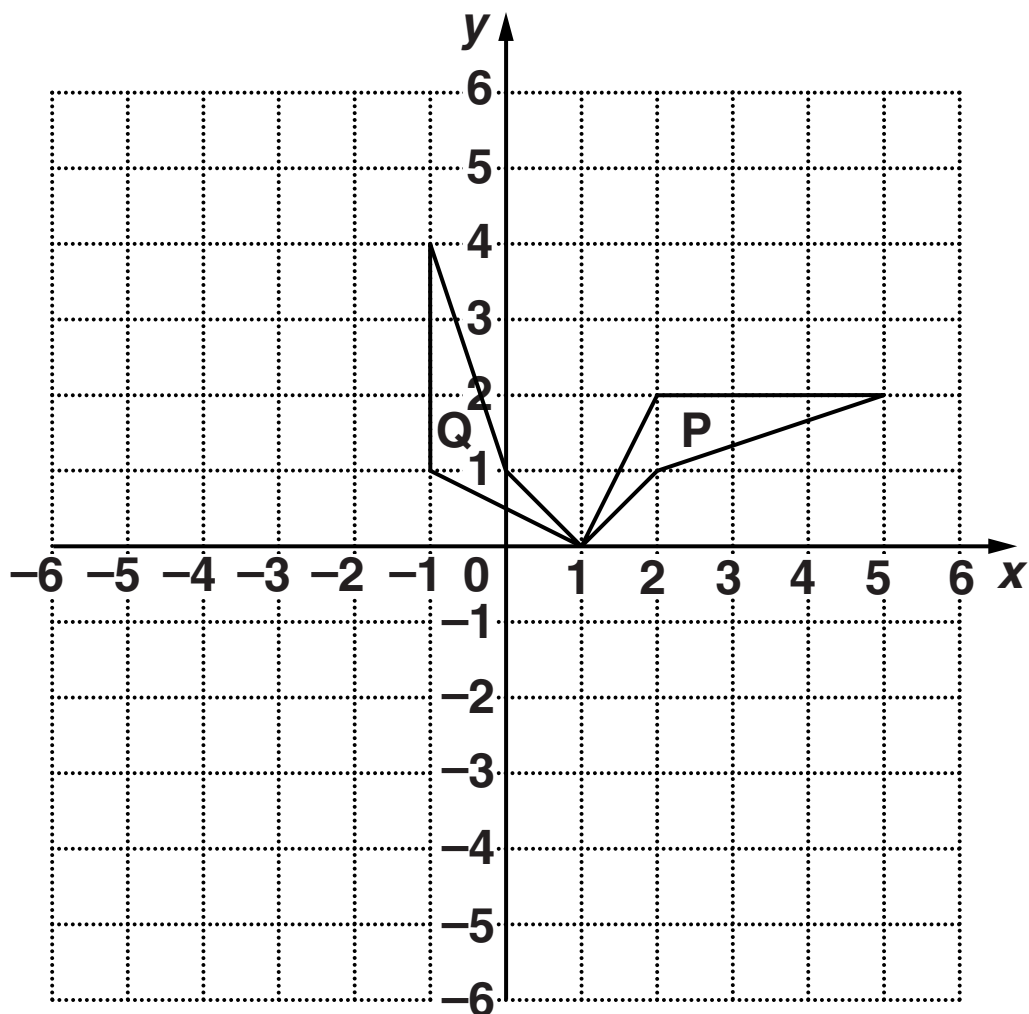
H _____ [2]

(c) Write down expressions in terms of n for the number of Cs and Hs in Diagram n .

(c) C _____

H _____ **[3]**

- 7 Jonah drew shape P on a square grid. He then transformed shape P to shape Q.



- (a) Describe fully the SINGLE transformation that maps shape P onto shape Q.

[3]

- (b) Draw the reflection of shape P in the line $y = -1$. Label the image R.

[2]

- 8 This is a formula for changing temperatures in degrees Celsius, C , into degrees Fahrenheit, F .

$$F = \frac{9}{5} \times C + 32$$

There is a temperature when the numerical value of F is equal to the numerical value of C .

Find the temperature when $F = C$.

_____ degrees [3]

- 9 Items are advertised for sale on an internet site.
The cost of the advert for each item is a percentage of the selling price.

2% on each item sold for £50 or less

7% on each item sold for over £50

Carrie uses the site to sell a pair of shoes for £52 and a dress for £49.50.

After paying for the adverts, for which item did Carrie receive more?

How much more did she receive?

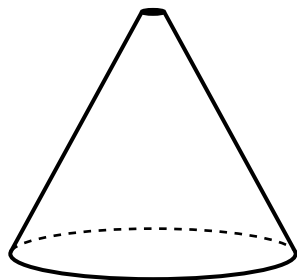
Carrie received _____ pence more

for selling _____

[4]

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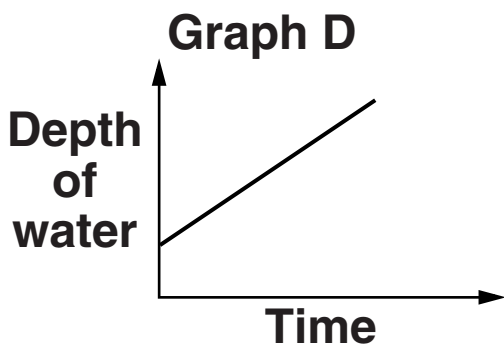
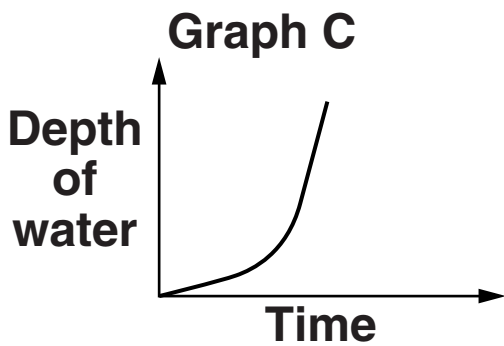
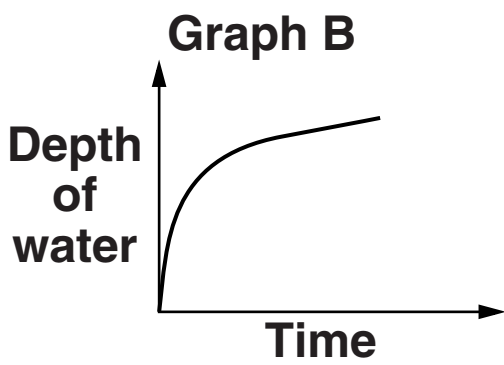
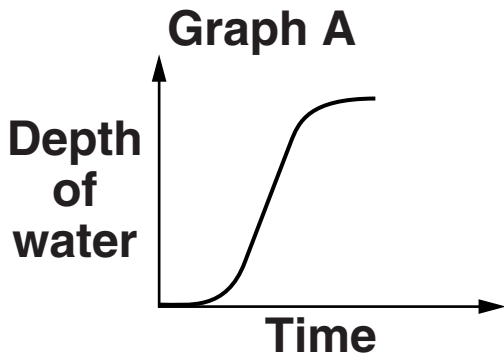
10 (a) Here is an empty container.



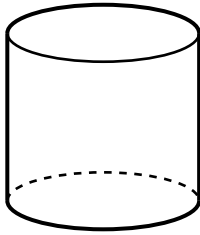
Water is poured into the container at a constant rate.

Which of the graphs opposite represents the depth of water in the container as water is poured in?

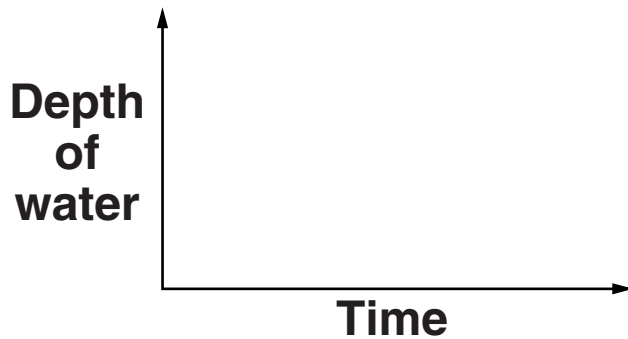
(a) Graph _____ [1]



- (b) Here is an empty cylinder.
Water is poured into the cylinder at a constant rate.



Sketch a graph to represent the depth of water in the cylinder as water is poured in.



[1]

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- 11 90 people each exercised for 30 minutes. Each person's recovery time was measured. The results are summarised in this table.

Recovery time (m minutes)	Number of people
$0 < m \leq 4$	2
$4 < m \leq 8$	7
$8 < m \leq 12$	29
$12 < m \leq 16$	26
$16 < m \leq 20$	16
$20 < m \leq 24$	10

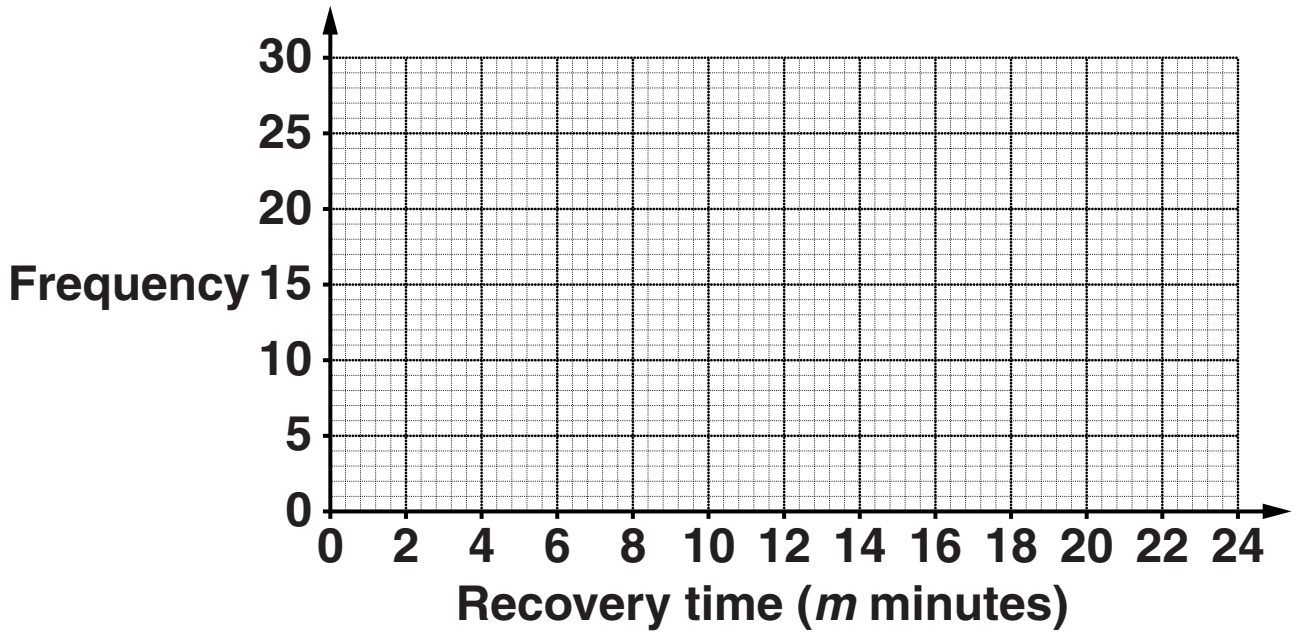
- (a) Calculate an estimate of the mean recovery time.

(a) _____ minutes [4]

(b) Write down the modal class.

(b) _____ [1]

(c) Draw a frequency polygon for the data in the table.



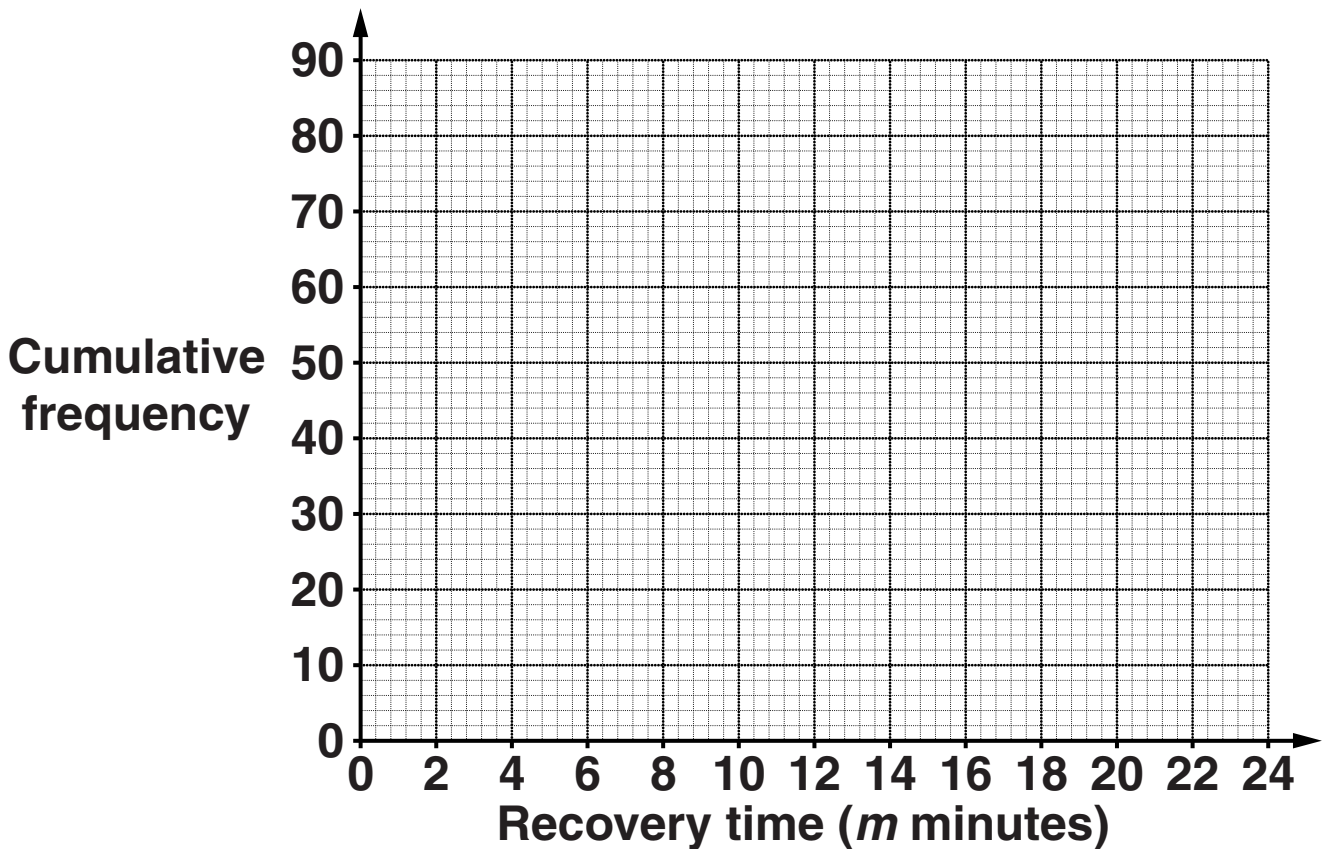
[2]

(d) Complete this cumulative frequency table for the recovery times.

Recovery time (m minutes)	Number of people
$0 < m \leq 4$	2
$0 < m \leq 8$	
$0 < m \leq 12$	
$0 < m \leq 16$	
$0 < m \leq 20$	
$0 < m \leq 24$	

[1]

(e) Draw a cumulative frequency graph for the recovery times.



[3]

(f) Use your graph to estimate

(i) the median recovery time,

(f)(i) _____ minutes [1]

(ii) the number of people who took LONGER THAN 15 minutes to recover.

(ii) _____ [2]

(g) Which of mean, median or modal class is the most appropriate to use as the average recovery time? Give a reason for your choice.

_____ because _____

_____ [2]

(h) One week later these people were asked to see how an energy drink affected their recovery time.

Write a question, with a response section, that they could be asked.

_____ [2]

12 (a) Factorise.

$$x^2 - 16$$

(a) _____ **[1]**

(b) Rearrange this formula to make u the subject.

$$v^2 = u^2 + 2as$$

(b) _____ **[2]**

(c) Simplify.

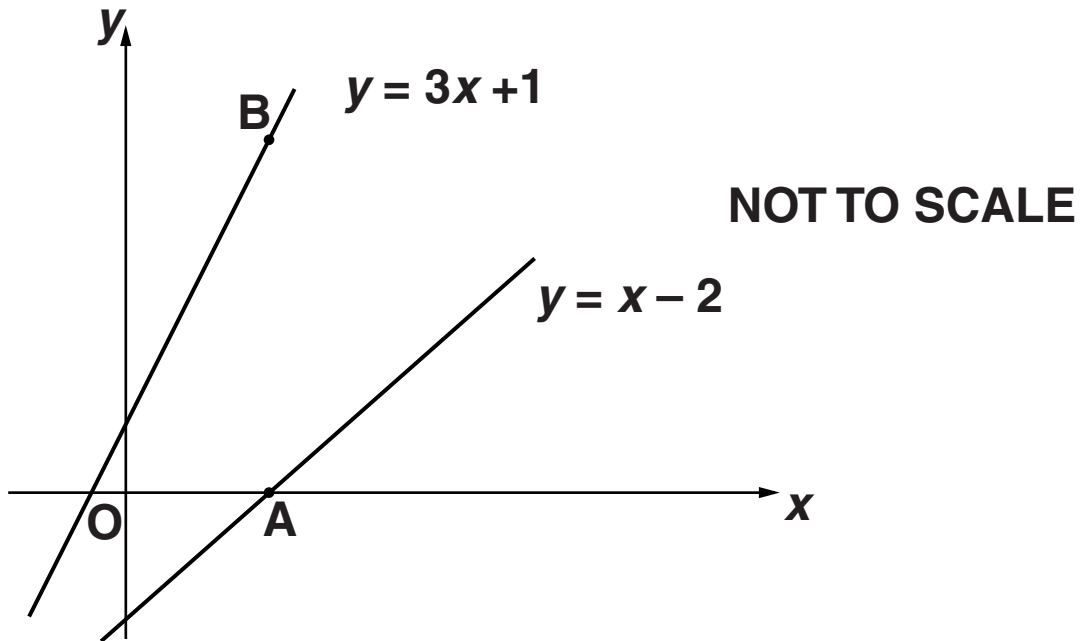
(i) $s^2t^8 \times s^3t^2$

(c)(i) _____ **[2]**

(ii) $(x^3y)^4$

(ii) _____ [2]

- 13 The diagram shows the graphs of $y = x - 2$ and $y = 3x + 1$.



- (a) The line $y = x - 2$ cuts the x -axis at A.
B is on the line $y = 3x + 1$ such that the line AB is parallel to the y -axis.

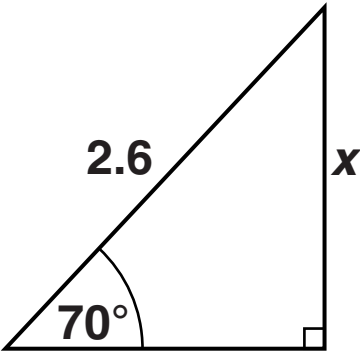
Work out the coordinates of B.

(a) (_____ , _____) [3]

(b) Work out the coordinates of the point where the lines $y = x - 2$ and $y = 3x + 1$ cross.

(b) (_____ , _____) [3]

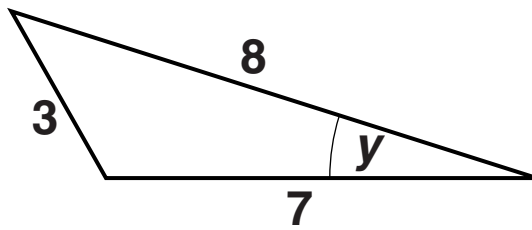
14 (a) Use the diagram below to calculate x .



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(a) _____ [3]

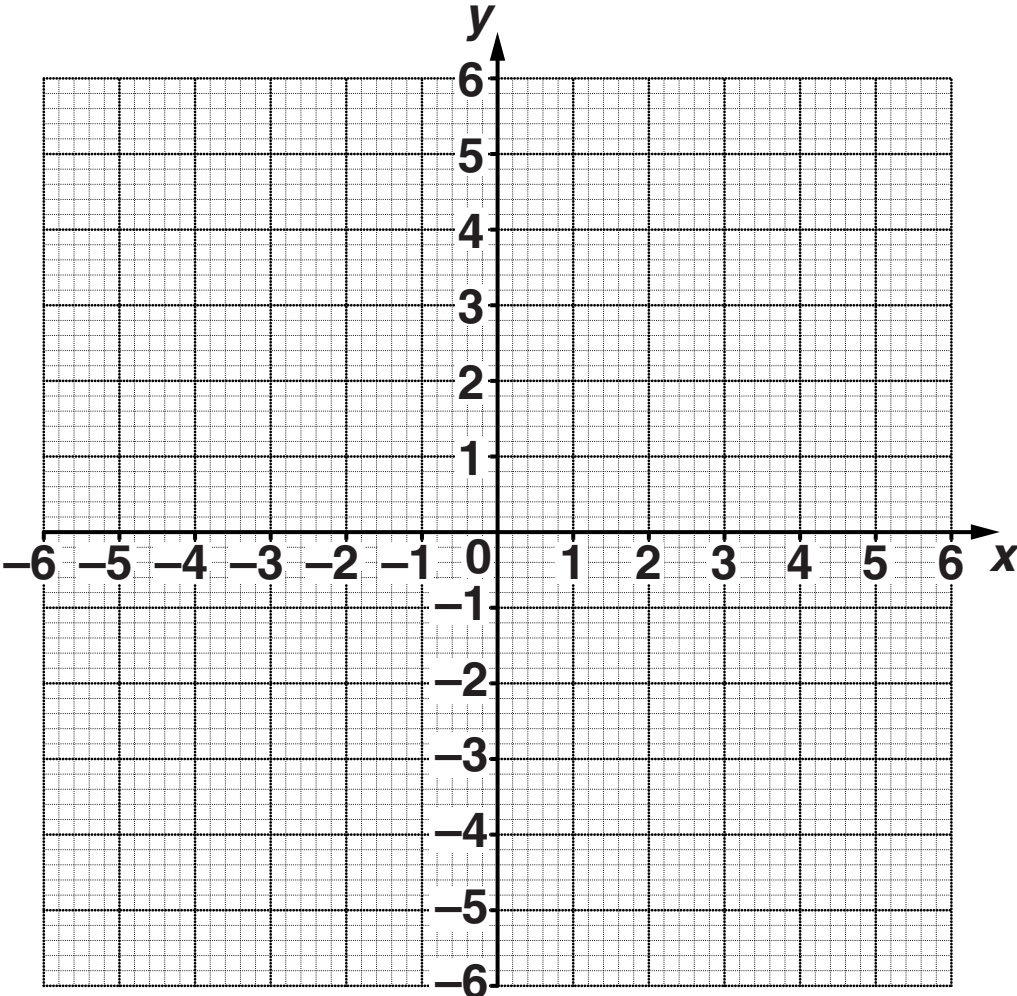
(b) Use the diagram below to calculate y .



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(b) _____ ° [4]

15 (a) Draw accurately the graph of $x^2 + y^2 = 25$.



[2]

(b) (i) Show that the curve $x^2 + y^2 = 25$ and the line $y = 3x - 1$ intersect when $5x^2 - 3x - 12 = 0$.

[3]

- (ii) Solve algebraically $5x^2 - 3x - 12 = 0$.
Give your answers correct to 2 decimal places.**

(b)(ii) _____ [3]

- (iii) Hence find the coordinates of the points where the curve and the line intersect.**

(iii) _____ [2]

16 Ian has 160 metal cylinders each of length 36 cm and radius r cm.
The 160 cylinders are melted down and made into a sphere of radius 30 cm.

Calculate r .

_____ [5]

17 The total resistance, T , of an electrical circuit is given by this formula.

$$\frac{1}{T} = \frac{1}{A} + \frac{1}{B}$$

$A = 1.5$ and $B = 5.6$, each correct to the nearest 0.1.

Work out the maximum possible value of T .
Show clearly the values you use.

_____ [4]

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