Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4353/02

MATHEMATICS (UNITISED SCHEME)

UNIT 3: Calculator-Allowed Mathematics

HIGHER TIER

A.M. MONDAY, 12 November 2012

$1\frac{3}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **10**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**8**	
2	**4**	
3	**6**	
4	**7**	
5	**7**	
6	**8**	
7	**3**	
8	**4**	
9	**4**	
10	**6**	
11	**9**	
12	**6**	
13	**5**	
14	**9**	
15	**4**	
TOTAL MARK		

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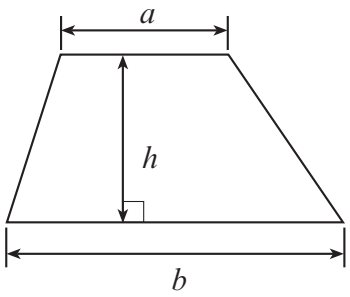
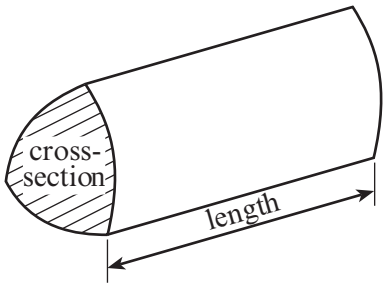
Formula List

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

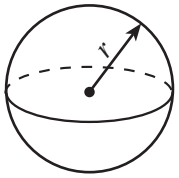


Volume of prism = area of cross-section × length



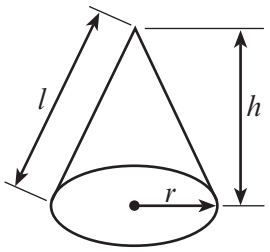
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = $\pi r l$

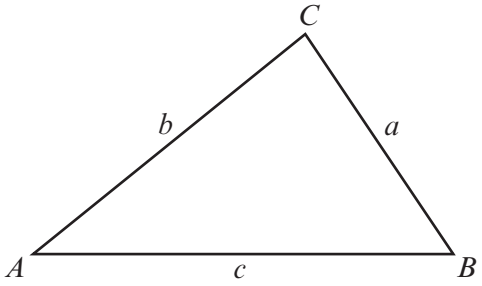


In any triangle ABC

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 = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

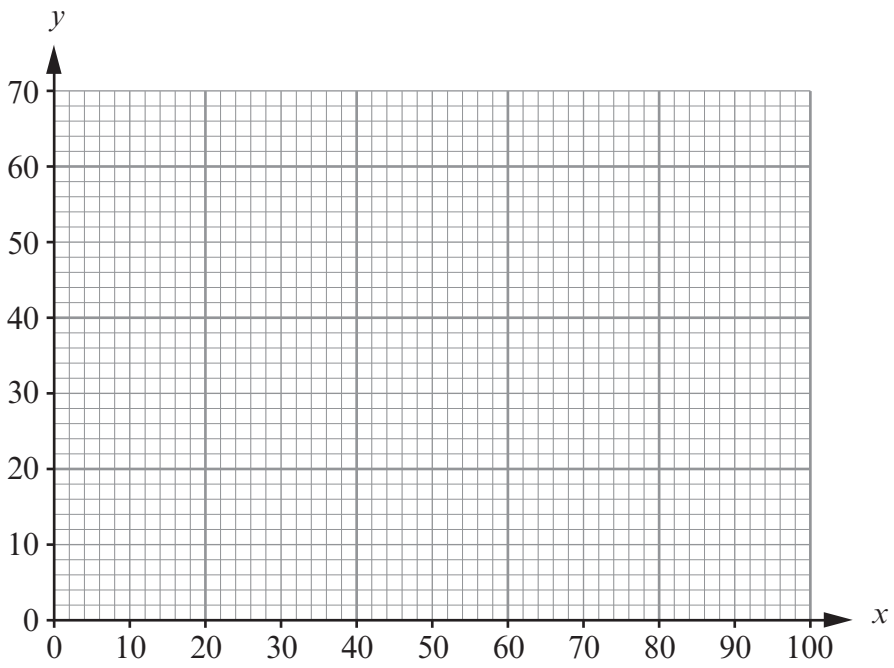
where $a \neq 0$ are given by

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

1. In an experiment, values of x and y are recorded to look for a possible relationship. The table below shows the results.

x	20	50	80	90	60	40	100	70	0	30
y	26	38	56	64	46	36	62	48	14	20

(a) On the grid below, draw a scatter diagram to show the results.



[2]

(b) The mean of the x values is 54.
Calculate the mean of the y values and then draw the line of best fit on your scatter diagram.

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(c) Which type of correlation does your scatter diagram show?

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(d) Using your line of best fit, find an approximate value of y when x is 35.

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Examiner only

2. *(a)* When $r = 6{\cdot}2$ and $t = -3{\cdot}1$, find the value of $5r - 2t$.

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(b) When $x = \frac{1}{2}$ and $y = \frac{3}{4}$, find the value of $x^2 + 7y$.

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Examiner only

3. *(a)* The mean of 5 numbers in a list is 24.
When two extra numbers are added to the list, the mean increases by four.
What does this tell you about the values of the two extra numbers?

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(b) Four numbers are listed in ascending order.
The mode of the four numbers is 3.
No number in the list is greater than 3.
The range of the four numbers is 5.
The median of the four numbers is 2.
Find the four numbers.

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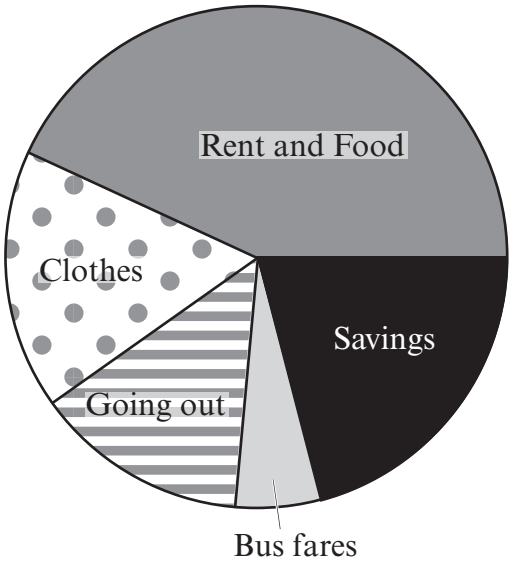
Examiner only

4. The pie chart shows what Maria plans to do with her first month's salary of £1620.



(a) Calculate the amount Maria plans to spend on clothes from her first month's salary.

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(b) How much more does Maria plan to spend, in the first month, on clothes than on bus fares?

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Examiner only

(c) Mark finds a job with a lower first month's salary than Maria's first month's salary. He draws a pie chart that shows what he plans to do with his first month's salary.

The angle for 'going out' on Mark's pie chart is the same as the angle for 'going out' on Maria's pie chart.

Looking at Mark's pie chart, Maria states

"We will both have the same amount of money to spend on going out."

Explain, with reasons, whether Maria is correct or not.

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Examiner only

5. *(a)* Use a ruler and a pair of compasses only to construct an accurate drawing of the rhombus described below.

Rhombus
- All sides are of length 6 cm
- The acute angles are 60°

You must show all your construction lines.

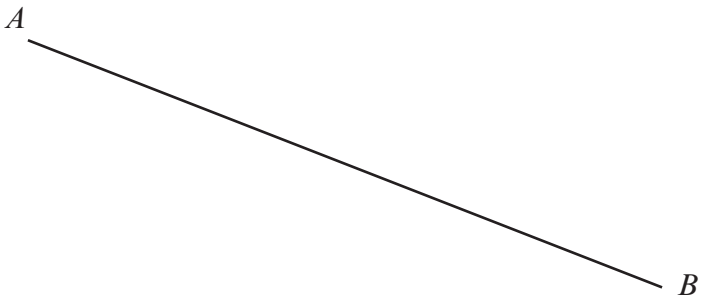
[4]

Examiner only

(b) Shade the region that satisfies both of the following conditions.

(i) The points are less than 6·5 cm from A.
(ii) The points are nearer to B than to A.

[3]



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Turn over.

Examiner only

6. Boxes of raisins are sold in supermarkets.

The number of raisins per box in each of 100 boxes was counted.
The table below shows a summary of the results.

Number of raisins per box	Number of boxes
120 to 128	8
129 to 137	26
138 to 146	48
147 to 155	18

(a) Calculate an estimate for the mean number of raisins per box.

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(b) Which is the modal group for the number of raisins per box?

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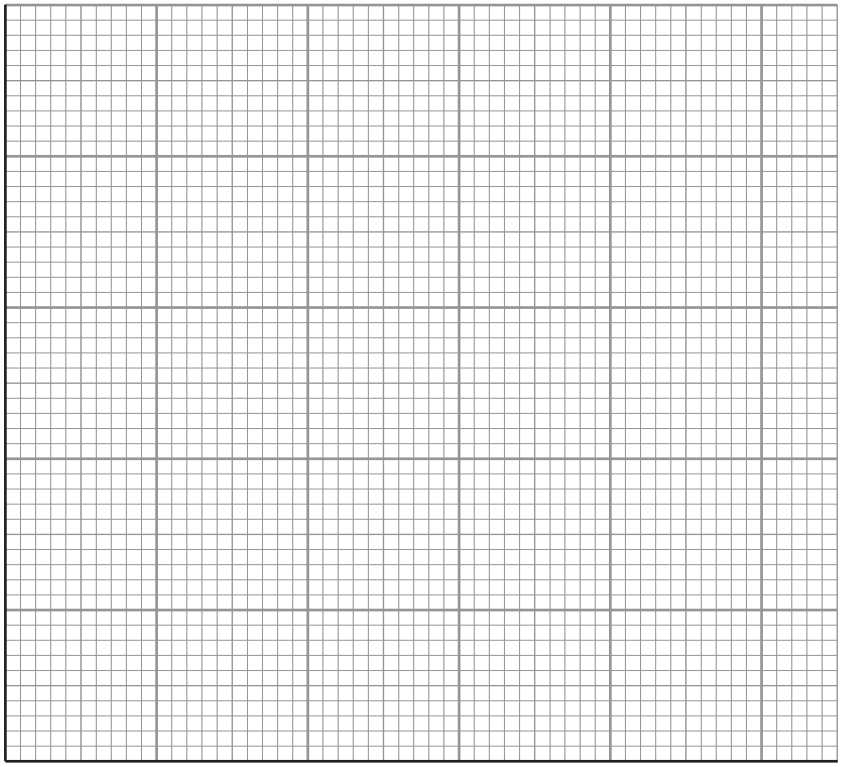
Examiner only

(c) On the graph paper below, draw a frequency polygon to show the distribution of the number of raisins in each box.



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Turn over.

Examiner only

7.

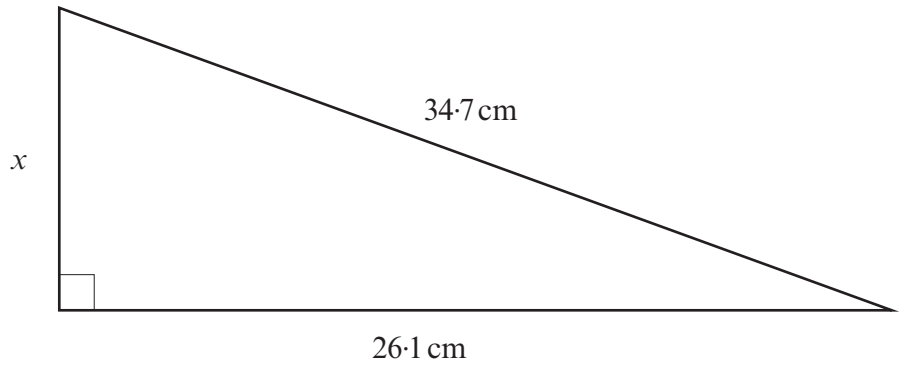

Diagram not drawn to scale

Calculate the length of the side marked x in the diagram.

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8. *(a)* Factorise $5x^2 - 10x$.

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(b) Solve $x^2 - 6x = 0$.

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Examiner only

9. *(a)* Write down the value of $\frac{1}{2 \times 10^{-6}}$ in standard form.

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(b) Find, in standard form, the value of $(2{\cdot}3 \times 10^{-5}) + (7{\cdot}8 \times 10^{-6})$, giving your answer correct to two significant figures.

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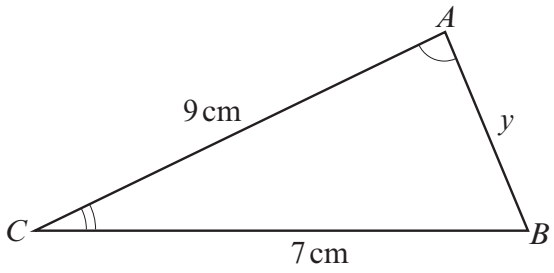
Examiner only

10. *You will be assessed on the quality of your written communication in this question.*

Triangle *ABC* is similar to triangle *FGH*.



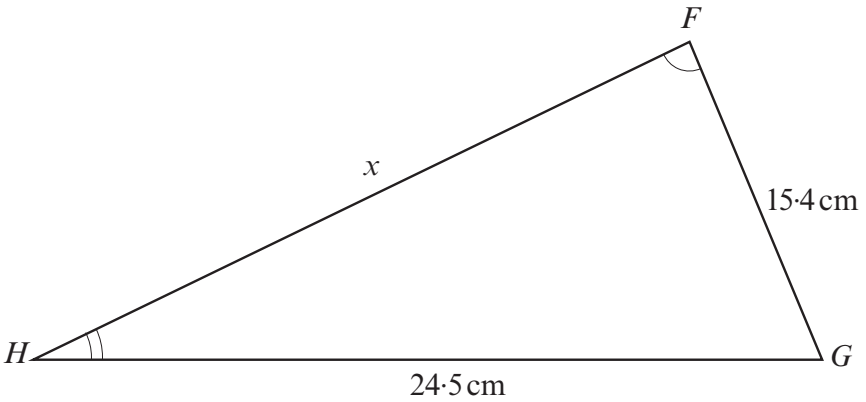


Diagram not drawn to scale

Calculate the lengths x and y.
You must show all your working.

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Examiner only

11. *(a)* Factorise $x^2 - 5x - 14$.

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(b) Solve $\frac{x+2}{3} + \frac{x-2}{2} = 3$.

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(c) Use the formula method to solve the equation $2x^2 + 3x - 3 = 0$, giving your solutions correct to two decimal places.

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Examiner only

12. A company needs to report the density of platinum in kg/m^3.
The company produces a platinum sphere with a radius of 3·4 cm.
The platinum sphere weighs 3509·6 g.
Calculate the density, in kg/m^3, of the platinum used to make the sphere.

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Examiner only

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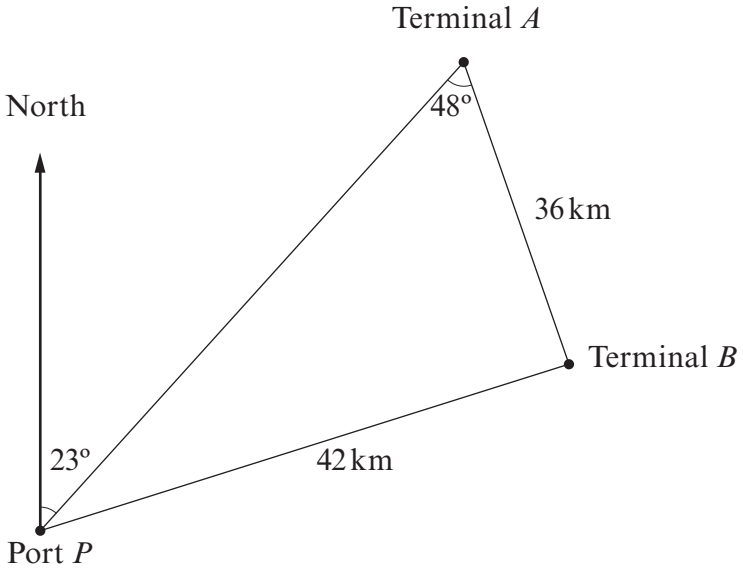

Diagram not drawn to scale

A tanker leaves Port *P* on a bearing of 023° to travel to Terminal *A*.
At Terminal *A*, the tanker changes direction to travel to Terminal *B*.
From Terminal *B* the tanker returns to Port *P*.
Given this information and the information shown on the diagram, calculate the bearing of Terminal *B* from Port *P*.

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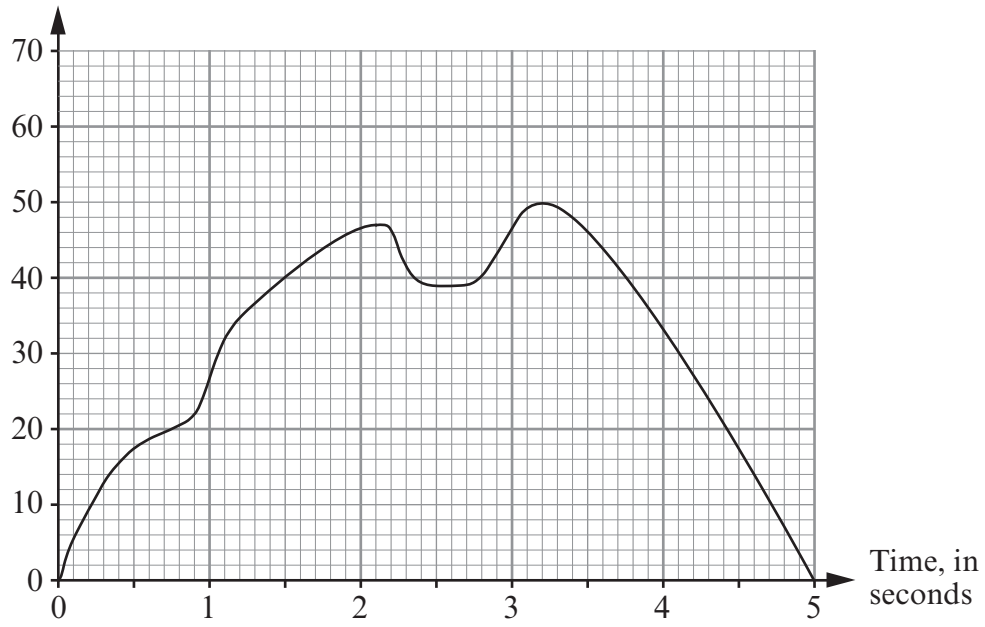
Examiner only

14. An engineer carried out an experiment.
He recorded the velocity of a particle during the first 5 seconds of the experiment.



(a) Calculate the acceleration of the particle at 3 seconds.
You must state the units of your answer.

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Examiner only

(b) (i) Calculate an estimate for the area enclosed by the x-axis and the curve shown in the graph.

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(ii) Write down an estimate for the distance travelled by the particle in the 5-second period.

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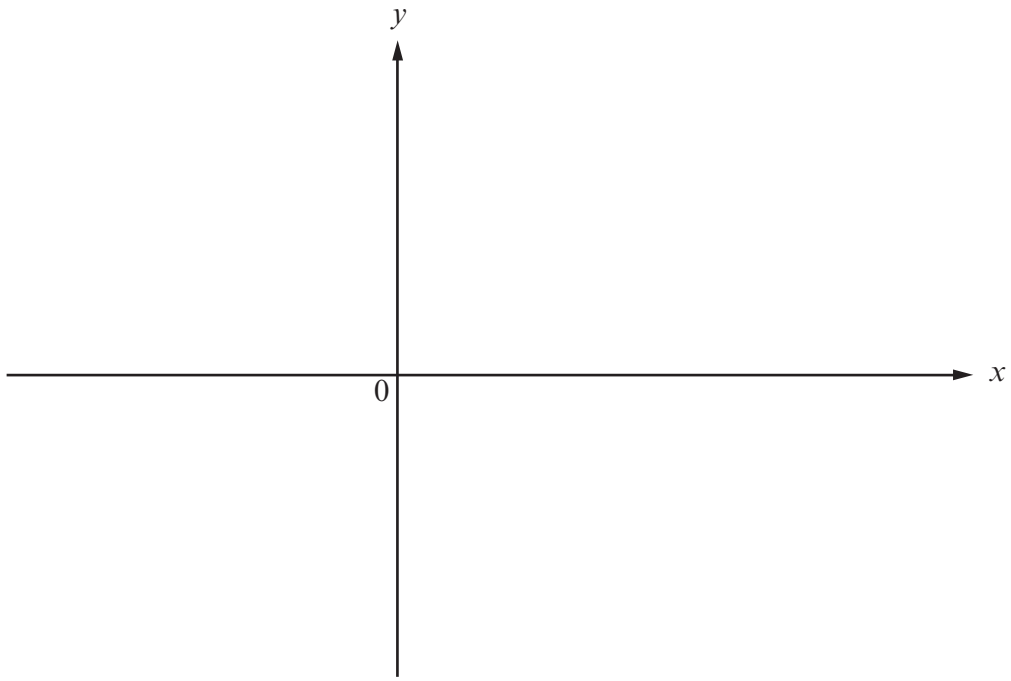
TURN OVER

Examiner only

15. *(a)* Using the axes below, **sketch** the graph of $y = \sin x$ for values of x from -180° to 180°.

[2]



(b) Find all solutions of the following equation in the range -180° to 180°.

$$\sin x = -0{\cdot}4542$$

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