



MATHEMATICS

1 hour

Surname
Other Names

INSTRUCTIONS TO CANDIDATES

- Answer all questions
- Use black ink or black ball-point pen
- In addition to this paper, you will require a 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

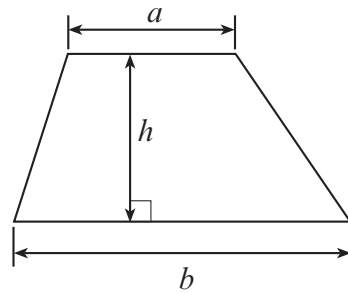
I declare that the above named student was fully supervised during the test. The assessment was completed under strict exam conditions and in the time allowed, in accordance with the instructions on the test paper.

INVIGILATOR NAME

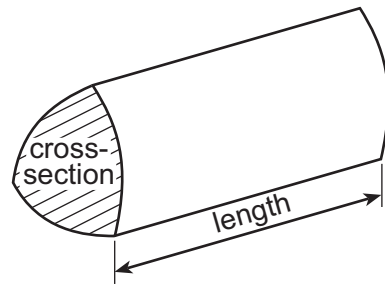
SIGNATURE: _____ DATE: _____

Formula List

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

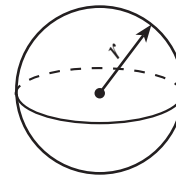


Volume of prism = area of cross-section \times length



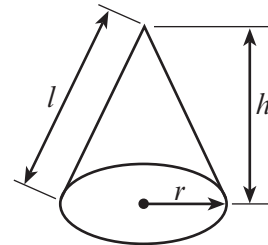
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

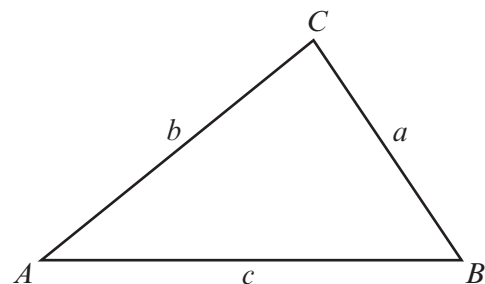


In any triangle ABC

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 $ax^2 + bx + c = 0$

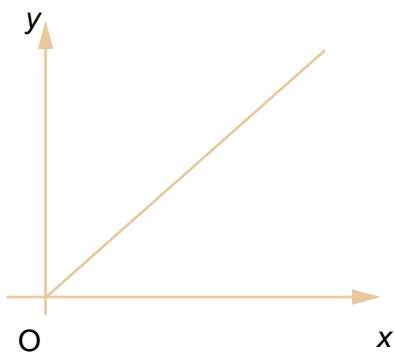
where $a \neq 0$ are given by

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

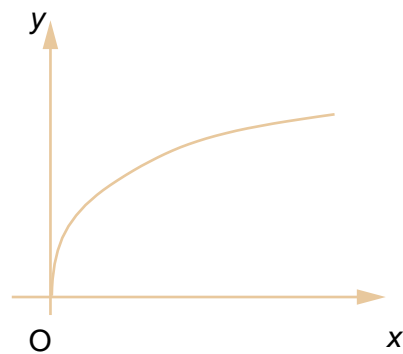
Answer **all** the questions.

1 These graphs show different relationships between the variables x and y .

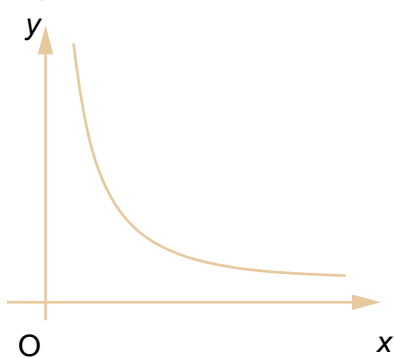
Graph A



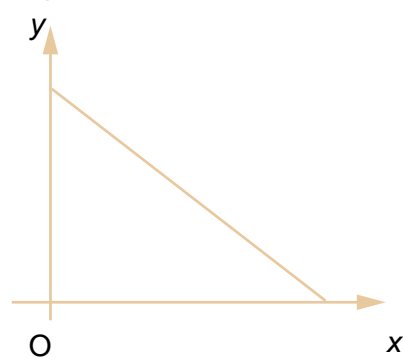
Graph B



Graph C



Graph D



Identify the graph which shows the following.

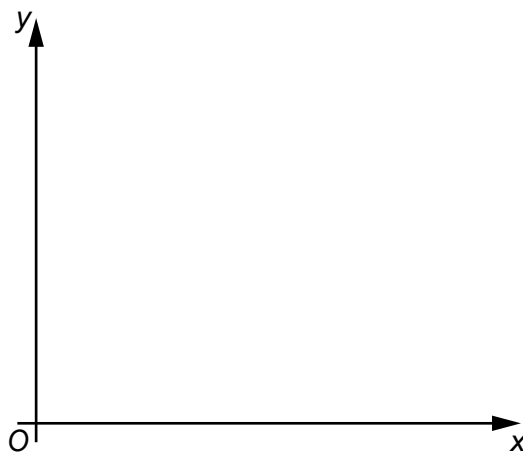
(a) y is directly proportional to x .

(a) Graph [1]

(b) y is inversely proportional to x .

(b) Graph [1]

2 Sketch a graph which shows that y is directly proportional to x^2 .



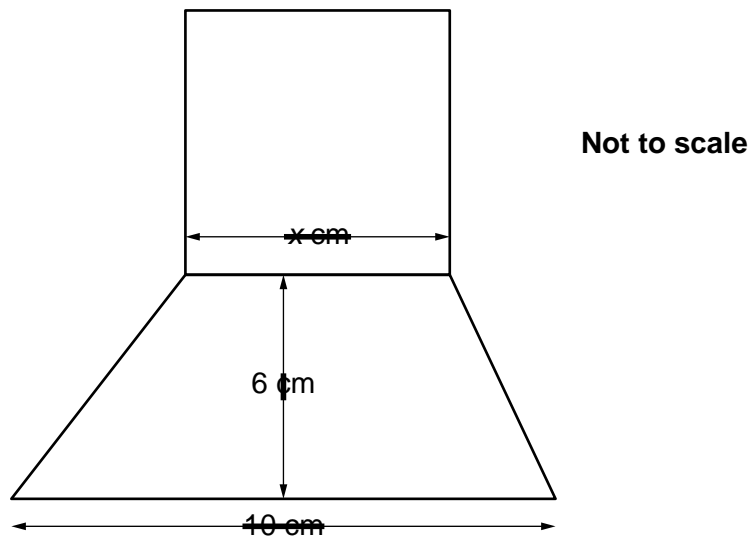
[2]

- 3 A regular polygon has n sides.
The polygon's interior angle is 5 times the size of its exterior angle.

Find n .

$n = \dots\dots\dots$ [5]

- 4 In the diagram, the square and the trapezium share a common side of length x cm.

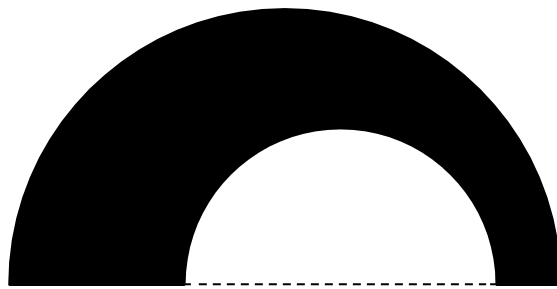


The area of the square is equal to the area of the trapezium.

Work out the value of x .

$x =$ [6]

5 The shape below is formed from two semicircles and a straight line.



Not to scale

The radius of the large semicircle is 8cm.
The radius of the small semicircle is t cm.

Find an expression, in terms of t , for the **exact perimeter** of the shaded shape.

..... cm [3]

- 6 A £1 coin weighs 8.75g, correct to the nearest 0.01g.
Mitul weighs the contents of a large bag of £1 coins.
The coins weigh 2.63kg, correct to the nearest 10g.

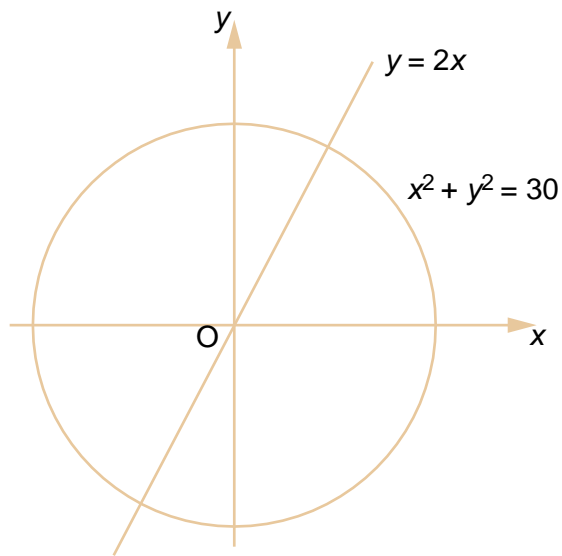
Mitul says

I am sure that the bag contains exactly £300 because, using bounds,
 $2625 \div 8.755 = 299.8$ to 1 decimal place.

Show that Mitul may not be correct.

.....
..... [3]

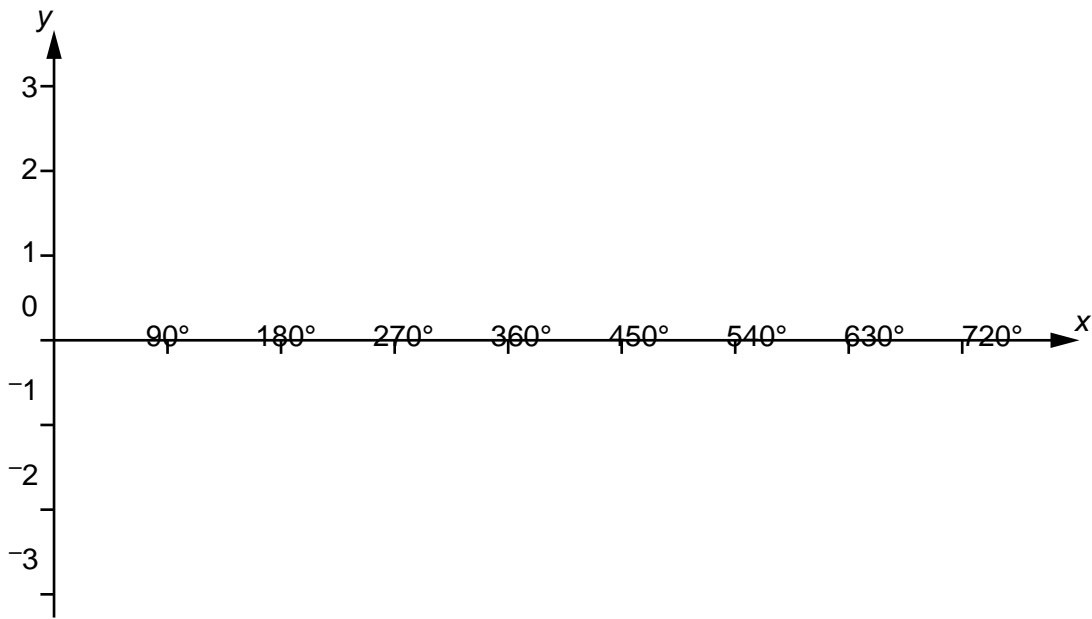
- 7 Find the exact coordinates of the two intersections of the line $y = 2x$ and the circle $x^2 + y^2 = 30$.



Not to scale

(..... ,) and (..... ,) [5]

8 (a) Sketch the graph of $y = \cos x + 1$ for $0^\circ \leq x \leq 720^\circ$.



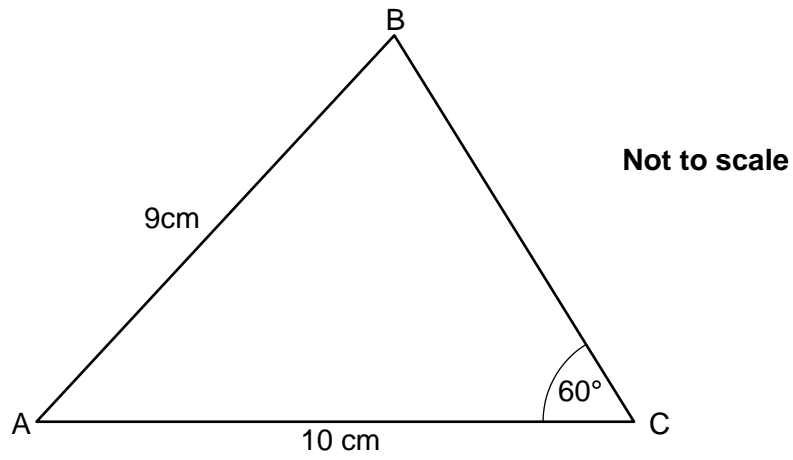
[3]

(b) Explain why the equation $\cos x + 1 = 2.7$ has no solutions.

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

9 In this triangle:

- $AB = 9\text{cm}$
- $AC = 10\text{cm}$
- $\text{angle } BCA = 60^\circ$
- $\text{angle } ABC < 90^\circ$



Calculate the area of triangle ABC.

..... cm^2 [6]

10. Show that $\frac{5x}{x+5} + \frac{25}{x-7} - \frac{300}{(x+5)(x-7)}$ simplifies to an integer

[6]

11. Let $f(x) = x^2 - 4x$, $x \in \mathbb{R}$

(a) Sketch $y=f(x)$ showing the co-ordinates of all points where $y=f(x)$ meets the co-ordinate axes.

(b) Find the range of $f(x)$.

(c) Determine the number of solutions to $f(x)=1/x$ making your method clear.

(d) Use a numerical method to find a solution to $1/x=f(x)$ to 5 significant figures. Make your method clear.

[10]