GCSE MATHEMATICS

S21-C300

With Calculator Assessment Resource R

Higher Tier

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

Curved surface area of a cone = πrl

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

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

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

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

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

1. Rashid plays a game.
Each time he can score 1 point, 5 points or 10 points.
The table shows the probability of each outcome.

Points	Probability
1	0·80
5	0·15
10	0·05

Rashid plays the game 40 times.

How many times does he expect to score more than 1 point? [3]

.....

.....

.....

.....

2. *ABCD* is a parallelogram.

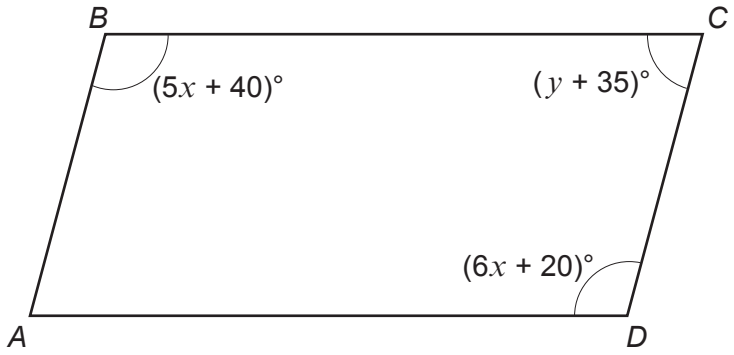


Diagram not drawn to scale

Work out the value of x and the value of y.
You must show all your working. [5]

x = ... y = ...

3. Cheng stands at *O* and rolls a ball along the horizontal ground.

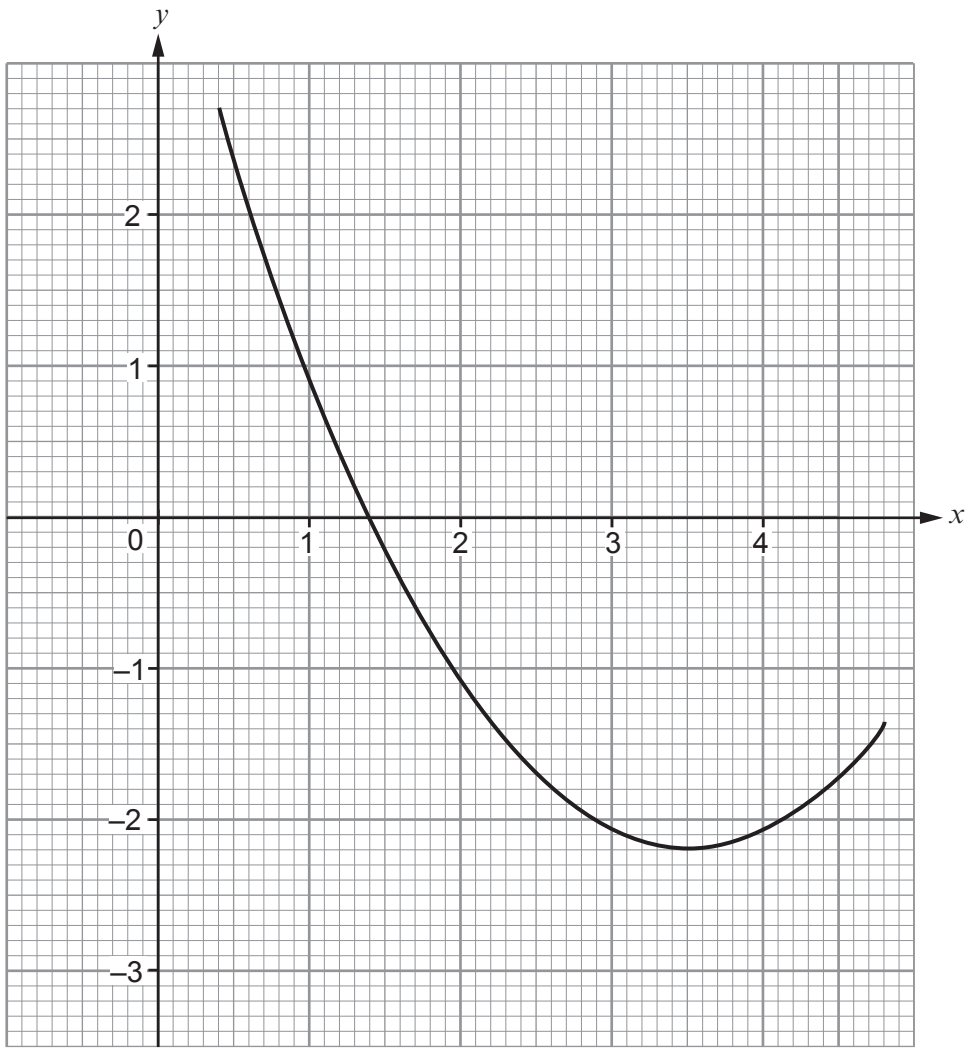
The ball stops at point *B*, which:

- is equidistant from *X* and *Y*,
- lies on the bisector of angle *XOY*.

Use a ruler and a pair of compasses to **construct** suitable lines and arcs to show the position of point *B*.

Construction arcs must be clearly shown. [5]

4. The graph shows part of a quadratic curve.



(a) Use the graph to write down the minimum value of y. [1]

.....

(b) The curve cuts the x-axis at (1·4, 0) and (a, 0).

Calculate the value of a. [2]

.....

.....

.....

.....

5. n is a positive integer.

Prove that, for all possible values of n, $(2n - 1)^2$ is an odd number. [2]

6. The mean of the data in the frequency table below is 2·7.

x	Frequency
1	a
2	5
3	1
4	b
5	2
6	3
Total	30

Work out the values of a and b.
You must show all your working. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

7. A rectangle has:

- length y cm,
- perimeter 30 cm,
- area 55 cm^2.

(a) Form an equation in y and show that it can be simplified to $y^2 - 15y + 55 = 0$. [3]

(b) (i) Use the quadratic formula to solve the equation given in part *(a)*.
Give your answers correct to 2 decimal places.
You must show all your working. [3]

(ii) Interpret your answers in terms of the rectangle. [1]

8. *(a)* Show that $x = \sqrt{x+7}$ is a rearrangement of $x^2 - x - 7 = 0$. [1]

(b) Use the iteration formula

$$x_{n+1} = \sqrt{x_n + 7} \quad \text{starting with } x_1 = 3$$

to find a solution of $x^2 - x - 7 = 0$. Give your answer correct to 2 decimal places.

You must give all your calculated values of x_{n+1}. [3]

9. The diagram shows a sector of a circle with radius r cm and angle $x°$.

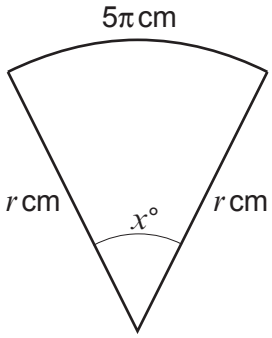


Diagram not drawn to scale

The arc length of the sector is 5π cm.

(a) Show that $x = \frac{900}{r}$. [2]

.....

.....

.....

.....

.....

(b) The area of the sector is 30π cm^2.

Calculate the value of x. [4]

.....

.....

.....

.....

.....

.....

.....