# GCSE MATHEMATICS

S21-C300

## With Calculator Assessment Resource Q

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 = $\pi rl$

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*

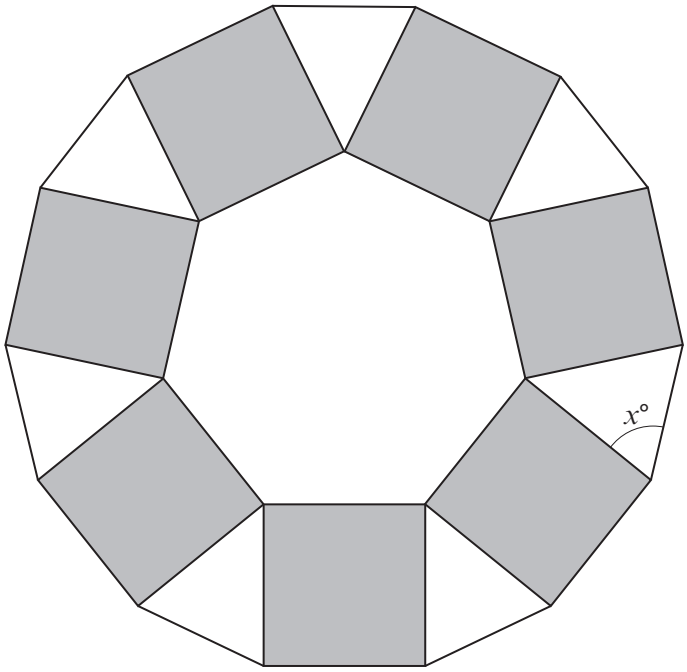
Where $a$ is constant acceleration, $u$ is initial velocity, $v$ is final velocity, $s$ is displacement from the position when $t = 0$ and $t$ is time taken:

$$v = u + at$$

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

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

**1.**




This pattern is made from a regular seven-sided polygon surrounded by squares and isosceles triangles.

Show that the value of $x$ is 64·3 correct to 1 decimal place. [4]

You must show all your working.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**2.** A cylindrical glass contains 500 $cm^3$ of water.
The glass has an internal radius of 3·5 cm.

Calculate the height of the water in the glass. [3]

.....

.....

.....

.....

.....

.....

.....

.....

**3.** The diagram shows two right-angled triangles.

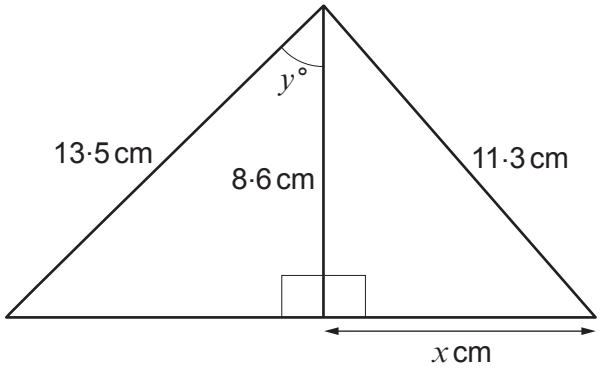



*Diagram not drawn to scale*

*(a)* Calculate the value of $x$. [3]

*(b)* Calculate the value of $y$. [3]

**4.** The speed limit on a road is decreased from 70 mph to 50 mph.
The road is 7·3 miles long.

How much longer does it take to travel along the road at 50 mph than at 70 mph?
Give your answer in minutes correct to 1 decimal place. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**5.**

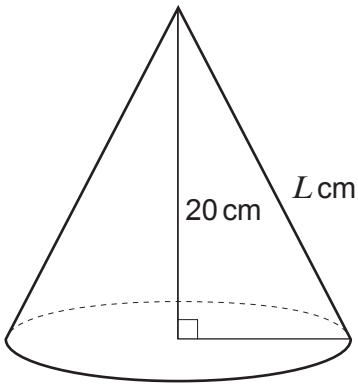



*Diagram not drawn to scale*

*(a)* A cone has vertical height 20 cm.
The volume of the cone is 2400 $cm^3$.

Calculate $L$, the slant height of the cone. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(b)* Cones *A* and *B* are mathematically similar.

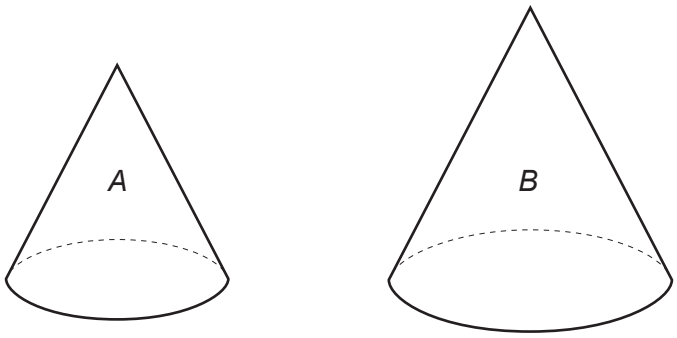



*Diagram not drawn to scale*

The diameter of the base of cone *A* is 12 cm.
The diameter of the base of cone *B* is 18 cm.

The total surface area of cone *A* is 300 $cm^2$.

Calculate the total surface area of cone *B*. [3]

.....

.....

.....

.....

.....

.....

.....

.....

**6.** A pet hotel is allowed to have a maximum of 10 pets at one time.
It takes only cats and dogs.
Each cat requires 1 unit of accommodation and each dog requires 3 units of accommodation.
For the hotel to make a profit, there must be at least 15 units occupied each day.

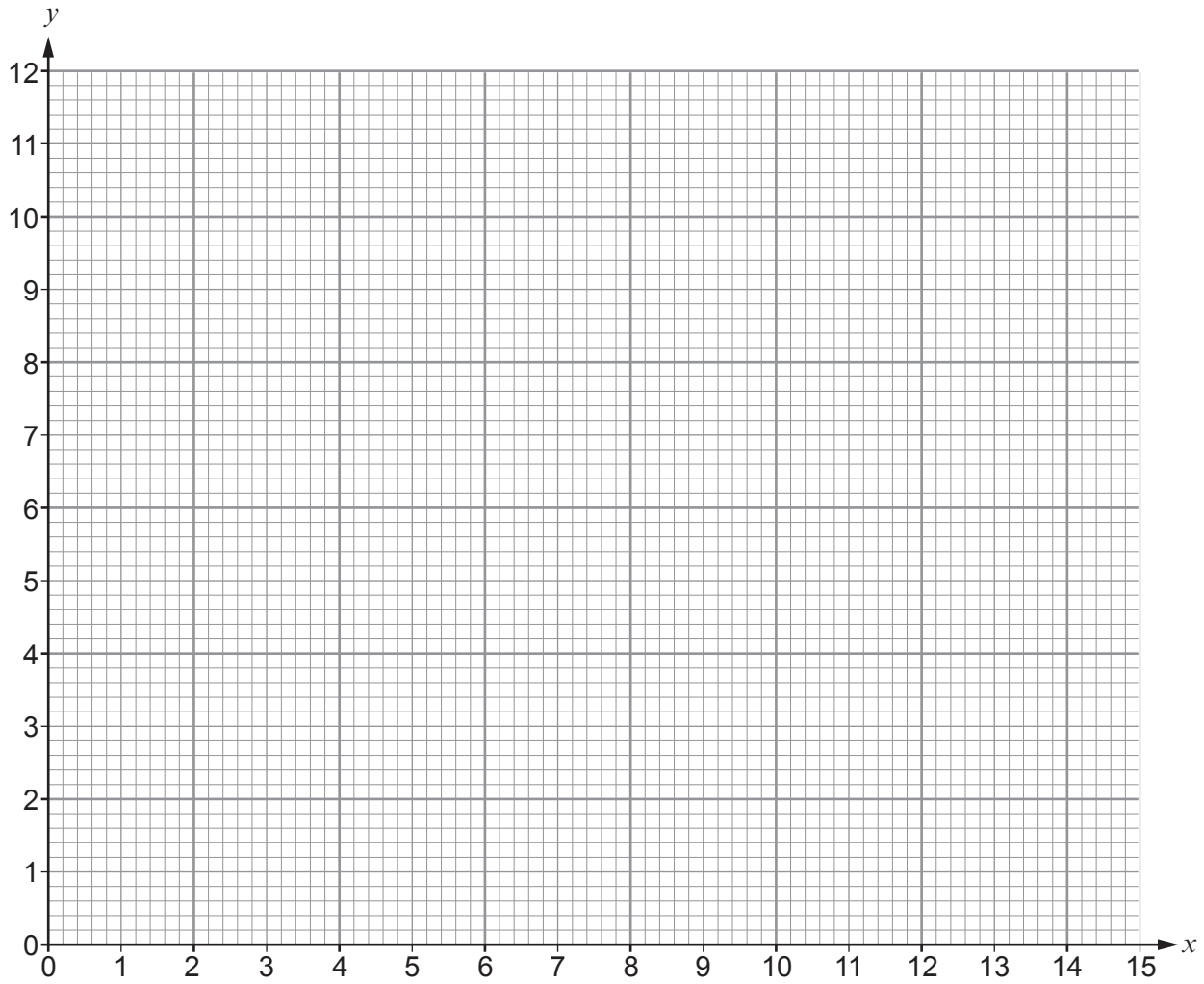
Let $x$ be the number of cats and $y$ the number of dogs in the pet hotel.

*(a)* Two inequalities that represent this information are $x \geqslant 0$ and $y \geqslant 0$.
Write down **two** *further* inequalities that represent the information. [2]

.....

.....

*(b)* On the graph paper below, draw the region that satisfies all of these inequalities.
Indicate clearly the region that is your answer. [3]




*(c)* One Wednesday there are enough pets staying for the hotel to make a profit.
What is the fewest number of **dogs** that could be in the hotel? [1]

.....

**7.**

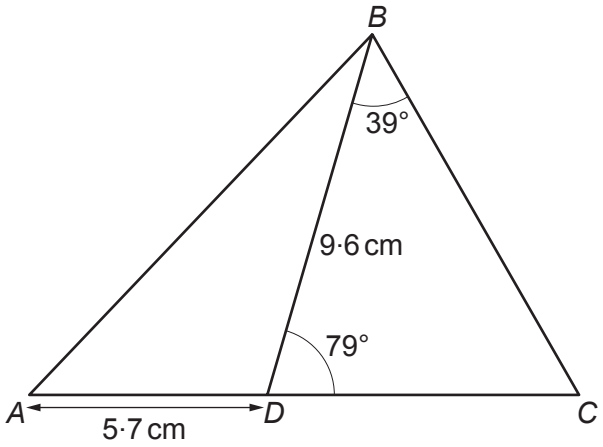



*Diagram not drawn to scale*

In the diagram, $AD = 5{\cdot}7$ cm, $BD = 9{\cdot}6$ cm, $B\hat{D}C = 79°$ and $D\hat{B}C = 39°$.

$ADC$ is a straight line.

*(a)* Calculate the length of $DC$. [3]

.....

.....

.....

.....

.....

*(b)* Mona assumes that the values in the diagram are all exact and uses these to work out the area of triangle $ABD$.
In fact, the lengths are correct but $B\hat{D}C$ has been **rounded up** to the nearest whole number.

Is Mona's answer too large or too small?
Use calculations to justify your decision. [3]

Too large ☐ Too small ☐

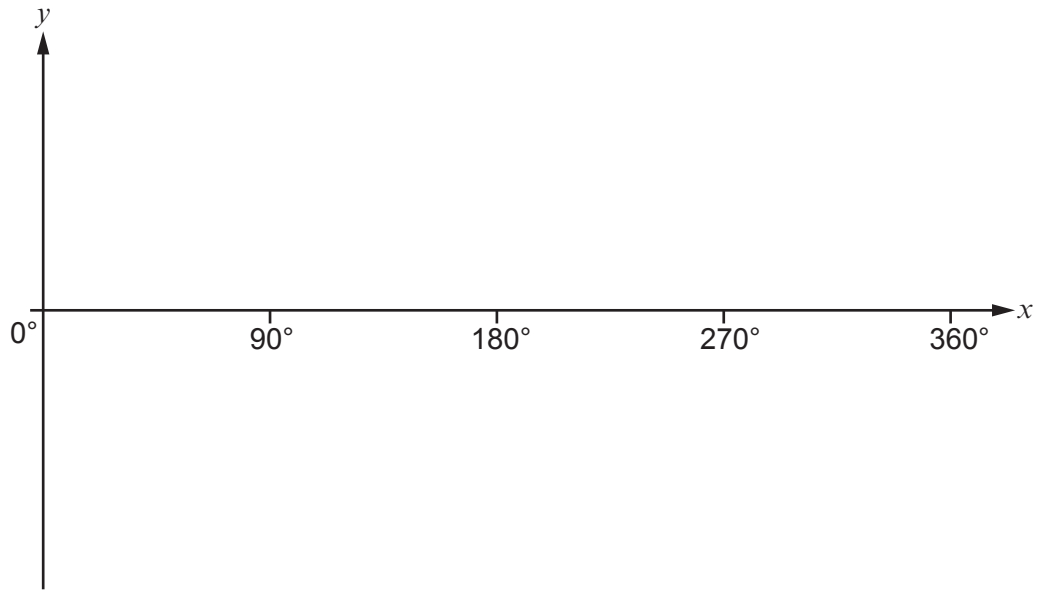
.....

.....

.....

.....

**8.** *(a)* On the axes below, sketch the graph of $y = \tan x°$ where $0° \leqslant x \leqslant 360°$. [2]




.....

.....

*(b)* Solve the equation $\tan x = 0{\cdot}8391$ in the range $0° \leqslant x \leqslant 360°$. [2]

.....

.....

.....

.....