# GCSE MATHEMATICS

S21-C300

## Non-Calculator Assessment Resource A

Foundation 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.** *(a)* Halima makes a shape by joining 5 cubes.

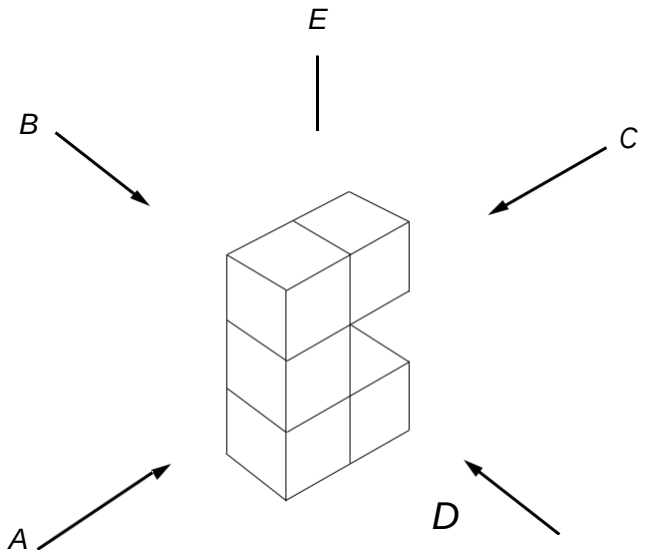
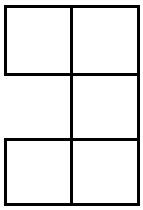



*Diagram not drawn to scale*

She looks at each of the side elevations, from the positions *A*, *B*, *C* and *D*, and the plan, from *E*.

(i) Here is what Halima sees from one of her positions.



Which position is this?
Circle your answer. [1]

*A* *B* *C* *D* *E*

(ii) How many square faces can Halima see from position *C*?
Circle your answer. [1]

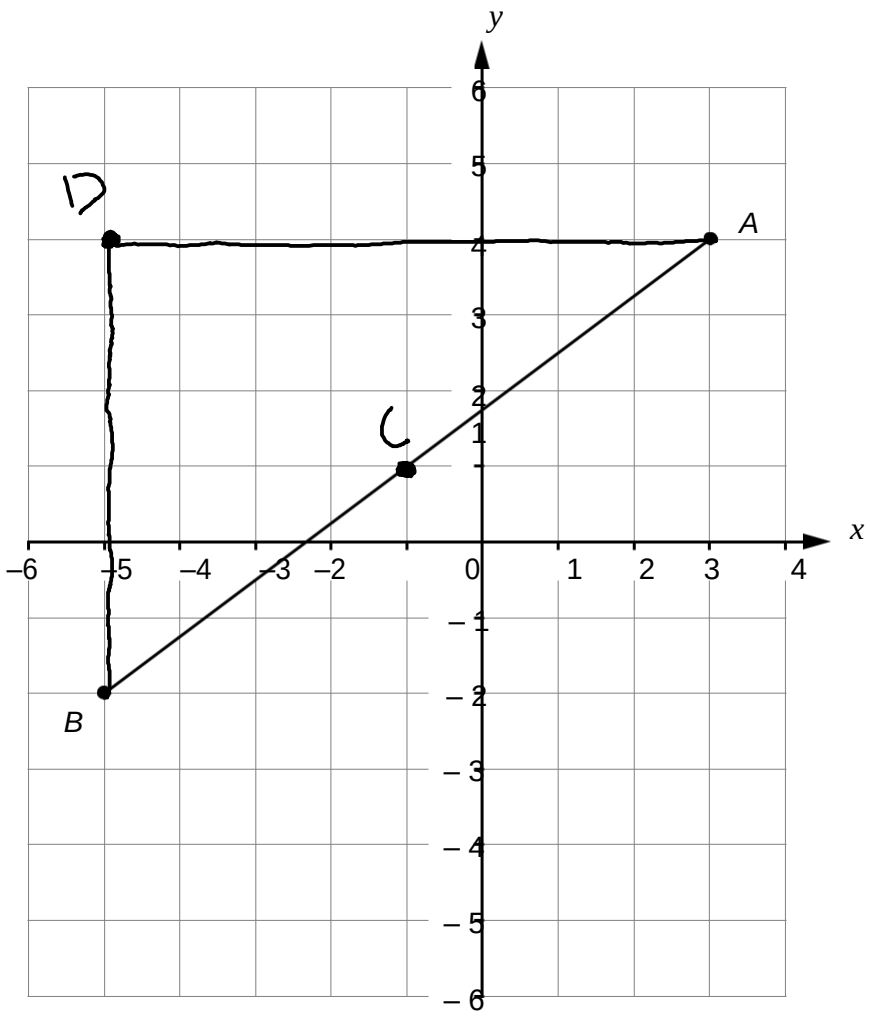
1 2 3 4 5

*(b)* The diagram shows the plan and side elevation of another 3D shape.


Circle the correct name for the 3D shape shown. [1]

cylinder circle pyramid cone sphere

**2.**




The line *AB* is drawn on the 1 cm grid above.

*(a)* (i) Write down the coordinates of *A*. [1]

*A* ( 3 , 4 )

(ii) The point *C* is the mid-point of *AB*.

Mark the position of the point *C* on the grid. [1]

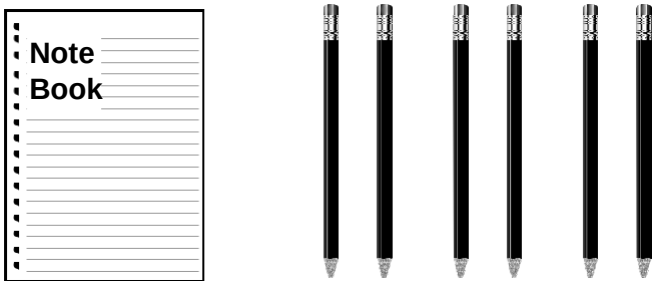
*(b)* The line *BD* is parallel to the *y*-axis.
Triangle *ABD* is a right-angled triangle.

Mark the position of point *D* on the grid and write down the length of *AD*. [2]

Length *AD* = ..... 8 ..... cm

**3.** Petra is shopping with 2 of her friends.

*(a)* She buys a note book and six **identical** pencils.




The note book costs the same as 2 of the pencils.
Her bill is £16.80.

(i) How much does a note book cost? [3]

pencils = x  notebook = y

y = 2x  6x + y = £16.80

6x + 2x = £16.80 → x = $\frac{16.80}{8}$ = £2.10

y = notebook = 2x = £4.20

(ii) Petra pays with a £50 note.
She is given £34.20 change.
She tells the shopkeeper,

"You have given me too much change."

Is Petra correct?

Yes ☑ No ☐

Show how you decide. [1]

50 − 16.80  50 − 16 = 34

34 − 0.80 = 33.20 change

*(b)* The 3 friends go to a café.
Here is part of the menu.

| Drinks | |
|---|---|
| Flat white | £4.25 |
| Latte | £3.95 |
| Americano | £2.95 |
| Tea (per pot) | £3.00 |
| **Cakes** | |
| Cupcake | £2.00 |
| ~~Cake of the day (per slice) £4.00~~ | |


Each of the 3 friends orders one drink and one cake from this menu.

They save a total of exactly £5 using the 3 for 2 offers.
Their bill totals £16.50 **after** the saving has been taken off.

What drinks and cakes did the 3 friends order?
You must show all your working. [4]

£16.50 + £5 = £21.50

Cheapest cake = £2.00 (cupcake) so cheapest drink (tea) must be £5 - £2 = £3.00

So one friend bought cupcake and tea = £5 off

Other 2 = 16.50 total

Other 2 definitely bought expensive cake £4.00

2 × £4.00 = £8.00

£16.50 − £8.00 = £8.50 for 2 drinks

So both bought flat white. £4.25 × 2 = £8.50.

Drinks Tea , flat white , cake of day

Cakes cupcake , flat white , cake of day

**4.** *(a)*

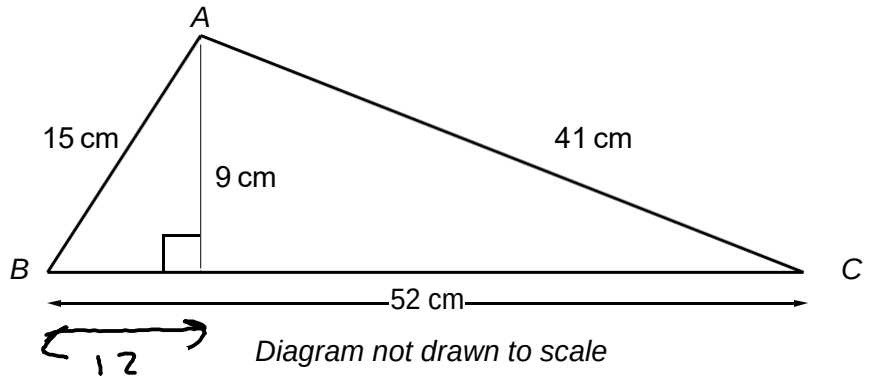



*Diagram not drawn to scale*

Work out the area of triangle *ABC*. [2]

$52 \times 9 \times 1/2 = 26 \times 9$

$= 20 \times 9 = 180$

$6 \times 9 = 54$

$234$

Area *ABC* = ..... 234 ..... $cm^2$

*(b)* This shape is made from two rectangles.

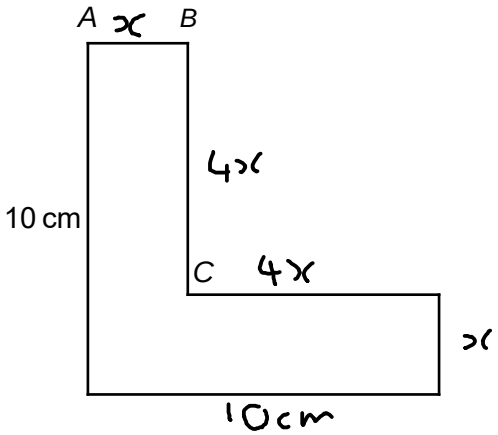



*Diagram not drawn to scale*

The shape has one line of symmetry.
The perimeter of the shape is 40 cm.
The length of *BC* is 4 times the length of *AB*.

Work out the length of *BC*. [3]

$40 = 10 + 10 + 4x + 4x + x + x$

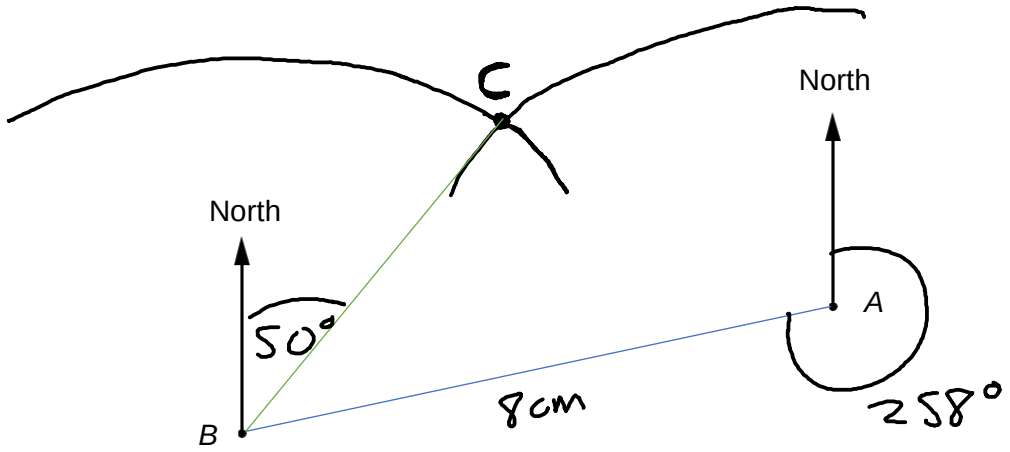
$20 = 10x \quad x = 2$

$BC = 4x = 4 \times 2 = 8$

8

*BC* = ..... cm

**5.** The diagram shows the position of two points, *A* and *B*.
The scale is 1 cm represents 1 km.




1 cm represents 1 km

*(a)* Measure and write down the bearing of *B* from *A*. [1]

8 cm = 8 km

B is 8 km from A on a bearing of 258°

*(b)* Point *C* is 5 km from *A* and 6 km from *B*.
The bearing of *C* from *B* is an acute angle.

Complete the diagram to find the position of point *C*. [3]

Set protractor to 6 cm from B and 5 cm from A and draw an arc. C can be where they intersect.

**6.**

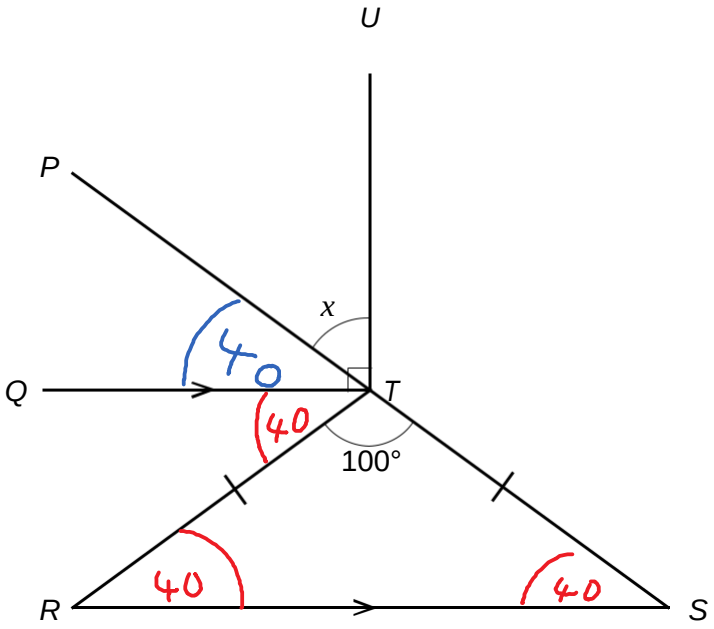



*Diagram not drawn to scale*

Show that $x = 50°$.

Give a reason for each step of your answer. [4]

TRS = 40° as angles in triangle add to 180°

180 − 100 = 80  80 ÷ 2 = 40 = TRS = TSR

RTQ = 40° as alternate angles are equal

PTQ = 40° as PS is straight line 180°

180 − (40 + 100) = 40°

UTP = x = 90 − 40 = 50°

**7.** *(a)* Calculate $\frac{3}{7} + \frac{7}{9}$.

Give your answer as a mixed number. [3]

Common denominator $7 \times 9 = 63$

$$\frac{3 \times 9}{63} + \frac{7 \times 7}{63} = \frac{27}{63} + \frac{49}{63} = \frac{76}{63} = 1\,\frac{13}{63}$$

*(b)* When a fraction is divided by 1/3 the answer is 6/7.

Find this fraction. [2]

$x$ is the fraction

$$x \div \frac{1}{3} = \frac{6}{7} \rightarrow x \times 3 = 6/7$$

$$x \times \frac{3}{1} = \frac{6}{7} \rightarrow x = \frac{2}{7}$$

**8.** *(a)* $120 = 2^3 \times 3^k \times 5$

Find the value of $k$. [1]

$120 = 8 \times 5 \times 3^k \rightarrow 120 = 40 \times 3^k$

$3 = 3^k \rightarrow k = 1$

*(b)* Write 168 as a product of its prime factors. [2]

168

2 | 84

2 | 42

2 | 21

7 | 3

$2 \times 2 \times 2 \times 7 \times 3 = 168$

$2^3 \times 7 \times 3 = 168$

*(c)* *LoWatts Ltd* makes light bulbs that are identical in size.

They have regular orders from *Company A* for 120 light bulbs and from *Company B* for 168 light bulbs.

*LoWatts Ltd* uses one size of box to supply both *Company A* and *Company B*.
Each box used contains the same number of light bulbs and is full.
The number of boxes used is as few as possible.

How many light bulbs does each box hold? [3]

we need HCF = Highest common factor

120

2 | 60

2 | 30

2 | 15

5 | 3

$120 = 2^3 \times 5 \times 3$

168

2 | 84

2 | 42

2 | 21

7 | 3

$168 = 2^3 \times 7 \times 3$

$2^3 \times 3 = 24$ in each box

**9.**

$$\mathbf{p} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

Work out the column vector $\frac{1}{2}\mathbf{P} - \mathbf{q}$. [2]

$\frac{1}{2}p = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ $\begin{pmatrix} 2 \\ 1 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$

$\frac{1}{2}\mathbf{p} - \mathbf{q} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$