

8300

## GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic

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Algebra

Substituting into formulae

v1.0

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Name \_\_\_\_\_

### Materials

For this paper you must have:

- Mathematical instruments

### Information

- The marks for questions are shown in brackets

### Advice

- In all calculations, show clearly how you work out your answer

For questions 1 to 5 you must **NOT** use a calculator.



**Q1.**

Here is a formula.

$$V = \frac{1}{2}x^2h$$

Work out the value of  $V$  when  $x = 10$  and  $h = 7$

**(Total 2 marks)**

**Q2.**

This formula converts temperature in degrees Fahrenheit ( $F$ ) to kelvin ( $K$ )

$$K = \frac{5}{9}(F - 32) + 273$$

A pottery oven is heated to 2192 degrees Fahrenheit.

Work out this temperature in kelvin.

**(Total 3 marks)**

**Substituting into formulae – questions 3 to 5 are Cross-topic questions**

**Q3.**

A window cleaner uses this formula.

$$C = 2W + 5$$

$C$  = cost, in £, for the customer

$W$  = number of windows to be cleaned

(a) How much does it cost for 6 windows to be cleaned?

**(2)**

(b) The cost for another customer was £24

Show why this cost **must** be incorrect.

**(1)**

**(Total 3 marks)**

**Q4.**

$$T = 5P - W$$

(a) Work out the value of  $T$  when  $P = 4$  and  $W = 2$

**(2)**

(b) Work out the value of  $P$  when  $T = -40$  and  $W = 10$

**(3)**

**(Total 5 marks)**

**Q5.**

A football team has  $P$  points.

$$P = 3W + D$$

$W$  is the number of wins

$D$  is the number of draws

- (a) A team has 6 wins and 2 draws.  
How many points does the team have?
- (b) After 33 games a different team has 53 points.  
11 games were draws.  
How many games has this team **lost**?

(1)

(4)

**(Total 5 marks)**

For the rest of the questions, you **may** use a calculator.



**Q6.**

$$d = g^2 - 2h$$

Work out the value of  $d$  when  $g = 15$  and  $h = 63$

**(Total 2 marks)**

### **Substituting into formulae – Cross-topic questions**

**Q7.**

To travel to a festival, a group of people will hire a minibus.

This formula has all costs in £

$$\text{Cost per person} = \frac{165 + \text{cost of the minibus}}{\text{number of people in the group}}$$

- (a) With 12 people in the group, the cost of the minibus will be £567  
Work out the cost per person.
- (b) With 15 people in the group, they will hire a different minibus.  
The cost per person will be £50  
Work out the cost of this minibus.

(2)

(3)

**(Total 5 marks)**

**Q8.**

This formula works out the tax you pay.

$$T = 0.2(E - 10\,600)$$

$T$  is the tax you pay in pounds.

$E$  is the amount you earn in pounds.

(a) How much tax do you pay if you earn £20 000?

(2)

(b) What is the most you can earn without paying tax?

(1)

(c) Alison pays £5200 tax.

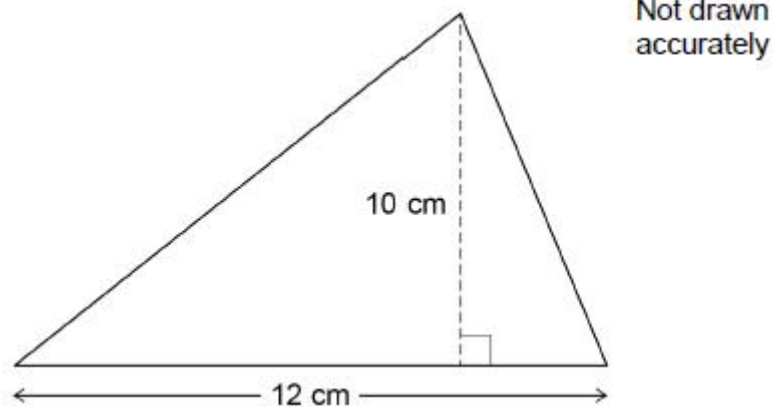
Work out the amount she earns.

(3)

**(Total 6 marks)**

**Q9.**

A force of 180 newtons (N) is applied to the surface of this triangle.



Work out the pressure.

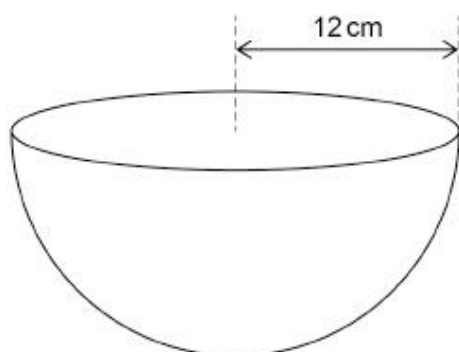
Use  $\text{pressure} = \frac{\text{force}}{\text{area}}$

**(Total 3 marks)**

Q10.

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

A bowl is a hemisphere with radius 12 cm



Not drawn  
accurately

Water is poured into the bowl  
at a rate of  $325 \text{ cm}^3$  per second  
for 8 seconds.

Does the water fill **more than** 70% of the bowl?

You **must** show your working.

(Total 4 marks)

Q11.

Here is a formula.

$$s = 5t^2$$

$s$  is the distance in metres a ball falls when dropped

$t$  is the time taken in seconds

- (a) A ball is dropped.  
1.2 seconds later it hits the floor.  
What distance does the ball fall?
- (b) A different ball is dropped from 2 metres above the floor.  
Work out the time taken for this ball to hit the floor.

(2)

(3)

Question 11(c) is **higher** tier only

- (c) Which of these statements is true for the second ball?  
Copy one statement

☐

It falls 2 metres in **exactly** double the time it falls the first metre.

☐

It falls 2 metres in **less than** double the time it falls the first metre.

☐

It falls 2 metres in **more than** double the time it falls the first metre.

You **must** show working to support your answer.

(3)

(Total 8 marks)