# Instructions

**Answers**

This means write down your answer or show your working and your answer.

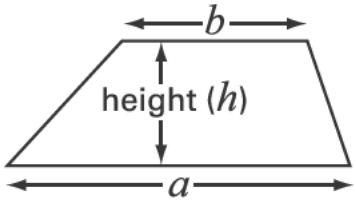
**Calculators**

You **must not** use a calculator in this test.

# Formulae

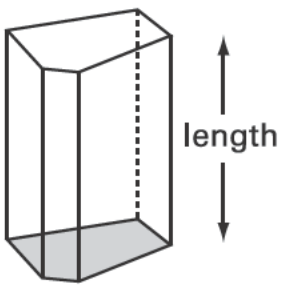
You might need to use these formulae.

**Trapezium**




$$\text{Area} = \frac{(a+b)}{2} \times h$$

**Prism**




Volume = area of cross-section × length

**1.** Write each expression in its simplest form.

$(3d + 5) + (d - 2)$

. . . . . .

1 mark

$3m - (-m)$

. . . . . .

1 mark

**2.** (a) Two numbers **multiply** together to make **–15**
They **add** together to make **2**

What are the two numbers?

. . . . . and . . . . . .

1 mark

(b) Two numbers **multiply** together to make **–15**,
but **add** together to make **–2**

What are the two numbers?

. . . . . and . . . . . .

1 mark

(c) Two numbers **multiply** together to make **8**,
but **add** together to make **–6**

What are the two numbers?

. . . . . and . . . . . .

1 mark

(d) The square of 5 is 25
The square of **another** number is also 25

What is that other number?

. . . . . .

1 mark

**3.** There are some cubes in a bag.
The cubes are either **red** (R) or **black** (B).

The teacher says:

> If you take a cube at random out of the bag, the probability that it will be **red** is $\frac{1}{5}$

(a) What is the probability that the cube will be black?

. . . . . .

1 mark

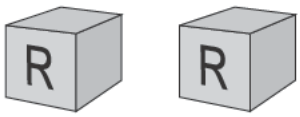
(b) A pupil takes one cube out of the bag.
It is red.


What is the **smallest** number of **black** cubes there could be in the bag?

. . . . . .

1 mark

(c) Then the pupil takes another cube out of the bag.
It is also red.




From this new information, what is the **smallest** number of **black** cubes there could be in the bag?

. . . . . .

1 mark

(d) A different bag has **blue** (B), **green** (G) and **yellow** (Y) cubes in it.
There is at least one of each of the three colours.

The teacher says:

> If you take a cube at random out of the bag, the probability that it will be **green** is $\frac{3}{5}$

There are **20** cubes in the bag.

What is the **greatest** number of yellow cubes there could be in the bag?

Show your working.

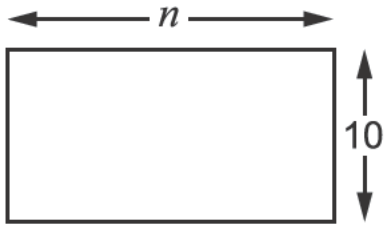
. . . .

. . . . . . . . . . . . .

2 marks

**4.** Jenny and Alan each have a rectangle made out of paper.

One side is 10cm.
The other side is $n$ cm.




(a) They write expressions for the **perimeter** of the rectangle.

Jenny writes $2n + 20$

Alan writes $2(n + 10)$

Tick (✓) the true statement below.

Jenny is correct and Alan is wrong. ☐

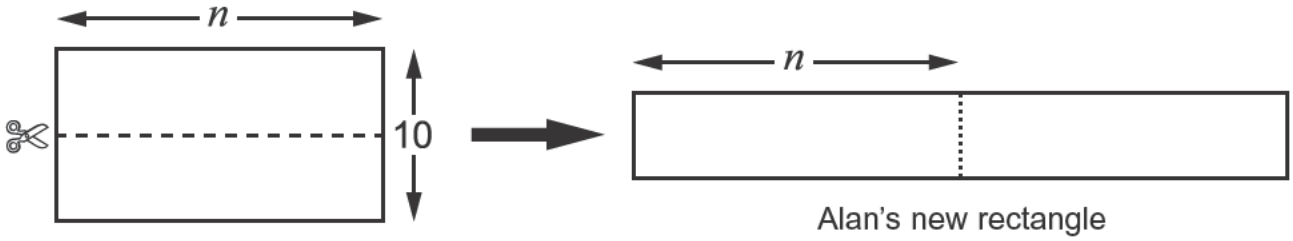
Jenny is wrong and Alan is correct. ☐

Both Jenny and Alan are correct. ☐

Both Jenny and Alan are wrong. ☐

1 mark

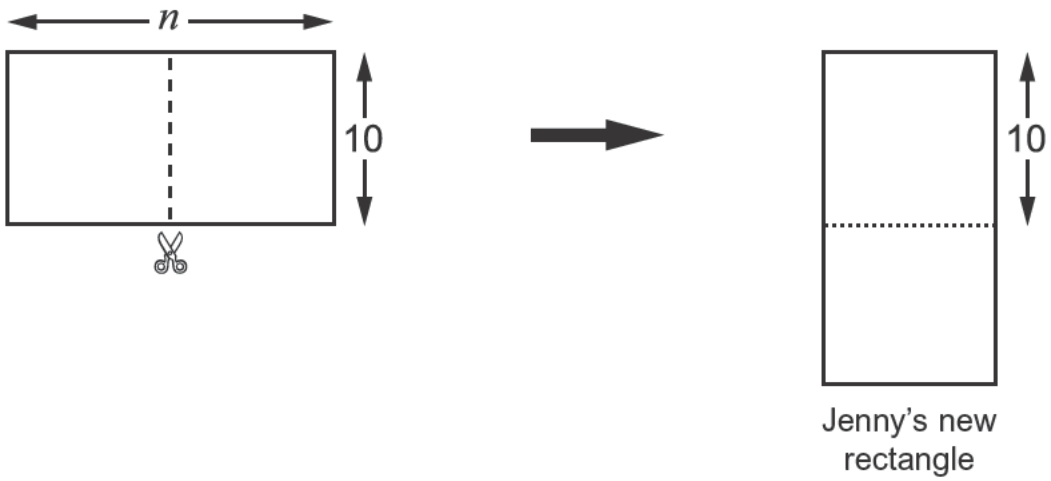
(b) Alan cuts his rectangle, then puts the two halves side by side.




What is the perimeter of Alan's new rectangle?
Write your expression as simply as possible.

2 marks

(c) Jenny cuts her rectangle a different way, and puts one half below the other.




What is the perimeter of Jenny's new rectangle?

Write your expression as simply as possible.

. . . .

. . . .

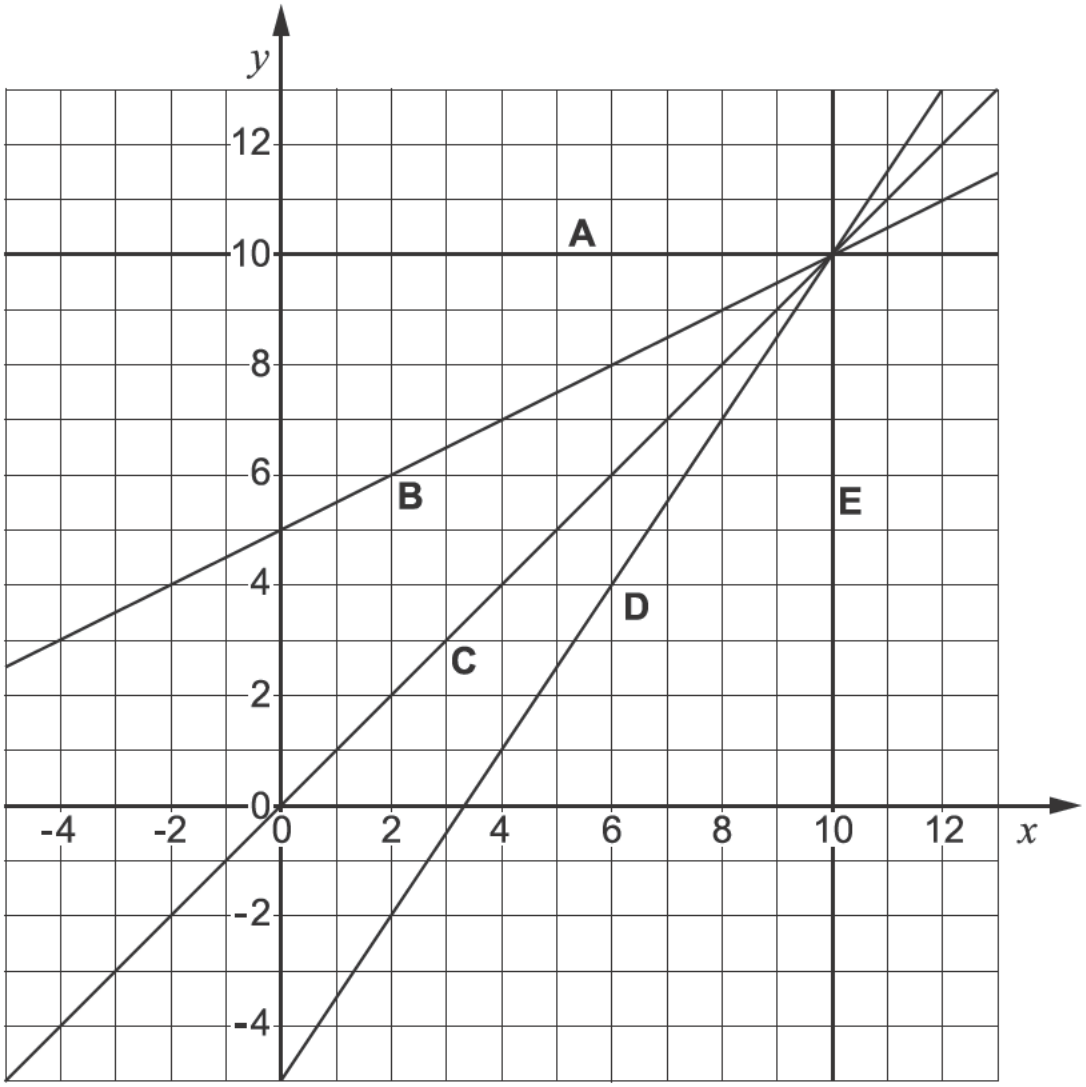
2 marks

(d) What value of $n$ would make the perimeter of Jenny's new rectangle the **same value** as the perimeter of Alan's new rectangle?

. . . .

1 mark

**5.** These straight line graphs all pass through the point ( 10, 10 )




(a) Fill in the gaps to show which line has which equation.

line . . . . . has equation $x = 10$

line . . . . . has equation $y = 10$

line . . . . . has equation $y = x$

line . . . . . has equation $y = \frac{3}{2}x - 5$

line . . . . . has equation $y = \frac{1}{2}x + 5$

2 marks

(b) Does the line that has the equation $y = 2x - 5$ pass through the point $(10, 10)$?

Explain how you know.

. . . .
1 mark

(c) I want a line with equation $y = mx + 9$ to pass through the point $(10, 10)$

What is the value of $m$?

$m =$ . . . . . . .

. . . .
1 mark

**6.** (a) Circle the **best** estimate of the answer to

$$72.34 \div 8.91$$

6 7 8 9 10 11

. . . .
1 mark

(b) Circle the **best** estimate of the answer to

$$32.7 \times 0.48$$

1.2 1.6 12 16 120 160

. . . .
1 mark

(c) Estimate the answer to $\dfrac{8.62 + 22.1}{5.23}$

Give your answer to **1 significant figure**.

. . . . . .

. . . .
1 mark

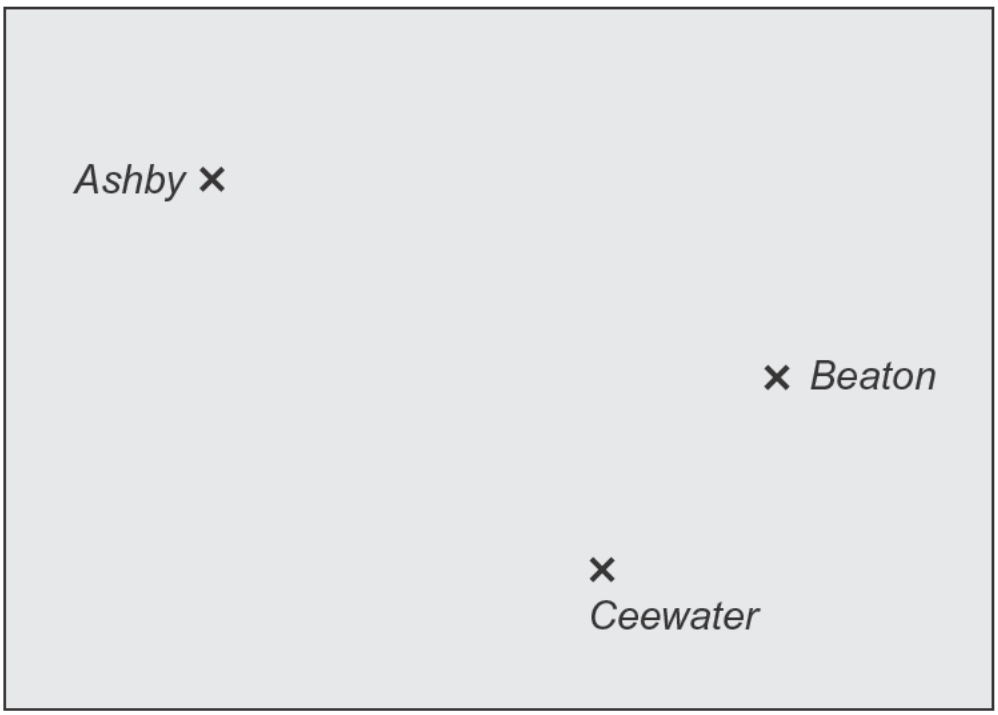
(d) **Estimate** the answer to $\dfrac{28.6 \times 24.4}{5.67 \times 4.02}$

. . . . . .

. . . .
1 mark

**7.** The plan shows the position of three towns, each marked with a ×

The scale of the plan is **1 cm to 10 km**.




The towns need a new radio mast.

The new radio mast must be:

nearer to Ashby than Ceewater, and
less than 45 km from Beaton.

Show on the plan the region where the new radio mast can be placed.

Leave in your construction lines.

. . . .

. . . .

. . . .

3 marks

**8.** (a) Two of the expressions below are **equivalent**.

Circle them.

$5(2y + 4)$ $5(2y + 20)$ $7(y + 9)$

$10(y + 9)$ $2(5y + 10)$

. . . .
1 mark

(b) One of the expressions below is **not** a correct factorisation of $12y + 24$

Which one is it? Put a cross (✘) through it.

$12(y + 2)$ $3(4y + 8)$ $2(6y + 12)$

$12(y + 24)$ $6(2y + 4)$

. . . .
1 mark

(c) Factorise this expression.

$7y + 14$ . . . . . .

. . . .
1 mark

(d) Factorise this expression as fully as possible.

$6y^3 - 2y^2$ . . . . . .

. . . .

. . . .
2 marks

**9.** Look at these number cards.


(a) Choose two of the cards to give the **lowest possible answer**.
Fill in the cards below and work out the answer.

☐ × ☐ = . . . . . . . . . . . . . . . . . . . . .

2 marks

(b) Choose two of the cards to give the answer **100**

☐ ÷ ☐ = 100 . . . . .

1 mark

**10.** (a) Look at these cards.

You can see two of the expressions. The third is hidden.

| | | |
|---|---|---|
| $3x - 10$ | $3x$ | ? |

The **mean** value of the expressions is $3x$

What is the hidden expression?

. . . .

1 mark

(b) Write a set of three expressions that has a mean value of $4x$

| | | |
|---|---|---|
| | | |

. . . .

1 mark

(c) What is the mean value of these three expressions?

| | | |
|---|---|---|
| $2x + 3$ | $5x - 9$ | $5x + 12$ |

Show your working.

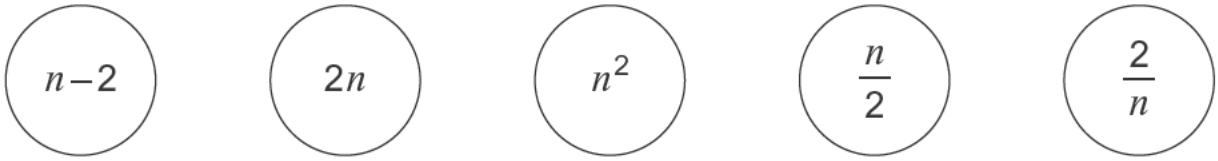
Write your expression as simply as possible.

. . . .

. . . .

2 marks

**11.** Look at these expressions.




(a) Which expression gives the greatest value when $n$ is **between 1 and 2**?

. . . .
1 mark

(b) Which expression gives the greatest value when $n$ is **between 0 and 1**?

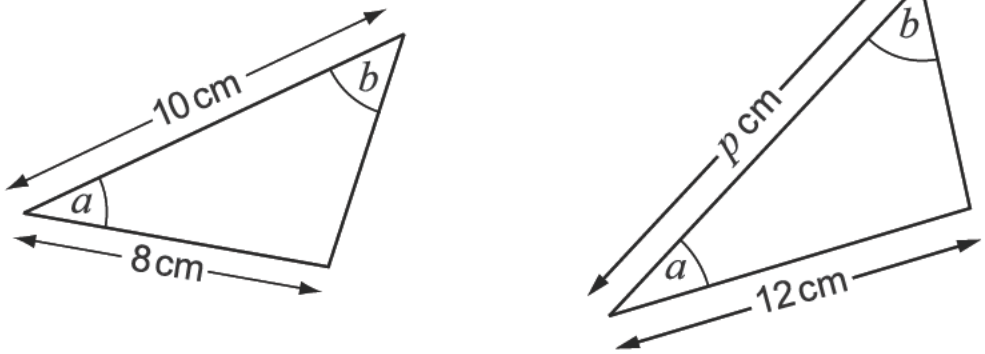
. . . .
1 mark

(c) Which expression gives the greatest value when $n$ is **negative**?

. . . .
1 mark

**12.** (a) The triangles below are **similar**.

Not drawn accurately




What is the value of $p$?

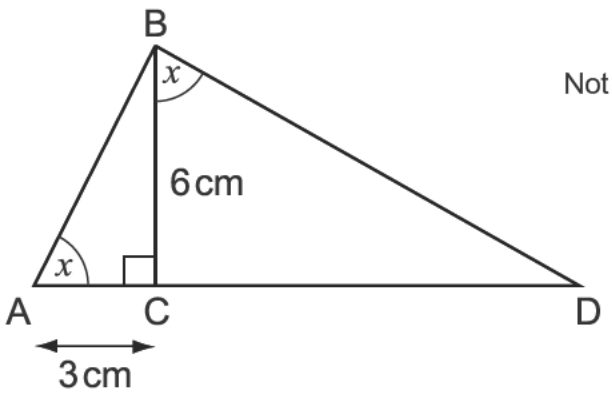
Show your working.

. . . .

. . . . . cm . . . .

2 marks

(b) Triangles ABC and BDC are similar.



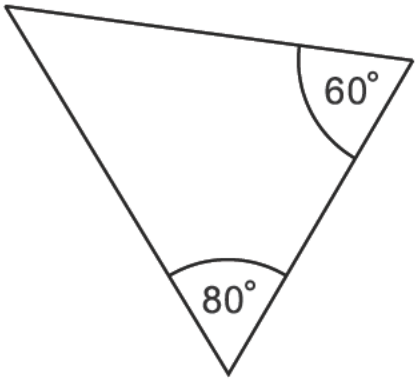

Not drawn accurately

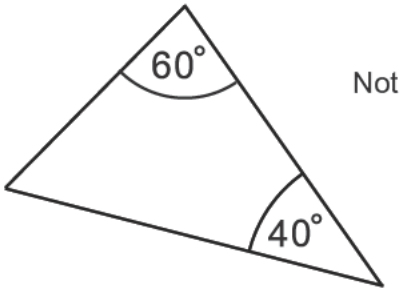
What is the length of CD?

. . . . . cm . . . .

1 mark

(c) Look at the triangles below.




Not drawn accurately

Are they similar?

Show working to explain how you know.

1 mark

**13.** Look at the table.

| | | |
|---|---|---|
| $7^0$ | = | 1 |
| $7^1$ | = | 7 |
| $7^2$ | = | 49 |
| $7^3$ | = | 343 |
| $7^4$ | = | 2401 |
| $7^5$ | = | 16807 |
| $7^6$ | = | 117649 |
| $7^7$ | = | 823543 |
| $7^8$ | = | 5764801 |

(a) Explain how the table shows that $49 \times 343 = 16807$

. . . .

1 mark

(b) Use the table to help you work out the value of $\frac{5764801}{823543}$

. . . . . .

. . . .

1 mark

(c) Use the table to help you work out the value of $\frac{117649}{2401}$

. . . . . .

1 mark

(d) The units digit of $7^6$ is 9

What is the units digit of $7^{12}$?

. . . . . .

1 mark

**14.** (a) Explain how you know that $(y + 3)^2$ is not equal to $y^2 + 9$

. . . .

1 mark

(b) Multiply out and simplify these expressions.

$(y + 2)(y + 5)$

. . . .

1 mark

$(y – 6)(y – 6)$

. . . .

. . . .

2 marks

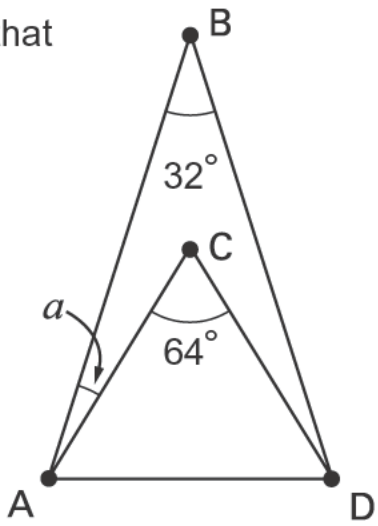
$(3y – 8)(2y + 5)$

. . . .

. . . .

2 marks

**15.** Two isosceles triangles have the same base, AD, so that AB = DB and AC = DC

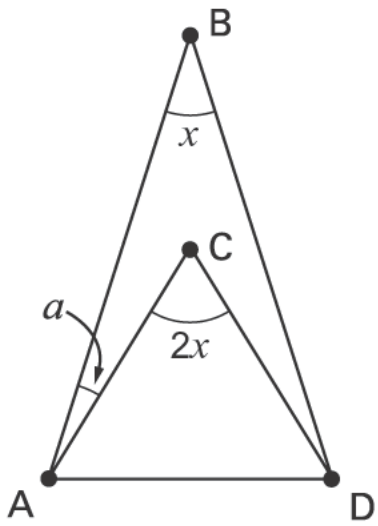



(a) Show, by calculating, that angle $a$ is $16^\circ$

. . . .
1 mark

(b) Other pairs of isosceles triangles can be drawn from the same base, AD
Angle ACD is twice the size of angle ABD

Call these angles $2x$ and $x$




Prove that angle $a$ is always half of angle $x$

. . . .

. . . .
2 marks