Mathematics test

Paper 2
Calculator allowed

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below. If you have been given a pupil number, write that also.

First name _____

Last name _____

School _____

Pupil number

Remember

- The test is 1 hour long.
- You may use a calculator for any question in this test.
- You will need: pen, pencil, rubber, ruler and a scientific or graphic calculator.
- Some formulae you might need are on page 2.
- This test starts with easier questions.
- Try to answer all the questions.
- Write all your answers and working on the test paper – do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marker's use only	Total marks	
	Borderline check	

Instructions

Answers

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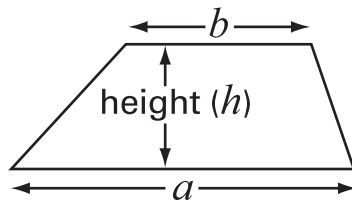
Calculators

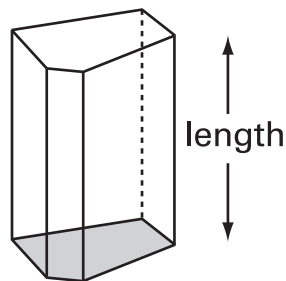You **may** use a calculator to answer any question in this test.

Formulae
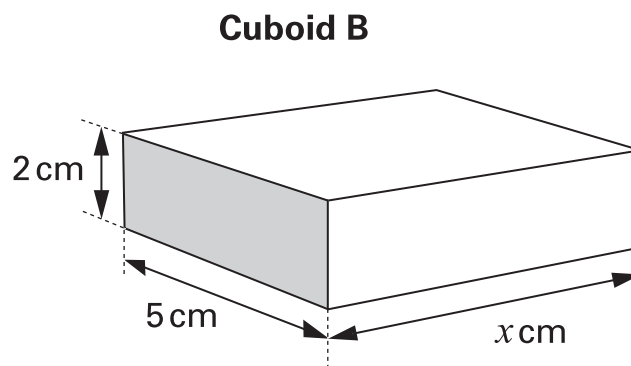## You might need to use these formulae

Trapezium

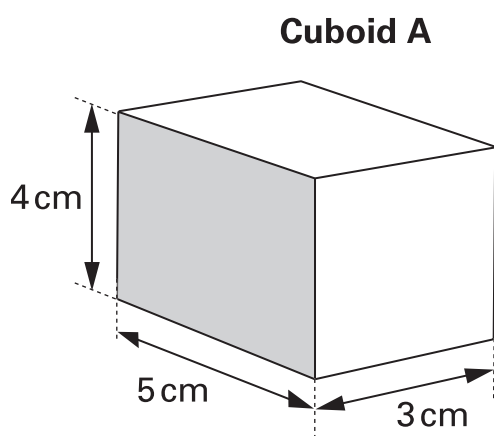$$\text{Area} = \frac{1}{2}(a + b)h$$

Prism

Volume = area of cross-section × length

1. The drawing shows 2 cuboids that have the **same volume**.

Cuboid A

4 cm

5 cm

3 cm

Cuboid B

2 cm

5 cm

x cm

Not drawn accurately

(a) What is the volume of cuboid A?

Remember to state your units.

1 mark

. . . .

1 mark

(b) Work out the value of the length marked x
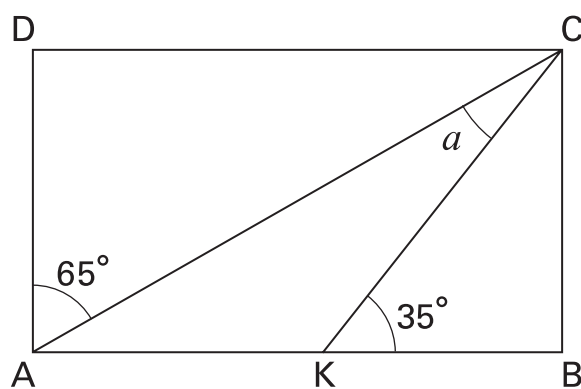
. . . . cm

1 mark

2. The diagram shows a rectangle.

Not drawn accurately

Work out the size of angle a

You **must** show your working.

$a = \ldots\ldots\ldots\ldots°$

3 marks

3. A company sells and processes films of two different sizes.

The tables show how much the company charges.

Film size: **24** photos	
Cost to **buy** each film	£2.15
Postage	free
Cost to **print** each film	£0.99
Postage for each film	60p

Film size: **36** photos	
Cost to **buy** each film	£2.65
Postage	free
Cost to **print** each film	£2.89
Postage for each film	60p

I want to take **360** photos.

I need to buy the film, pay for the film to be printed,
and pay for the postage.

Is it cheaper to use all films of size 24 photos, or all films of size 36 photos?

How much cheaper is it? Show your working.

Use film size: …….. photos

How much cheaper   £

4 marks

4. Look at the equations.

$$3a + 6b = 24$$

$$2c - d = 3$$

(a) Use the equations to work out the value of the expressions below.

The first one is done for you.

$$8c - 4d = \quad \underline{12}$$

$$a + 2b = \quad \dots\dots$$

1 mark

$$d - 2c = \quad \dots\dots$$

1 mark

(b) Use one or both of the equations to write an expression that has a value of **21**

$$\dots\dots\dots\dots\dots = \quad 21$$

1 mark

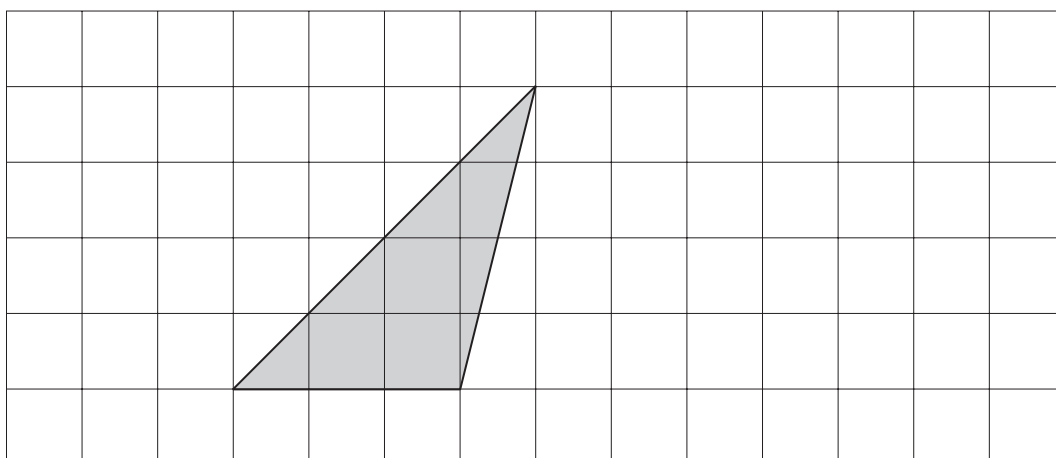**5.**   The shapes in this question are drawn on square grids.
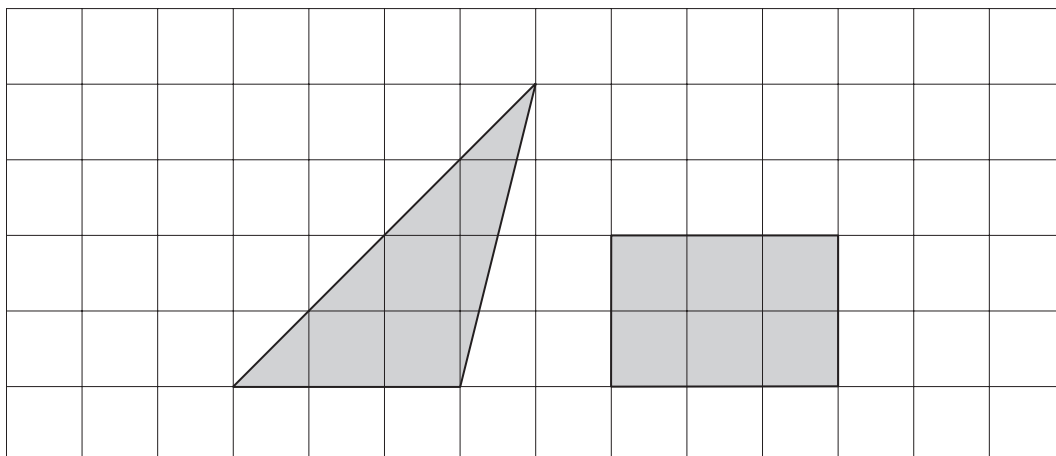
(a) Show that the triangle and the rectangle have the **same area**.
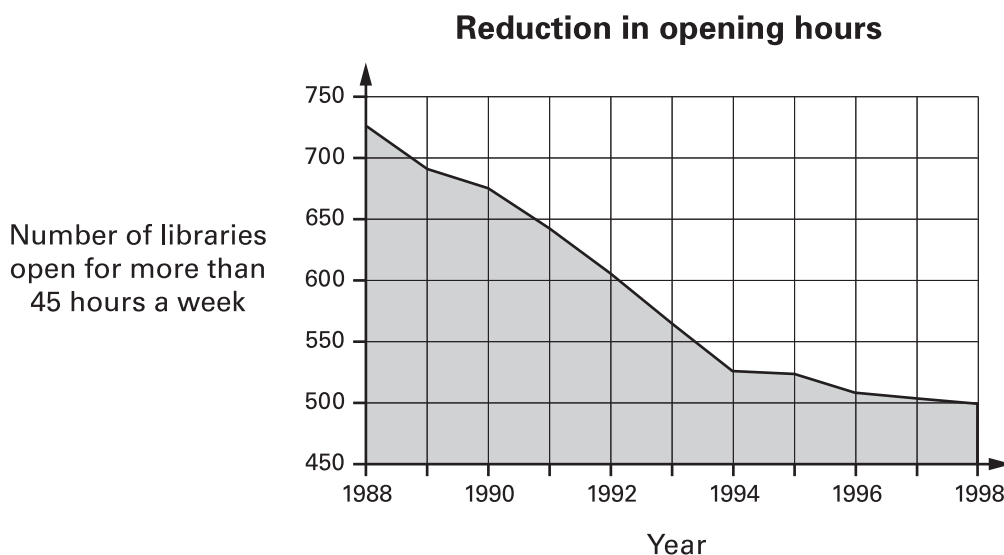
1 mark

(b) On the grid below, draw a **parallelogram** that has the same area
     as the triangle. It must **not** have any right angles.

1 mark

6.   A newspaper wrote an article about public libraries in England and Wales.
It published this diagram.

Reduction in opening hours

Number of libraries
open for more than
45 hours a week

Year

Use the diagram to decide whether each statement below is true or false,
or whether you cannot be certain.

(a) The number of libraries open for more than 45 hours per week
fell by more than half from 1988 to 1998.

☐ True   ☐ False   ☐ Cannot be certain

Explain your answer.

(b) **In 2004** there will be **about 450 libraries** open in England and Wales
for more than 45 hours a week.

☐ True   ☐ False   ☐ Cannot be certain

Explain your answer.
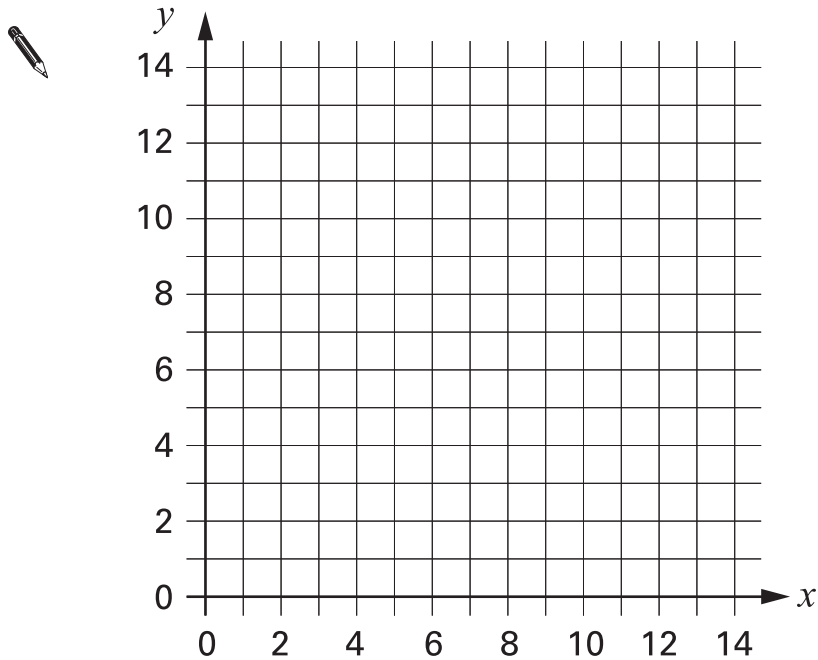
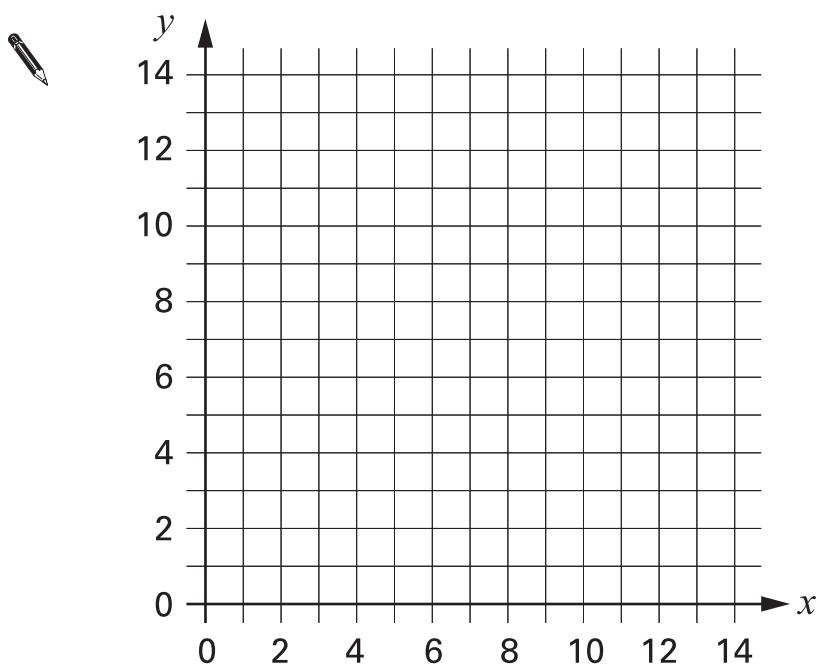**7.** (a) Each point on the straight line $x + y = 12$ has an x coordinate and a y coordinate that **add together** to make **12**

Draw the straight line $x + y = 12$

1 mark

(b) Plot on the grid below at least 6 points whose x coordinate and y coordinate **multiply together** to make 12

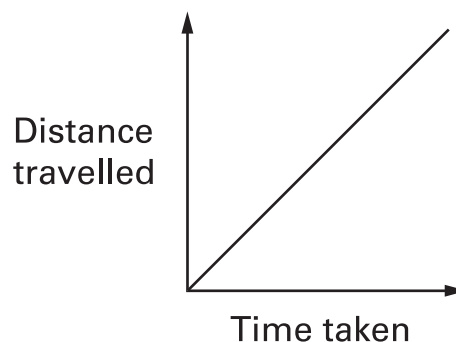Then draw the part of the curve $xy = 12$ that you would see on the grid below.

2 marks

8.   I went for a walk.

The distance–time graph shows information about my walk.

Distance travelled

Time taken

Tick (✓) the statement below that describes my walk.

I was walking faster and faster. ☐

I was walking slower and slower. ☐

I was walking north-east. ☐

I was walking at a steady speed. ☐

1 mark

I was walking uphill. ☐

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9. (a) From 5th May 2000 to 5th May 2001 a swimming club had the same members.

Complete the table to show information about the ages of these members.

Ages of members	
Mean (5th May 2000)	24 years 3 months
Range (5th May 2000)	4 years 8 months
Mean (5th May 2001)	
Range (5th May 2001)	

1 mark

(b) The table below shows information about members of a different club.

Ages of members	
Mean	17 years 5 months
Range	2 years 0 months

A new member, aged **18 years 5 months**, is going to join the club.

What will happen to the **mean** age of the members?

Tick (✓) the correct statement below.

It will increase by more than 1 year. ☐

It will increase by exactly 1 year. ☐

It will increase by less than 1 year. ☐

It will stay the same. ☐

It is not possible to tell. ☐

What will happen to the **range** of ages of the members?

It will increase by more than 1 year. ☐

It will increase by exactly 1 year. ☐

It will increase by less than 1 year. ☐
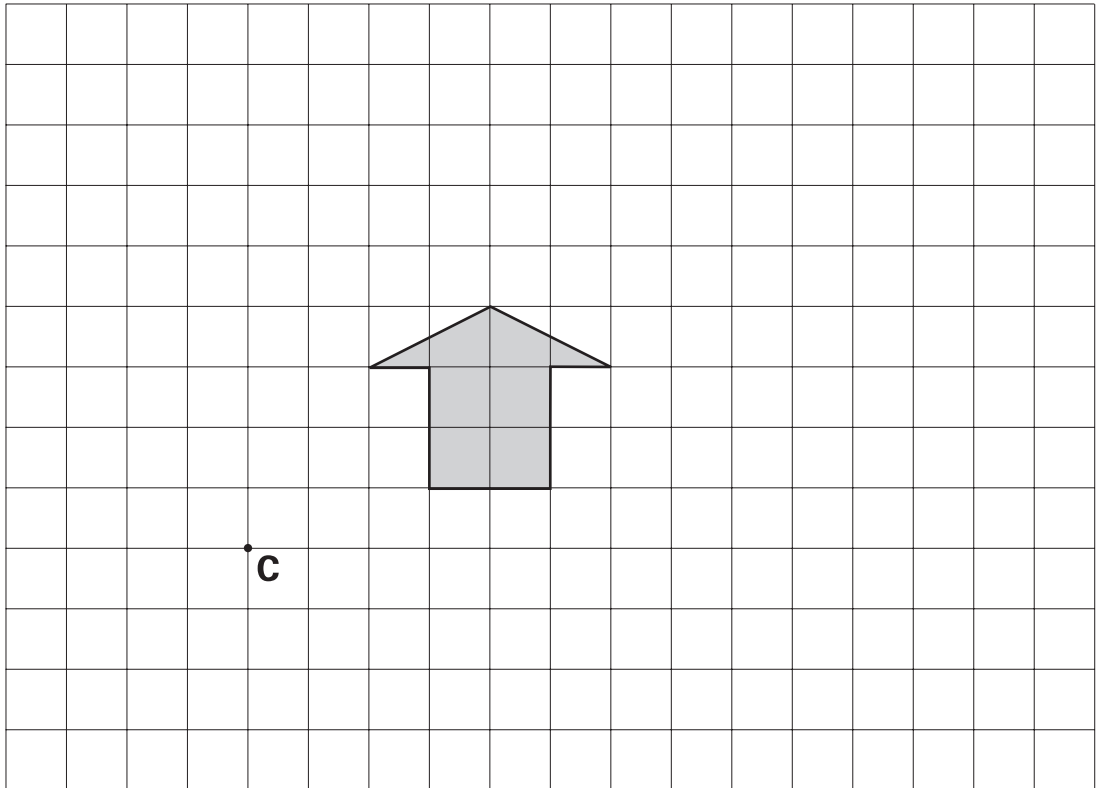
It will stay the same. ☐

It is not possible to tell. ☐

10. (a) The grid shows an arrow.

On the grid, draw an **enlargement** of **scale factor 2** of the arrow.
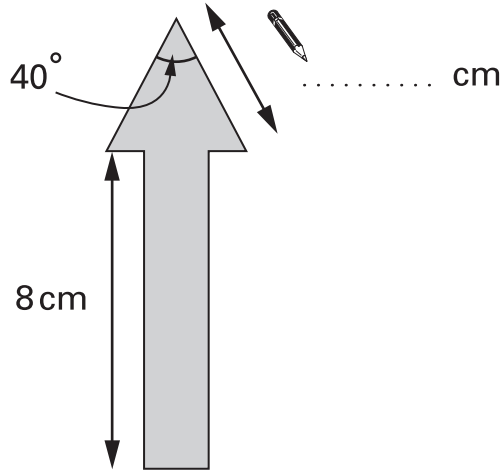
Use **point C** as the centre of enlargement.

2 marks

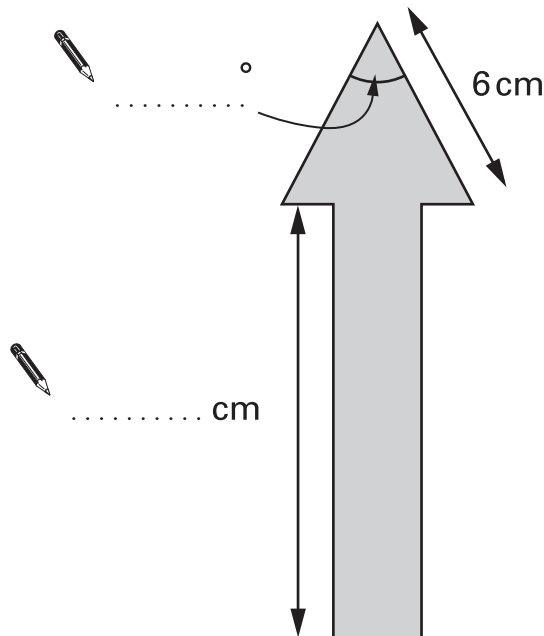(b) The sketch below shows two arrows.

The bigger arrow is an **enlargement** of **scale factor 1.5** of the smaller arrow.

Write down the **three** missing values.

40°

.... cm

8 cm

Not drawn accurately

°

....

6 cm

.... cm

11.   A box contains cards with one question on each card.

There are 4 categories of questions.

Each category has some easy and some difficult questions.

The table shows the probability of selecting a card at random from the box.

Category	Easy	Difficult
Music	0.2	0.15
Sport	0.2	0.1
History	0.1	0.05
Nature	0.15	0.05

(a) I am going to take one card at random from the box.

What is the probability that it will be

a **history** question?

. . . .

1 mark

an **easy** question?

. . . .

1 mark

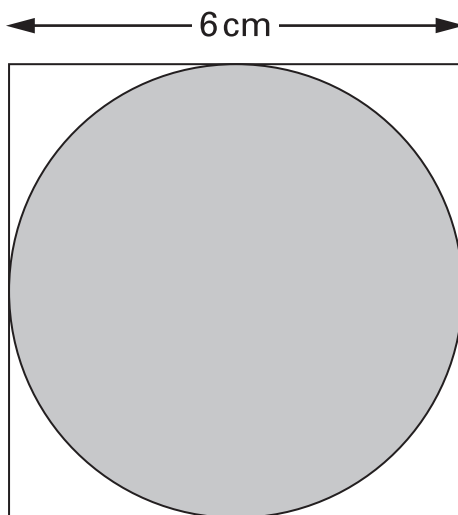(b) There are **40** cards in the box.

How many of these are **music** questions?

. . . .

1 mark

12.   The diagram shows a square and a circle.

The circle touches the edges of the square.
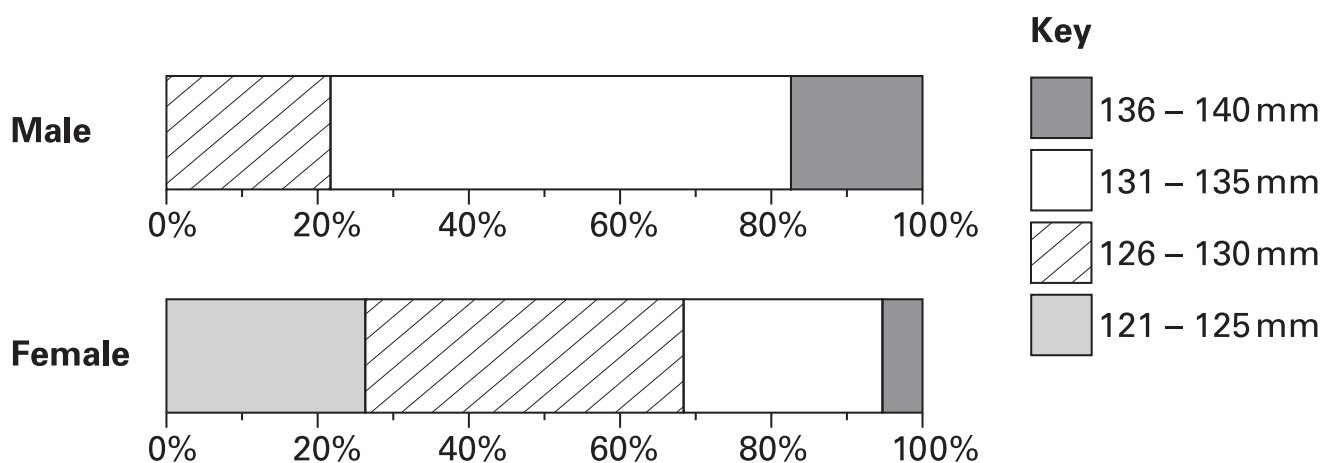

What **percentage** of the diagram is shaded?

Show your working.

. . . . %

13. The percentage charts show information about the wing length of adult blackbirds, measured to the nearest millimetre.

Key

▓	136 – 140 mm
☐	131 – 135 mm
▨	126 – 130 mm
▨	121 – 125 mm

Male

0%   20%   40%   60%   80%   100%

Female

0%   20%   40%   60%   80%   100%

(a) Use the data to decide whether these statements are true or false, or whether there is not enough information to tell.

> The smallest male's wing length is larger than the smallest female's wing length.

☐ True   ☐ False   ☐ Not enough information

Explain your answer.

1 mark

> The biggest male's wing length is larger than the biggest female's wing length.

☐ True   ☐ False   ☐ Not enough information

Explain your answer.

1 mark

(b) Calculate an estimate of the **mean** wing length of the **male** blackbirds.

You **must** show your working.

.... mm

. . . .

. . . .

3 marks

14. (a) One calculation below gives the answer to the question

What is 70 increased by 9%?

Tick (✓) the correct one.

| 70 × 0.9 | 70 × 1.9 | 70 × 0.09 | 70 × 1.09 |

1 mark

Choose one of the other calculations.

Write a question **about percentages** that this calculation represents.

calculation chosen: ………………

question it represents: …………………………………………………

1 mark

Now do the same for one of the remaining two calculations.

calculation chosen: ………………

question it represents: …………………………………………………

1 mark

(b) Fill in the missing decimal number.

To decrease by 14%, multiply by ……………

1 mark

(c) A **10% increase** followed by **another 10% increase**
is **not** the same as a total increase of **20%**.

What is the total percentage increase?

Show your working.

.... %

15. The star nearest the Earth (other than the Sun) is Proxima Centauri.

Proxima Centauri is **4.22** light-years away.

(One light-year is 9.46×10^{12} kilometres.)

Suppose a spaceship could travel at **40 000 km per hour**.

(a) Write what the following calculations represent.

The first one is done for you.

$4.22 \times 9.46 \times 10^{12}$ Number of km from Earth to Proxima Centauri
....

$\dfrac{4.22 \times 9.46 \times 10^{12}}{40\,000}$

....

....

1 mark

$\dfrac{4.22 \times 9.46 \times 10^{12}}{40\,000 \times 24 \times 365.25}$

....

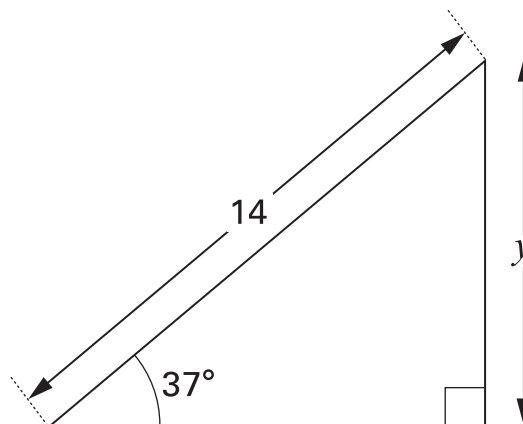...

1 mark

(b) Work out $\dfrac{4.22 \times 9.46 \times 10^{12}}{40\,000 \times 24 \times 365.25}$

Give your answer to the nearest thousand.

....

1 mark

16. (a) Calculate the value of y

Show your working.

Not drawn accurately

14

y

37°

y = ...

. . . .
2 marks

(b) Calculate the value of angle m
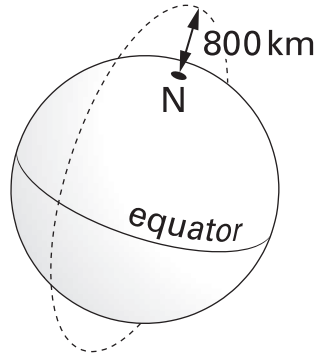
Show your working.

Not drawn accurately

14

m

6
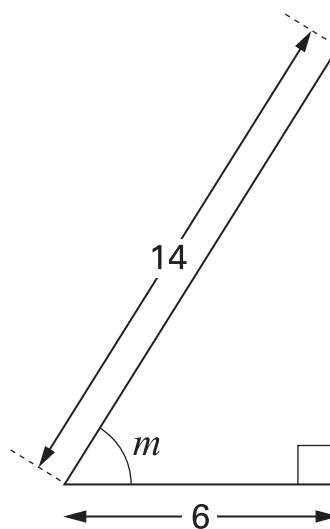
m = ...°

. . . .
2 marks

17. A satellite passes over both the north and south poles, and it travels **800 km above** the surface of the Earth.

800 km

N

equator

The satellite takes **100 minutes** to complete one orbit.

Assume the Earth is a sphere and that the diameter of the Earth is **12 800 km**.

Calculate the speed of the satellite, in **kilometres per hour**.

Show your working.

. . . .

. . . .

. . . . km/h

3 marks

18. (a) Show that $\dfrac{a^2 - b^2}{a - b}$ simplifies to $a + b$

(b) Simplify the expression $\dfrac{a^3 b^2}{a^2 b^2}$

(c) Simplify the expression $\dfrac{a^3 b^2 - a^2 b^3}{a^2 b^2}$

Show your working.

END OF TEST