Ma

KEY STAGE
3

TIER
6–8

2007

Mathematics test

Paper 1
Calculator **not** allowed

First name _____

Last name _____

School _____

Remember

- The test is 1 hour long.
- You **must not** use a calculator for any question in this test.
- You will need: pen, pencil, rubber, ruler and a pair of compasses.
- 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. Marks may be awarded for working.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

Instructions

Answers

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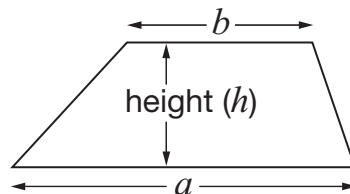
Calculators

You **must not** use a calculator to answer any question in this test.
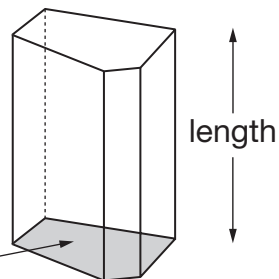
Formulae
You might need to use these formulae

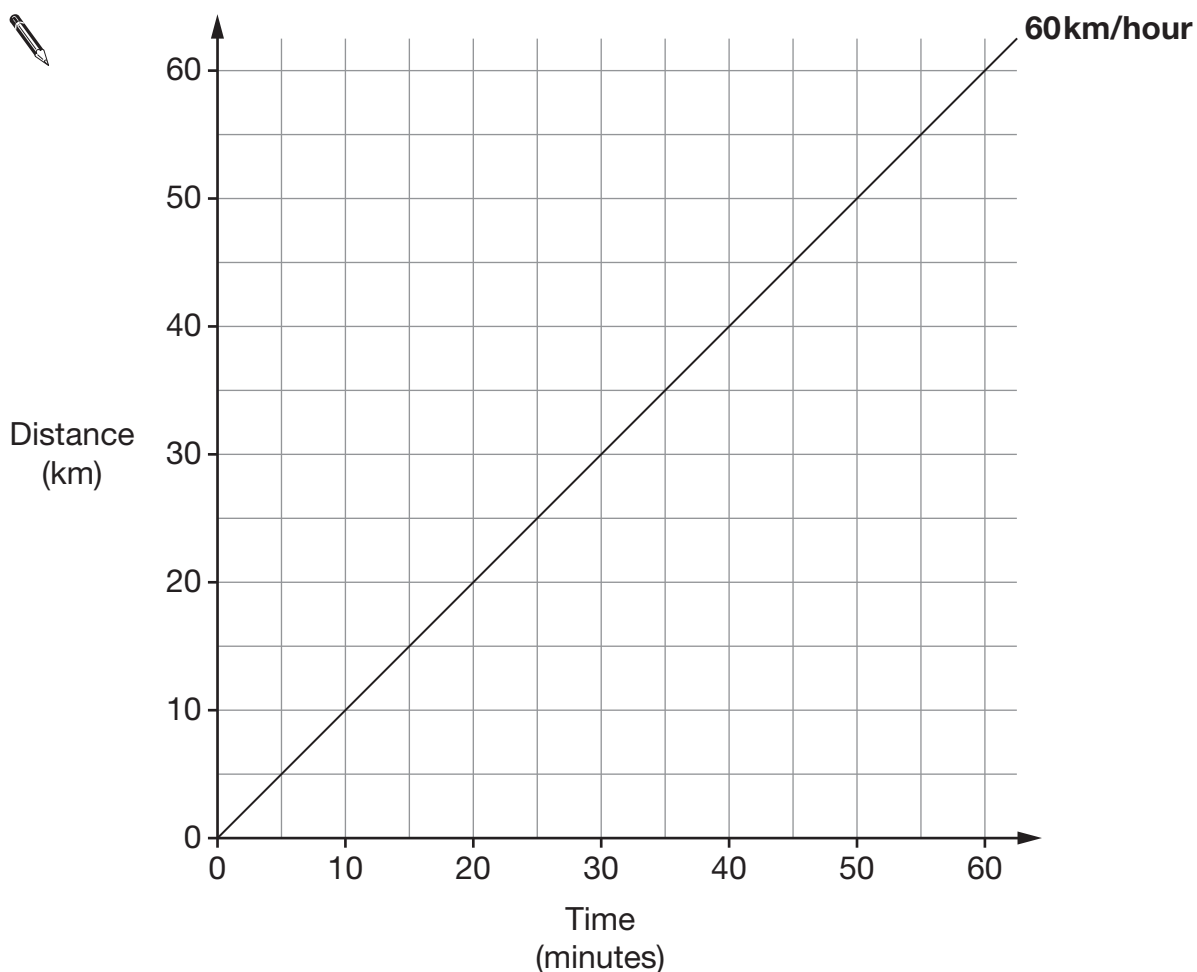**Trapezium**

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

Prism

Volume = area of cross-section × length

1. The line on the graph below represents a speed of 60 km/hour.

60 km/hour

Distance (km)

Time (minutes)

(a) Draw a line on the graph to represent a speed of **30 km/hour**.

Label the line by writing 30 km/hour.

1 mark

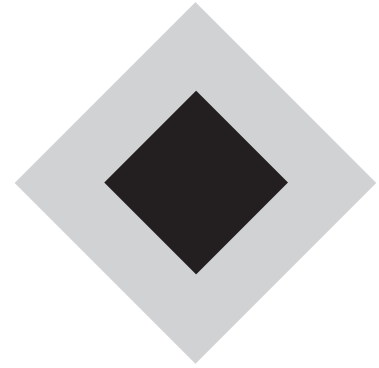(b) Now draw a line on the graph to represent a speed of **120 km/hour**.

Label the line by writing 120 km/hour.

1 mark

2. (a) In this design, the ratio of **grey to black** is **3 : 1**
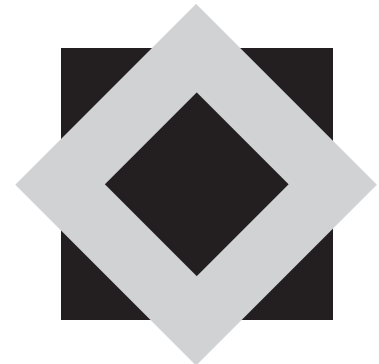
What **percentage** of the design is **black**?

_____ %

(b) In this design, **60%** is **grey** and the rest is black.

What is the ratio of **grey to black**?

Write your ratio in its simplest form.

_____ : _____

3. In a bag there are only red, blue and green counters.

(a) I am going to take a counter out of the bag at random.

Complete the table below.

Colour of counters	Number of counters	Probability
Red	6	
Blue		$\frac{1}{5}$
Green	6	

2 marks

(b) Before I take a counter out of the bag, I put **one extra blue** counter into the bag.

What effect does this have on the probability that I will take a **red** counter?
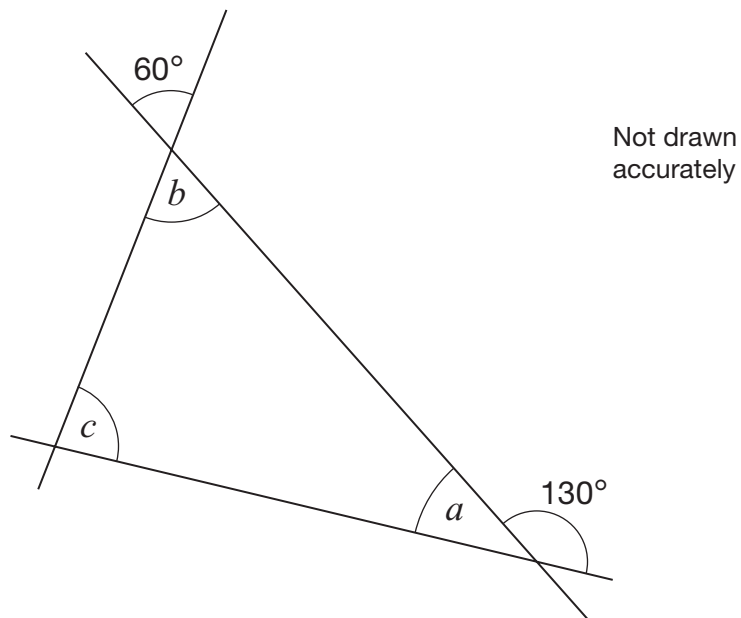
Tick (✓) the correct box.

☐ The probability has increased.

☐ The probability has decreased.

☐ The probability has stayed the same.

☐ It is impossible to tell.

1 mark

4.   The diagram shows three straight lines.

60°

b

Not drawn
accurately

c

a   130°

Work out the sizes of angles *a*, *b* and *c*

Give reasons for your answers.

a = _____ °   because _____

_____

_____

1 mark

b = _____ °   because _____

_____

_____

1 mark

c = _____ °   because _____

_____

_____

1 mark

5. (a) Some of the fractions below are **smaller than** $\frac{1}{9}$

Tick (✓) them.

☐ $\frac{1}{10}$ ☐ $\frac{4}{9}$ ☐ $\frac{1}{2}$ ☐ $\frac{1}{100}$ ☐ $\frac{1}{8}$

1 mark

(b) To the nearest per cent, what is $\frac{1}{9}$ **as a percentage**?

Tick (✓) the correct percentage.

☐ 0.9%   ☐ 9%   ☐ 10%   ☐ 11%   ☐ 19%

1 mark

(c) Complete the sentence below by writing a **fraction**.

$\frac{1}{9}$ is half of _____
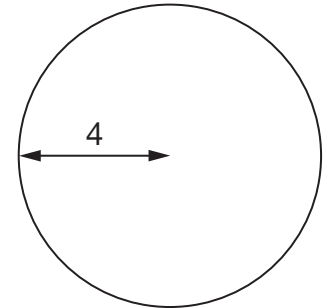
1 mark

6. Solve this equation.

$$2(2n + 5) = 12$$

$$n = \underline{\hspace{2cm}}$$

7. Kevin is working out the **area** of a circle with **radius 4**

He writes:

> Area = π × 8

Explain why Kevin's working is **wrong**.

8. Write the missing numbers in these fraction sums.

$$\frac{1}{4} + \frac{\boxed{}}{8} = 1$$

$$\frac{1}{3} + \frac{8}{\boxed{}} = 1$$

9. Look at the cube.

The area of a **face** of the cube is $9x^2$

Area = $9x^2$
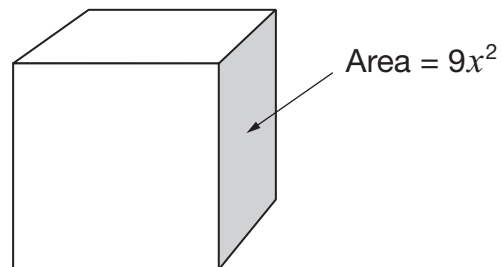
(a) Write an expression for the **total surface area** of the cube.

Write your answer as simply as possible.

(b) Write an expression for the **volume** of the cube.

Write your answer as simply as possible.

10. Chris read the first 55 numbers from a book of random numbers.

As he read each number he recorded it in the diagram below.

0	5	9	9	8	3	4	1	
1	6	3	1	0	3			
2	8	2						
3	1	1	6	9	3			
4	6	9	9	4	7	0		
5	5	7	7	6				
6	0	2	8	4	8	0	3	5
7	6	8	0	1	5	4		
8	6	6	9	2	8	5	7	
9	6	7	8	0	0			

Key

1 | 3   represents 13

(a) What was the **largest** number he recorded?

_____

(b) Explain how Chris could change the diagram to make it easier for him to find the **median** of his data set.

11. Here is the rule to find the **geometric mean** of two numbers.

> **Multiply** the two numbers together, then
>
> find the **square root** of the result.

Example: geometric mean of 4 and 9 $= \sqrt{4 \times 9}$

$$= \sqrt{36}$$

$$= 6$$

(a) For the two numbers **10** and x, the geometric mean is **30**

What is the value of x?

$x =$ _____

1 mark

(b) Reena says:

'For the two numbers **–2** and **8**, it is **impossible** to find the geometric mean.'

Is Reena correct?

☐ Yes   ☐ No

Explain your answer.

1 mark

12. (a) **Draw lines** to match each nth term rule to its number sequence.

nth term		Number sequence
$4n$		4, 7, 12, 19, …
$(n + 1)^2$		4, 8, 12, 16, …
$n^2 + 3$		4, 9, 16, 25, …
$n(n + 3)$		4, 10, 18, 28, …

2 marks

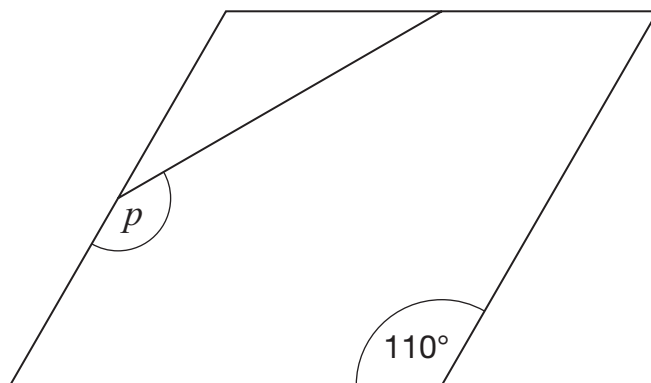(b) Write the **first four** terms of the number sequence using the nth term rule below.

$n^3 + 3$

_____, _____, _____, _____

2 marks

13. The diagram shows a **rhombus**.

The **midpoints** of two of its sides are joined with a straight line.

110°

p

Not drawn
accurately

What is the size of angle *p*?

$$p = \underline{\hspace{2cm}}^{\circ}$$

2 marks

14. A bag contains counters that are **red**, **black**, or **green**.

$\frac{1}{3}$ of the counters are **red**

$\frac{1}{6}$ of the counters are **black**

There are **15 green** counters in the bag.

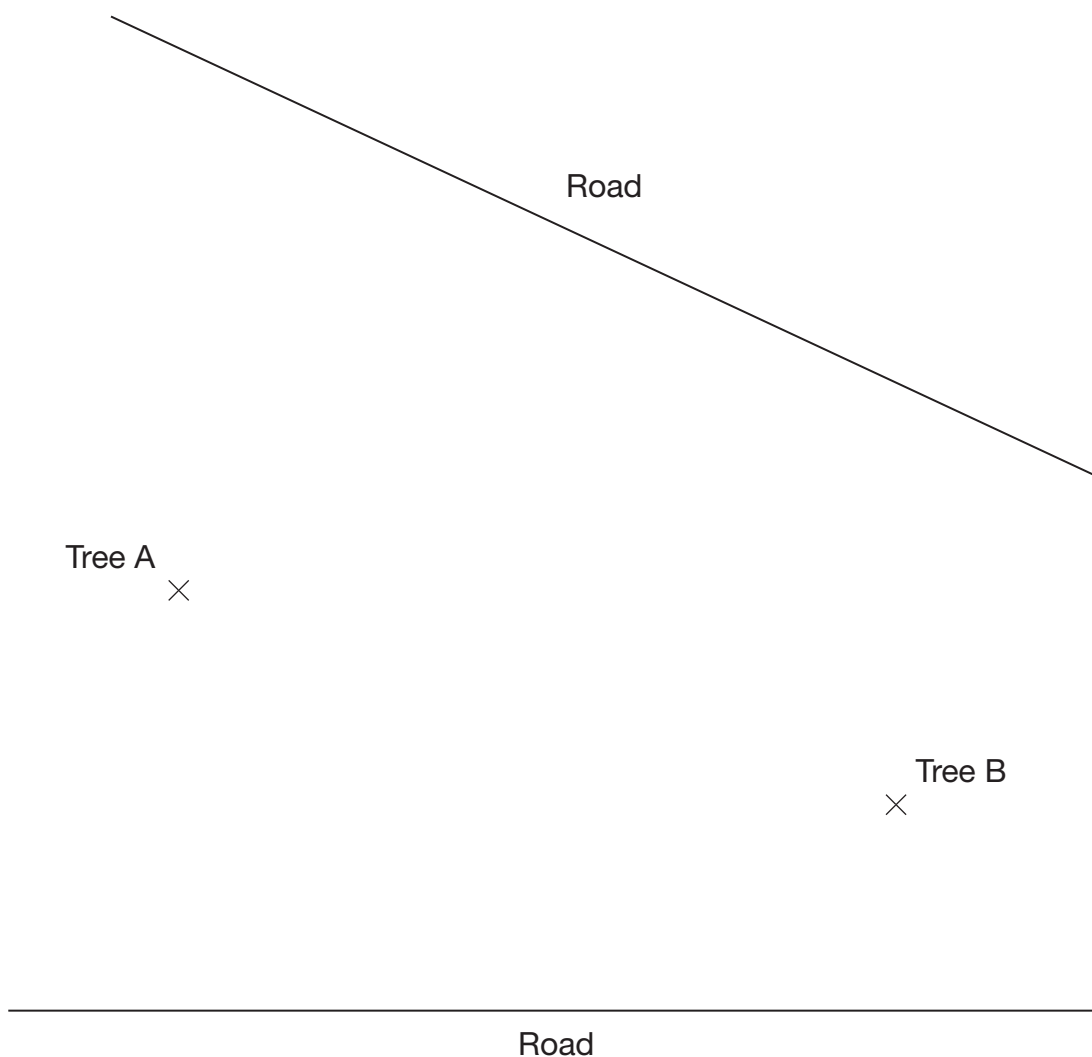How many **black** counters are in the bag?

2 marks

15.   Here is a plan of some land.

There will be a fence that is always the **same distance** from tree A as from tree B, going all the way from one road to the other road.

Use compasses and a straight edge to show accurately on the plan where the fence will go.

You **must** leave in your construction lines.

Road

Tree A
✕

Tree B
✕

Road

2 marks

16. Work out the values of m and n

$$5^8 \times 5^4 = 5^m$$

$m =$ _____

$$\frac{5^8}{5^4} = 5^n$$

$n =$ _____

17. A **square** of area **64cm^2** is cut to make two rectangles, A and B.

Area = 64 cm^2

A   B

Not drawn accurately
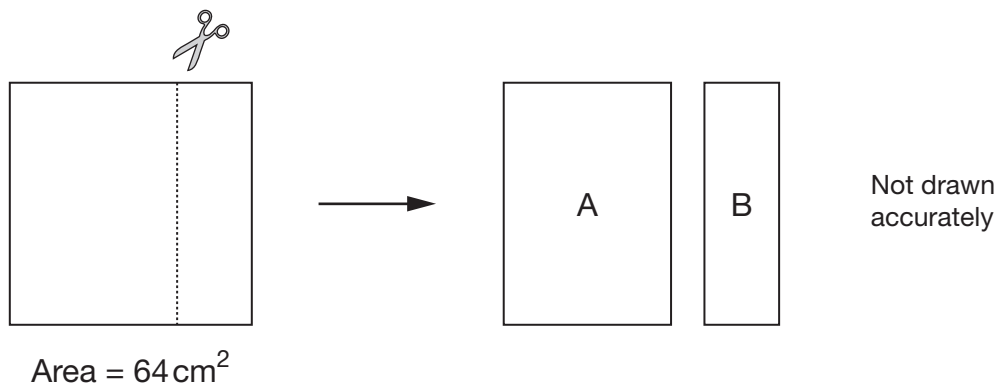
The ratio of **area A** to **area B** is **3 : 1**

Work out the dimensions of rectangles A and B.

Rectangle A: _____ cm by _____ cm

Rectangle B: _____ cm by _____ cm

2 marks

18. A teacher has some coins in his pocket.

He is going to take one of the coins at random.

He says:

> There are **more than four** coins in my pocket.
>
> The total value of the coins is **25p**.
>
> The probability that I will take a **1p** coin is $\dfrac{1}{4}$

List **all the coins** that must be in his pocket.

2 marks

19. For each equation below, when x **increases by 3**, what happens to y?

Complete the sentences.

$$y = x$$

When x increases by 3, y increases by _____

$$y = 2x$$

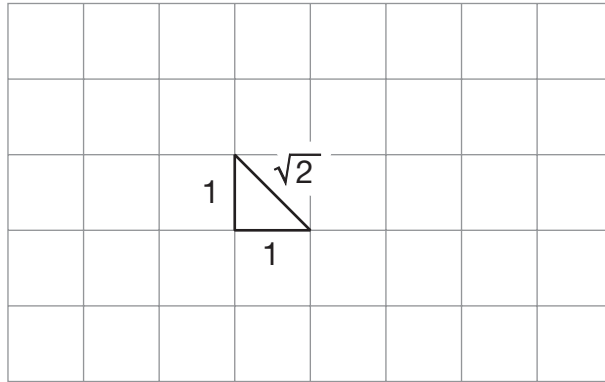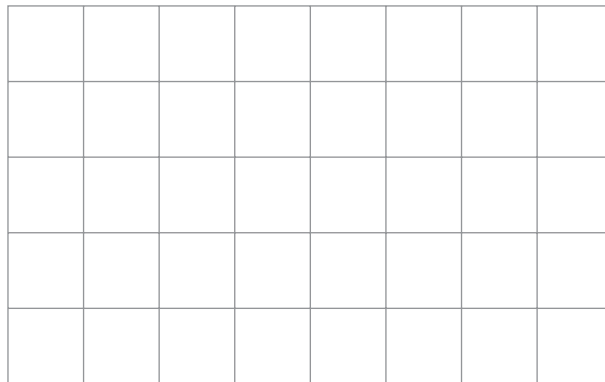When x increases by 3, y increases by _____

$$y = 3x + 1$$

When x increases by 3, y increases by _____

2 marks

20.   The perimeter of the triangle drawn on the square grid is $(2 + \sqrt{2})$ cm.

$\sqrt{2}$

1

1
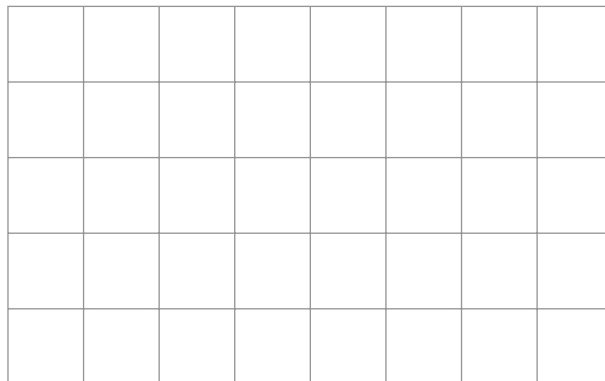
(a)   On the square grid below, draw a **triangle** with a perimeter of $3(2 + \sqrt{2})$ cm.

(b)   On the square grid below, draw a **shape** with a perimeter of $(2 + 3\sqrt{2})$ cm.

21. Look at this information.

$$y^2 = 10$$

Use the information to write numbers in the boxes below.

$$y^4 = \boxed{}$$

$$y^{\boxed{}} = 1000$$

22. (a) Is 3^{100} even or odd?

$\square$ Even $\square$ Odd

Explain your answer.

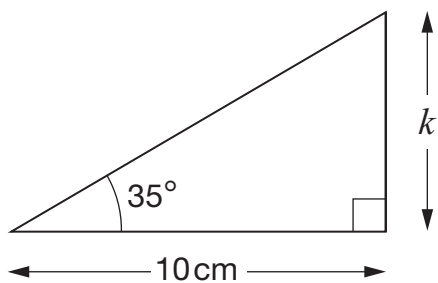(b) Tick (✓) the number below that is the same as $3^{100} \times 3^{100}$

$\square$ 3^{200} $\square$ 6^{100} $\square$ 9^{200} $\square$ $3^{10\,000}$ $\square$ $9^{10\,000}$

23. (a)   Use **tan35°** as **0.7** to work out length k

Not drawn
accurately

k

35°

10 cm

$k =$ _____ cm

(b)   Now use tan35° as 0.7 to work out the **area** of this isosceles triangle.

Not drawn
accurately

35°

20 cm
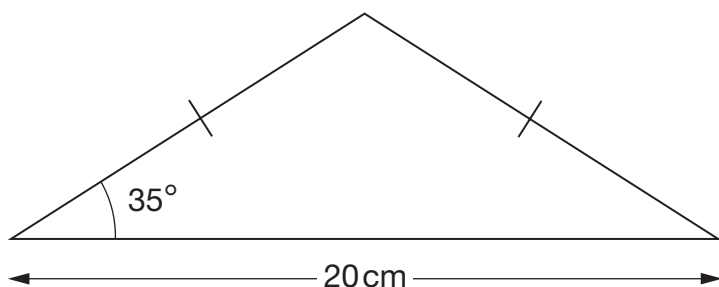
You **must** show your working.

Area = _____ cm^2
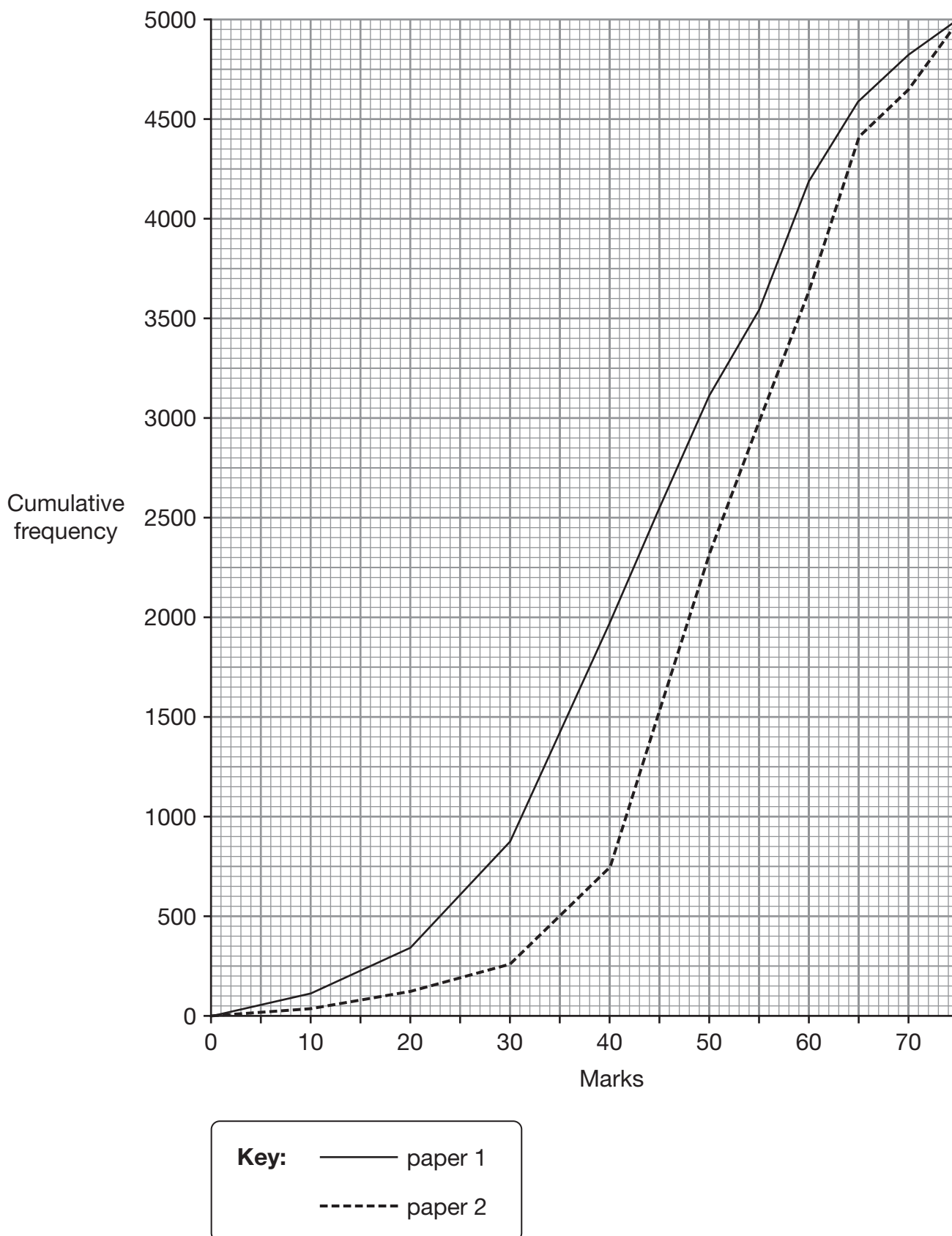
24. 5000 pupils took part in a test. Pupils took two papers, paper 1 and paper 2.

The graph shows the cumulative frequencies of their marks for each paper.

Use the graph to answer these questions.

For each question tick (✓) True, or False, or Not enough information.

(a)   The median mark for **paper 1** was about 38

☐ True   ☐ False   ☐ Not enough information

Explain your answer.

(b)   The inter-quartile range of the marks for **paper 1** was about 23

☐ True   ☐ False   ☐ Not enough information

Explain your answer.

(c)   Paper 1 was easier than paper 2.

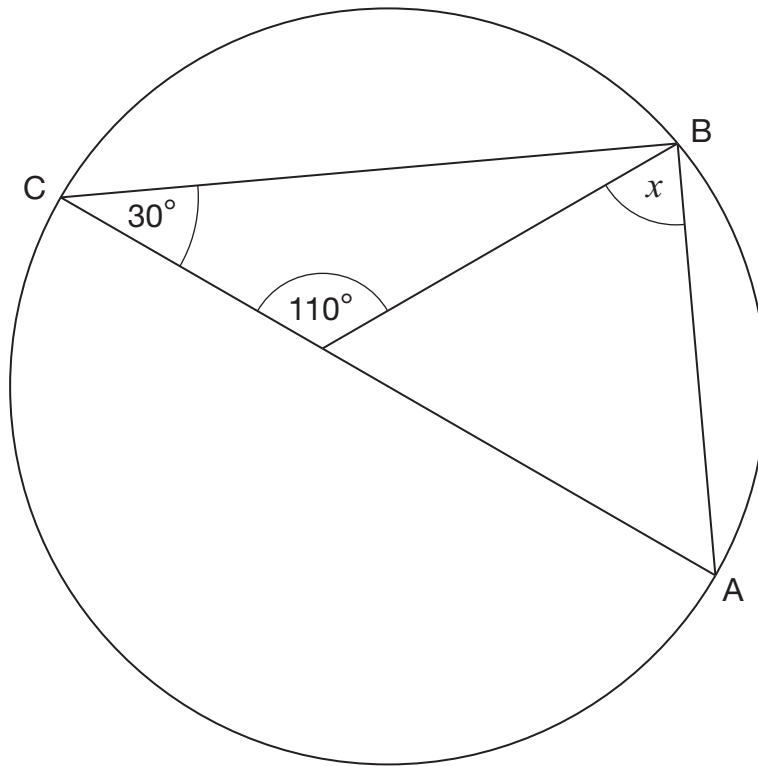☐ True   ☐ False   ☐ Not enough information

Explain your answer.

25.   AC is the diameter of a circle and B is a point on the circumference of the circle.

Not drawn
accurately

What is the size of angle x?

$$x = \underline{\hspace{3cm}}^{\circ}$$

26. Write a number in each box to make the inequalities true.

$$\boxed{} \div \boxed{} \quad < \quad -1$$

$$-1 \quad < \quad \boxed{} \div \boxed{} \quad < \quad 0$$

27. Two pupils each drew a triangle with
one side of 5cm, one angle of 20° and one angle of 60°

Must their triangles be congruent?

☐ Yes   ☐ No

Explain your answer.

END OF TEST