Mathematics test

Paper 2
Calculator allowed

First name __________________________________________

Last name __________________________________________

School __________________________________________

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, an angle measurer or protractor 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. Marks may be awarded for working.
■ Check your work carefully.
■ Ask your teacher if you are not sure what to do.

For marker’s use only

<table>
<thead>
<tr>
<th>TOTAL MARKS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Borderline check</td>
<td></td>
</tr>
</tbody>
</table>
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
Area = \( \frac{1}{2}(a + b)h \)

Prism
Volume = area of cross-section \( \times \) length
1. The graph shows the date each year that frogs’ eggs were first seen.

(a) On what date in 1997 were frogs’ eggs first seen?

(b) At the beginning of each year, the warmer the weather, the earlier frogs’ eggs are first seen.

What can you say about the weather at the beginning of 1991?
2. (a) Here is an expression.

\[ 2a + 3 + 2a \]

Which expression below shows it written as simply as possible?
Put a ring round the correct one.

\[ 7a \quad 7 + a \quad 2a + 5 \]

\[ 4a + 3 \quad 4(a + 3) \]

(b) Here is a different expression.

\[ 3b + 4 + 5b - 1 \]

Write this expression as simply as possible.
3. Here are two containers and the amounts they hold.

A

750 millilitres

B

0.5 litre

Not drawn accurately

Which container holds the greater amount?

☐ A  ☐ B

How much more does it hold?

Give your answer in millilitres.

__________ millilitres

1 mark

4. (a) A triangle has three equal sides.

Write the sizes of the angles in this triangle.

__________ ° , __________ ° , __________ °

1 mark

(b) A right-angled triangle has two equal sides.

Write the sizes of the angles in this triangle.

__________ ° , __________ ° , __________ °

1 mark
5. The diagram shows five fair spinners with grey and white sectors. Each spinner is divided into equal sectors.

I am going to spin all the pointers.

(a) For one of the spinners, the probability of spinning grey is \(\frac{3}{4}\). Which spinner is this? Write its letter.

(b) For two of the spinners, the probability of spinning grey is more than 60% but less than 70%. Which two spinners are these? Write their letters.
6. (a) Look at the drawing of a prism on the grid.

How many faces does the prism have?

(b) Use the grid below to draw a solid with 6 faces.
7. The graph shows the average heights of fir trees of different ages.

The table shows the cost of fir trees of different heights.

<table>
<thead>
<tr>
<th>Height (metres)</th>
<th>Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>0.50</td>
<td>3</td>
</tr>
<tr>
<td>1.00</td>
<td>4</td>
</tr>
<tr>
<td>1.50</td>
<td>5</td>
</tr>
<tr>
<td>2.00</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>120 cm to 159 cm</th>
<th>160 cm to 199 cm</th>
<th>200 cm to 239 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>£20.00</td>
<td>£25.00</td>
</tr>
</tbody>
</table>

(a) One of these fir trees is \(5\frac{1}{2}\) years old.

How much is it likely to cost?

(b) One of these fir trees costs £25.00

How old is the tree likely to be?

Between ___________ and ___________ years old
8. Here is a rectangle.

8 cm

2 cm

Not drawn accurately

(a) A **square** has the **same area** as this rectangle.

What is the **side length** of this square?

__________ cm

1 mark

(b) A **different square** has the **same perimeter** as this rectangle.

What is the **side length** of this square?

__________ cm

1 mark
9. Kate buys 24 cans of lemonade.

She buys the cans in packs of 4
Each pack costs £1.20

Steve buys 24 cans of lemonade.
He buys the cans in packs of 6
Each pack costs £1.60

Kate pays more for her 24 cans than Steve pays for his 24 cans.

How much more?
10. Three shapes fit together at point B.

Will ABC make a straight line?

☐ Yes  ☐ No

Explain your answer.

11. Solve these equations.

\[ 32x + 53 = 501 \]

\[ x = \underline{\underline{\phantom{0}}} \]  

\[ 375 = 37 + 26y \]

\[ y = \underline{\underline{\phantom{0}}} \]
12. In a survey, 60 people were asked:

What kind of newspaper did you buy today?

Here are the results.

<table>
<thead>
<tr>
<th>Type of newspaper</th>
<th>Number of people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning newspaper</td>
<td>35</td>
</tr>
<tr>
<td>Evening newspaper</td>
<td>10</td>
</tr>
<tr>
<td>No newspaper</td>
<td>15</td>
</tr>
</tbody>
</table>

Complete the pie chart to show this information.
Completing rules

13. Look at the information.

\[ x = 4 \quad y = 13 \]

Complete the rules below to show **different** ways to get \( y \) using \( x \)

The first one is done for you.

To get \( y \), **multiply** \( x \) by \( 2 \) and **add** \( 5 \)

This can be written as \( y = 2x + 5 \)

To get \( y \), **multiply** \( x \) by \( \) and **add** \( \)

This can be written as \( y = \)

1 mark

To get \( y \), **multiply** \( x \) by \( \) and **subtract** \( \)

This can be written as \( y = \)

1 mark

To get \( y \), **divide** \( x \) by \( \) and **add** \( \)

This can be written as \( y = \)

1 mark
14. The diagram shows a shaded parallelogram drawn inside a rectangle.

What is the area of the shaded parallelogram?

You must give the correct unit with your answer.
15. Write the missing numbers.

\[ 6x + 2 = 10 \]

so \[ 6x + 1 = \quad \]

\[ 1 - 2y = 10 \]

so \[ (1 - 2y)^2 = \quad \]

1 mark

1 mark

16. The value of \( \pi \) correct to 7 decimal places is:

\[ 3.1415927 \]

(a) Write the value of \( \pi \) correct to 4 decimal places.

\[ \quad \]

1 mark

(b) Which value below is closest to the value of \( \pi \)?

Put a ring round the correct one.

\[ \frac{179}{57} \quad \frac{3}{7} \quad \left( \frac{16}{9} \right)^2 \quad \frac{355}{113} \]
17. Enlarge the shaded shape by a **scale factor of 2**, using **P** as the centre of enlargement.
18. (a) Here are two equations.

\[ k = a + b \]
\[ a + b + k = 30 \]

What is the value of \( k \)?

\[ k = \underline{\hspace{2cm}} \]

(b) Look at this information.

\[ 10 = c + d \]
\[ c \text{ is one more than } d \]

What is the value of \( c \)?

\[ c = \underline{\hspace{2cm}} \]

(c) Now look at this information.

\[ 10 = e + f \]
\[ e \text{ is more than } f \]

What else can you say about the value of \( e \)?

\[ \underline{\hspace{2cm}} \]
19. A pupil investigated how the teachers at his school travel to work. The table shows the results.

<table>
<thead>
<tr>
<th>Number of teachers who travel by car</th>
<th>Number of teachers who do not travel by car</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>7</td>
</tr>
</tbody>
</table>

(a) What **percentage** of these teachers travel by car?

(b) **18 teachers** travel by car. Some of these teachers travel together.

Write the missing frequency in the table below.

<table>
<thead>
<tr>
<th>Number of teachers in one car</th>
<th>Number of cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

(c) What is the **mean** number of teachers in each car?
20. (a) Jenny wants to multiply out the brackets in the expression $3(2a + 1)$

She writes: $3(2a + 1) = 6a + 1$

Show why Jenny is **wrong**.

(b) Sandeep wants to multiply out the brackets in the expression $(k + 4)(k + 7)$

He writes: $(k + 4)(k + 7) = k^2 + 28$

Show why Sandeep is **wrong**.
21. A computer is going to choose a letter at random from an English book. The table shows the probabilities of the computer choosing each vowel.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>A</th>
<th>E</th>
<th>I</th>
<th>O</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.08</td>
<td>0.13</td>
<td>0.07</td>
<td>0.08</td>
<td>0.03</td>
</tr>
</tbody>
</table>

What is the probability that it will **not** choose a vowel?
22. I am going to use a wooden beam to support a load. The cross-section of the beam is a rectangle.

The formula below gives the greatest load, $M$ kg, that a beam of this length can support.

$$M = 5d^2w$$
where $d$ is the depth of the beam in cm,
$w$ is the width of the beam in cm.

I can place the cross-section of the beam in two different ways.

<table>
<thead>
<tr>
<th>1st way</th>
<th>2nd way</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d = 11$</td>
<td>$d = 8$</td>
</tr>
<tr>
<td>$w = 8$</td>
<td>$w = 11$</td>
</tr>
</tbody>
</table>

In which way will the beam be able to support the greater load?
Calculate the difference.

The _____ way supports the greater load,
with a difference of _________ kg.
23. One day, each driver entering a car park paid **exactly £1.50**

Here is what was put into the machine that day.

- Number of £1 coins: 136
- Number of 50p coins: 208

On that day, what percentage of drivers paid with **three 50p coins**?
24. (a) Look at the triangular prism.

![Triangular Prism Diagram](image)

Work out the volume of the prism.

\[ \text{Volume} = \frac{1}{2} \times \text{base} \times \text{height} \times \text{length} \]

\[ \frac{1}{2} \times 4 \times 6 \times 10 = 120 \text{ cm}^3 \]

(b) One face of another prism is made from 5 squares.

Each square has side length 3cm.

![Rectangular Prism Diagram](image)

Work out the volume of the prism.

\[ \text{Volume} = \text{length} \times \text{width} \times \text{height} \]

\[ 10 \times 3 \times 3 = 90 \text{ cm}^3 \]
25. The graph shows a straight line with gradient 1

(a) On the graph, draw a different straight line with gradient 1

(b) The equation of another straight line is \( y = 5x + 20 \)
Write the missing number.

The straight line \( y = 5x + 20 \) passes through \((0,\,\text{______})\)

(c) A straight line is parallel to the line with equation \( y = 5x + 20 \)
It passes through the point \((0,\,10)\)
What is the equation of this straight line?
26. This shaded shape is made using two semicircles.

One semicircle has a diameter of 20 cm.
The other has a diameter of 30 cm.

Calculate the perimeter of the shaded shape.
27. The table shows the number of boys and girls in two different classes.

<table>
<thead>
<tr>
<th></th>
<th>Class 9A</th>
<th>Class 9B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Girls</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

A teacher is going to choose a pupil at random from each of these classes.

In which class is she more likely to choose a boy?

You must show your working.

Tick (✓) your answer.

Class 9A  Class 9B

2 marks
28. The triangle in this question is not drawn accurately.

Use Pythagoras’ theorem to explain why triangle A must be right-angled.
END OF TEST