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.

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 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.

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**Formulae**

You might need to use these formulae

**Trapezium**

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

**Prism**

\[
\text{Volume} = \text{area of cross-section} \times \text{length}
\]
1. Each year, there is a tennis competition in Australia and another one in France.

The table shows how much money was paid to the winner of the men’s competition in each country in 2002.

<table>
<thead>
<tr>
<th>Country</th>
<th>Money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1000 000 Australian dollars (£1 = 2.70 Australian dollars)</td>
</tr>
<tr>
<td>France</td>
<td>780 000 Euros (£1 = 1.54 Euros)</td>
</tr>
</tbody>
</table>

Which country paid more money?
You must show your working.

Tick (✓) the country that paid more.
2. Look at the rectangle drawn on a square grid.

Draw an **enlargement** of this rectangle with **scale factor 2**

Use **point A** as the **centre** of enlargement.
3. About 2000 years ago, a Greek mathematician worked out this formula to find the area of any triangle.

For a triangle with sides $a$, $b$ and $c$

\[ \text{Area} = \sqrt{s(s-a)(s-b)(s-c)} \]

where \[ s = \frac{a+b+c}{2} \]

A triangle has sides, in cm, of 3, 5 and 6

Use $a = 3$, $b = 5$ and $c = 6$ to work out the area of this triangle.
4. Here is some information about all the pupils in class 9A.

<table>
<thead>
<tr>
<th></th>
<th>girls</th>
<th>boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>right-handed</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>left-handed</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

A teacher is going to choose a pupil from 9A at random.

(a) What is the probability that the pupil chosen will be a girl?

(b) What is the probability that the pupil chosen will be left-handed?

(c) The teacher chooses the pupil at random.

She tells the class the pupil is left-handed.

What is the probability that this left-handed pupil is a boy?
5. The screens of widescreen and standard televisions look different. They have different proportions.

Keri starts to draw scale drawings of the televisions. For each, the height is 4.5 cm.

What should the width of each scale drawing be?

Widescreen television

Ratio of height to width is 9 : 16

Standard television

Ratio of height to width is 3 : 4

The width of this scale drawing should be ............... cm

1 mark

The width of this scale drawing should be ............... cm

1 mark
6. A spinner has the numbers 1 to 4 on it.

- The probability of spinning a number 4 is 0.1
- The probability of spinning a number 1 is 0.6
- The probability of spinning a number 2 is the same as the probability of spinning a number 3

Calculate the probability of spinning a number 3

7. I think of a number.

I multiply this number by 8, then subtract 66

The result is twice the number that I was thinking of.

What is the number I was thinking of?
8. Here is some information about A levels in 2002.

<table>
<thead>
<tr>
<th></th>
<th>English</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>72 000</td>
<td>54 000</td>
</tr>
<tr>
<td>Percentage gaining grade A</td>
<td>19%</td>
<td>37%</td>
</tr>
</tbody>
</table>

**How many more** students gained grade A in mathematics than in English?

2 marks
9. (a) Look at this equation.

\[ 14y - 51 = 187 + 4y \]

Is \( y = 17 \) the solution to the equation?

[ ] Yes  [ ] No

Show how you know.

(b) Now look at this equation.

\[ 3y^2 = 2601 \]

Is \( y = 17 \) a solution to the equation?

[ ] Yes  [ ] No

Show how you know.
10. Write these expressions as simply as possible.

\[ 9 - 3k + 5k = \ldots \quad \text{1 mark} \]

\[ k^2 + 2k + 4k = \ldots \quad \text{1 mark} \]

\[ 3k \times 2k = \ldots \quad \text{1 mark} \]

\[ \frac{9k^2}{3k} = \ldots \quad \text{1 mark} \]
Here are four charts drawn by a computer.

**Charts to show the average amount of milk produced by different breeds of cow**

**Chart 1**
- **Breed of cow:** A, D, G, H, J, S
- **Litres of milk:** 0, 5, 10, 15, 20, 25

**Chart 2**
- **Breed of cow:** A, D, G, H, J, S
- **Litres of milk:** 0, 5, 10, 15, 20, 25

**Chart 3**
- **Breed of cow:** A, D, G, H, J, S
- **Litres of milk:** 0, 5, 10, 15, 20, 25

**Chart 4**
- **Key:**
  - A - Ayrshire
  - D - Dexter
  - G - Guernsey
  - H - Holstein
  - J - Jersey
  - S - Shorthorn

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**Key:**
A - Ayrshire  D - Dexter  G - Guernsey  H - Holstein  J - Jersey  S - Shorthorn
Only one of these charts is a good way of showing the data. For each of the other three charts, explain why the type of chart is not a good way of showing the data.

Chart ...........

because .................................................................

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

1 mark

Chart ...........

because .................................................................

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

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

1 mark

Chart ...........

because .................................................................

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

1 mark
12. In one week Jamal watched television for **26 hours**.
   In that week:

   He watched television for the **same** length of time on Monday, Tuesday, Wednesday and Thursday.

   On each of Friday, Saturday and Sunday, he watched television for **twice as long** as on Monday.

   How long did he spend watching television on **Saturday**?
   Write your answer in hours and minutes.

   ................ hours  ............... minutes
   2 marks
14. Multiply out the brackets in these expressions.

\[ y(y - 6) = \quad \text{.........................} \quad 1 \text{ mark} \]

\[ (k + 2)(k + 3) = \quad \text{.........................} \quad 1 \text{ mark} \]
15. ABCD is a parallelogram.

Work out the sizes of angles $h$ and $j$

Give reasons for your answers.

$h = \ldots \degree$ because .................................................................

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$1$ mark

$j = \ldots \degree$ because .................................................................

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$1$ mark
A newspaper printed this information about the world’s population.

If the world was a village of 100 people,

6 people would have 59% of the total wealth.
The other 94 people would have the rest.

On average, how many times as wealthy as one of the other 94 people would one of these 6 people be?
17. The diagram shows two circles and a square, ABCD. A and B are the centres of the circles. The radius of each circle is 5 cm.

Calculate the area of the shaded part of the square.
18. The graph shows the heights of **150** fir trees.

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

<table>
<thead>
<tr>
<th>Height, $h$ (metres)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.2 \text{ m} &lt; h \leq 1.5 \text{ m}$</td>
<td>£18.00</td>
</tr>
<tr>
<td>$1.5 \text{ m} &lt; h \leq 1.75 \text{ m}$</td>
<td>£22.00</td>
</tr>
<tr>
<td>$1.75 \text{ m} &lt; h \leq 2 \text{ m}$</td>
<td>£26.00</td>
</tr>
</tbody>
</table>

Use this information to calculate the total price of the 150 fir trees. You **must** show your working.

£
19. (a) Each side of a square is increased by 10% 

By what percentage is the area increased?

(b) The length of a rectangle is increased by 20% 
The width is decreased by 20%

By what percentage is the area changed?
20. Here are sketches of five different graphs.

Which graph best matches each relationship below? For each relationship, give the letter of the correct graph.

(a) The circumference of a circle plotted against its diameter.

Graph ...  

(b) The area of a circle plotted against its radius.

Graph ...  

(c) The length of a rectangle of area 30 cm² plotted against its width.

Graph ...
21. (a) Calculate the length \( w \)

\[ w = \quad \text{cm} \]

(b) Calculate the size of angle \( x \)

\[ x = \quad \text{o} \]
22. A formula to find the volume, \( V \), of this bowl is

\[
V = \frac{1}{3} \pi h \left( \frac{a^3 - b^3}{a - b} \right)
\]

(a) When \( a = 10 \text{ cm}, \ b = 7 \text{ cm} \) and \( h = 5 \text{ cm} \), what is the volume of the bowl?

Give your answer correct to 3 significant figures.

\[ \text{cm}^3 \]

(b) When \( b = 0 \), the bowl is a cone.

Write a simplified formula for the volume of this cone.

\[ V = \text{ cm}^3 \]
23. The diagram shows two circles with a point of intersection at A. The centre of the larger circle is B. The radius of this circle is 6 cm. BC is a diameter of the smaller circle. The radius of this circle is 5 cm.

(a) Explain why angle BAC must be a right angle.

(b) What is the length of AC?