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 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

TOTAL MARKS

PrimaryTools.co.uk
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. (a) Look at the equation.

\[ 5x + 1 = 2x - 8 \]

Complete the sentence below by ticking (✓) the correct box.

The value of \( x \) is ...

- [ ] ... one particular number.
- [ ] ... any number less than zero.
- [ ] ... any number greater than zero.
- [ ] ... any whole number.
- [ ] ... any number at all.

1 mark

(b) Now look at this equation.

\[ y = 3x - 2 \]

Complete the sentence below by ticking (✓) the correct box.

The value of \( x \) is ...

- [ ] ... one particular number.
- [ ] ... any number less than zero.
- [ ] ... any number greater than zero.
- [ ] ... any whole number.
- [ ] ... any number at all.

1 mark
2. Gita threw three darts.

Use the information in the box to work out what numbers she threw.

The lowest number was 10
The range was 10
The mean was 15

Gita's numbers were ____ , ____ and ____

3. A cookery book shows this conversion table.

<table>
<thead>
<tr>
<th>Mass in ounces</th>
<th>Mass in grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>110</td>
</tr>
<tr>
<td>5</td>
<td>150</td>
</tr>
<tr>
<td>10</td>
<td>275</td>
</tr>
</tbody>
</table>

Use the table to explain how you can tell the conversions **cannot all be exact**.
4. Concorde could travel **1 mile every 3 seconds**.

How many miles per hour (mph) is that?

\[ \text{\text{mph}} \]

2 marks

5. In a bag, there are only red, white and yellow counters.

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

The probability that it will be red is more than \( \frac{1}{4} \).

It is twice as likely to be white as red.

Give an example of how many counters of each colour there could be.

Write numbers in the sentence below.

\[ \text{There could be } \underline{\text{red}}, \underline{\text{white}} \text{ and } \underline{\text{yellow counters}}. \]
6. (a) The **perimeter** of a regular hexagon is $42a + 18$

Write an expression for the length of one of its sides.

(b) The **perimeter** of a different regular polygon is $75b - 20$

The length of one of its sides is $15b - 4$

How many sides does this regular polygon have?

(c) The **perimeter** of a square is $4(c - 9)$

Find the perimeter of the square when $c = 15$
7. A dessert has both fruit and yoghurt inside.

Altogether, the mass of the fruit and yoghurt is 175g.

The ratio of the mass of fruit to the mass of yoghurt is 2 : 5

What is the mass of the yoghurt?

_______ g

2 marks

8. The diagram shows a plan of Luke's new lawn.

The lawn is a circle with radius 3m.

Work out the area of the lawn.

_______ m²

2 marks
9. To find the \( n \)th triangular number, you can use this rule.

\[
n\text{th triangular number} = \frac{n}{2} (n + 1)
\]

Example: 3rd triangular number = \( \frac{3}{2} (3 + 1) \)

= 6

(a) Work out the 10th triangular number.

(b) Now work out the 100th triangular number.
10. Look at triangle ABC.

ABD is an isosceles triangle where AB = AD.

Work out the sizes of angles \( x \), \( y \) and \( z \)

Give reasons for your answers.

\[ x = \ldots \text{ }^\circ \text{ because } \ldots \]

\[ y = \ldots \text{ }^\circ \text{ because } \ldots \]

\[ z = \ldots \text{ }^\circ \text{ because } \ldots \]
11. (a) The graphs show information about the different journeys of four people.

Write the correct names next to the journey descriptions in the table below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Journey description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann</td>
<td>This person walked slowly and then ran at a constant speed.</td>
</tr>
<tr>
<td>Ben</td>
<td>This person walked at a constant speed but turned back for a while before continuing.</td>
</tr>
<tr>
<td>Chris</td>
<td>This person walked at a constant speed without stopping or turning back.</td>
</tr>
<tr>
<td>Dee</td>
<td>This person walked at a constant speed but stopped for a while in the middle.</td>
</tr>
</tbody>
</table>
(b) Ella made a different journey of 4km.

She walked to a place 4km away from her starting point.

Here is the description of her journey.

For the first 15 minutes she walked at 4km per hour.
For the next 15 minutes she walked at 2km per hour.
For the last 30 minutes she walked at a constant speed.

Show Ella's journey **accurately** on the graph below.

(c) For the last 30 minutes of her journey, what was Ella's speed?

\[ \text{ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ km per hour} \]
12. A shop has this special offer.

Reduction of 10% when your bill is between £50 and £100
Reduction of 20% when your bill is more than £100

Before the reductions, Marie’s bill is £96 and Richard’s bill is £108

After the reductions, who paid more?

You must show working to explain your answer.

Tick (✓) the correct answer.

☐ Marie  ☐ Richard  ☐ Both paid the same

2 marks
13. The scatter graph shows the maximum number of passengers plotted against the wingspans of some passenger planes.

(a) What type of correlation does the scatter graph show?

(b) Draw a line of best fit on the scatter graph.

(c) Another passenger plane has a wingspan of 40m. The plane is full of passengers. If each passenger takes 20 kg of bags onto the plane, estimate how much their bags would weigh altogether.

\[ \text{kg} \]
14. Kaylee has some 1cm cubes. 

She makes a solid cube with side length **6cm** out of the cubes.

Then she uses all these cubes to make some cubes with side length **2cm**.

How many of these **2cm** cubes can Kaylee make?
15. You can buy jars of the same jam in two sizes.

454g for £1.59

340g for £1.25

Which jar is better value for money?

You must show working to explain your answer.

Tick (✔) your answer.

A   B

2 marks
16. Tom’s height is 1.8m.
He stands near a tree.

At 4pm, the length of Tom’s shadow is 2.7m.
At 4pm, the length of the tree’s shadow is 6.3m.

What is the height of the tree?
17. Here are the \( n \)th term expressions for three different sequences.

\[
\begin{align*}
\text{Sequence A} & : 2^{(n-1)} \\
\text{Sequence B} & : \frac{n^2 - n + 2}{2} \\
\text{Sequence C} & : \frac{n(n^2 - 3n + 8)}{6}
\end{align*}
\]

The first three terms of each sequence are 1, 2 and 4.

What is the 4th term of each sequence?

You **must** show your working.

Sequence A __________

Sequence B __________

Sequence C __________

3 marks
18. (a) Look at this triangle.
Work out length AC.

AC = \[\text{cm}\]

(b) Look at this triangle.
Work out length DF.

DF = \[\text{cm}\]
19. The box plots show the marks in a test for pupils in Year 10 and Year 11.

(a) The **lowest** mark in Year 11 was greater than the lowest mark in Year 10.
How much greater?

(b) Show that the **median** mark in Year 11 is **9 marks greater** than the median mark in Year 10.

(c) The teacher says:

The marks were **more consistent** in Year 11 than in Year 10.

Do you agree?

[ ] Yes  [ ] No

Explain your answer.
20. The graph shows a circle with centre (0, 0)

The circle has the equation:

\[ x^2 + y^2 = 25 \]

(a) There are two points on the circumference of the circle with an \textbf{x-coordinate of 3}

Complete the coordinates of these two points.

\[ (3, \underline{\phantom{0}}) \] and \[ (3, \underline{\phantom{0}}) \]

(b) What is the \textbf{radius} of the circle?

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

1 mark

(c) Point P is on the circumference of the circle.

Its \textbf{x-coordinate is equal} to its \textbf{y-coordinate}.

What are the coordinates of point P, correct to \textbf{1 decimal place}?

\[ P \text{ is } (\underline{\phantom{0}}, \underline{\phantom{0}}) \]

2 marks
21. In 1988 there was a survey of giant pandas seen in the wild in China. In 2004 the survey was repeated. There was a 40% increase.

The table shows some of the results.

<table>
<thead>
<tr>
<th>Year</th>
<th>Approximate number of giant pandas seen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>x</td>
</tr>
<tr>
<td>2004</td>
<td>1600</td>
</tr>
</tbody>
</table>

About \( x \) giant pandas were seen in 1988.

Work out the value of \( x \) and give your answer to the nearest 100.

\[ x = \text{__________} \]
22. A cube is cut through four of its vertices, A, B, C and D, into two identical pieces. The diagram below shows one of the pieces.

Find the length of the line \( AC \).
23. A teacher has number cards, numbered from 1 to \( n \)

\[
\begin{array}{cccc}
1 & 2 & 3 & 4 \\
\vdots & & & \text{... the numbers continue ...}
\end{array}
\]

The teacher says:

I have \( n \) number cards, numbered from 1 to \( n \)

\[
\frac{1}{5} \text{ of the cards show square numbers.}
\]

What could the value of \( n \) be?

There are three possible answers. Give them all.

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

or \( n = \underline{\hspace{2cm}} \)

or \( n = \underline{\hspace{2cm}} \)

2 marks
24. A window is made with two pieces of glass.
   One piece is a square, the other is a semicircle.

   The area of the square is 1 m$^2$

   What is the area of the semicircle?
   Give your answer in cm$^2$ to the nearest whole number.

\[
\text{cm}^2
\]

3 marks