Year 8 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 details in the spaces below.

First name ________________________________
Last name ________________________________
Class ______________________________________
Date _______________________________________

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, a pair of compasses 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 marking use only

Total marks ________
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 \times \text{length}
Here is an algebra puzzle.

The shaded column shows the total of each row.

For example: \( a + a + a = 24 \)

\[
\begin{array}{ccc}
  a & a & a \\
  a & b & b \\
  a & b & c \\
\end{array}
\]

\( 24 \)
\( 28 \)
\( 19 \)

Work out the values of \( a, b \) and \( c \)

\( a = \ldots \) \( b = \ldots \) \( c = \ldots \)
2

(a) In a **leap year**, what is the **probability** that a month chosen at random has exactly **28 days**?

(b) In a year that is **not a leap year**, what is the **probability** that a month chosen at random has exactly **28 days**?

(c) In any year, what is the **probability** that a month chosen at random has **31 days**?
Most new ovens have temperatures marked in °C.

Some old ovens have temperatures marked in units called gas marks.

Here is how to change gas marks to °C:

\[
\text{Gas mark} \times 14 + 120 = °C
\]

(a) Gas mark 6 is hotter than gas mark 2.

How many °C hotter?

\[
\ldots \ldots \ldots °C
\]

(b) What gas mark is 190°C?

\[
\text{Gas mark} \ldots \ldots \ldots
\]
You can write any whole number as a product of its prime factors.

Here is an example for the number 60:

\[ 60 = 2 \times 2 \times 3 \times 5 \]

Write \( 225 \) as a product of its prime factors.

\[ 225 = \text{.........................} \]

'3 marks'
The perimeter of a rectangle is one metre. Each longer side is 36 centimetres. What is the length of each shorter side?

How many two-digit numbers have digits that add to twelve?
Look at this number chain.

Each number is the square root of the previous number.

(a) What number comes after 2 in the chain?
   Give your answer as a decimal.

(b) What number comes before 256 in the chain?

(c) The chain goes on forever.
   Will the number 0 ever be in the chain? Tick (✓) Yes or No.

Explain your answer.
(a) Write these expressions as simply as possible. The first one is done for you.

\[ n + 1 + 2 \rightarrow n + 3 \]

\[ 3n + 5n \rightarrow \] 1 mark

\[ 2n + 7 + n + 2 \rightarrow \] 1 mark

(b) Multiply \((5n + 2)\) by 3
Write your answer without any brackets.

(c) Multiply \((n + 2)\) by \((n + 3)\)
Write your answer without any brackets.
Look at these three time intervals.

Arrive them in size order, shortest first.
Then fill in the missing number of minutes.

1 hour 25 minutes  125 minutes  1.25 hours

shortest

longest

difference in time is ............... minutes
The bar chart shows the eye colour of 45 different people.

Complete the pie chart to show the same data.
The diagram shows a square and an equilateral triangle.

Calculate the sizes of angles $x$, $y$ and $z$

$x = \ldots \ldots$  $y = \ldots \ldots$  $z = \ldots \ldots$
Tim Henman is a tennis player.

In 2002 a newspaper published this information about his earnings.

<table>
<thead>
<tr>
<th>On court earnings</th>
<th>Off court earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>£700 000</td>
<td>£2.1 million</td>
</tr>
</tbody>
</table>

What percentage of Tim’s total earnings was from off court earnings?

\[
\frac{(128 - 89.6) \times 1.25}{128 - (89.6 \times 1.25)}
\]

\[
\frac{38.4 \times 1.25}{128 - (89.6 \times 1.25)}
\]
New school

14 Pupils in year 8 wanted to know if pupils in year 7 liked their new school. They wrote a questionnaire.

(a) Here is one question.

Tick (✓) the statement that best describes why you like your new school.

- New subjects
- Able to make new friends
- Bigger playground

Give one reason why this is not a very good question.

(b) Here is a different question.

Do you like school dinners?

- Yes  - No

Give one reason why this is not a very good question.
Two shillings, Solving

15 The picture shows a two shilling coin.
People used these coins in England before the year 1971.

The radius of this coin is 1.4 cm.

What is the area of the face of the coin?

\[ \text{Area} = \pi r^2 \]

\[ = \pi (1.4)^2 \]

\[ = 6.1576 \text{ cm}^2 \]

2 marks

16 Solve this equation.

\[ 5y + 3 = 3y + 14 \]

\[ 2y = 11 \]

\[ y = \frac{11}{2} \]

2 marks
I did an experiment.

I dropped a piece of string onto a square grid.
I recorded the number of grid lines that it crossed.

I repeated the experiment with different lengths of string.
The scatter graph shows my results.

(a) What is the relationship between the length of string and the number of grid lines crossed?

(b) I dropped a piece of string that crossed 50 grid lines.

About how long do you think this piece of string was?
Different sequences of numbers start like this:

\[
\begin{align*}
2 & \quad 4 & \quad 8 & \quad \ldots \\
\end{align*}
\]

(a) The \(n\)th term of one of the sequences is \(n(n - 1) + 2\)

What is the 4th term of this sequence?

(b) The \(n\)th term of a different sequence is \(2^n\)

What is the 4th term of this sequence?
Writers use some letters of the alphabet more than others.

The pie chart shows how often one writer used vowels (A, E, I, O or U) in a sample of his writing.

(a) Marie says: ‘The pie chart shows the letter used most often is E’.

Do you agree with her? Tick (✔) Yes or No.

☐ Yes ☐ No

Explain your answer.

(b) The letter E was used 130 times.

The angle of the sector representing E is 46.8°

Altogether, how many letters were in the writer’s sample?
Look at this information.

There are about 60 million people living in the UK.
In every 1000 people there are about 200 who are aged under 16
Of the people aged under 16, about 20% had their sight tested last year.

About how many people aged under 16 had their sight tested last year?
Two goats are tied to points A and B on opposite sides of a barn.

The scale drawing below shows the barn and where the goats are tied. Each goat can reach exactly 4 metres.

Draw accurately the area each goat can reach.
22 (a) The diagrams represent a number sequence.

The sequence continues by adding $b$ each time.

1st term

2nd term $a + b$

3rd term $a + b + b$

4th term $a + b + b + b$

A pupil says:

The $n$th term is $a + nb$

The pupil is wrong. What is the $n$th term of the sequence?

(b) A number sequence begins:

12, 18, 24, 30 ...

The sequence continues by adding 6 each time.

What is the 81st term of the sequence?
23 The diagram shows a right-angled triangle.

Use Pythagoras' theorem to work out the length of side AC.

\[ \sqrt{10^2 + 24^2} \]

\[ \approx 26 \text{ cm} \]

2 marks
Which average speed is greater?

You must show your working.
A pupil collected data on the number of people in cars.

<table>
<thead>
<tr>
<th>Number of people in each car</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>178</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Show that the **mean** number of people in a car was **1.4**
END OF TEST