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.
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 × length
1. 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.
2. 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 \( y = 2x + 5 \).

1 mark

To get \( y \), multiply \( x \) by \( \underline{\text{ }} \) and add \( \underline{\text{ }} \).

This can be written as \( y = \underline{\text{ }} \).

1 mark

To get \( y \), multiply \( x \) by \( \underline{\text{ }} \) and subtract \( \underline{\text{ }} \).

This can be written as \( y = \underline{\text{ }} \).

1 mark

To get \( y \), divide \( x \) by \( \underline{\text{ }} \) and add \( \underline{\text{ }} \).

This can be written as \( y = \underline{\text{ }} \).

1 mark
3. 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.

2 marks
4. Write the missing numbers.

\[ 6x + 2 = 10 \]
so \[ 6x + 1 = \] 

\[ 1 - 2y = 10 \]
so \[ (1 - 2y)^2 = \]

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

\( \text{3.1415927} \)

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

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

Put a ring round the correct one.

\[
\frac{179}{57} \quad 3\frac{1}{7} \quad \left(\frac{16}{9}\right)^2 \quad 355 \quad 113
\]
6. Enlarge the shaded shape by a **scale factor of 2**, using \( P \) as the centre of enlargement.
7. (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.

\[
10 = c + d
\]

\( c \) is one more than \( d \)

What is the value of \( c \)?

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

(c) Now look at this information.

\[
10 = e + f
\]

\( e \) is more than \( f \)

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

\[
\underline{\hspace{2cm}}
\]
8. 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></td>
</tr>
<tr>
<td>2</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?
9. (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**.
10. 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>

(a) What is the probability that it will **not** choose a vowel?

(b) The probability that the computer will choose the letter **T** is **0.09**

The computer chooses a letter at random, and then another, and then another.

What is the probability that these letters will be **E, then A, then T**?
11. 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.

1st way

\[ d = 11 \] 
\[ w = 8 \]

2nd way

\[ d = 8 \] 
\[ w = 11 \]

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.

3 marks
12. 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?
13. (a) Look at the triangular prism.

Work out the volume of the prism.

\[
\text{cm}^3
\]

1 mark

(b) One face of another prism is made from 5 squares.
Each square has side length 3cm.

Work out the volume of the prism.

\[
\text{cm}^3
\]

1 mark
14. 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.

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

(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?
15. 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.

\[
\text{Perimeter} = \pi \times 20 + \pi \times 30
\]

\[
= 10\pi + 15\pi = 25\pi 
\]

Approximately 78.5 cm

2 marks
16. 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
17. The triangles in this question are not drawn accurately.

(a) Use Pythagoras' theorem to explain why triangle A must be right-angled.

\[
\text{A}
\]

(b) Triangle A is enlarged to make triangle B.

Use similar triangles to show that \( d = 9.2 \text{cm} \).
(c) The diagram shows the Earth and two other planets.

Planet P is $6.9 \times 10^7$ km from Earth.
Planet Q is $9.2 \times 10^7$ km from Earth.

How far is Planet P from Planet Q?
Give your answer in standard form.
18. Look at the equation in the box.

\[ x + (x + 1) + (x + 2) = y \]

Use it to help you write the missing expressions in terms of \( y \).

The first one is done for you.

\[ 5 + x + (x + 1) + (x + 2) = y + 5 \]

\[ (x + 5) + (x + 6) + (x + 7) = \_\_\_\_\_\_\_ \]

\[ 2x + 2(x + 1) + 2(x + 2) = \_\_\_\_\_\_\_ \]

\[ (x + a) + (x + 1 + a) + (x + 2 + a) = \_\_\_\_\_\_\_ \]  

2 marks
19. Here is part of a newspaper report about wildlife in a country in Africa.

The number of gorillas has **fallen by 70%** in the last ten years. Only about **5000 gorillas** are left.

About how many gorillas were there in this country ten years earlier?
20. On a street, there are **100 houses**.

   - **60** are terraced houses.
   - **30** are semi-detached.
   - The rest are detached.

The table shows the mean number of bedrooms in each type of house.

<table>
<thead>
<tr>
<th>Type of house</th>
<th>Mean number of bedrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terraced</td>
<td>2.5</td>
</tr>
<tr>
<td>Semi-detached</td>
<td>3.3</td>
</tr>
<tr>
<td>Detached</td>
<td>4.1</td>
</tr>
</tbody>
</table>

What is the mean number of bedrooms per house on this street?
21. I am thinking of a number.

When I subtract 25 from my number, then square the answer, I get the **same result as** when I square my number, then subtract 25 from the answer.

What is my number?

You **must** show an algebraic method.
22. (a) One light year is approximately $9,430,000,000,000$ kilometres. 
Write this distance in standard form.

\[
\text{\underline{\hspace{10cm}}} \text{ km}
\]

(b) A star called Wolf 359 is approximately 7.8 light years from Earth.

About how many kilometres is this?
Write your answer in standard form.

\[
\text{\underline{\hspace{10cm}}} \text{ km}
\]
23. I have a square piece of card.

I cut a triangle from each corner so that the remaining card is in the shape of a **regular octagon**.

The **perimeter** of the regular octagon is **32cm**.

Work out length $y$.
24. Look at the simultaneous equations.

\[
\begin{align*}
x + 2y &= a \\
x + y &= b
\end{align*}
\]

(a) Write an expression for \( y \) in terms of \( a \) and \( b \)

\[ y = \underline{\phantom{00000}0} \]

1 mark

(b) Now write an expression for \( x \) in terms of \( a \) and \( b \)

Write your expression as simply as possible.

\[ x = \underline{\phantom{00000}0} \]

2 marks
END OF TEST