Paper 1
Calculator not allowed

First name

Last name

School

Remember

- The test is 1 hour long.
- You must not use a calculator for any question in this test.
- You will need: pen, pencil, rubber and a ruler.
- 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.

TOTAL MARKS
### Instructions

**Answers**
This means write down your answer or show your working and write down your answer.

**Calculators**
You **must not** use a calculator to answer any question in this test.

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### 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. Match each instruction on the left with an instruction on the right that has the same effect.

The first one is done for you.

- Add 0
- Add 2
- Subtract 2
- Subtract 0
- Add $\frac{1}{2}$
- Subtract $\frac{1}{2}$
- Add $-2$
- Subtract $-2$
2. Pupils are investigating oak leaves. They want to collect a sample of oak leaves.

Here is their plan for how to collect the sample.

<table>
<thead>
<tr>
<th>Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose one oak tree.</td>
</tr>
<tr>
<td>Take 10 leaves from the lowest branches of the tree.</td>
</tr>
</tbody>
</table>

Give **two** reasons why this sample of leaves may **not be representative** of all oak leaves.

First reason:

Second reason:
3. Look at the rectangle.

The total area of the rectangle is **40cm²**

Work out lengths \(x\) and \(y\)

\[
x = \underline{\text{cm}} \quad y = \underline{\text{cm}}
\]

2 marks
4. (a) Bags A and B contain some counters.

\[ 6y + 1 \text{ counters} \]

Bag A

\[ 4y + 7 \text{ counters} \]

Bag B

The number of counters in each bag is the same.

Work out the value of \( y \)

2 marks

(b) Bag C contains more counters than bag D.

\[ 4k \text{ counters} \]

Bag C

\[ k + 12 \text{ counters} \]

Bag D

What is the smallest possible value of \( k \)?

2 marks
5. Gary took part in a quiz show and won a **million pounds**.

He spent **£20 000** on a holiday.

Then he spent **half** of the **money left** on a house.

How much did Gary’s house cost?

£

2 marks
6. Look at these two scatter graphs. They are both drawn using the same scale.

(a) Which scatter graph shows positive correlation?

☐ A  ☐ B

Explain your answer.

(b) Which scatter graph shows stronger correlation?

☐ A  ☐ B

Explain your answer.
7. Look at the sequence of shapes on a square grid. 

The table shows information about these shapes.

<table>
<thead>
<tr>
<th>Shape number</th>
<th>Base $B$</th>
<th>Height $H$</th>
<th>Area $A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

**Rules** connect $N$, $B$, $H$ and $A$.

Write one missing letter in each space below to complete the rule.

\[ H = \underline{} + 1 \]

\[ A = \underline{} \times 2 \]

\[ \underline{} = 2N + 2 \]
8. Look at this information.

\[
\frac{27}{40} = 0.675
\]

\[
\frac{29}{40} = 0.725
\]

Use this information to write the missing **decimals** below.

\[
\frac{31}{40} = \text{__________}
\]

1 mark

\[
\frac{23}{40} = \text{__________}
\]

1 mark
9. In this question, \( n \) stands for any whole number.

(a) For the expression \( 2n \), tick (✓) the correct statement below.

- [ ] \( 2n \) must be odd.
- [ ] \( 2n \) must be even.
- [ ] \( 2n \) could be odd or even.

Explain your answer.

(b) For the expression \( 3n \), tick (✓) the correct statement below.

- [ ] \( 3n \) must be odd.
- [ ] \( 3n \) must be even.
- [ ] \( 3n \) could be odd or even.

Explain your answer.
10. (a) On this necklace the ratio of black beads to white beads is $1 : 3$

How many more black beads do you need to add to make the ratio of black to white $3 : 1$?

(b) Here is the necklace again.

How many more black beads and white beads do you need to add to make the ratio of black to white $3 : 2$?
11. Show that the **difference** between $3^2$ and $3^3$ is **18**

12. Sophie says:

   If $n$ represents a prime number, then $2n + 1$ will also represent a prime number.

   Use an example to explain why she is **wrong**.
13. A game has six rounds.

In each round of the game, the player gains points which are added to their total score.

(a) The graph shows Sue’s total score after each round of her game.

How many points did Sue gain in round 4?

(b) Derek plays the game.

The graph of his total score after each round is a straight line.

What can you say about the number of points Derek gained in each round?
14. Inside the rectangle below is a shaded rhombus.

The vertices of the rhombus are the midpoints of the sides of the rectangle.

What is the area of the shaded rhombus?
15. (a) Sandra is thinking of two numbers.
   Her two numbers have a **negative sum**, but a **positive product**.
   Give an example of what her numbers could be.
   
   ___________ and ___________  
   1 mark

(b) Mark is also thinking of two numbers.
   His two numbers have a **positive sum**, but a **negative product**.
   Give an example of what his numbers could be.
   
   ___________ and ___________  
   1 mark

16. The mean of five numbers is **10**
   I add one more number and the mean is now **11**
   What number did I add?
   
   ____________________________  
   2 marks
17. Solve these simultaneous equations using an algebraic method.

\[
3x + 6y = 30
\]
\[
x + 6y = 20
\]

You must show your working.

\[
\begin{align*}
x &= \\
y &=
\end{align*}
\]

3 marks
18. This shape is made of four congruent rectangles.
Each rectangle has side lengths $2a$ and $a$

The perimeter of the shape is $80 \text{ cm}.$

Work out the area of the shape.

\[
\text{cm}^2
\]
19. The diagram shows three congruent circles drawn on an isometric grid.

The area of this equilateral triangle is $y$.

The area of this segment is $w$.

Write expressions, using $y$ and $w$, for area A and area B.

Area A = __________________
Area B = __________________
20. (a) A pupil wrote:

For all numbers $j$ and $k$,

$$(j + k)^2 = j^2 + k^2$$

Show that the pupil is **wrong**.

(b) A different pupil wrote:

For all numbers $j$ and $k$,

$$(j + k)^2 \text{ can never be equal to } j^2 + k^2$$

Show that this pupil is also **wrong**.
21. I have two fair four-sided dice.

The dice are both numbered 3, 4, 5 and 6

I am going to roll both dice and multiply the scores.

What is the probability that the product is a multiple of 3?
22. Solve these equations using an algebraic method.
You must show your working.

\[ \frac{5(3y - 4)}{2y} = 7 \]

\[ (x + 4)(x - 4) = 9 \]

\[ y = \quad \text{2 marks} \]

\[ x = \quad \text{or} \quad x = \quad \text{2 marks} \]
23. Pupils in a class investigated how far they live from school.

The frequency diagram shows the results.

(a) Complete the cumulative frequency graph below to show these results.

(b) Estimate the median distance from school for this class.
24. Look at the graph.

At points A and B, \( y = x - 2 \) and \( y = x^2 - 2 \)
What are the coordinates of A and B?

A is \((______,______)\)  

B is \((______,______)\)
25. In the diagram triangle BCD is mathematically similar to triangle ACE.

Work out the length of BD.
26. Look at the graph.

The $x$-axis, the $y$-axis and the lines $y = x$ and $y = -x$ divide the graph into eight regions, A to H.

(a) Write down the letters of the four regions where $x \geq 0$

______, ______, ______ and ______

1 mark

(b) Write down the letters of the four regions where $y \geq x$

______, ______, ______ and ______

1 mark

(c) Write down the letters of the four regions where $xy \geq 0$

______, ______, ______ and ______

1 mark
27. A cyclist went 1 km up a hill at 15 km per hour.

Then she went 1 km down the hill at 30 km per hour.

Show that her average speed for the 2 km was 20 km per hour.
END OF TEST