INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer all the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do not write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is 100.
- This document consists of 20 pages. Any blank pages are indicated.
Area of trapezium = \( \frac{1}{2} (a + b)h \)

Volume of prism = (area of cross-section) \( \times \) length

In any triangle \( ABC \)
Sine rule \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)

Cosine rule \( a^2 = b^2 + c^2 - 2bc \cos A \)
Area of triangle = \( \frac{1}{2} ab \sin C \)

Volume of sphere = \( \frac{4}{3} \pi r^3 \)
Surface area of sphere = \( 4\pi r^2 \)

Volume of cone = \( \frac{1}{3} \pi r^2 h \)
Curved surface area of cone = \( \pi rl \)

The Quadratic Equation
The solutions of \( ax^2 + bx + c = 0 \),
where \( a \neq 0 \), are given by
\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]
One day 300 people visit a museum.
The ratio of adults to children is 2 : 3.

(a) Work out the number of adults and the number of children.

(a) Adults ____________ Children ____________ [2]

(b) This two-way table summarises some information about the visitors to the museum.

(i) Complete the table.

<table>
<thead>
<tr>
<th></th>
<th>Adults</th>
<th>Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>______</td>
<td>_______</td>
<td>132</td>
</tr>
<tr>
<td>Female</td>
<td>______</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>______</td>
<td>_______</td>
<td>300</td>
</tr>
</tbody>
</table>

[1]

(ii) One of the adults is chosen at random.

Find the probability that the adult is a male.

(b)(ii) ____________________________ [2]

(iii) Find the ratio of male to female visitors.

Write the ratio in its simplest form.

(iii) _____________ : ___________ [2]
2 Fresh Clean and Cleanup are two home cleaning companies.

(a) Fresh Clean charges £3.50 for each room they clean and an extra £15 call out charge. Write down a formula for the total charge, £F, for cleaning a house with \( n \) rooms.

\[ F = 3.50n + 15 \] [2]

(b) Cleanup uses this formula to work out the total charge to clean a house.

\[ C = 25h + 10 \]

\( C \) is the total charge in £ for a clean taking \( h \) hours.

Pete's house has 8 rooms and will take \( 1\frac{1}{2} \) hours to clean.

Which of the two cleaning companies, Fresh Clean or Cleanup, will be cheaper and by how much?

(b) ____________________ by £ ____________ [3]
3  (a) Multiply out.

\[ a(3 + a) \]

(a) \______________ [1]

(b) Factorise.

\[ 4b - 12 \]

(b) \______________ [1]

(c) Rearrange this formula to make \( p \) the subject.

\[ T = 4p + 5 \]

(c) \( p = \______________ \) [2]

(d) Solve this inequality.

\[ 3x - 6 < x + 4 \]

(d) \______________ [3]
Sofia uses a pedometer to record the number of steps she takes each day for one month. Her results are summarised in the table below.

<table>
<thead>
<tr>
<th>Steps per day (s)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6000 \leq s &lt; 7000$</td>
<td>3</td>
</tr>
<tr>
<td>$7000 \leq s &lt; 8000$</td>
<td>4</td>
</tr>
<tr>
<td>$8000 \leq s &lt; 9000$</td>
<td>6</td>
</tr>
<tr>
<td>$9000 \leq s &lt; 10000$</td>
<td>8</td>
</tr>
<tr>
<td>$10000 \leq s &lt; 11000$</td>
<td>7</td>
</tr>
<tr>
<td>$11000 \leq s &lt; 12000$</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) Draw a frequency polygon to display this information.

(b) Write down the modal class of the number of steps per day.

(b) ______________________ [1]
(c) Sofia reads that taking at least 10 000 steps per day is an important part of a healthy lifestyle. For what percentage of the month did she meet this target?

(c) ___________________________ % [2]

(d) One day Sofia goes for a walk in the hills. The length of the walk is 7 km, correct to the nearest kilometre. What is the longest possible length of Sofia’s walk?

(d) ___________________________ km [1]

5 Kate thinks of a number. She multiplies it by 3 and then adds 3.

Leo thinks of the same number as Kate. He subtracts 5 and then multiplies the result by 6.

Kate and Leo both end up with the same number. Find the numbers that they start and end with.

Start ____________________________

End ____________________________ [4]
ABCDE is a square-based pyramid. The length of each edge is 6 cm.

(a) Construct a full-size net of the pyramid. The base is drawn for you.
(b) Use measurements from your diagram to calculate the total surface area of the pyramid.

(b) __________________________ cm² [4]

7 (a) The price of a printer is £64.50 excluding VAT.

Calculate the price of the printer including VAT at 20%.

(a) £ _____________________________ [3]

(b) The price of a season ticket is increased by 10% in January 2012 and then by another 10% in January 2013.

Calculate the overall percentage increase in the price of the season ticket.

(b) ____________________________ % [3]
8 (a) Find the size of the exterior angle of a regular 12-sided polygon.

\[ \text{(a)} \quad \text{____________________________ °} \quad [2] \]

(b) Hence find the size of the interior angle of a regular 12-sided polygon.

\[ \text{(b)} \quad \text{____________________________ °} \quad [1] \]

9 In the sketch below, A is the point (-10, 8) and B is the point (0, 3).

(a) Find the coordinates of the midpoint of the line AB.

\[ \text{(a)} \quad \text{______________ , ______________} \quad [2] \]

(b) Find the equation of the line AB.

\[ \text{(b)} \quad \text{____________________________} \quad [3] \]
10 (a) Work out.

\[ \frac{2\frac{2}{5}}{2\frac{1}{4}} \]

Give your answer as a mixed number in its simplest form.

(a) ________________________ [3]

(b) Write down the reciprocal of 5.

(b) ________________________ [1]

(c) Write as a single power of 5.

\[ 5^6 \div 5^{-3} \]

(c) ________________________ [1]
These box plots represent data for the salaries of the employees working in two companies.

(a) Find the median for company A.

\( \£ \) _____________________________ [1]

(b) Find the interquartile range for company B.

\( \£ \) _____________________________ [2]

(c) Make two different comparisons between the salaries in the two companies.

1  ________________________________________________________________________
   ________________________________________________________________________
2  ________________________________________________________________________
   ________________________________________________________________________ [2]
12 State which calculation, in each of the following pairs, has an incorrect answer. Explain how you can tell without giving the correct answer.

(a)  
<table>
<thead>
<tr>
<th>A</th>
<th>$300 \times 4000 = 12000$</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>$0.003 \times 0.04 = 0.00012$</td>
</tr>
</tbody>
</table>

Calculation ______ has an incorrect answer  
because _______________________________________________________________ [1]

(b)  
<table>
<thead>
<tr>
<th>C</th>
<th>$6497 \times 1.08 = 7016.76$</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>$5684 \div 0.96 = 5456.64$</td>
</tr>
</tbody>
</table>

Calculation ______ has an incorrect answer  
because _______________________________________________________________ [1]

(c)  
<table>
<thead>
<tr>
<th>E</th>
<th>$5.8 \times 10^{-3} \times 1.2 \times 10^{-2} = 6.96 \times 10^5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$4.6 \times 10^8 \div 3.7 \times 10^2 = 1.24 \times 10^4$</td>
</tr>
</tbody>
</table>

Calculation ______ has an incorrect answer  
because _______________________________________________________________ [1]
In the diagram, A, B, C and D are points on the circle centre O. AB = AD and angle BOD = 116°.

Calculate

(a) angle BAD,

(b) angle BCD,

(c) angle ABO.
14 (a) Solve algebraically these simultaneous equations.

\[
\begin{align*}
6x + 2y &= 5 \\
4x - 5y &= 16
\end{align*}
\]

(a) \[x = \] \[y = \] [4]

(b) Factorise and solve.

\[
6x^2 + 11x - 10 = 0
\]

(b) \[x = \] and \[x = \] [3]
15 (a) A photo is 12 cm wide by 10 cm high. An enlargement of the photo is 15 cm wide.

Calculate the height of the enlargement.

(a) ______________________ cm [3]

(b) In the diagram, AD is parallel to BC. Angle ABC = 80°, angle CAD = 30° and angle ADC = 70°.

Show that triangles ABC and DCA are similar.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
[3]
16 Vector \( \mathbf{p} = \begin{pmatrix} 4 \\ -2 \end{pmatrix} \) and vector \( \mathbf{q} = \begin{pmatrix} -3 \\ 5 \end{pmatrix} \).

Calculate.

(a) \( \mathbf{p} + \mathbf{q} \)

(b) \( 3\mathbf{p} - \mathbf{q} \)

17 This sketch shows the graph of \( y = x^2 \).

(a) On the same axes, sketch the graph of \( y = 2x^2 \).

(b) Describe the transformation that maps the graph of \( y = x^2 \) onto \( y = x^2 - 3 \).
18 Simplify.

\[ \frac{6 + \sqrt{2}}{\sqrt{2}} \]

Give your answer in the form \( a\sqrt{2} + b \).

[3]

19 OAB is a sector of a circle.
Angle AOB = 80°.

The length of arc AB is \( 12\pi \) cm.

Find the perimeter of the sector.
Give your answer in the form \( a + b\pi \).

[4]
The diagram shows the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.

One solution to the equation $\sin x = 0.8$ is $x = 53^\circ$, correct to the nearest degree.

Find the values of $x$ which satisfy $\sin x = -0.8$ in the range $0^\circ \leq x \leq 360^\circ$.

$x = \underline{\phantom{0000}}$ [2]
21* Jamie organises a game to raise money for charity.

**Number Generator Game**
- £1 per go
- Pick 2 cards
- Win £5 for a number greater than 55

He shuffles these six cards and places them face down on a table.

1 2 3 4 5 6

Players pick a card at random and place it in the *First card* position on the grid below. They then pick a second card at random and place it in the *Second card* position on the grid.

Explain why £5 may not be an appropriate prize for this game.