Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may not be used.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.
1 Solve the equation \( \frac{x}{2} - \frac{2}{x+1} = 1 \)

(Total for Question 1 is 4 marks)
2. The diagram shows a solid wax cylinder.

The diagram shows a solid wax cylinder.

The cylinder has base radius $2x$ and height $9x$.

The cylinder is melted down and made into a sphere of radius $r$.

Find an expression for $r$ in terms of $x$.

(Total for Question 2 is 3 marks)

Lots more papers at www.bland.in
Here are the first six terms of a Fibonacci sequence.
1 1 2 3 5 8

The rule to continue a Fibonacci sequence is, the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

(b) Show that the 6th term of this sequence is 3

(c) Given that the 3rd term is 7 and the 6th term is 29, find the value of $a$ and the value of $b$.

$ABCD$ is a square.
$P$ and $D$ are points on the $y$-axis.
$A$ is a point on the $x$-axis.
$PAB$ is a straight line.

The equation of the line that passes through the points $A$ and $D$ is $y = -2x + 5$

Find the length of $PD$.

Diagram NOT accurately drawn

$\text{(Total for Question 3 is 4 marks)}$

Lots more papers at www.bland.in
Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is, the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

The first three terms of a different Fibonacci sequence are

\( a \) \( b \) \( a + b \)

(b) Show that the 6th term of this sequence is \( a + 5 \) \( b \)

Given that the 3rd term is 7 and the 6th term is 29,

(c) find the value of \( a \) and the value of \( b \).

(a) On the grid, draw the graph of \( x^2 + y^2 = 4 \)

(b) On the grid, sketch the graph of \( y = \cos x \) for \( 0^\circ \leq x \leq 360^\circ \)

(Total for Question 4 is 4 marks)
A cylinder has base radius $x$ cm and height $2x$ cm.

A cone has base radius $x$ cm and height $h$ cm.

The volume of the cylinder and the volume of the cone are equal.

Find $h$ in terms of $x$.
Give your answer in its simplest form.

$\boxed{h = \text{...........................................}}$

(Total for Question 5 is 3 marks)
6

\[ \frac{1}{u} + \frac{1}{v} = \frac{1}{f} \]

\[ u = 2 \frac{1}{2}, \quad v = 3 \frac{1}{3} \]

(a) Find the value of \( f \).

(b) Rearrange \( \frac{1}{u} + \frac{1}{v} = \frac{1}{f} \) to make \( u \) the subject of the formula.

Give your answer in its simplest form.

.......................................................

.......................................................

.......................................................

(Total for Question 6 is 5 marks)

Lots more papers at www.bland.in
Here are the first six terms of a Fibonacci sequence.
1 1 2 3 5 8

The rule to continue a Fibonacci sequence is, the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

(b) Show that the 6th term of this sequence is $3a + 5b$.

(c) Given that the 3rd term is 7 and the 6th term is 29, find the value of $a$ and the value of $b$.

Diagram NOT accurately drawn

The diagram shows a solid cone and a solid hemisphere.
The cone has a base of radius $x$ cm and a height of $h$ cm.
The hemisphere has a base of radius $x$ cm.
The surface area of the cone is equal to the surface area of the hemisphere.

Find an expression for $h$ in terms of $x$.

..............................................................................................

(Total for Question 7 is 4 marks)

Lots more papers at www.bland.in
Here are the first six terms of a Fibonacci sequence.
1 1 2 3 5 8

The rule to continue a Fibonacci sequence is, the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

(b) Show that the 6th term of this sequence is 3

(c) Given that the 3rd term is 7 and the 6th term is 29,
find the value of a and the value of b.

Each equation in the table represents one of the graphs A to F.

Write the letter of each graph in the correct place in the table.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>y = 4 \sin x°</td>
<td></td>
</tr>
<tr>
<td>y = 4 \cos x°</td>
<td></td>
</tr>
<tr>
<td>y = x^2 - 4x + 5</td>
<td></td>
</tr>
<tr>
<td>y = 4 \times 2^x</td>
<td></td>
</tr>
<tr>
<td>y = x^3 + 4</td>
<td></td>
</tr>
<tr>
<td>y = \frac{4}{x}</td>
<td></td>
</tr>
</tbody>
</table>

(Total for Question 8 is 3 marks)
9 Here is a shape $ABCDE$.

$AB$, $BC$ and $CD$ are three sides of a square.  
$BC = x$ cm.  
$AED$ is a semicircle with diameter $AD$.

The perimeter, $P$ cm, of the shape $ABCDE$ is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

(a) Rearrange this formula to make $x$ the subject.

..............................................

..............................................

(2)
The area, $A \text{ cm}^2$, of this shape is given by $A = kx^2$ where $k$ is a constant.

(b) Find the exact value of $k$.
    
    Give your answer in its simplest form.

.....................................................

(3)

(Total for Question 9 is 5 marks)
10  Express the recurring decimal $0.2\overline{13}$ as a fraction.

.......................................................

(1)

(b) Show that the 6th term of this sequence is $3a + 5b$.

(2)

(c) Given that the 3rd term is 7 and the 6th term is 29, find the value of $a$ and the value of $b$.

.......................................................

(Total for Question 10 is 3 marks)
Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is, the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

(b) Show that the 6th term of this sequence is $3a + 5b$.

(c) Given that the 3rd term is 7 and the 6th term is 29, find the value of $a$ and the value of $b$.

In the diagram, $AB = BC = CD = DA$.

Prove that triangle $ADB$ is congruent to triangle $CDB$.

(Total for Question 11 is 3 marks)
12 Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

(Total for Question 12 is 3 marks)
13 The table shows information about the ages, in years, of 1000 teenagers.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teenagers</td>
<td>158</td>
<td>180</td>
<td>165</td>
<td>141</td>
<td>131</td>
<td>115</td>
<td>110</td>
</tr>
</tbody>
</table>

Sophie takes a sample of 50 of these teenagers, stratified by age.

Calculate the number of 14 year olds she should have in her sample.

14 $P$ is inversely proportional to $V$.

When $V = 8, P = 5$

(a) Find a formula for $P$ in terms of $V$.

$$P = \ldots$$

(b) Calculate the value of $P$ when $V = 2$

$$P = \ldots$$

Lots more papers at www.bland.in
The diagram shows a regular hexagon and a square.

Calculate the size of the angle \( a \).

\[ \text{.........................} \]

\( \text{(Total for Question 15 is 4 marks)} \)