GCSE MATHEMATICS (LINEAR)  
Higher Tier Paper 2  

Friday 4 November 2016  

Materials  
For this paper you must have:  
• a calculator  
• mathematical instruments.  

Instructions  
• Use black ink or black ball-point pen. Draw diagrams in pencil.  
• Answer all questions.  
• You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.  
• Do all rough work in this book.  

Information  
• The marks for questions are shown in brackets.  
• The maximum mark for this paper is 105.  
• The quality of your written communication is specifically assessed in Questions 2, 6 and 20. These questions are indicated with an asterisk (*).  
• You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.  

Advice  
• In all calculations, show clearly how you work out your answer.  

Please write clearly in block capitals.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature
Area of trapezium = \( \frac{1}{2} (a+b)h \)

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

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 = \( \pi rl \)

In any triangle \( ABC \)

Area of triangle = \( \frac{1}{2} ab \sin C \)

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

Cosine rule \( a^2 = b^2 + c^2 - 2bc \cos A \)

The Quadratic Equation
The solutions of \( ax^2 + bx + c = 0 \), where \( a \neq 0 \), are given by

\[
x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}
\]
Answer all questions in the spaces provided.

1. On this grid, rotate shape $A$ by $90^\circ$ clockwise about point $P$. [3 marks]

Turn over for the next question
100 people are asked about their work. Here are some of the results.

<table>
<thead>
<tr>
<th></th>
<th>Full time</th>
<th>Part time</th>
<th>Not working</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>24</td>
<td>9</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Women</td>
<td>18</td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

2 (a) The total number working **part time** is the same as the total number of people **not working**.

Complete the table.

[4 marks]
*2 (b) In this survey, there are 60 men and 40 women.

Which is greater

- the percentage of the men who work full time
- or
- the percentage of the women who work full time?

You must show your working.

Answer

Turn over for the next question
3. This hexagon has two lines of symmetry.

Not drawn accurately

Work out the size of angle $y$.

[3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer __________________________ degrees
4 A builder mixes sand and cement in the ratio 4 : 1

4 (a) Altogether he mixes 250 kg

How much sand and cement does he use? [2 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Sand ______________________ kg

Cement ____________________ kg

4 (b) Cement is sold in 25 kg bags.

Work out the maximum amount of mix that the builder can make with 3 bags of cement. [3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer _________________________ kg

Turn over for the next question
5 (a) Complete the table of values for \( y = x^2 - 5 \) for values of \( x \) from \(-3\) to \(3\) [2 marks]

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-3)</th>
<th>(-2)</th>
<th>(-1)</th>
<th>(0)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>(4)</td>
<td>(-4)</td>
<td>(-1)</td>
<td>(1)</td>
<td>(4)</td>
<td>(4)</td>
<td>(4)</td>
</tr>
</tbody>
</table>

5 (b) Draw the graph of \( y = x^2 - 5 \) for values of \( x \) from \(-3\) to \(3\) [2 marks]

5 (c) Use the graph of \( y = x^2 - 5 \) to write down the values of \( x \) when \( y = 0 \) [1 mark]

Answer ___________________ and ___________________
The table shows the proportions of left-handed and right-handed students in a school.

<table>
<thead>
<tr>
<th></th>
<th>Left-handed</th>
<th>Right-handed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Girls</td>
<td>12%</td>
<td>88%</td>
</tr>
</tbody>
</table>

*6 (a) 20 boys and 10 girls are chosen at random from the school.

Estimate the number of left-handed students chosen.

[3 marks]

Answer

---

6 (b) There are an equal number of boys and girls in the school.

A student is chosen at random.

Work out the probability that the student is right-handed.

[2 marks]

Answer
7 (a) Work out the area of a circle of radius 6 cm

[2 marks]

Answer ____________________________ cm²

7 (b) Quarter circles of radius 6 cm are cut from the corners of a rectangle as shown.

[3 marks]

Work out the shaded area.

Answer ____________________________ cm²
8 In 1981 the population of England was 46 million.
In 2011 the population of England was 53 million.

Work out the increase in population as a percentage of the 1981 figure.

[3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer ____________________________________ %

Turn over for the next question
9. The area of the rectangle and the area of the triangle are equal.

Not drawn accurately

Work out the value of $x$.

[4 marks]

\[
x = \underline{\hspace{3cm}}
\]
A ladder of length 31 feet is leaning against a wall as shown. The foot of the ladder is 8 feet from the wall. The wall is 35 feet tall.

Work out the distance from the top of the ladder to the top of the wall.

Answer _________________ feet
11 Bag A contains 3 red balls and 7 blue balls.
Bag B contains 8 red balls and 2 blue balls.

A ball is picked at random from each bag.

11 (a) Complete the tree diagram to show all the probabilities.

[3 marks]
11 (b) Work out the probability of picking a red ball from Bag A and a blue ball from Bag B. [2 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
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______________________________________________________________________________

Answer ____________________________________________

Turn over for the next question
12 The straight line passes through points (0, 2) and (2, 8)

12 (a) Work out the equation of the straight line.

Answer: ____________________________
12 (b) On this grid the line $y = \frac{1}{2} x$ is shown.

On the same grid, draw the line $x + y = 9$ for values of $x$ from 0 to 9 [2 marks]

12 (c) Solve the simultaneous equations

$y = \frac{1}{2} x$

and $x + y = 9$

[2 marks]

Answer ____________________________________________
13 (a) Simplify fully \(5x^2 \times 3y^4 \times 2x \times y^3\) 

[2 marks]

Answer ________________________________

13 (b) Expand and simplify \((x + 7)(x - 3)\) 

[2 marks]

Answer ________________________________

13 (c) Solve \((x - 8)(x + 2) = 0\) 

[1 mark]

Answer ________________________________

13 (d) Factorise \(8x^2y + 6xy^2\) 

[2 mark]

Answer ________________________________
14 In a sale the normal price of a dress is reduced by 25%  
The sale price is then reduced by £10  
The dress is now priced at £80  
The manager says,  
““The price is now one-third less than the normal price.””  
Show that he is correct. [5 marks]
A train company records the number of minutes, $t$, some trains were late in one month.

The histogram summarises the results.

15 (a) How many trains were more than 15 minutes late? [3 marks]

Answer: ___________________________
15 (b) Which is the modal class?
Circle your answer. [1 mark]

\[ 0 < t \leq 5 \quad 15 < t \leq 25 \quad 25 < t \leq 30 \quad 30 < t \leq 60 \]

16 Which of these when converted to decimals are recurring decimals?
Circle your answers. [2 marks]

\[ \frac{1}{3} \quad \pi \quad \sqrt{3} \quad \frac{3}{16} \quad \frac{5}{7} \]

Turn over for the next question
The surface area of a solid cylinder is given by the formula

\[ S = 2\pi rh + 2\pi r^2 \]

17 (a) Rearrange the formula to make \( h \) the subject.  

[2 marks]

Answer _______________________________

17 (b) Work out the value of \( h \) when \( S = 95\pi \) cm\(^2\) and \( r = 5.3 \) cm

Give your answer to a suitable degree of accuracy.  

[4 marks]

Answer _______________________________ cm
18. \( y \) is inversely proportional to \( x^2 \) where \( x > 0 \)

When \( x = 2 \), \( y = 20 \)

18 (a) Form an equation for \( y \) in terms of \( x \). [3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer _______________________________________

18 (b) Work out the value of \( x \) when \( y = 5 \) [2 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer _______________________________________

Turn over}

WMP/Nov16/4365/2H
19 (a) Work out the length \( x \).

\[ \text{Answer } \] cm

19 (b) Circle the statements that are true.

\[
\begin{align*}
\sin 123^\circ &= \sin 57^\circ \\
\sin 123^\circ &= \cos 57^\circ \\
\cos 123^\circ &= \cos 57^\circ \\
\cos 123^\circ &= -\cos 57^\circ
\end{align*}
\]
19 (c) Work out the length $y$. [1 mark]

Answer __________________________ cm

Turn over for the next question
A rectangle of card, 20 cm by 10 cm, is used to make a cylindrical tube A, as shown. The card does **not** overlap.

Another rectangle of card, 20 cm by 10 cm, is used to make a cylindrical tube B, as shown. The card does **not** overlap.
The tubes are filled with clay.

Which tube uses more clay? You **must** show your working.

[4 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer ____________________________________________

Turn over for the next question
21 Use algebra to work out the $x$-coordinates of the points of intersection of

\[ y = 3x^2 \]

and \[ y = 4x + 2 \]

Give your answers to 1 decimal place. 

[5 marks]  

Answer _______________________________
Work out the height \( h \) of the triangle \( ABC \).

Not drawn accurately

[5 marks]

Answer

\[ \underline{\text{cm}} \]

END OF QUESTIONS
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There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
Answer in the spaces provided