Edexcel GCSE
Mathematics (Linear) – 1380
Paper 4 (Calculator)
Higher Tier
Tuesday 10 November 2009 – Morning
Time: 1 hour 45 minutes

Instructions to Candidates
In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must NOT write on the formulae page.
Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates
The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).
There are 29 questions in this question paper. The total mark for this paper is 100.
There are 24 pages in this question paper. Any blank pages are indicated.
Calculators may be used.
If your calculator does not have a \( \pi \) button, take the value of \( \pi \) to be 3.142 unless the question instructs otherwise.

Advice to Candidates
Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.
Volume of a prism = area of cross section × 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

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

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 TWENTY NINE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. Ali asked 200 students which sport they like best.
They could choose swimming or tennis or athletics.

The two-way table shows some information about their answers.

```
<table>
<thead>
<tr>
<th></th>
<th>Swimming</th>
<th>Tennis</th>
<th>Athletics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>54</td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>
```

Complete the two-way table.

2. (a) Use your calculator to work out the value of \( \frac{8.7 \times 12.3}{9.5 - 5.73} \).
Write down all the digits from your calculator.
Give your answer as a decimal.

\[ \text{..........................................} \] (2)

(b) Write your answer to part (a) correct to 1 significant figure.

\[ \text{..........................................} \] (1)

(Total 3 marks)
3. (a) \( p = 2 \)
\[ q = -4 \]

Work out the value of \( 3p + 5q \)

...................................................(2)

(b) Factorise \( 3m - 6 \)

...................................................(1)

4. Frank did a survey on the areas of pictures in a magazine. 

The magazine had 60 pages. 
Frank worked out the area of each of the pictures in the first 2 pages. 

This may not be a good method to do the survey. 
Explain why.

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

(Q3 Total 3 marks)

(Q4 Total 1 mark)
5.

The diagram shows a prism.

(a) On the diagram, draw in one plane of symmetry for the prism.

(b) In the space below, sketch the front elevation from the direction marked with an arrow.

(Total 4 marks)
6. (i) Write down the size of the angle marked $a$.

\[ \theta \]

(ii) Give a reason for your answer.

\[ \text{(Total 2 marks)} \]

7. A circle has a radius of 5 cm.

Work out the area of the circle.
Give your answer correct to 3 significant figures.

\[ \text{cm}^2 \]

\[ \text{(Total 2 marks)} \]
Soap powder is sold in two sizes of box.

- **Small box**
  - 2 kg of soap powder for £1.72

- **Large box**
  - 9 kg of soap powder for £7.65

A small box contains 2 kg of soap powder and costs £1.72
A large box contains 9 kg of soap powder and costs £7.65

Which size of box gives the better value for money?

Explain your answer.
You must show all your working.
9. Describe fully the single transformation that maps triangle A onto triangle B.

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

10. A computer costs £360 plus 17\(\frac{1}{2}\)\% VAT.

Calculate the total cost of the computer.

£ ....................................

(Total 3 marks)
11. The scatter graph shows some information about 10 cars. It shows the time, in seconds, it takes each car to go from 0 mph to 60 mph. For each car, it also shows the maximum speed, in mph.

(a) What type of correlation does this scatter graph show?

(b) Estimate the maximum speed for this car.
In the diagram, all measurements are in centimetres.

The lengths of the sides of the triangle are

\[ 2x + 9 \]
\[ 2x - 3 \]
\[ 4x + 5 \]

(a) Find an expression, in terms of \( x \), for the perimeter of the triangle.
Give your expression in its simplest form.

\[ \text{Perimeter} = 2x + 9 + 2x - 3 + 4x + 5 \]

\[ \text{Perimeter} = 8x + 7 \]

(b) Find the value of \( x \).

\[ x = \text{...} \]

(Total 4 marks)
13. A piece of wood is 180 cm long.
   Tom cuts it into three pieces in the ratio 2 : 3 : 4

   Work out the length of the longest piece.

\[ \text{cm} \]

14. The equation

\[ x^3 + 2x = 60 \]

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.
You must show all your working.

\[ x = \text{...............} \]

(Total 3 marks)

(Total 4 marks)
15. (a) Simplify \( m^3 \times m^4 \)

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

(b) Simplify \( p^7 + p^3 \)

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

(c) Simplify \( 4x^2y^3 \times 3xy^2 \)

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

16. \( ABC \) is a right-angled triangle.
\( AB = 14 \text{ cm} \).
\( BC = 12 \text{ cm} \).

Calculate the length of \( AC \).
Give your answer correct to 3 significant figures.

\[ \text{.................................. cm} \]
17. (a) Complete the table of values for \( y = x^2 - 3x - 1 \)

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

(b) On the grid, draw the graph of \( y = x^2 - 3x - 1 \) for values of \( x \) from \(-2\) to \(4\)

(Total 4 marks)
18. The table shows some information about the heights ($h$ cm) of 100 students.

<table>
<thead>
<tr>
<th>Height ($h$ cm)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$120 \leq h &lt; 130$</td>
<td>8</td>
</tr>
<tr>
<td>$130 \leq h &lt; 140$</td>
<td>16</td>
</tr>
<tr>
<td>$140 \leq h &lt; 150$</td>
<td>25</td>
</tr>
<tr>
<td>$150 \leq h &lt; 160$</td>
<td>30</td>
</tr>
<tr>
<td>$160 \leq h &lt; 170$</td>
<td>21</td>
</tr>
</tbody>
</table>

(a) Find the class interval in which the median lies.

.............................................
(1)

(b) Work out an estimate for the mean height of the students.

......................................... cm
(4)

(Total 5 marks)
19. (a) Expand and simplify \((x - 3)(x + 5)\)

\[
(x - 3)(x + 5) = x^2 + 2x - 15
\]

(b) Solve \(\frac{29 - x}{4} = x + 5\)

\[
x = \frac{29 - 4}{4 + 1} = \frac{25}{5} = 5
\]

20. The table gives information about the cost of the gas used by a family.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of gas (in £)</td>
<td>124</td>
<td>63</td>
<td>24</td>
<td>121</td>
<td>136</td>
<td>71</td>
<td>32</td>
</tr>
</tbody>
</table>

(a) Work out the four-point moving averages for this information. The first three have been worked out for you.

\[
\begin{align*}
\text{£83} & \quad \text{£86} & \quad \text{£88} & \quad \text{£}
\end{align*}
\]

(b) Use the moving averages to describe the trend.
21. In a sale, normal prices are reduced by 12%.
The sale price of a digital camera is £132.88

Work out the normal price of the digital camera.

\[ \text{normal price} = \frac{\text{sale price}}{1 - \text{discount rate}} \]
\[ \text{normal price} = \frac{132.88}{1 - 0.12} \]
\[ \text{normal price} = \frac{132.88}{0.88} \]
\[ \text{normal price} = 150 \]

£ ................................

22. 

\[ AB CD \] and \[ PQ RS \] are mathematically similar.

(a) Find the length of \( PQ \).

\[ \frac{AB}{PQ} = \frac{AD}{PS} \]
\[ \frac{6}{PQ} = \frac{10}{12} \]
\[ PQ = \frac{6 \times 12}{10} \]
\[ PQ = 7.2 \]

\[ \text{................................. cm} \] (2)

(b) Find the length of \( AD \).

\[ \frac{AB}{AD} = \frac{BC}{CS} \]
\[ \frac{6}{AD} = \frac{10}{15} \]
\[ AD = \frac{6 \times 15}{10} \]
\[ AD = 9 \]

\[ \text{................................. cm} \] (2) Q22

(Total 4 marks)
23.

$ABC$ is a right-angled triangle.
$AC = 10.6\, \text{cm}$.
$BC = 8.2\, \text{cm}$.

Calculate the size of the angle marked $x$.
Give your answer correct to 3 significant figures.

........................................ °

(Total 3 marks)
24. The table below gives some information about some students in a school.

<table>
<thead>
<tr>
<th>Year group</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 12</td>
<td>126</td>
<td>94</td>
<td>220</td>
</tr>
<tr>
<td>Year 13</td>
<td>77</td>
<td>85</td>
<td>162</td>
</tr>
<tr>
<td>Total</td>
<td>203</td>
<td>179</td>
<td>382</td>
</tr>
</tbody>
</table>

Andrew is going to carry out a survey of these students. He uses a sample of 50 students, stratified by year group and gender.

Work out the number of Year 13 girls that should be in his sample.

25. \( y \) is directly proportional to \( x \).

When \( x = 500 \), \( y = 10 \)

(a) Find a formula for \( y \) in terms of \( x \).

\[ y = \frac{10}{500} x \]

(b) Calculate the value of \( y \) when \( x = 350 \)

\[ y = \frac{10}{500} \times 350 \]
In triangle $ABC$,

$AC = 5 \text{ cm}$.
$BC = 8 \text{ cm}$.
Angle $ACB = 75^\circ$.

(a) Calculate the area of triangle $ABC$.
Give your answer correct to 3 significant figures.

\[ \text{.......... cm}^2 \]  
(2)

(b) Calculate the length of $AB$.
Give your answer correct to 3 significant figures.

\[ \text{.......... cm} \]  
(3)
27. The incomplete histogram and table give some information about the times, in minutes, that cars were parked in a car park.

(a) Use the information in the histogram to complete the frequency table.

<table>
<thead>
<tr>
<th>Time (t minutes)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 &lt; t \leq 30$</td>
<td></td>
</tr>
<tr>
<td>$30 &lt; t \leq 40$</td>
<td>35</td>
</tr>
<tr>
<td>$40 &lt; t \leq 60$</td>
<td></td>
</tr>
<tr>
<td>$60 &lt; t \leq 80$</td>
<td>30</td>
</tr>
<tr>
<td>$80 &lt; t \leq 120$</td>
<td>20</td>
</tr>
</tbody>
</table>

(b) Use the information in the table to complete the histogram.

(Total 4 marks)
28. \[ v = \sqrt[3]{\frac{a}{b}} \]

\( a = 6.43 \) correct to 2 decimal places.
\( b = 5.514 \) correct to 3 decimal places.

By considering bounds, work out the value of \( v \) to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

\[ v = \quad \text{...............................} \]

Q28
(Total 5 marks)
29. Solve \( \frac{4}{x+3} + \frac{3}{2x-1} = 1 \)