COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: NON-CALCULATOR PAPER

Monday 26 January 2015

Please read this information before the examination starts.

- This examination is 60 minutes long.
- All questions should be attempted.
- A row of dots .......... denotes a space for your answer.
- You must show all your working or you may receive no marks.
- Answers given as fractions should be reduced to their lowest terms.
1. (a) Ann has £59.25 and Beth has £49.89

How much money do Ann and Beth have in total?

Answer: £ ......................... (2)

(b) Colin has £20.02 and then he buys a bag which costs £8.73

How much money does Colin have left?

Answer: £ ........................... (2)

(c) A box of pens costs £3.35

How much would it cost to buy 9 of these boxes of pens?

Answer: £ ........................... (2)

(d) 9 identical boxes of pencils cost £31.05 altogether.

How much does 1 box of these pencils cost?

Answer: £ ........................... (2)
2. Dan is 12 years old and Emma is 21 years old.

   (i) Write down the ratio of Dan’s age to Emma’s age in its simplest form.

      Answer: .............:........... (1)

Mother shares £132 between Dan and Emma in the ratio of their ages.

   (ii) How much does Dan receive?

      Answer: £ ................. (2)

3. Work out the value of

   (a) (i) $-4 + 8 \times -5$

      Answer: ..................... (2)

   (ii) $5 \times \sqrt{121} + 7$

      Answer: ..................... (2)

   (b) (i) Which number should be written in the box to complete the following calculation?

      \[ 72 \div (9 \times \Box) = 8^2 \div 4^2 \]

      Answer: ..................... (2)

   (ii) Which mathematical operation (+, −, ×, ÷) should be written in the box to complete the following calculation?

      \[ 12 - 8 \Box 2 = 2 \]

      Answer: ..................... (1)
4. (a) Jack scored 36 marks out of 80 in a test.
   What is 36 out of 80 as a percentage?

   Answer: ................................%  (2)

(b) Jessica’s first throw of a javelin is 33 metres.
   Her second throw is 11% longer.
   How long is Jessica’s second throw?

   Answer: ................................. m  (2)

(c) Write the following numbers in order of size, starting with the smallest.

   \[
   \frac{5}{9} \quad 55\% \quad 0.505
   \]

   Answer: .................., ............... , .............  (2)
5. (i) Write the number 32 as a product of its prime factors, using indices.

Answer: ........................................ (2)

(ii) Write 320 as a product of its prime factors, using indices.

Answer: ........................................ (1)

6. You are told that \(654 \times 32.5 = 21255\)
Use this fact to work out

(i) \(654 \times 3.25\)

Answer: ........................................ (1)

(ii) \(655 \times 32.5\)

Answer: ........................................ (1)

(iii) \(2125.5 \div 325\)

Answer: ........................................ (1)
7. By first writing each number in the following calculation correct to 1 significant figure, estimate the value of

\[
\frac{305 \times 6.123}{0.499}
\]

Answer: .................................. (3)

8. Paul is building a bookcase.
   All the shelves are \(\frac{7}{8}\) of a metre long.
   Paul has a piece of wood which is \(2\frac{3}{20}\) metres long.
   He cuts two shelves from this piece of wood.
   (i) What is the length, in centimetres, of the piece of wood that remains?

Answer: .................................. cm (3)

Paul buys a piece of wood which is \(4\frac{1}{2}\) metres long.
(ii) How many shelves can he cut from this piece?

Answer: .................................. (2)
9. (i) At 9 am the temperature in Alaska is $-12.7^\circ C$ and in Washington it is $-2.9^\circ C$.

(a) What is the difference between these two temperatures?

Answer: $..........................^\circ C$ (1)

By noon, the temperature in Washington has risen by $4.5^\circ C$.

(b) What is the temperature in Washington at noon?

Answer: $..........................^\circ C$ (1)

(ii) There are two different temperature scales: Celsius ($^\circ C$) and Fahrenheit ($^\circ F$).

To convert Celsius to Fahrenheit, this formula can be used:

$$F = \frac{9}{5}C + 32$$

Where $F$ is the temperature in $^\circ F$ and $C$ is the temperature in $^\circ C$.

(a) If the temperature is $-10^\circ C$, what is the temperature in Fahrenheit?

Answer: $..........................^\circ F$ (2)

(b) If the temperature is $50^\circ F$, what is the temperature in Celsius?

Answer: $..........................^\circ C$ (2)
10. If \( x = 2 \), \( y = -2 \), and \( z = -6 \) find the value of

(i) \( 7x - 4y \)

Answer: 

(ii) \( 2xyz \)

Answer: 

(iii) \( z - y^3 \)

Answer: 

(iv) \( \frac{2z^2}{3y} \)

Answer:
11. (i) Work out the size of each of the angles marked $a$, $b$, $c$ and $d$ in the diagram below.

Answer: $a =$ ........................................ (1)

$b =$ ........................................ (2)

$c =$ ........................................ (1)

$d =$ ........................................ (1)

(ii) Is shape $ABCD$ a parallelogram?
Give a reason for your answer.

Answer: Yes/No reason: ................................................................. ................................................................. (2)
12. The currency in the Czech Republic is the koruna (CZK).

£1 is worth 28 CZK.

(i) Draw a straight line on the grid below to convert CZK to £.

(ii) **Showing clearly where you take your readings**, use your graph to help you answer the following questions:

(a) How many CZK are worth £17.50?

Answer: ....................... CZK (2)

(b) How many pounds are worth 420 CZK?

Answer: £ ......................... (2)

(c) Tomas has 350 CZK.

James has £14

Who has more money and by how many pounds?

Answer: ....................... by £ ....................... (2)
13.  
(i) Explain why the triangle $PQR$ with sides of length 5 cm, 12 cm and 13 cm contains a right angle.

Answer: .................................................................................................................

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

(ii) Using ruler and compasses, construct this triangle and label it $PQR$.
(One side, $QR$, has already been drawn for you.)

(iii) Calculate the area of triangle $PQR$.

Answer: .................. cm$^2$ (1)

Look at the trapezium $ABCD$.

(iv) (a) What is the area of $ABCD$?

Answer: .................. cm$^2$ (2)

(b) What is the perimeter of $ABCD$?

Answer: .................. cm (1)
14. (i) A straight line has the equation $y = 1 - 2x$

(a) Complete the table of values below for the line $y = 1 - 2x$

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td></td>
<td></td>
<td>-3</td>
</tr>
</tbody>
</table>

(b) Draw and label the line $y = 1 - 2x$ on the grid opposite.

(ii) A curve has the equation $y = 2x^2 - 2$

(a) Complete the table of values below for the curve $y = 2x^2 - 2$

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>0</td>
<td></td>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

(b) Draw and label the curve $y = 2x^2 - 2$ on the grid opposite.

(iii) Use your graph to find the positive $x$-value which satisfies the equation

$1 - 2x = 2x^2 - 2$

Answer: $x = \ldots$
15. (a) The patterns below are made up of grey and white squares.

![Patterns 1, 2, and 3]

(i) Draw pattern 4 in the grid below.

![Grid]

(ii) Complete the table below to show the number of grey and white squares in each pattern.

<table>
<thead>
<tr>
<th>pattern</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>grey squares</td>
<td>4</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>white squares</td>
<td>6</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(iii) In which pattern are there 20 grey squares?

Answer: ...........................................

(iv) In which pattern is the number of grey squares 15 more than the number of white squares?

Answer: ...........................................
(b) A sequence of numbers is generated using the following formula for the $n$th term:

$$(n + 1)^2 + 3$$

The first term of this sequence is 7

(i) Write down the next three terms of the sequence.

Answer: .................., .................., .................. \hspace{1cm} (2)

(ii) Explain why the number 68 is not a number in this sequence.

Answer: .............................................................................................................

......................................................................................................................... \hspace{1cm} (1)

(iii) Which term in the sequence is 147?

Answer: term ..................... \hspace{1cm} (1)

TURN OVER FOR QUESTION 16
16. (a) Chris is building a patio using the rectangular paving blocks shown below.

(i) In terms of $x$, what is the perimeter of the block?
   Simplify your answer.

   Answer: ....................... cm (2)

(ii) Find the value of $x$ if the perimeter of the block is 1.2 metres.

   Answer: $x =$ ....................... (2)

(b) Matt is building a rectangular swimming pool and has drawn the plan of it below.

(i) (a) By considering the height of this rectangle, write down an equation in terms of $y$ and $z$

   Answer: ................................. (1)

(b) By considering the width of this rectangle, write down an equation in terms of $y$ and $z$

   Answer: ................................. (1)

(ii) Using your answers to part (b) (i), solve simultaneous equations to find the value of $y$ and the value of $z$

   Answer: $y =$ ................. $z =$ .................. (3)

(Total marks: 100)