1. The numbers 12.5, 15.06, 9.9002 and 9.06 are put in order starting with the lowest. Helen says 'Even if you round the numbers correct to 1 significant figure you will still get the same order.' Is she correct? Explain your answer clearly. [3 marks]

2. A, 7.5 and C are three numbers. There is a difference of 5.8 between A, the highest number, and C, the lowest number. 7.5 is exactly halfway between A and C. Find A and C. [3 marks]

\[ A = \quad C = \]

3. An integer, G, is rounded to the nearest 1000 to give the value 10 000.
   a. Write down a possible value for G. [1 mark]
      
      Answer

   b. Find the greatest possible difference between values for G. [3 marks]
      
      Answer
4 Gemma adds two integers; the answer is 19. She says ‘The difference between my numbers is 5.’ What are Gemma’s two numbers? Show that your answer is correct. [2 marks]

Answer ___________________ and __________________

5 In this question the year is 2015 and you can only use each digit of the date once in your answer to part b.
Ali says ‘I can make a calculation with the answer 10.’ He writes

\[10 - 5 \times 2 = 10\]

and says

10 take away 5 is 5
5 times 2 is 10.

a Explain why Ali is wrong and give the correct answer to the calculation. [2 marks]

b Write two different calculations each with the answer 10. [2 marks]

Answer ___________________ and __________________
Airlines have these rules about the size of bags that can be carried on to a plane.

A bag must have length < 56 cm and
width < 45 cm and
depth < 25 cm.

Jenny’s bag has a depth of 24 cm.
The area of the front of the case is 2200 cm².
Sean says ‘You won’t be able to carry that case on to a plane.’
Jenny thinks she will be able to.
Show that Sean and Jenny could both be correct.

[5 marks]
7. Decide whether each statement is always true, sometimes true or never true. In each case, give an example to support your answer.

a. A number $P$, correct to the nearest integer, is 5.
   Another number $Q$, correct to 1 decimal place, is 5.0.

   So $P \neq Q$.  

   The statement is __________________________ true.

   Example, .................................................................

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b. $G$ is an integer and $0 \leq H \leq 1$.

   \[
   \frac{G}{H} > G
   \]

   The statement is __________________________ true.

   Example, .................................................................

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2 Expressions

1 In a magic square the total of every row, every column and every diagonal is the same.
In a normal magic square the numbers used are the integers 1, 2, 3, ...

\[
\begin{array}{ccc}
4 & 9 & 2 \\
3 & 5 & 7 \\
8 & 1 & 6 \\
\end{array}
\]

Total = 15

Here is a 4-by-4 magic square.

\[
\begin{array}{cccc}
7 & 12 & 1 & 14 \\
2 & 13 & 8 & 11 \\
16 & 3 & 10 & 5 \\
9 & 6 & 15 & 4 \\
\end{array}
\]

The total, \(T\), for a normal magic square with \(n\) squares on each side is \(T = \frac{n(n^2 + 1)}{2}\).

a Show that this formula gives the correct total for the 4-by-4 square shown. [2 marks]

b This is a 2-by-2 square.

\[
\begin{array}{ccc}
& & \\
& g & \\
& & \\
\end{array}
\]

Write expressions in terms of \(g\) for each of the remaining three squares, and decide whether it is possible to have a 2-by-2 normal magic square. [4 marks]
2 The shape of the Earth is an oblate spheroid. The formula for its volume is

\[ V = \frac{4}{3}\pi a^2 c \]

where

- \( a \) is the polar radius (distance between the centre and the North Pole)
- \( c \) is the equatorial radius (distance between the centre and the equator).

\[ a \]

The internet gives the following information for the Earth.
- Polar diameter (distance between N and S poles) = 7900 miles.
- Equatorial diameter is 26 miles more than the polar diameter.

Show that the volume of the earth is **approximately** 260 billion cubic miles. [4 marks]

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3  Here $a$ is a whole number.
You are given three facts about a rectangle:
• The length of the rectangle is a whole-number multiple of $a$.
• The width of the rectangle is a whole number.
• The area of the rectangle is $12a^2 + 6a$.

a  Find all four different pairs of values for the length and width of the rectangle. [4 marks]

Answer

b  An expression for the perimeter of the rectangle is $14a + k$.
   Find the value of the integer $k$. [2 marks]

Answer
4  a  Ethan says that $4^{x+4} = 2^{x+4}$ because $4 = 2^2$.
Explain why Ethan is wrong and write $4^{x+4}$ as a power of 2.  

Answer

b  Find the value of $x$.  

\[
\frac{2^{12x-3} \times 4^{x+4}}{2^{5+3x}} = 2^5
\]