



OUNDLE

School

2015 Academic Scholarship

Mathematics

Paper II

Time Allowed: **2 hours**

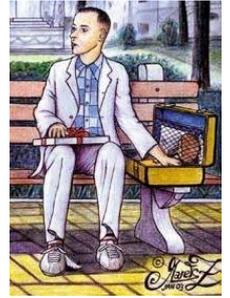
Calculators may NOT be used for this paper

Instructions to candidates:

- You are not expected to have time to do all the questions.
- You may answer the questions in any order.
- Choose those questions which you think you can answer best.
- **Remember to show your working and clearly show the method you are using.**
- Answers should be given to 3 significant figures where appropriate.
- π may be taken as 3.14.
- **The number of marks for each question is show in square brackets**

- 1 Forrest Gump can run at a rate of 10 miles per hour however, after every mile, he must rest for 1 minute. How long would it take him to complete a 10 mile run?

[4]



- 2 Solve for x : $\frac{x}{x-1} = 14$

[4]

- 3 As my birthday approaches, I start collecting leaves for the party. On the first day of the month I collect 1, on the second day of the month I collect 2, on the third day 3 and so on until the day of my birthday. If I collect 276 leaves in total (including collecting on my birthday), on what day of the month is my birthday?

[8]



- 4 For the following system of equations, find the values of A, B, and C which are all positive:

$$A \times B = 6$$

$$B \times C = 3$$

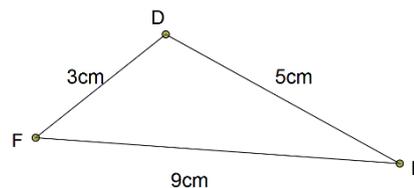
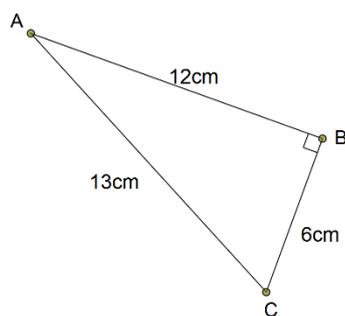
$$C \times A = 72$$

[8]

- 5 My sister had six children, but never got a set of twins or triplets. Last Christmas, the mean of her children's ages (in years) was 4.5 and if we multiplied all of their ages together, the result was 5040. How old were her children last Christmas?

[8]

- 6 State, in a few words, what is mathematically incorrect about the following triangles:

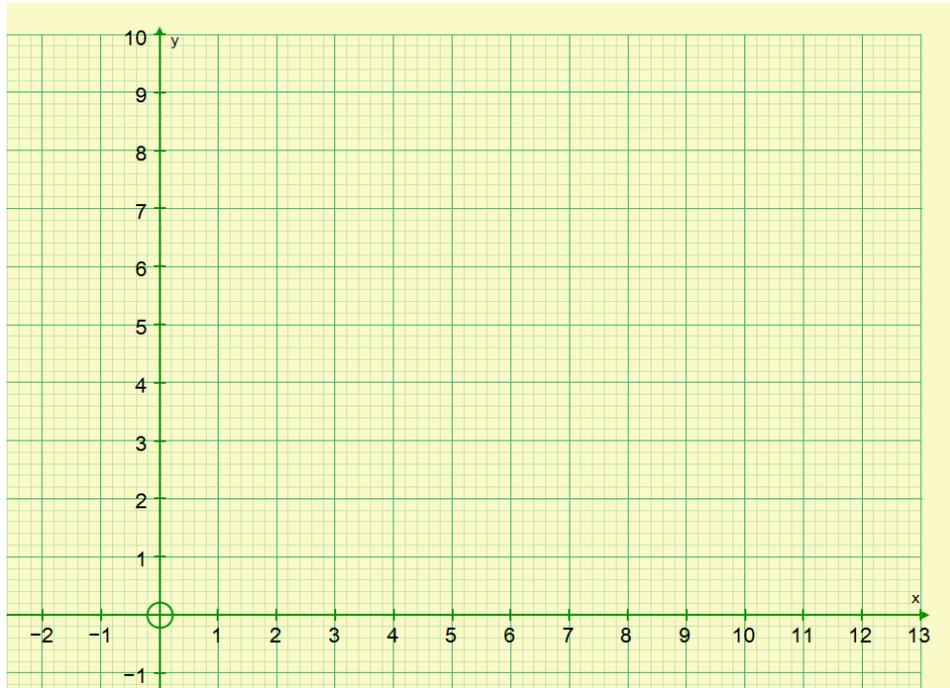


[6]

- 7 Kevin has a 30 litre barrel which contains 24 litres of water. At home in Grimsby, he adds some more water so that the amount in the barrel is increased by 20% before transporting it to his destination in Blackpool. If 20% of the water splashes out en route to Blackpool, how much water is in the barrel when it arrives?

[6]

- 8
- On the graph below, plot the triangle with vertices at A(4,1), B(5,4) and C(8,3).
 - Plot the line $y=x$
 - Reflect triangle ABC in the line $y=x$
 - Prove that ABC is a right-angled triangle (drawing the triangle to scale is not proof)



[12]

- 9 A block of wood 2m high 3m long and 4m wide is to be carved into spheres of radius 1m each. How many such spheres can be carved out of this block? (show your working)

[6]

- 11 Laura cycles to school each morning. She cycles the first half of the distance at a steady speed of 24km/h but then gets tired and travels the second half at 12 km/h. What is her average speed for the entire journey?



[6]

- 12 If 58, 56 and 54 are the first three terms in a sequence where each term is 2 smaller than the previous term, find:

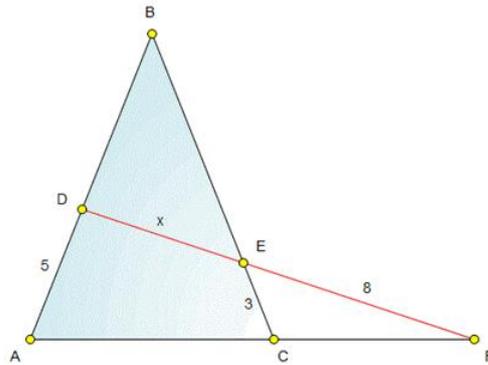
- the sum of the first 10 terms.
- the sum of the first 100 terms (do not write them all out!)
- two possible values of n if the sum of the first n terms is 660.

[12]

13 The diagram shows isosceles triangle ABC. Point F lies along the same straight line as AC, point D lies on AB a distance of 5 units from A and point E lies on BC a distance of 3 units from C. Points D, E and F lie on a straight line.

a) Draw on the diagram a straight line that is parallel to AB and which passes through E. Mark with a letter G, the point where this line intersects the line AC.

b) If line EF is of length 8 units, find x where x is the length of DE.



[8]

14 The number 8 has 4 factors, namely 1, 2, 4, and 8.

a) Write down all of the factors of the numbers 4, 6, 9 and 12.

b) What is the condition for a number to have an odd number of factors?

c) Find the smallest number that has exactly 8 factors?

d) Find the smallest number that has exactly 14 factors?

[12]

[Total: 100 Marks]