DO NOT WRITE ON THIS PAPER	**TIME** 2 hours	*Paper 2 of 5 from ZigZag Education*
Sample GCSE Examination Paper **Higher tier non-calculator paper**	Standard Equipment: lined or squared paper, pen, pencil, ruler. Additional Equipment: graph paper, pair of compasses, plain paper.	

1. a) Estimate: $\dfrac{111 \times 0.0018}{12}$

   b) Write 51^2 as the product of primes

   c) Calculate $4 \times 1.2 \times 10^4$ and write your answer in standard form.

   d) Calculate $\dfrac{1.2 \times 10^4}{3}$ and write your answer in standard form. 6 marks

2. 30 students swim the length of the pool and their time is recorded.
   Jim puts the results in the following table.
   Estimate the mean time for the class.

Time in seconds	Frequency
$10 < t \leq 20$	3
$20 < t \leq 25$	10
$25 < t \leq 35$	17

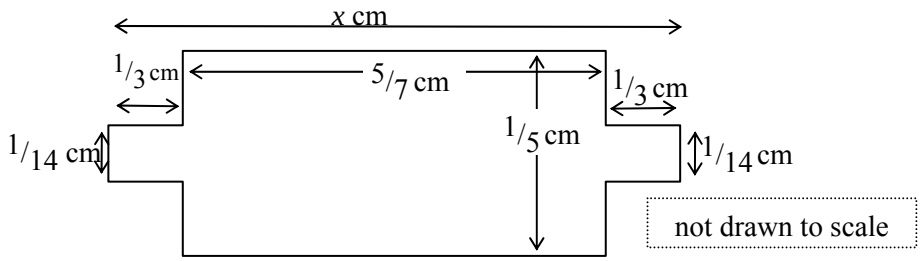
   4 marks

3. a) Write down formulae to represent the n^{th} term of sequences i) and ii).
      i) 5, 9, 13, 17,...
      ii) $1/2, 2/3, 3/4, 4/5$,...

   b) Jim thinks of a number, times it by 3 and then adds 4.
      If the result is ***x*** what did he start with?

   c) Jo thinks of a number. He tells John that his number is not a whole number.
      He also tells John that if he adds 50 to his starting number then this is the same as multiplying his starting number by 5.
      i) Formulate an equation in ***x*** which must be true; where ***x*** is Jo's starting number.
      ii) Solve the equation. 9 marks

4. In the following diagram find *x* and the perimeter and the area of the shape.

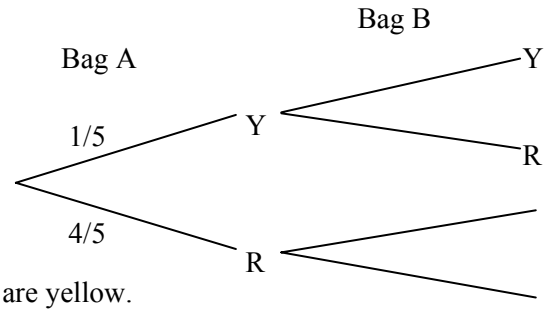


   5 marks

5. a) Solve the equation $10 - x = 2x - 10$ and write your answer as a mixed number.

   b) Simply the expression: $\dfrac{x^2 - 9}{x - 3}$ 4 marks

6. There are two bags.
   Bag A contains 1 yellow ball and 4 red balls.
   Bag B contains 1 yellow ball and 9 red balls.
   A ball is selected from bag A and then from B.

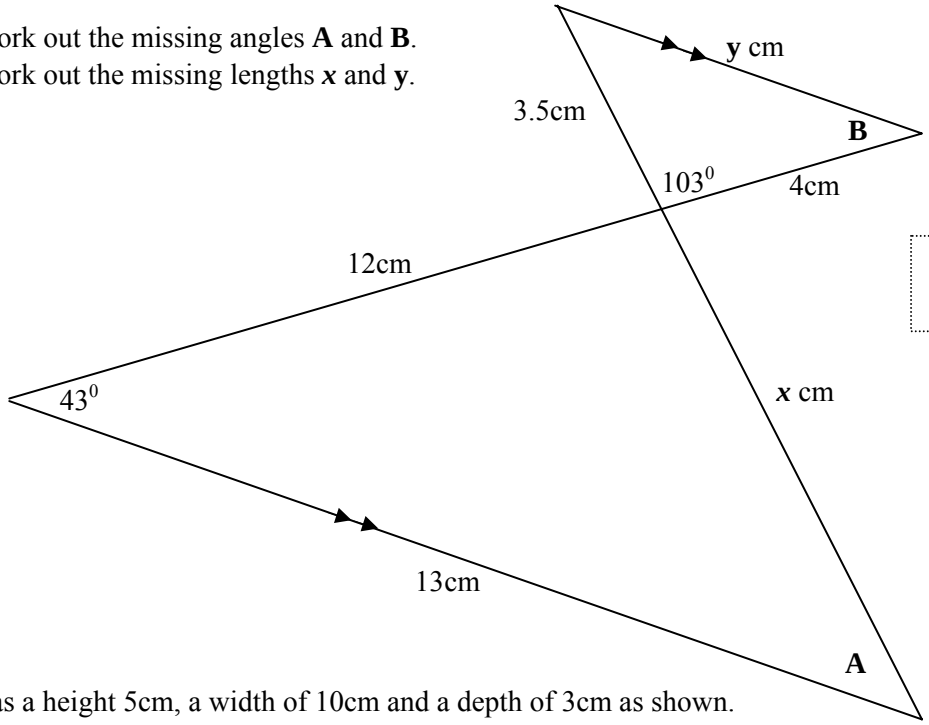


   a) Copy and complete the tree diagram
   b) Calculate the probability that both balls are yellow. 4 marks

7. John buys some skis in a sale. His skis were reduced by 10%. He pays £189.
   a) How much would he have paid if the skis had not been in the sale?
   Joshua also buys some skies whose price before the sale is £212.12.
   b) Calculate the cost of Joshua's skis after the sale of 10% to the nearest penny. 4 marks

8. a) Construct on plain paper the triangle ABC such that:
AB = 10cm, BC = 6cm and AC = 9cm.
b) Measure the acute angle ABC to the nearest degree.
c) Draw the line of points that are the same distance from AB and BC.
d) Shade all the points inside the triangle that are less than 4cm from A. 5 marks

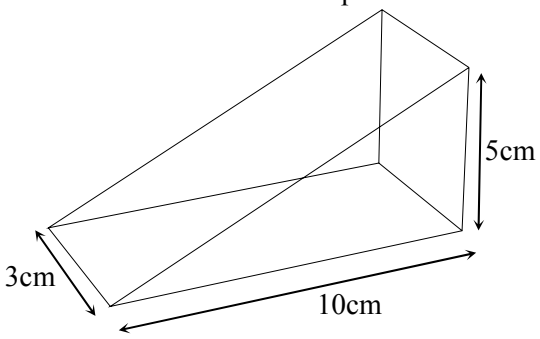
9. a) Work out the missing angles **A** and **B**.
b) Work out the missing lengths ***x*** and **y**.

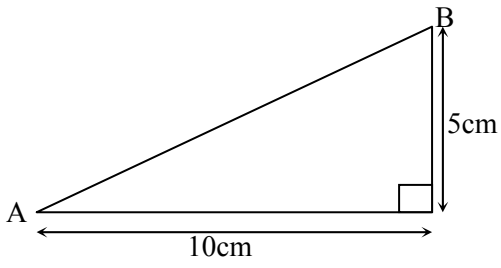


Not drawn accurately

6 marks

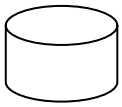
10. A prism has a height 5cm, a width of 10cm and a depth of 3cm as shown.
One of the faces of the prism is a right-angled triangle as shown.
Calculate the volume of this prism and the length AB giving your answer exactly.





3 marks

11. Jim makes some solid model cylinders.
All of his cylinders follow the relationship that the height of the cylinder is inversely proportional to the square of its radius.
Jim's first cylinder is 5cm high and its radius is 10cm.



a) Find an equation that links height to radius and evaluate any constants.
The radius of another of his cylinders is 5cm.
b) What is its height?
Jim makes another 5 cylinders that follow the above relationship.
The volume of a cylinder is given by: $V = \pi r^2 h$.
c) What is special about the volume of all of his 5 new cylinders? Justify your answer. 6 marks

12. Express as a single fraction:

a) $\frac{y}{2}+\frac{y}{3}$ b) $\frac{y}{2}\times\frac{y}{3}$ c) $\frac{y}{4}-\left(\frac{y}{2}-\frac{y}{3}\right)$ 3 marks

13. Calculate:

a) $400^{-1/2} \times 9^{1/2}$

b) $(2^3)^{1/3}$

c) $9^{-1/2}$

4 marks

14. 30 students swim the school pool and their time is recorded. Jim puts the results in the following table:

Time in seconds	Frequency
$10 < t \leq 20$	3
$20 < t \leq 25$	10
$25 < t \leq 35$	17

a) Draw a histogram to represent Jim's data.

b) Suggest an improvement to Jim's grouping of the data.

6 marks

15. Solve the simultaneous equations $x^2 - y^2 = 1$

$x + y = 2$

5 marks

16. Solve the equation $\frac{2x-3}{4x} + \frac{x-1}{2x+1} = -2$ and show that one solution can be written in the form $\sqrt{\frac{1}{a}}$ with a an integer and find the other solution in similar form.

6 marks

17. The length of a pendulum l is directly proportional to the square of the period T of the pendulum. A pendulum has a period of 0.5 seconds, and is 1 metre long.

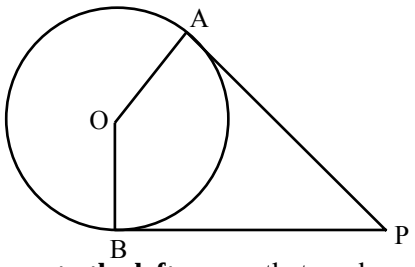
a) What length of pendulum has a period of 2 seconds?

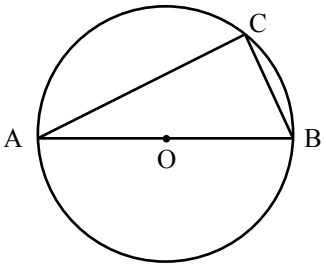
b) What is the period for a pendulum of length 16 m?

c) A pendulum P is constructed which has a period 4 times bigger than another pendulum Q. What is be the ratio of their lengths?

8 marks

18. a) **With reference to the diagram to the right**, prove that AP = BP. AP, BP are tangents at A, B respectively.





b) **With reference to the diagram to the left**, prove that angle ACB = 90°.

7 marks

19. A solid cone has a height of 8cm and a slanted height of 10cm as shown. Calculate the total surface area of the cone, leaving your answer in terms of π.

6 marks