OUNDLE

School

2016 Academic Scholarship

Preliminary Examination

Mathematics

Time Allowed: 1½ hours

- **Calculators may NOT be used.**
- Write your answers on **lined paper** and **show as much working as possible**. **Answers without clear logical working will gain little credit.**
- Do not spend too long on any single question. If you are having difficulty with a particular question, move on and return to it at the end if you have time. Do not be concerned if you cannot answer all of the questions.
- **At the end of the examination**, hand in both the question paper and your answers with your name clearly indicated on all sheets.

1. Work out :

(a) 17×31

(b) $4 \div \frac{1}{2}$

(c) $2 \times \frac{3}{7}$

(d) 0.04^2

(e) 20% of 20% of 25

(f) $\frac{9}{0.3}$

(g) $9\,000 \times 0.006$

(h) $\sqrt{3^2 - 2^3}$

(i) $12 \div 2 + (3 - 7) \times 2^2$

(j) $6\frac{1}{4} \div 2\frac{1}{2}$

2. You are told that $78 \times 49 = 3\,822$.

Without any further calculations, write down the answers to the following (do not spend a long time on this question)

(a) 7.8×0.49

(b) $3\,822 \div 0.78$

3. You are told that a, b and c have the values 3, $\frac{1}{2}$ and -4 but you do not know which letter has which value.

(a) Work out the largest possible value of $a^2 - ab$

(b) Work out the smallest possible value of $\frac{a}{bc}$

4. Remove brackets and simplify fully :

(a) $-2\,(x-3)$

(b) $x^2\,(x-1)$

(c) $(x+1)(x-2)$

5. (a) Write down two different numbers (apart from 6 and 36) that have a highest common factor (HCF) of 6 and a lowest common multiple (LCM) of 36.

(b) Write down the LCM of $6a^2b$ and $9a^3b^2$

6. Factorise fully :

(a) $2-4x$

(b) $4x^3-6x^2+12x$

FOR QUESTIONS 7 AND 8 USE A CLEAR ALGEBRAIC METHOD <u>NOT A TRIAL AND ERROR APPROACH</u>.

7. Solve each equation for x :

(a) $4x+3 = 19$

(b) $4 = \frac{14}{x+3}$

(c) $\frac{x-2}{3} = \frac{x-1}{4}$

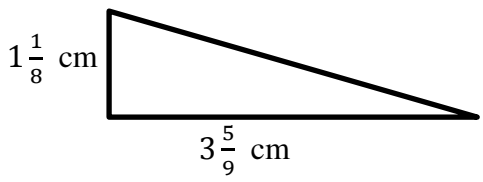
8. Solve for x and y :

$$3x-2y = 10$$

$$x+4y = 1$$

FOR THE REMAINING QUESTIONS, YOU CAN ANSWER THEM IN ANY ORDER THAT YOU CHOOSE. YOU MUST SHOW FULL WORKING TO MAKE IT CLEAR HOW YOU OBTAINED YOUR ANSWER. (ANSWERS WITHOUT WORKING WILL BE AWARDED VERY FEW MARKS)

9.



Diagrams **NOT** accurately drawn.



The area of the square is 18 times the area of the triangle.

Work out the **perimeter** of the square.

10.

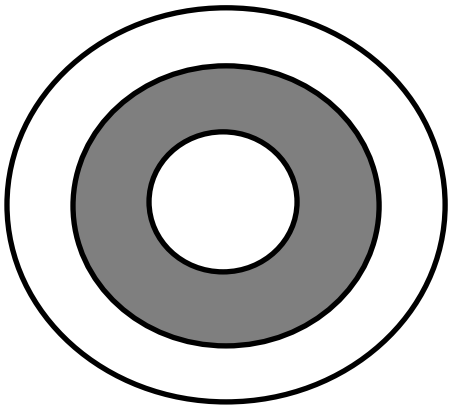


Diagram **NOT** accurately drawn.

The three circles have the same centre and have radii 2 cm, 3 cm and 4 cm.
What fraction of the largest circle is shaded ?

11.



If it takes 2 minutes to fill a bath using just the cold tap, and 3 minutes using just the hot tap, how long would it take to fill the bath with both taps on ?
(Give your answer in minutes and seconds).

12. (a) (i) A certain car can travel approximately 360 kilometres on 40 litres of petrol.
Estimate how far it can travel on 25 litres of petrol.

(ii) Another car can travel a km on x litres of petrol and b km on y litres of petrol.
Write down an expression for y in terms of a, b and x.

(b) A group of x workers take 5 hours to complete a task.
If 8 of them are ill, it takes 50 % more time for the task to be completed.
Find x.
(You may assume that they all work at exactly the same speed !).

13.



In a round-robin chess tournament, every player played every other player once.
If 21 matches were played, how many contestants were there ?

14.

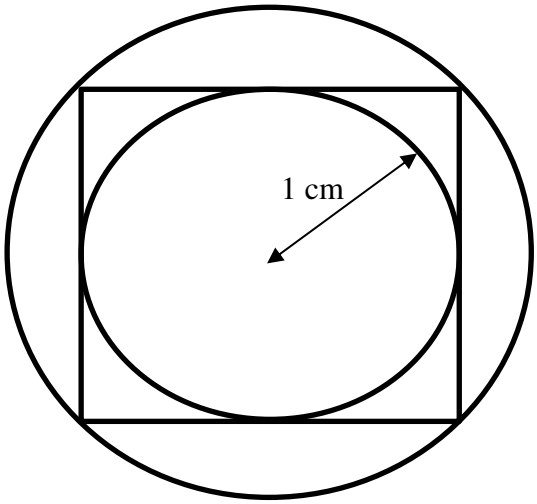


Diagram **NOT** accurately drawn.

The diagram shows a circle of radius 1 cm, around which a square has been drawn to just touch the circle, around which a second circle has been drawn just touching the square.

Calculate the ratio of the area of the smaller circle to the larger circle, giving your answer in its simplest form.

15.

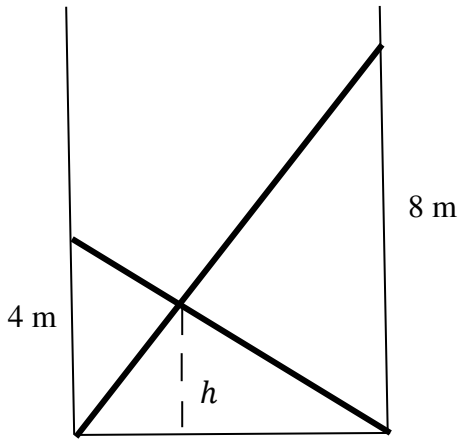


Diagram **NOT** accurately drawn.

Two ladders are propped up in a narrow passageway between two buildings.
The ends of the ladders are 8 m and 4 m above the ground, and the feet are touching the opposite walls. Find the height of the point where they cross (i.e. the length marked h on the diagram).
(You may assume that the ground is horizontal and the walls are vertical).