OUNDLE

School

2020 Academic Scholarship

Mathematics

PAPER I

Time Allowed: **1 hour and 30 minutes**

Calculators are **NOT** allowed

Instructions to candidates:

- Answer on the lined paper provided.
- 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**.
- Give answers to 3 significant figures where needed.
- The number of marks for each question is shown in square brackets.

Question 1 Work out the following.

a) 27% of 47

b) $33 \times 43 + 67 \times 43$

c) $34 \times 42 + 83 \times 84$

d) $3\frac{2}{3} + 2\frac{4}{7}$

[8]

Question 2 Simplify the following expressions fully.

a) $4x + 3y - x - 2xy - y + 3yx$

b) $3x + 2(3 - 5x) - (12 - 4x)$

c) $111x^3 \div 37x^2$

d) $2x - 3x^2 + x(5x - 4)$

[8]

Question 3 Solve the following equations

a) $3x - 2 = 4x + 3(2x - 5)$

b) $3x = \frac{1}{2}x + 5$

c) $48x^2 - 192 = 0$

d) $\frac{3x-1}{3+2x} = 4$

[8]

Question 4

a) I think of a number and subtract 5. I multiply the result by 7 and get a final answer of −84.
What was my number?

b) I think of a number, multiply it by 3 and then add 9. Squaring the result gives 144.
What *two* numbers could I have started with?

[4]

Question 5

The average of the two positive integers *m* and *n* is 5.

What is the largest possible value for *n*?
Show clear working.

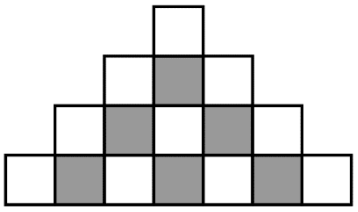
[4]

Question 6
Roman wins a contest with a prize of £200. He gives 30% of the prize to Jackie.
He then splits 15% of what remains equally between Dale and Natalia.

How much money does Roman give Dale?
Show clear working.

[4]

Question 7



Shaded and unshaded squares are arranged in rows so that:

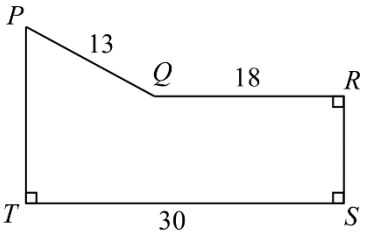
- the first row consists of one unshaded square,
- each row begins with an unshaded square,
- the squares in each row alternate between unshaded and shaded, and
- each row after the first has two more squares than the previous row.

The first 4 rows are shown.

What is the number of shaded squares in the 2020th row?
Show clear working.

[4]

Question 8



In the diagram, pentagon $PQRST$ has $PQ = 13$, $QR = 18$, $ST = 30$, and a perimeter of 82.
Also, $\angle QRS = \angle RST = \angle STP = 90°$.

What is the area of the pentagon $PQRST$?
Show clear working.

[4]

Question 9

Nate is driving to see his grandmother.
If he drives at a constant speed of 40 km/h, he will arrive 1 hour late.
If he drives at a constant speed of 60 km/h, he will arrive 1 hour early.

At what constant speed should he drive to arrive just in time?
Show clear working.

[4]

Question 10

Carley made treat bags. Each bag contained exactly 1 chocolate, 1 mint, and 1caramel.
The chocolates came in boxes of 50. The mints came in boxes of 40. The caramels came in boxes of 25.
Carley made no incomplete treat bags and there were no unused chocolates, mints or caramels.

What is the minimum total number of boxes that Carley could have bought?
Show clear working.

[4]

Question 11

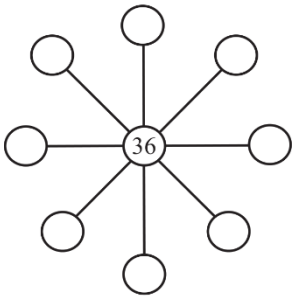
Suppose that x and y are real numbers with $-4 \le x \le -2$ and $2 \le y \le 4$.
Find the greatest possible value of

$$\frac{x+y}{y}$$

Show clear working.

[6]

Question 12



In the diagram, the central circle contains the number 36.
Positive integers are to be written in the eight empty circles, one number in each circle, so that the product of the three integers along any straight line is 2592.
If the nine integers in the circles must be all different, what is the largest possible sum of these nine integers?

Show clear working.

[6]