OUNDLE
School

EXAMINATION PAPER
Academic Scholarship 2022

Mathematics – Paper 1

Time allowed: 90 minutes

Name: _____

Instructions

- Calculators are **NOT** allowed.
- Please write your answers on lined paper.
- 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 workings and clearly show the method you are using.
- Give answers to 3 significant figures where necessary.

Question 1 Work out the following:

a) 0.03×4.5

b) $8 \div 1\frac{4}{5}$

c) 24% of 155

d) $\sqrt{40000}$

e) $16 \times 78 - 12 \times 39$

Question 2 Find the missing terms (?) in each of the following sequences:

a) $-7,\ -3,\ 1,\ 5,\ ?,\ \ldots$

b) $12,\ 6,\ 3,\ ?,\ \ldots$

c) $2,\ 8,\ 18,\ ?,\ 50,\ \ldots$

d) $?,\ \frac{3}{8},\ \frac{4}{27},\ \frac{5}{64},\ \ldots$

Question 3 Simplify the following expressions fully:

a) $7xy - 4x + 2y + x - 3yx$

b) $3x + 2(3x - 7) - (5 - x)$

c) $140x^3 \div 35x^2$

d) $8x + 3x^2 - 4x(x - 2)$

Question 4 If $a = \frac{2}{3}$, $b = -0.5$, and $c = 6$, find the value of:

a) $2a + 3b$

b) ac^2

c) $\frac{2c}{ab}$

d) $\frac{4(2b+3)^2}{ac-2}$

Question 5 Solve the following equations:

a) $\frac{2}{x} - 5 = 0$

b) $2x - 4 = \frac{x}{3}$

c) $x(x - 2) = 16 - 2x$

Question 6 Solve for x and y

$$y = 2x + 7$$
$$3x - 2y = -13$$

For the remaining questions, you should show full working which clearly shows how you arrived at your answer.

Question 7
Jane buys a painting and a vase from an antiques shop for a total of £42. She later sells both items for an overall profit of 25%. She sold the vase for £25.50, which represented a 50% profit. What was the percentage profit on the painting?

Question 8
Bill and Ben each have some marbles in the ratio 3:5. Ben trades a quarter of his marbles for 2 of Bill's. They now have an equal number of marbles; how many marbles do they have in total?

Question 9
Two identical dice, with the numbers $-3, -2, -1,\ 0,\ 1,\ 2$ on the faces, are rolled and the two numbers on the top faces are recorded.

a) What is the probability that the **product** of the two numbers is negative?

b) What is the probability that the **sum** of the two numbers is negative?

c) What is the probability that the product and the sum of the two numbers are both negative?

Question 10

Charlotte picks 5 positive integers which have a:

Mean of 5
Mode of 3
Range of 7

a) Find the three possible sets of numbers that Charlotte could have picked.

b) Charlotte swaps one of her numbers for another positive integer. The mean is now 6 but there is no mode. Which of the three possible sets of numbers did Charlotte originally pick?

Question 11

Alice's car display records her average speed for each journey. On one journey she has been driving for 30mins and her average speed is 40mph. Alice stops at a set of traffic lights; when she sets off again the display now shows that her average speed is 32mph.

a) How long was Alice stopped at the lights? Give your answer in minutes and seconds.

Alice is now driving at a constant speed of 60mph.

b) How long does Alice need to drive at this speed to increase her average speed for the journey to 40mph again?

Question 12

On an analogue clock the hour and minute hands move smoothly, so that each is moving around the dial at a constant rate.

a) Through how many degrees does each hand move every minute?

At 3 o'clock the hour and minute hands are at right angles to each other.

b) What is the acute angle between the hour and minute hands at half past 3?

c) How long after half past 3 will the hands next be at right angles again? Give your answer to the nearest minute.

Question 13

$$3^1 = 3$$
$$3^2 = 9$$
$$3^3 = 27$$
$$3^4 = 81$$

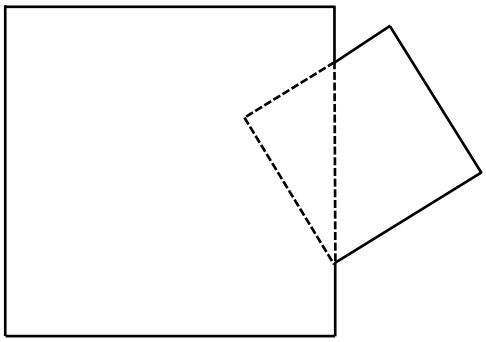
a) Write down the units digits of 3^5 and 3^6.

b) What would the units digit of 3^{333} be?

c) What is the units digit of the number equal to $1^1 + 2^{22} + 3^{333} + 4^{4444} + 5^{55555}$?

Question 14

Two squares are overlapped to form an irregular octagon, as shown in the diagram, with one corner of the smaller square lying on the side of the larger one. The larger square has sides of $10cm$ and the smaller one has sides of $4cm$.



The area of the overlap is $6cm^2$.

a) Find the area of the octagon.

b) Find the perimeter of the octagon.