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SURNAME:

FIRST NAME:

PREP SCHOOL:

Malvern College Academic Scholarship Examinations 2023

MATHEMATICS - Paper 1

Please read this information before the examination starts:

- Paper 1: 60 mins
- Marks: 100
- Specimen
- No Calculators are allowed for this paper
- Working must be shown to gain credit: No marks will be awarded for guessing or approaches that involve trial and improvement.

1. Find
   a. $5\frac{3}{4} - 3\frac{2}{5}$

.....[3]

   b. $4\frac{1}{5} \times 7\frac{1}{3}$

.....[3]

   c. 12.5% of 120

.....[2]

   d. $5^6 \times 2^7$

.....[2]

2. Simplify
   a. $5x - 2(3x - 6) + 12$

.....[2]

   b. $\frac{2a^2-6a}{6a-18}$

.....[2]

3. Solve the following equations

a. $5 - 6x = 12$

.....[2]

b. $3(x - 6) = 2 - (x + 5)$

.....[2]

c. $\frac{4x}{5-2x} = \frac{3}{4}$

.....[2]

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

.....[3]

4. Find 4 numbers with mean 6.5, mode 9 and median 7.

.....[3]

5.

a. Factorise

i. $4nm - 6nm^3$

.....[2]

ii. $f^2 - 9g^2$

.....[2]

b. Using similar methods as above find the following without doing long calculations.

i. $1.6 \times 4.235 + 8.4 \times 4.235$

.....[2]

ii. $56^2 - 44^2$

.....[2]

6. x and y represent numbers. We know that $x \div y = 2.5$.
Write down the value of:

a. $2x \div y$

.....[1]

b. $x \div 10y$

.....[2]

c. $\frac{y}{x}$

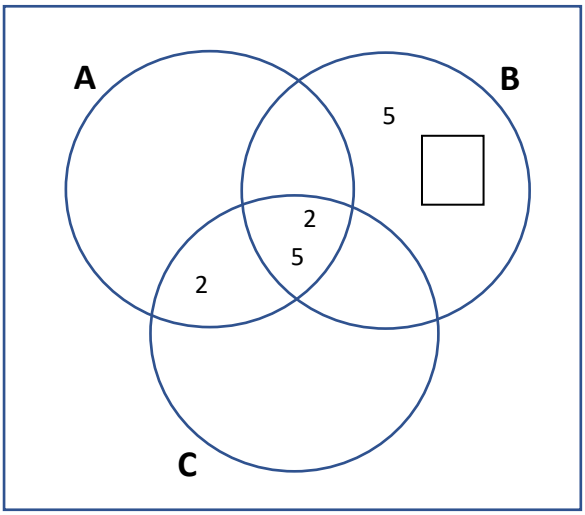
.....[1]

7. A = 360, B = 350 and C = $2^2 \times 3^3 \times 5$

a. Write A as the product of prime factors

……[2]

The Venn Diagram below shows some of the prime factors of the three numbers



b. Fill in the missing number in the rectangle of B

……[1]

c. Complete the rest of the diagram for A and C

……[3]

d. What is the Highest Common Factor of A,B and C

……[2]

e. What is the Lowest Common Multiple of A and B, giving your answer in index form.

……[2]

8. The surface area and volume of the Great Lakes are shown below.

Name	Surface Area (m^2)	Volume (m^3)
Lake Ontario	1.9×10^{10}	1.64×10^{12}
Lake Erie	2.57×10^{10}	4.8×10^{11}
Lake Michigan	5.8×10^{10}	4.9×10^{12}
Lake Huron	6.0×10^{10}	3.5×10^{12}
Lake Superior	8.2×10^{10}	1.2×10^{13}

a. Write 2.57×10^{10} as a normal number.

……[1]

b. Roughly how many times more water is in Lake Michigan than Lake Erie?

……[1]

c. Which two lakes combined have a similar surface area to Lake Superior?

……[2]

d. What is the volume of water in Lake Ontario and Lake Erie combined?

……[2]

e. Could all the water from the four smaller Lakes fit inside Lake Superior? (you must justify your answer with maths working.

……[2]

9. Butch and Cassidy invest money in ‘Sundance’ Bank.
    a. Butch invests $300 in a Wild West Websaver and gains a 5% return on his investment every year. How much does he have after
        i. 1 year

…….[2]

        ii. 2 years

…….[2]

    b. Cassidy invests $400 in a Sundance Kid Savings account and after 1 year has a total of $416. What was the interest rate?

…….[2]

    c. Butch puts some money into a Stocks and Shares account that might go down as well as up. In the first year it goes up by 20% and in the second year falls by 20%. Butch is horrified to discover he now has less than he started with.
    Explain why and find out by what percentage his investment has fallen.

…….[2]

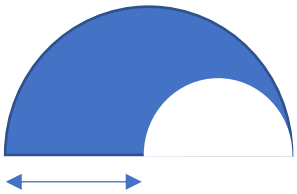
10. Simplify, giving your answers as powers of 3.
    a. $3^6 \times 9^2$

…….[2]

    b. $3^{4x-1} \times 3^x$

…….[2]

11. St Engelbert's school are putting on a performance of Twelfth Night. A pupil designs an outline for the Jester's hat shown below. It is a semicircle removed from a semicircle of radius 20 cm.



Find, giving your answer in terms of π

a. The area that is shaded

.....[3]

b. The perimeter of the shape

.....[3]

12. Naomi, Oscar and Peter are playing a came with marbles.

They start with marbles in the ratio 4:3:1 respectively.

a. Oscar gives 3 marbles to Peter so they have the same number. How many marbles were there to start with?

.....[2]

After playing a game they have marbles in the ratio 1:7:x

b. Oscar has 12 marbles more than Naomi. What is the value of x?

.....[2]

c. Explain why only 2 of them cannot have an even number of marbles each.

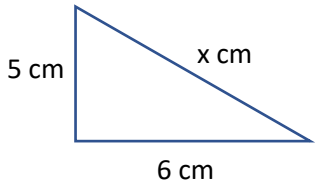
.....

..... [1]

13.

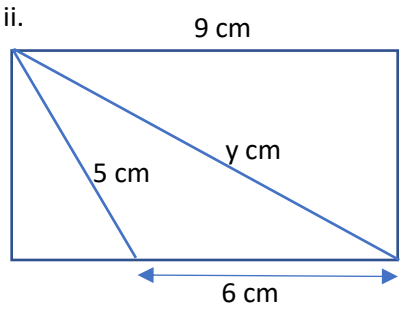
a. Find the missing lengths leaving your answers as square roots.

i.



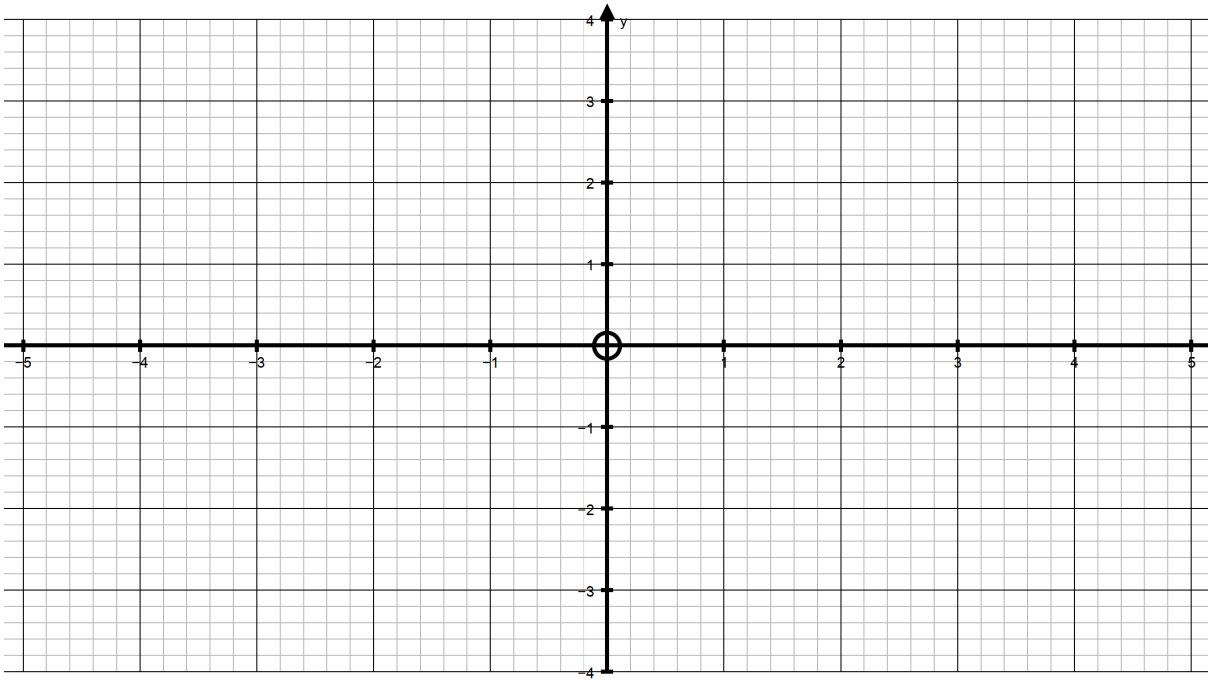
……[2]

ii.



……[3]

14. On the graph paper below plot points to draw the curve $y = (x + 1)^2 - 3$



[2]

Use the graph to solve the following equation

$$(x + 1)^2 - 3 = -\frac{1}{2}x + 1$$

.....[2]

15. Some information about the number of siblings members of class 8A have is shown below.

Number of Siblings	Frequency	
0	1	
1	4	
2	3	6
3	2	

There are 3 people in the class who have 2 siblings

a. How many people are in class 8A?

……[1]

b. How many siblings does the class have?

……[2]

c. What is the MEAN number of siblings?

……[2]

The data from class 8B has been damaged, when Mrs A Prone, spilt tea on the paper. She fills in the gaps as shown below.

Number of Siblings	Frequency	
0	4	
1	x	
2	5	
3	y	

Mrs Prone knows there are 16 people in the class and the Mean number of siblings was 1.5.

d. Form a simplified equation in x and y relating to the total in the class.

……[2]

e. Form a similar equation relating to the mean.

……[2]

f. Find the values of x and y.

……[3]

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