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SURNAME:

FIRST NAME:

PREP SCHOOL:

Malvern College Academic Scholarship Examinations 2024

MATHEMATICS - Paper 2

Please read this information before the examination starts:

- Paper 1: 60 mins (Option Paper)
- Marks: 75
- Specimen
- No calculators are allowed for this paper
- Section A (25 marks): Multiple choice but with working and explanations required.
- Section B (50 marks): Investigative questions. These are more challenging and require full solutions.

Section B (50 marks):

Each question is worth 10 marks. Greater marks are given for clear detailed working and explanation. You should not expect to finish all of these but attempt as many as you can.

Answer on lined paper

6. In a Science Laboratory there are two strengths of alcohol solution:

1) The 50% solution which is made up of 50% alcohol and 50% water.

2) The 20% solution which is made up of 20% alcohol and 80% water.

a. If I mix 200 ml of the 50% solution with 100 ml of the 20% solution, what is the percentage of the resultant mixture?

[3]

b. I want to make a 38% solution. If I start with 90 ml of the 50% solution, how much of the 20% solution should I add?

[4]

c. Give instructions for producing 450 ml of 30% solution using both the 50% and 20% solutions.

[3]

7. Peter shops at Alfonso's Bakery. He buys 2 buns and 1 cake for £3.50 on a Tuesday and buys 1 bun and 2 cakes for £4.00 on a Thursday.

a. On Friday, it's his birthday and for the office buys 4 buns and 3 cakes. How much change will he get from a £10 note?

[3]

Roberta shops at Belinda's Coffee House.

• On Monday she buys 1 bun, 1 cake and 2 doughnuts for £4.20.

• On Tuesday she buys 1 bun, 2 cakes and 1 doughnut for £4.80.

• On Wednesday she buys 2 buns, 1 cake and 1 doughnut for £4.60.

b. On Wednesday she buys 1 bun, 1 cake and 1 doughnut. How much does this cost?

[3]

Sam thinks of two numbers x and y . He tells me that $x^2 - y^2 = 20$ and that the sum of the two numbers is 5.

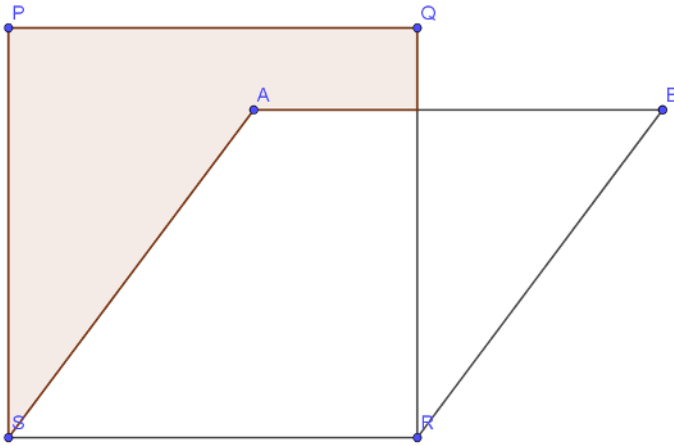
c. What is the difference between the two numbers?

d. What are the numbers?

[4]

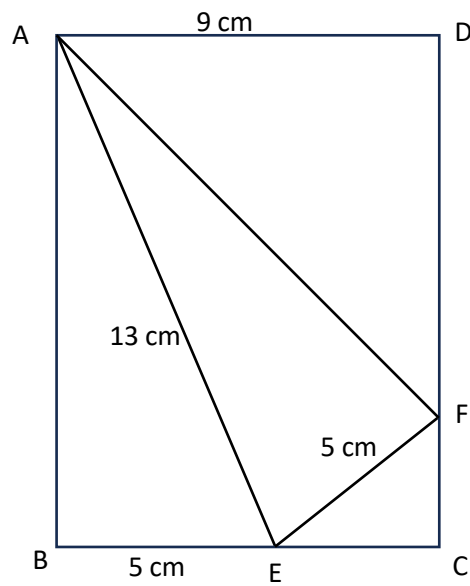
8. a. In the diagram below, PQRS is a square with an area of 100 cm^2 , and ABRS is a rhombus (with the same length sides as the square) with an area of 80 cm^2 .

Find the area of the shaded region.



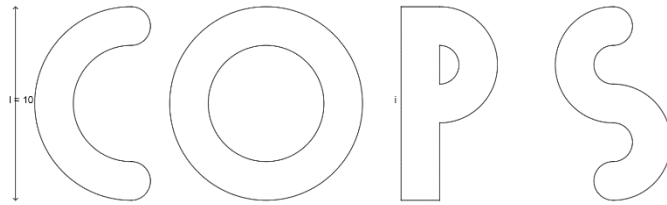
[5]

- b. AFE is a triangle in the rectangle ABCD. Find the size of angle AFD showing your working clearly.



[5]

9. PC Ursula Rose Nicholson-Davies (known as Your Nicked for short) is designing some new lettering to spell out the word COPS.



All the lettering is to be 10 cm high, and the writing to be 2 cm thick. For example, the C is made from 2 semicircular arcs of radius 5 cm and 3 cm capped by 2 semicircles of radius 1 cm at the ends. All the letters are made from straight lines or semicircular arcs.

Give all answers as a multiple of π .

- Find the area contained by the letter O. [3]
- Find the area contained by the letter C. [3]
- Find the area contained by the letter P. (*The diameter of the circle that makes the hole in P is the same thickness as the letter*) [4]

10. This question is do with fractions.

- Solve $\frac{6}{8-\frac{4}{x-3}} = \frac{3}{5}$ [2]
- The fraction $\frac{47}{11}$ can be written as $a + \frac{1}{b+\frac{1}{c+\frac{1}{d}}}$. Find the values of a,b,c and d. [3]
- In the following sequence $U_1 = 1 + \frac{1}{1+1}$, $U_2 = 1 + \frac{1}{1+\frac{1}{1+1}}$ and $U_3 = 1 + \frac{1}{1+\frac{1}{1+\frac{1}{1+1}}}$
 - Evaluate U_1 , U_2 and U_3 giving answers as improper fractions.
 - Find U_5 and U_{10} [5]



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