

TMC Year 13 Zonal 2025

Y13/1. Find $\text{Arg}(-\sqrt{3}i)$ in radians.

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Y13/2. Evaluate $i^2 + i^4 + i^6 + i^8$

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Y13/3. Simplify $(5 - 2i)^2 - (3 + 2i)^2$. Express your answer in the form $a + bi$

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Y13/4. What is the **length** of the vector $-2i + 4j - 4k$?

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Y13/5. Give the coordinates of a point which lies on the line $\frac{x-2}{10} = \frac{3-y}{9} = \frac{z+3}{9}$

Y13/6. Find the equation of the oblique asymptote of $y = \frac{x^2 - x - 2}{x - 1}$

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Y13/7. The rational expression $\frac{3x + 11}{x^2 - x - 6}$ can be written as $\frac{A}{x-3} + \frac{B}{x+2}$. Find $A \times B$

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Y13/8. Find the constant term in the expansion of $(2x + \frac{1}{x^2})^6$

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Y13/9 Solve for x : $\frac{x+2}{x-1} = \frac{x}{2}$

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Y13/10. Find the area of a regular octagon with side length 2.
Give your answer in simplified surd form.

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Y13/11. An aeroplane takes 4 hours and 15 minutes to fly from Island A to Island B. If it were to decrease its speed by p %, the trip would take 7 hours and 5 minutes?

Find the value of p .

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Y13/12 In how many ways can 10 students be split up into 2 equal teams?

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Y13/13. If everyone in a room shakes hands with everyone else and 780 handshakes take place,
Calculate the number of people in the room.

Y13/14 A chemist mixes one container of 3% solution of a chemical and another container of 8% solution to yield 20 litres of a 7% solution.? How many litres of 8% solution is required?

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Y13/15 What is the range of $y = \frac{(x+4)(3-2x)}{(x+1)(x-2)}$?

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Y13/16 Simplify $3x^2 + 6x + 12 + \frac{19}{x-2}$. Give your answer as a single fraction

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Y13/17. Solve $2^{2x+1} - 5(2^x) = -2$

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Y13/18. Calculate the probability that Anna gets exactly three heads in a row by flipping five coins.

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Y13/19. If $x + \frac{1}{x} = 4$, what is the value of $x^4 + \frac{1}{x^4}$

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Y13/20. What is the size of the acute angle between the hour and minute hands of a clock at 10:47?

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