

Year 13 Zonal 2026

Y13/1. The **length** of the vector $3i + pj - 2k$ is 7. Find the values of p .

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Y13/2. Find the principal argument of $-1 - i$ in degrees.

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Y13/3. Evaluate $\frac{\sqrt{-4} + \sqrt{-9}}{\sqrt{-1-2-3-4-15}}$

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Y13/4 The solutions of $x^2 + 4x = -13$ are of the form $x = a \pm bi$

Find the value of $a \times b$

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Y13/5. Find the equation of the oblique asymptote of $y = \frac{x^2 + 5x + 7}{x + 2}$

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Y13/6. . The vectors $\begin{pmatrix} m \\ -6 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ 6 \\ 0 \end{pmatrix}$ are orthogonal. What is the value of m ?

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Y13/7. Express $\frac{2x^2+2x+1}{x^2(x+1)}$ in partial fractions

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Y13/8. Evaluate $\lim_{x \rightarrow 0} \frac{4e^{2x} - 4}{e^x - 1}$

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Y13/9. A car travels **360 km**. If its average speed is increased by **15 km/h**, the journey takes **2 hours less**. Find the original speed of the car.

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Y13/10. Two towns **A and B** are **300 km apart**. A car leaves town A at **8:00 am** travelling at **60 km/h**. Another car leaves town B at **9:00 am** travelling towards A at **90 km/h**.
At what time will they meet?

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Y13/11. What is the size of the smaller angle between the hour and minute hands of a clock at 9:30?

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Y13/12 A group of people attend a meeting. Each person shakes hands once with every other person. If the total number of handshakes is 703, find the number of people at the meeting.

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Y13/13. Given that it is 4 o'clock, exactly how long, in minutes, will it take for the minute hand to catch up with the hour hand?

Y13/14 A container has **15 litres** of a solution containing **40% alcohol**. Some litres of this solution are removed and replaced with pure alcohol. The final solution contains **70% alcohol**. Find the amount removed and replaced.

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Y13/15 In a survey of **80 students**, students were asked if they play **soccer, basketball, or tennis**.

- 45 students play soccer.
- 12 students play both soccer and basketball.
- 8 students play both soccer and tennis.
- 3 students play all three sports.

What percentage of students like only soccer?

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Y13/16 A can complete a task in 16 days, B in 24 days, and C in 12 days.
They all work together for 2 days, after which C leaves.
Find the total number of days taken to complete the task.

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Y13/17. Solve $49^x + 6(7^x) = 7$

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Y13/18. A 5 is written at the right-hand end of a three-digit number. Its value increases by 4235.
Find the original number.

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Y13/19. Five years ago, a father was **four times as old as his son**. In ten years, the father will be **twice as old as his son**. Find the sum of their present ages.

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Y13/20. A company has **12 employees**. A manager wants to choose a **president, vice-president and secretary** from these employees. In how many different ways can the positions be filled?

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