

Year 13 Finals 2024.

Y13/1. Evaluate $i + i^2 + i^3 + \dots + i^{49} + i^{50}$

Y13/2. The rational expression $\frac{4x+7}{(x-2)(2x+1)}$ can be written as $\frac{A}{x-2} + \frac{B}{2x+1}$. Find $A + B$

Y13/3. Find the coordinates of the point of intersection of the asymptotes of

$$y = \frac{2x^2 - x - 3}{x - 2}$$

Y13/4. Solve $\frac{x-5}{x+2} \leq 0$

Y13/5. What is the range of the function $y = 6\sin x + 8\cos x$?

Y13/6. Find n if the coefficients of x^3 to x^4 in the expansion of $(2+x)^n$ are in the ratio 4:11

Y13/7. A vat contains 4000 litres of wine with an alcohol content of 10%. How much of the wine, in litres, must be removed so that when it is replaced with wine with 18% alcohol content, the alcohol content in the final mixture is 12%?

Y13/8. Three 10 cent coins, two 20 cent coins and four 50 cent coins are to be placed side by side. In how many ways can this be done?

Y13/9 At Aman's hardware 3 hammers, 1 screwdriver and 1 spanner cost \$25; 1 hammer, 3 screwdrivers and 1 spanner cost \$20 while 1 hammer, 1 screwdriver, and 3 spanners cost \$17.50.

How much will 7 hammers, 7 screwdrivers and 7 spanners cost?

Y13/10. What is the size of the obtuse angle between the hour and minute hands of a clock at 2:45?

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 25%, how long would the trip take? Give your answer in hours (h) and minutes (min).

Y13/12. A stone is dropped into a pool of water. The diameter of the circular ripple formed is increasing at a rate of 1.2 mm/s. Calculate the rate, in terms of π in mm^2/s , at which the area of the ripple is increasing after 5 seconds.

Y13/13. Kara drove a distance of 144 km. If she had driven 6 km/h faster, she could have made the trip in 20 minutes less time. How fast did she drive in km/h?

Y13/14 A painter can paint a room in 4 hours while an apprentice can paint the same room in 5 hours. Calculate the time, in minutes, it would take 2 painters and 5 apprentices to paint the room if they work together.

Y13/15 Find the sum of all 4 digit numbers that can be formed using the digits 1, 2, 3 and 4 without repetition.

Y13/16 A bag contains 100 balls and 95% are red, Some of the red balls are removed from the bag and after this 75% of the ball in the bag are red.

How many red balls were removed from the bag?

Y13/17. Solve $2(4^{2x}) - 17(4^x) + 8 = 0$

Y13/18. Two vertical poles, 80 m and 20 m high, are 13 m apart on level ground. Straight wires are attached from the top of each pole to the bottom of the other pole. Find the vertical distance from the ground to the intersection of the wires in metres.

Y13/19. Find the number which when added to the square of its reciprocal gives a minimum sum.

Y13/20. For what values of x is the function $y = |x^2 - x - 6|$ not differentiable?
