

Year 12 Finals 2023

1. A sector of a circle has radius 6 and arc length 10. What is the area of the sector?

2. Find the value of k if $\sqrt{4^{36}} + 8^{12} = 2^k$

3. The polynomial $f(x) = x^3 - cx + d$ has a remainder of 2 when divided by $x - 1$ and a remainder of 5 when divided by $x + 2$. Find the value of $c + d$.

4. What is the perimeter of an equilateral triangle whose area is $16\sqrt{3}$?

5. A regular hexagon is inscribed in a circle of radius 10. What is the area of the hexagon?

6. The distance between the points $(6, n)$ and $(n + 5, 2)$ for some real number n is 5. What is sum of all possible values of n ?

7. What is the range of the function $y = \sqrt{4 - x^2}$?

8. Solve $(x - 4)(x - 3) < 6x$

9. A circle with a center at $(6, 5)$ is tangent to a line at the point $(2, 7)$. Find the equation of the line tangent to the circle.

10. On Vakale island, 99% of the population are natives. Some natives emigrate so that only 98% of the population are natives. If the initial population of Vakale was 1000, how many natives emigrated?

11. The graph of $y = \frac{6}{x-1} - 2$ has horizontal asymptote $y = a$ and vertical asymptote $x = b$. Find the value of $a + b$

12. Find the product of all real numbers p for which the function $y = px^2 + x + p$ touches, but does not cross, the x -axis.

13. The sum of the x -components of the x -intercepts of the line given by $y = -\frac{2}{3}x + \frac{5}{3}$ and the line perpendicular to it through the point $(1, 1)$ is $\frac{k}{6}$. Find the value of k .

14. The total area bounded by the curve $y = x^2 - 4$ and the x -axis is $\frac{k}{3}$. What is the value of k ?

15. Find the area of the region enclosed by the graphs of the functions of $y = |x|$ and $y = 4$

16. Kamal, planning to walk 40 km realizes that by walking one km per hour faster, he could make the journey in 2 hours less time. How many km per hour was he originally going to be walking?

17. Find the value of $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \dots + 19^2 - 20^2$

18. The probability of Tomasi passing Mathematics in Fiji Year 12 Certificate Examination is 0.7, while the probability that he passes English is 0.6.
The probability that he passes **both** subjects is 0.5.

What is the probability that he **fails** both?

19. Find all values of k for which a **horizontal line** $y = k$ cuts the graph of $y = x^3 - 1.5x^2 + 4$ at exactly one point.

20. Given that it is 3 o'clock, exactly how long, in minutes, will it take for the minute hand to catch up with the hour hand?
