

1. Solve for x : $27^{6-x} = 9^{x-1}$
2. Find the largest root of $(x - 17)(2x + 85)(8x - 1704) = 0$.
3. It is given that y varies directly as x . If x is multiplied by 4.12, by what is y multiplied? Express your answer as an exact decimal.
4. Given: $a_1 = 5$; for all $k \geq 1$, $a_{(k+1)} = 4a_k - 3$. Find a_5 .
5. If 5 is one of the roots for x of the equation $x^3 + 6x^2 + kx - 140 = 0$, find the absolute value of the difference between the largest root for x and the smallest root for x of the given cubic equation.
6. The line represented by the determinant equation $\begin{vmatrix} x & y & 1 \\ 2 & 3 & 1 \\ 4 & 7 & 1 \end{vmatrix} = 0$ passes through the point $(w, 21)$. Find the value of w .
7. Find the largest integer less than 2002 that leaves a remainder of 2 when divided by 7 and leaves a remainder of 3 when divided by 13.
8. If $4x^2 + 8xy + ky^2 = 9$ represents a pair of straight lines, find the value of k .
9. If $x^3 + kx - 7.239x^2 + w = 0$ has 3 equal roots for x , find the value of one of these equal roots. Express your answer as an exact decimal.
10. When the expression $(4y^4 - 5y^2 - 8y + 3)$ was divided by the expression $(2y - 3)$, the result was $ky^3 + py^2 + wy - 1$. If $y \neq 1.5$, find the value of $k + p + w$.
11. If $i = \sqrt{-1}$ and if $\frac{3+2i}{i}$ is expressed in $x + yi$ form, find the value of $x + y$.
12. From 3 math coaches (none of whom is a junior or a senior), 6 juniors, and 8 seniors, how many different committees can be formed consisting of exactly 1 math coach, 1 junior, and 3 seniors?

13. A mixed doubles team consists of 1 girl and 1 boy. A match is a game played between any 2 teams (order of the teams is irrelevant). From 6 girls and 4 boys, how many distinct mixed doubles team matches can be arranged?
14. S. T. Amp bought 100 stamps yesterday for \$19.50. Some were 25 cent stamps; some were 4 cent stamps; the rest were .29 cent stamps. If the number of 25 cent stamps and 29 cent stamps had been reversed, he would have paid \$20.70. Find the number of 29 cent stamps that S. T. actually bought.
15. If $\frac{7}{x^3-8} = \frac{C}{x-2} + \frac{Dx+E}{x^2+2x+4}$ where C , D , and E are real numbers, find the value of $7C+D$. Express your answer as an exact decimal.
16. If 4 and $\frac{11}{13}$ are two of the roots for x of $13x^3 - kx^2 + wx + 5.5k = 0$, find the absolute value of the difference between the largest root for x and the smallest root for x of the given cubic equation.
17. Let $f(x) = 2x^2 + 5x$. Find the sum of all distinct values of x such that $f(f(x)) = f(x)$.
18. Express in simplest radical form: $11\sqrt{2} + 5\sqrt{32} - 7\sqrt{8}$.
19. Aaron motored y miles upstream at the constant combined net rate of $2x$ miles per hour. Note: the combined net rate includes Aaron's rate in still water and the rate of the stream. If the rate of the stream remains constant at p miles per hour and Aaron's rate in still water remains constant, then it will take Aaron $\frac{ky}{2x+wp}$ hours to return to his starting point under these conditions. Find the value of $k+w$.
20. If $\log_k 7 - \log_w 7 = \log_w 7 - \log_p 7$ where $k > 1$, $w > 1$, and $p > 1$, then $x = (\log_p w)(y + \log_k p)$. Find the value of $x+y$.

