1. Solve for $x$: $27^{b-x} = 9^{x-1}$

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 $a_3$.

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 determinate equation $\begin{vmatrix} x & y & 1 \\ 2 & 3 & 1 \end{vmatrix} = 0$ 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 $x^2 + kx - 7.239x^2 + w = 0$ 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 2\( x \) 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 \( x + y \).
A
Algebra II

Correct X 2 pts. ea. = [ ] School Code

Note: All answers must be written legibly in simplest form, according to the specifications stated in the Contest Manual. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required.

1. __________ 4
2. __________ 213
3. __________ 4.12 (must be this decimal)
4. __________ 1025
5. __________ 12
6. __________ 11
7. __________ 1927
8. __________ 4
9. __________ 2.413 (must be this decimal)
10. __________ 7

11. __________ -1
12. __________ 1008
13. __________ 180
14. __________ 20
15. __________ 3.5 (must be this decimal)
16. __________ 7
17. __________ -5
18. __________ $17\sqrt{2}$
19. __________ 3
20. __________ 3

ITEM ANALYSIS
102 Papers
Percent of Answers Corr
1A. Algebra II

1. 72%    11. 46%
2. 75%    12. 22%
3. 67%    13. 33%
4. 35%    14. 39%
5. 35%    15. 45%
6. 35%    16. 125%
7. 22%    17. 23%
8. 27%    18. 77%
9. 8%     19. 122%
10. 49%   20. 75%

ITEM ANALYSIS
166 Papers
Percent of Answers Corr
2A. Algebra II

1. 95%    11. 73%
2. 91%    12. 34%
3. 77%    13. 50%
4. 60%    14. 56%
5. 54%    15. 8%
6. 42%    16. 14%
7. 30%    17. 46%
8. 34%    18. 88%
9. 13%    19. 7%
10. 61%   20. 8%