Section A. Each correct answer is worth 1 point.

1. List three natural numbers.
2. Two lines that do not lie in the same plane are said to be _____.
3. Solve for all real numbers: \( x^3 = 9x \).
4. \( \sqrt{150} \) is between what two whole numbers?
5. Express \( (5\sqrt{3})^2 \) in simplest form.
6. Find the midpoint of the segment whose endpoints are \((1000, -3000)\) and \((-3004, 2004)\).
7. The ratio of rocks to rolls is 2 to 3, and there are 2004 more rolls than rocks. How many rolls are there?

Section B. Each correct answer is worth 2 points.

8. Solve for \( m \) in terms of \( n \): \( am - bn = cmn \).
9. Simplify completely: \( \frac{x^3 - x^2 - 6x}{x^2 + x - 12} \).
10. Express as a rational number in simplest form: \( 3^{-2} - (-2)^{-3} \).
11. Solve for \( x \) and \( y \); express as an ordered pair \((x, y)\): \[ \begin{align*} x + y &= 11 \\ 3x - 2y &= 13 \end{align*} \]
12. Given \( f(x) = x^2 - x - 1 \) and \( g(x) = 2x + 3 \). If \( f(x) = 1 \), find all values of \( g(x) \).

Section C. Each correct answer is worth 3 points.

13. \( 2004_{\text{six}} = \) ____? ____ \text{five} (The subscripts “six” and “five” mean those numbers are written in base 6 and base 5. For example, \(23_{\text{six}} = 15_{\text{ten}}\).)
14. Solve for all values of \( x \): \( \sum_{n=0}^{4} (n!) - \sum_{n=0}^{4} n = x^2 - 25 \).
15. If \( \log_2[\log_3(\log_4 b)] = \log_4[\log_3(\log_2 a)] = 0 \), find the ratio of \( a \) to \( b \).
   Express in simplest form.
Section A. Each correct answer is worth 1 point.

1. A plane quadrilateral has integral sides of 1, 2, 4, and $x$. Find all possible values of $x$.

2. Express in simplest form: $\frac{a^{4n+3}}{a^{3n-2}}$.

3. Write all solutions which are real and rational: $x(x^2 + 4)(x^2 - 36)(x^2 - 5)(x + 0.7) = 0$.

4. Write the converse of “If Browns, then not Bengals.”

5. Give the last name of either (not both) of the two independent inventors of calculus.

6. The hypotenuse of a right triangle is 58, and one of the legs is 40. Find the length of the shortest side of that right triangle.

7. A single die (number cube) is rolled three times. What is the probability that the same number comes up all three times? Express as a fraction in simplest form.

Section B. Each problem is worth 2 points.

8. The six-digit number $2a00b4$ is divisible by 9 and divisible by 11. What is the number?

9. Find the exact perimeter of quadrilateral $QUAD$ on the right.

10. Solve for $x$: $\begin{vmatrix} 1 & x & 2 \\ 3 & 0 & 4 \\ -1 & 3 & -2 \end{vmatrix} = 2004$.


12. Solve for all real values of $x$, correct to the nearest thousandth:

$$0.2x^3 + 0.5x^2 - x + 2003 = 2004.$$ 

Section C. Each problem is worth 3 points.

13. A set of five natural numbers has a mean, median, and mode. The mean is 2004. Two of the numbers are 1900 and 1963. If the median is 2 less than the mode, write the value of the mode.

14. In right $\triangle ABC$, $m \angle A = 20.04^\circ$, and the right angle is at $C$. Find the numerical value of $\sin^2 A + \sin^2 B + \sin^2 C$.

15. A square pyramid has a base with perimeter 48 cm, and slant height 10 cm. Find the volume of the pyramid. Be sure to include the correct units.