Answer seven questions, selecting three from group I and two from each of the other two groups. Each complete answer will receive full credit. No credit will be allowed unless all operations (except mental ones) necessary to find results are given.

Group I 1 Divide $6x^3 + 11x^2 - 1$ by $3x - 1 + 2x^2$

2 Find the prime factors of $1 - \frac{x^2}{4}$, $9x^4 - 90x^3 + 189x^2$,
$a^3 + b^3$, $4x^4 + 3x^2y^2 + 9y^4$, $ax + 4a - 4x - 16$

3 Solve $\begin{cases} 3x + 8 = 4y + 2 \\ \frac{4x}{3} + \frac{y}{9} = 3 \end{cases}$

Give an axiom justifying each step in the solution.

4 Find a number such that if it is added to 1, 4, 9, 16 respectively, the results will form a proportion.

Group II 5 Solve $\sqrt{(x+1)} + \sqrt{(x-2)} = \sqrt{(2x+3)}$

6 Find the square root of $\frac{a^2}{9} + \frac{2ab}{15} - \frac{2a}{3} + \frac{b^2}{25} - \frac{2b}{5} + 1$

7 Simplify *three* of the following: $\sqrt[3]{-125x^6}$, $\sqrt[5]{\frac{-y^{10}}{32x^{15}}}$,

$\sqrt[4]{108r^4}$, $\sqrt[4]{\frac{4}{9}} \times \sqrt[4]{\frac{16}{27}}$, $\sqrt{75} - 4\sqrt{243} + 2\sqrt{108}$

Group III 8 Solve $\begin{cases} x^2 + 2xy = 55 \\ 2x^2 - xy = 35 \end{cases}$

9 If the speed of a railway train should be lessened 4 miles an hour the train would be half an hour longer in going 180 miles. Find the rate of the train.

10 If the greater of two numbers is divided by the less the quotient is 2 and the remainder is 3; the square of the greater number exceeds 6 times the square of the less by 25. Find the numbers.