EXAMINATION FOR QUALIFYING CERTIFICATES

ELEMENTARY ALGEBRA

Monday, September 17, 1923—9.15 a.m. to 12.15 p.m., only

Answer question 1 and five of the others. Full credit will not be granted unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

1. Divide $2a^2 + 5ax - 5b^2 - 2ab^2$ by $a + 2b$ and check the result, letting $a = 3$ and $b = 2$. [8]

2. Without multiplying the expressions and extracting the root of the result, find the square root of the following indicated product:
   \[(6x^2 - 19xy + 10y^2)(6x^2 + 11xy - 10y^2)(4x^2 - 25y^2)\] [8]

3. Does $\frac{x+2}{3} + \frac{x-5}{2}$ equal $\frac{2x-3}{3x}$ when $x$ equals 2? [Leave work to justify your answer.] [5]

4. Solve the following equations for $x$ and $y$:
   \[ax - by = c\]
   \[y - x = 1\] [10]

5. Solve the formula $l = a + (n - 1)d$ for $d$ in terms of $l$, $a$, and $n$. [5]

6. Using the formula given in e, find the value of $l$ if $a = 5$, $n = 7$ and $d = \frac{1}{2}$. [4]

7. Multiply $2\sqrt{3} + \sqrt{8}$ by $2\sqrt{2} - \sqrt{3}$. [5]

8. Express with rational denominator $\frac{\sqrt{2} - 3\sqrt{6}}{2\sqrt{6}}$. [5]

2. A man has saved $10,175. He invests part of it in bonds yielding 5% and the remainder in bonds yielding 6%. His yearly income from his investments is $582. How much did he invest at each rate? [10]

3. Extract the square root of
   \[4a^2 - 4a^2 + \frac{7a^2}{3} - \frac{2a}{3} + \frac{1}{9}\] [10]

4. The walls and ceiling of a room together contain 756 square feet; the room is 1\ 1/2 times as long as it is wide and the height of the ceiling is 9 feet. Find the length and the width of the room. [10]

Elementary Algebra—concluded

5. Find to the nearest hundredth the roots of the equation
   \[2x^2 - 5x - 4 = 0\] [10]

6. A man owns a store which he rents for $d$ dollars a month; if the taxes and improvements for the year amount to $n$ and $p$ dollars respectively, what is the yearly net income from his property? [4]

7. A manufacturer bought $x$ yards of cloth; if $y$ of these yards were damaged, how many dresses could be made from the remainder if each dress averaged 5 yards? [3]

8. If $a$ represents the rate of a launch in still water and $b$ the rate of the stream, what is the rate of the launch upstream? [3]

7. Solve the following equations, group your answers and check one set:
   \[2x = y - 3\]
   \[4x^2 + y^2 = 17\] [10]

8. The approximate populations of two towns, $A$ and $B$, for the years 1915 to 1920 are given in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>1915</th>
<th>1916</th>
<th>1917</th>
<th>1918</th>
<th>1919</th>
<th>1920</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>500</td>
<td>550</td>
<td>475</td>
<td>450</td>
<td>500</td>
<td>525</td>
</tr>
<tr>
<td>$B$</td>
<td>425</td>
<td>475</td>
<td>825</td>
<td>900</td>
<td>750</td>
<td>650</td>
</tr>
</tbody>
</table>

   a. Using the same axes, make a graph of the populations of each town, representing the data for $A$ by a solid line and the data for $B$ by a dotted line. [8]

   b. From the graph estimate at what approximate date the populations of the two towns were equal. [2]