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

b 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]

c 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]

d Solve the following equations for x and y:

$$ax - by = c$$
$$y - x = 1 \qquad [10]$$

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

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

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

h Express with rational denominator $\dfrac{\sqrt{2} - 3\sqrt{6}}{2\sqrt{6}}$ [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

$$4a^4 - 4a^3 + \frac{7a^2}{3} - \frac{2a}{3} + \frac{1}{9}$$ [10]

4 The walls and ceiling of a room together contain 756 square feet; the room is $1\frac{1}{2}$ 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]

5 Find to the *nearest* hundredth the roots of the equation

$$2x^2 - 5x - 4 = 0 \qquad [10]$$

6 *a* 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]

b 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]

c 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 up stream?   [3]

7 Solve the following equations, group your answers and check *one* set:

$$2x = y - 3$$
$$4x^2 + y^2 = 17 \qquad [10]$$

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

Year	1915	1916	1917	1918	1919	1920
A	500	550	475	450	500	525
B	425	475	825	900	750	650

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]