Course 1—Elementary Algebra

(Sample Examination)

Part I

Directions (1-25): Answer all questions in this part. Write the answer to each question in the space provided at the right. No work need be shown for this part. Each correct answer will receive 2 credits.   [50]

1. Reduce the fraction $\dfrac{2x+4}{x^2-4}$ to its lowest terms.

2. Express in simplest form the sum of $\dfrac{x+4}{3}$ and $\dfrac{x+5}{4}$.

3. Find the number of nickels equal in value to d dimes and q quarters.

4. Find the factors of $x^2+4x-21$.

5. Using the formula $A=p+prt$, find t when $A=\$1,650$, $p=\$1,500$ and $r=4\%$.

6. What is the length of a rectangle whose width is $4n$ and whose area is $20n^2+12n$?

7. Solve for x: $4(x-1)-3(x-2)=10$

8. Solve for y: $9y-2.1=2.1-5y$

9. Solve for the *positive* value of x: $6x^2=150$

10. Find the square root of 72 to the *nearest tenth*.

11. A furnace uses $1\frac{1}{2}$ tons of coal in 30 days. At this rate, how many days will a supply of 6 tons of coal last?

12. Subtract x^2+3x-1 from $2x^2-1$.

13. If $\tan A=.4000$, find A to the *nearest degree*.

14. Solve for n: $\dfrac{n}{2}+\dfrac{n}{3}=25$

15. Solve for t: $\dfrac{2}{3t+4}=\dfrac{1}{4t-3}$

16. Solve for a: $na+b=c$

17. An experimenter planted 105 seeds, of which 84 sprouted. What percent of the seeds *failed* to sprout?

18. Express as a single term the sum of $6\sqrt{3}$ and $2\sqrt{27}$.

19. Solve for p: $8 - 3p = p + 12$

20. In the figure at the right, the radius of the large circle is R and the radius of each small circle is r. Write, in terms of R and r, a formula that can be used to find the area of the shaded portion.
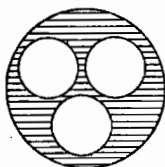
Directions (21-24): Indicate the correct completion for each of the following by writing on the line at the right the letter *a, b, c* or *d*.
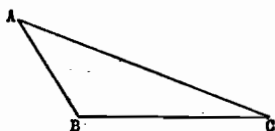
21. The expression m^3 means (*a*) $m + m + m$ (*b*) $3 + m$ (*c*) $3m$ (*d*) $m \times m \times m$

22. Which point lies on the graph of $2x + y = 10$? (*a*) $(10,0)$ (*b*) $(3,4)$ (*c*) $(0,8)$ (*d*) $(4,3)$

23. If $9a^3$ is multiplied by $2a^4$, the product is (*a*) $11a^7$ (*b*) $18a^7$ (*c*) $11a^{12}$ (*d*) $18a^{12}$

24. If $x^3 - x^2 + 3x + 1$ is divided by $x + 1$, the remainder is (*a*) 0 (*b*) 6 (*c*) -4 (*d*) 4

25. Construct a triangle congruent to triangle ABC.

Part II

Answer three questions from this part. Only algebraic solutions will be accepted. Show all work unless otherwise directed.

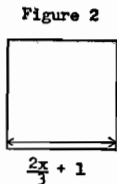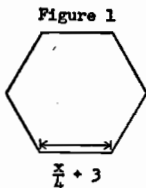**26.** Solve algebraically the following set of equations for x and y. *Check* in both the given equations. [8, 2]

$$\frac{x}{2} - \frac{y}{3} = 7$$

$$x - \frac{y}{2} = 13$$

27. Two trains start from the same point at the same time and travel in opposite directions, one going 12 miles per hour faster than the other. After 6 hours they are 648 miles apart. Find the speed of *each* train. Check.   [5, 4, 1]

28.

Figure 1   **Figure 2**

$\frac{x}{4} + 3$ $\frac{2x}{3} + 1$

    a. Express the perimeter of the regular hexagon (Figure 1) in terms of x.   [2]

    b. Express the perimeter of the square (Figure 2) in terms of x.   [2]

    c. If the perimeter of the hexagon is equal to the perimeter of the square, find the length of a side of *each* of these two figures. Check.   [5, 1]

29. A man has two investments that total $7,500. The annual interest on one investment at 4% is $165 more than the interest on the other at 5%. How much is invested at *each* rate?   [5, 5]

30. Write the equation or equations that may be used in solving the following problems. In each case, state what the letter or letters represent. (Solution of the equations is *not* required.)

    a. The sum of the digits of a two-digit number is 15. If the number is divided by the units digit, the result is 16. Find the number.   [5]

    b. Maple syrup worth $6.00 a gallon and corn syrup worth $.80 a gallon are used to make a mixture worth $2.36 a gallon. How many gallons of each kind of syrup are needed to make 50 gallons of the mixture?   [5]

Part III

Answer two questions from this part. Show all work unless otherwise directed.

31. *a.* On graph paper, plot the points $A(3,6)$, $B(7,4)$, $C(10,-8)$ and $D(-1,-4)$. [4]
  b. If the lines AC and BD are drawn, read from the graph the coordinates of the point of intersection of (1) AC and BD, (2) AC and the x-axis, (3) BD and the y-axis. [6]

32. A guy wire reaches from the top of a vertical telephone pole 38 feet high to a point on level ground 20 feet from the base of the pole.
  a. Find, to the *nearest degree,* the angle that the wire makes with the ground. [4]
  b. Find the length of the wire to the *nearest foot.* [6]

33. The length of a rectangle is 12 and a diagonal is 3 times the width.
  a. If the width of the rectangle is represented by w, write an equation that can be used to find w. [2]
  b. Solve the equation written in part *a* for the value of w, to the *nearest tenth.* [4]
  c. Using the result obtained in part *b*, find
    (1) the perimeter of the rectangle to the *nearest tenth* [2]
    (2) the area of the rectangle to the *nearest integer* [2]

34. Each of the equations in column A has *one and only one* of the numbers in column B as a root. List the numbers 1 through 5 on your answer paper. After *each* number write the letter *a, b, c, d, e* or *f* which indicates a root of the corresponding equation. [10]

Column A	Column B
(1) $\dfrac{x-3}{2x} = \dfrac{1}{3}$	a. $+3$
	b. -3
(2) $x^2 + 5x - 24 = 0$	c. $+6$
(3) $6 + \sqrt{x+3} = 9$	d. -6
(4) $\dfrac{2x}{3} + 3 = \dfrac{x}{3}$	e. $+9$
	f. -9
(5) $(x^2 - 1)(x + 3) = 0$	