June 20, 1983

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided.

1. Solve for b: $5(b + 4) = 40$ 1_____

2. Solve for x: $\frac{x}{4} + 3 = 6$ 2_____

3. Solve for x: $0.03x = 6$ 3_____

4. Using the formula $A = \frac{1}{2}bh$, find b if $A = 24$ and $h = 8$ 4_____

5. Factor: $4x^2 - 81$ 5_____

6. Factor: $x^2 + 5x - 6$ 6_____

7. Express in terms of x the cost in dollars of x pounds of coffee at \$2.95 per pound. 7_____

8. Express as a trinomial: $(2x - 5)(x + 3)$ 8_____

9. Solve the following system of equations for x:
$$7x - 2y = 8$$
$$2y = 3x$$
9_____

10. Solve for x: $5x + 7 = 2x - 5$ 10_____

11. Solve for x: $3x + 8 = 5$ 11_____

12. The lengths of the legs of a right triangle are 5 centimeters and 12 centimeters. Find the length in centimeters of the hypotenuse. 12_____

13. List the members of the set of all even integers greater than 12 and less than or equal to 18. 13_____

14. The area of a rectangle is represented by $n^2 - n - 12$. If the length of the rectangle is represented by $n + 3$, express the width of the rectangle in terms of n. 14_____

15. From $3x^2 + 6x + 10$ subtract $3x^2 - 8x - 5$. 15_____

Directions (16-30): Write in the space provided the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

16. Which set has the property of closure under multiplication? (1) $\{-1,0,1\}$ (2) $\{-\frac{1}{2},0,\frac{1}{2}\}$ (3) $\{0,2,4\}$ (4) $\{1,2,3,6\}$ 16_____

17. The sum of the lengths of two line segments is 24. If the length of one of these segments is represented by x, which expression represents the length of the second segment? (1) x (2) $x - 24$ (3) $x + 24$ (4) $24 - x$ 17_____

18. The prime factors of 30 are (1) 1,5,6 (2) 2,3,5 (3) 10,3 (4) 15,2 18_____

19. What is the y-intercept of the line whose equation is $y = 3x - 6$? (1) -6 (2) -3 (3) 3 (4) 6 19____

20. A stick 3 feet tall casts a shadow 5 feet long. At the same time, a nearby tree casts a shadow 50 feet long. What is the height in feet of the tree? (1) 10 (2) 250 (3) 30 (4) $83\frac{1}{3}$ 20____

21. The sum of $\frac{a+b}{3}$ and $\frac{a-b}{2}$ is (1) $\frac{5a-b}{6}$ (2) $\frac{2a}{5}$ (3) $\frac{-a-b}{6}$ (4) $\frac{5a-5b}{6}$ 21____

22. In triangle ABC, angle A is an obtuse angle. Which statement is an accurate description of angles B and C? (1) One is an acute angle and one is a right angle. (2) One is an acute angle and one is an obtuse angle. (3) Both are right angles. (4) Both are acute angles 22____

23. The expression $5\sqrt{3} - \sqrt{12}$ is equal to (1) $\sqrt{3}$ (2) $2\sqrt{3}$ (3) $3\sqrt{3}$ (4) $-3\sqrt{3}$ 23____

24. The graph of which equation contains the point (3,1)? (1) $y = x$ (2) $y - 3x = 0$ (3) $y = 3$ (4) $3y = x$ 24____

25. Which is the solution set of $5x - 3 \leq 12$? (1) $\{x|x \leq 15\}$ (2) $\{x|x \leq 3\}$ (3) $\{x|x \geq 3\}$ (4) $\{x|x > 15\}$ 25____

26. A woman invested x dollars at a 9% rate of interest. The annual income from the investment is \$400. Which equation expresses this relationship? (1) $0.09(400) = x$ (2) $0.9x = 400$ (3) $0.09x = 400$ (4) $\frac{x}{400} = 0.09$ 26____

27. Which is the smaller member of the solution set of $(x - 3)(x + 2) = 0$? (1) -2 (2) 2 (3) 3 (4) -3 27____

28. If set $A = \{4,5,6,7\}$, then which is not a subset of A? (1) $\{4,5\}$ (2) $\{\ \}$ (3) $\{0\}$ (4) $\{4,5,6,7\}$ 28____

29. If $\sin x = .5151$, what is the measure of angle x to the *nearest* degree? (1) 60° (2) 59° (3) 31° (4) 30° 29____

30. The product of $5x^4$ and $8x^5$ is (1) $40x^9$ (2) $40x^{20}$ (3) $13x^9$ (4) $13x^{20}$ 30____

Part II

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

31. Solve graphically and check:

$$x - 3y = 9$$
$$2x + y = 4$$

[8, 2]

32. Answer both *a* and *b*.

a Perform the indicated operation and express the result in simplest terms:

$$\frac{x^2 + 5x + 6}{2x - 4} \div \frac{x + 3}{x - 2} \quad [5]$$

b Solve for x: $\dfrac{x + 2}{x} - \dfrac{3}{2x} = 5$ [5]

33. Write an equation or a system of equations that can be used to solve *each* of the following problems. In each case, state what the variable or variables represent. [*Solution of the equations is not required.*]

a The measure of the second angle of a triangle is 30° less than the measure of the first angle. The measure of the third angle is one-third of the measure of the first angle. Find the measures of the three angles of the triangle. [5]

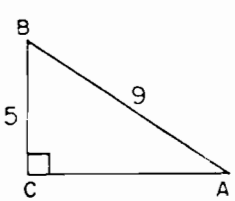
b Part of $5,000 is invested in stocks at 12% interest, and the remainder in bonds at 9% interest. The total annual income from both investments is $555. Find the number of dollars invested at each rate. [5]

34. A bus left Syracuse at 7 a.m., traveling east at 50 miles per hour. Another bus left Syracuse at 8 a.m., traveling west at 55 miles per hour. At what time were these buses 470 miles apart? [*Only an algebraic solution will be accepted.*] [5, 5]

35. Find three positive consecutive odd integers such that the square of the smallest is 9 more than the sum of the other two. [*Only an algebraic solution will be accepted.*] [5, 5]

36. Answer both *a* and *b*.

In the diagram, angle C is a right angle, $AB = 9$ and $BC = 5$.



a Find the measure of angle A to the *nearest degree.* [5]

b Find AC to the *nearest integer.* [5]

37. *On your answer paper,* write the letters *a* through *e*. Next to *each* letter write the numeral preceding the expression that best completes the statement or answers the question. [10]

a The reciprocal of a is (1) 1 (2) $\dfrac{1}{a}$ (3) $-\dfrac{1}{a}$ (4) $-a$

b How many days are in $2x$ weeks? (1) $\dfrac{2x}{7}$ (2) $7x$ (3) 14 (4) $14x$

c Which number is an integer? (1) $\sqrt{5}$ (2) π (3) $\sqrt{8}$ (4) $\sqrt{49}$

d Rounded to the *nearest tenth,* 21.88 would equal (1) 21.8 (2) 21.9 (3) 22.0 (4) 21.0

e If $x > y$ and $y > z$, which statement about integers x, y, and z must be true? (1) $x > z$ (2) $x = y$ (3) $y > x$ (4) $z > x$