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 \( b \): \( 5(b + 4) = 40 \)  
   \[ \underline{1} \]

2. Solve for \( x \): \( \frac{x}{4} + 3 = 6 \)  
   \[ \underline{2} \]

3. Solve for \( x \): \( 0.03x = 6 \)  
   \[ \underline{3} \]

4. Using the formula \( A = \frac{1}{2}bh \), find \( b \) if \( A = 24 \) and \( h = 8 \)  
   \[ \underline{4} \]

5. Factor: \( 4x^2 - 81 \)  
   \[ \underline{5} \]

6. Factor: \( x^2 + 5x - 6 \)  
   \[ \underline{6} \]

7. Express in terms of \( x \) the cost in dollars of \( x \) pounds of coffee at \$2.95 per pound.  
   \[ \underline{7} \]

8. Express as a trinomial: \( (2x - 5)(x + 3) \)  
   \[ \underline{8} \]

9. Solve the following system of equations for \( x \): \[ \begin{align*} 7x - 2y &= 8 \\ 2y &= 3x \end{align*} \]  
   \[ \underline{9} \]

10. Solve for \( x \): \( 5x + 7 = 2x - 5 \)  
    \[ \underline{10} \]

11. Solve for \( x \): \( 3x + 8 = 5 \)  
    \[ \underline{11} \]

12. The lengths of the legs of a right triangle are 5 centimeters and 12 centimeters. Find the length in centimeters of the hypotenuse.  
    \[ \underline{12} \]

13. List the members of the set of all even integers greater than 12 and less than or equal to 18.  
    \[ \underline{13} \]

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 \( n \).  
    \[ \underline{14} \]

15. From \( 3x^2 + 6x + 10 \) subtract \( 3x^2 - 8x - 5 \).  
    \[ \underline{15} \]

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) \( \{1,2,3,6\} \)  
    \[ \underline{16} \]

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) \( 24 - x \)  
    \[ \underline{17} \]

18. The prime factors of 30 are  
   (1) 1,5,6  
   (2) 2,3,5  
   (3) 10,3  
   (4) 15,2  
    \[ \underline{18} \]
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) $\frac{3}{5}$  (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) $\{4\}$  (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) $60^\circ$  (2) $59^\circ$  (3) $31^\circ$  (4) $30^\circ$  29

30. The product of $5x^4$ and $8x^6$ is  
(1) $40x^6$  (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:
   \[
   \frac{x^2 + 5x + 6}{2x - 4} \div \frac{x + 3}{x - 2} \quad [5]
   \]
   \[
   \frac{x + 2}{x} - \frac{3}{2x} = 5 \quad [5]
   \]

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. \([\text{Solution of the equations is not required.}]\)
   \( a \) The measure of the second angle of a triangle is \( 30^\circ \) 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? \([\text{Only an algebraic solution will be accepted.}]\) \([5,5]\)

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

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 \( \frac{1}{a} \) \( (1)\ 1\ (2)\ \frac{1}{a} \ (3)\ -\ \frac{1}{a} \ (4)\ -a \)
   \( b \) How many days are in \( 2x \) weeks? \( (1)\ \frac{2x}{7} \ (2)\ 7x \ (3)\ 14 \ (4)\ 14x \)
   \( c \) Which number is an integer? \( (1)\ \sqrt{5} \ (2)\ \pi \ (3)\ \sqrt{8} \ (4)\ \sqrt{49} \)
   \( d \) 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? \( (1)\ x > z \ (2)\ x = y \ (3)\ y > x \ (4)\ z > x \)