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 on the answer sheet.

1. In the proportion \( \frac{c}{d} = \frac{e}{f} \), \( c = 4 \), \( d = 9 \), and \( e = 8 \).
   Find the value of \( f \).
   
2. One of the factors of \( x^2 + 5x + 6 \) is \( x + 3 \). What is the other factor?
   
3. If \( \sin A = 0.9801 \), find the measure of angle \( A \) to the nearest degree.
   
4. Express the number of dollars earned by working for 8 hours at \( d \) dollars per hour, in terms of \( d \).
   
5. Solve for \( x \): \( 0.03x + 5 = 11 \)
   
6. Solve for \( p \): \( \frac{2}{3} = \frac{p - 2}{15} \)
   
7. Two numbers are in the ratio of \( 2:3 \) and the smaller number is 16. Find the larger number.
   
8. Solve for \( x \): \( 5 - x = 7 \)
   
9. Express the product of \( (3x - 2) \) and \( (2x + 1) \) as a trinomial.
   
10. Solve the following system of equations for \( x \):
    \[ \begin{align*}
    3x - y &= 10 \\
    2x + y &= 10 
    \end{align*} \]
    
11. If 15% of a number is 6, what is the number?
    
12. Solve for \( x \) in terms of \( a \) and \( b \):
    \( 3x - a = b \)
    
13. From \( 5x^2 - 6x + 2 \) subtract \( 3x^2 + 7 \).
    
14. The side of a square is represented by \( 3x - 2 \). Express the perimeter of the square in terms of \( x \).
    
15. Find the positive square root of 43 to the nearest tenth.
    
16. The point \( (2,k) \) lies on the graph of the equation \( y = 3x \).
    What is the value of \( k \)?
    
17. Solve for the positive value of \( x \):
    \( 3x^2 - 147 = 0 \)
    
18. What is the value of \( | -16 | - | 9 | \)?
Directions (19-30): Write in the space provided on the answer sheet the numeral preceding the expression that best completes each statement or answers each question.

19. The fraction \( \frac{x^2 - 16}{x + 4} \) is equivalent to
   (1) \( x + 4 \)
   (2) \( x - 4 \)
   (3) \( x - 12 \)
   (4) 0

   \( \text{19} \) ___

20. The expression \((2x^3y^2)(3x^2y)\) is equivalent to
   (1) \( 5x^5y^3 \)
   (2) \( 6x^6y^2 \)
   (3) \( 5x^0y^2 \)
   (4) \( 6x^5y^3 \)

   \( \text{20} \) ___

21. Which is an illustration of the distributive property?
   (1) \( a(bc) = (ab)c \)
   (2) \( ab = ba \)
   (3) \( a(b + c) = ab + ac \)
   (4) \( a + (b + c) = (a + b) + c \)

   \( \text{21} \) ___

22. The solution set of \( 2x - 5 > 7 \) is
   (1) \( \{x | x > 1\} \)
   (2) \( \{x | x < 1\} \)
   (3) \( \{x | x > 6\} \)
   (4) \( \{x | x < 6\} \)

   \( \text{22} \) ___

23. For which value of \( x \) is the expression \( \frac{6}{x - 4} \) undefined?
   (1) \(-6\)
   (2) \(-4\)
   (3) \(0\)
   (4) \(4\)

   \( \text{23} \) ___

24. The quotient of \( (4x^2 - 3x^2) \div x^2 \) is
   (1) \( 1 \)
   (2) \( 2x - 3 \)
   (3) \( 4x - 3 \)
   (4) \( 4 - 3x \)

   \( \text{24} \) ___

25. The expression \( \sqrt{200} \) is equivalent to
   (1) \( 10\sqrt{2} \)
   (2) \( 2\sqrt{10} \)
   (3) \( 8\sqrt{5} \)
   (4) \( 4\sqrt{5} \)

   \( \text{25} \) ___

26. Which is an equation of the straight line parallel to the \( x \)-axis and 2 units above it?
   (1) \( y = -2 \)
   (2) \( y = 2 \)
   (3) \( x = -2 \)
   (4) \( x = 2 \)

   \( \text{26} \) ___

27. Which is a subset of the set of natural numbers?
   (1) \( \{1, 2, 3\} \)
   (2) \( \{1, 3, 2\} \)
   (3) \( \{-1, 0, 1\} \)
   (4) \( \{0, 1, 2\} \)

   \( \text{27} \) ___

28. The expression \((x + 3)^2\) is equivalent to
   (1) \( x^2 + 6x + 9 \)
   (2) \( x^2 + 9 \)
   (3) \( x^2 + 6x - 9 \)
   (4) \( x^2 - 6x + 9 \)

   \( \text{28} \) ___

29. The graph of \( y = 2x = 1 \) has a slope of
   (1) \( 1 \)
   (2) \( 2 \)
   (3) \(-2\)
   (4) \( 2 \)

   \( \text{29} \) ___

30. The graph below represents the solution set of which inequality?

   \( \text{(1) } -1 \leq x \leq 3 \)
   \( \text{(2) } -1 \leq x < 3 \)
   \( \text{(3) } -1 < x < 3 \)
   \( \text{(4) } -1 \leq x \leq 3 \)

   \( \text{30} \) ___
NINTH YEAR MATHEMATICS

Part II

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

31. Solve graphically and check:
\[ x - 2y = 4 \]
\[ x = y + 2 \]  \[8, 2\]

32. Answer both a and b.

a Solve for \( x \):
\[ \frac{x - 1}{2} - \frac{x - 1}{3} = 2 \]  \[4\]

b Perform the indicated operation and express the result in simplest terms:
\[ \frac{x^2 - 9}{x^2 - 5x} \cdot \frac{x - 5}{x^2 - 6x + 9} \]  \[6\]

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 Mark and Susan together can paint a room in 3 hours. If Mark works alone, it takes him 9 hours. How many hours would it take Susan to paint the room alone?  \[5\]

b The altitude of a triangle exceeds twice the base by 2. The area of the triangle is 20. Find the base of the triangle.  \[5\]

34. Mr. Stevens invested $8,000 at 10% interest. How much money must he invest at 8% interest so that his total annual interest will equal 9% of his total investment? [Only an algebraic solution will be accepted.]  \[5, 5\]

35. Find three positive consecutive integers such that the square of the first is 10 more than the third. [Only an algebraic solution will be accepted.]  \[5, 5\]

36. In the accompanying diagram of right triangle \(ABC\), the right angle is at \(C\), \(AC = 6\), and \(AB = 13\).

a Find the measure of angle \(B\) to the nearest degree.  \[5\]

b Find \(BC\) to the nearest integer.  \[5\]
37. On your answer paper, write the letters a through e. For each algebraic statement listed in a through e, select the property, chosen from the list below, that is illustrated by the statement. Then write its number next to the appropriate letter. [10]

Properties

(1) Commutative property of multiplication
(2) Additive identity property
(3) Multiplicative identity property
(4) Distributive property
(5) Associative property of addition
(6) Multiplicative inverse property
(7) Additive inverse property
(8) Associative property of multiplication

\[ a \ 3 + (-3) = 0 \quad a____ \]
\[ b \ (3 + 2) + 1 = 3 + (2 + 1) \quad b____ \]
\[ c \ 3(\frac{1}{3}) = 1 \quad c____ \]
\[ d \ 3 + 0 = 3 \quad d____ \]
\[ e \ 3(2) = 2(3) \quad e____ \]