Examination January, 1977 Ninth Year Mathematics

Elementary Algebra

PART ONE *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. If three times a certain number is decreased by 7, the result is 20. What is the number? 1_____

2. Solve for y: $\frac{y+1}{12} = \frac{3}{4}$ 2_____

3. Solve for x: $3x = 2(5 - x)$ 3_____

4. Solve for x: $5 - 2x = -3$ 4_____

5. If $x = -3$, find the value of $2x^2$. 5_____

6. Express in *lowest terms*: $\frac{8x^4y^3}{2xy^3}$ 6_____

7. The legs of a right triangle are 9 and 12. What is the length of the hypotenuse? 7_____

8. Find the numerical value of $|-7| + |10|$. 8_____

9. Find the *positive* square root of 55 to the *nearest tenth*. 9_____

10. A person 5 feet tall is standing near a tree 30 feet high. If the person's shadow is 4 feet long, how many feet long is the shadow of the tree? 10_____

11. Find the positive root of $2x^2 = 72$. 11_____

12. If $\cos x = .4020$, find the measure of angle x to the *nearest degree*. 12_____

13. What is the slope of the line whose equation is $2x - y = 3$? 13_____

14. Solve the following system of equations for x:

$$y = 2x$$
$$x + y = 6$$

14_____

15. Express the sum of $\frac{x}{3}$ and $\frac{x}{2}$ as a single fraction in *simplest form*. 15_____

16. Two numbers are in the ratio 1:5 and their sum is 54. Find the *smaller* number. 16_____

17. Express in terms of a the average (arithmetic mean) of $2a + 4$ and $4a - 2$. 17_____

18. Solve for x in terms of a, b, and c: $a + bx = c$ 18_____

19. Factor completely: $3x^2 + 2x - 5$ 19_____

DIRECTIONS (**20-30**): *Write in the space provided the* numeral *preceding the expression that best completes* each *statement or answers* each *question.*

20. Which number does *not* have a reciprocal?
(1) 1 (2) -2 (3) $\frac{1}{3}$ (4) 0 20_____

21. A member of the solution set of $2x - 3 \geq 9$ is
(1) 7 (2) 5 (3) 3 (4) -3 21_____

22. Which represents the area of a rectangle whose length is $x + 1$ and whose width is $x - 1$?
(1) $x^2 + 1$ (2) $2x$ (3) $x^2 - 1$ (4) $4x$ 22_____

23. The expression $3(x + 4) = 3x + 12$ is an illustration of which property?
(1) associative property of addition

(2) commutative property of addition
(3) transitive property of equality
(4) distributive property of multiplication over addition 23_____

24. The graph of the equation $y = 2$ is a line
(1) parallel to the y-axis
(2) parallel to the x-axis
(3) passing through the origin
(4) passing through the point (2,0) 24_____

25. Which expression is equivalent to $\sqrt{48}$?
(1) $16\sqrt{3}$ (2) $4\sqrt{12}$ (3) $4\sqrt{3}$ (4) $2\sqrt{3}$ 25_____

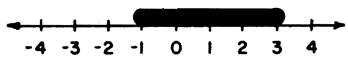
26. The solution set for $x^2 - x - 6 = 0$ is
(1) $\{2,3\}$ (3) $\{-2,3\}$
(2) $\{2,-3\}$ (4) $\{-2,-3\}$ 26_____

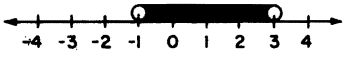
27. The number of feet in c inches is
(1) $\frac{c}{12}$ (2) $12c$ (3) $\frac{12}{c}$ (4) $36c$ 27_____

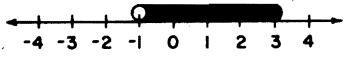
28. Which is a subset of the set of integers?
(1) real numbers (3) rational numbers
(2) natural numbers (4) irrational numbers 28_____

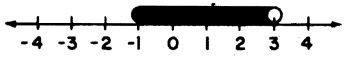
29. If $n - 2$ represents an even integer, what is the next *larger* even integer?
(1) n (2) $n - 1$ (3) $n - 4$ (4) $n + 2$ 29_____

30. Which graph shows the solution set of $-1 \leq x < 3$?

(1) 

(2) 

(3) 

(4) 

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

31. Answer *either a* or *b* but *not* both.

a Solve graphically and check:

$$\begin{aligned} x + y &= 8 \\ 2x - y &= 7 \end{aligned} \qquad [8,2]$$

OR

b (1) On the same set of coordinate axes, graph the following system of inequalities:

$$\begin{aligned} y &< x - 5 \\ y &\geqslant -2x + 4 \end{aligned} \qquad [8]$$

(2) Write the coordinates of a point in the solution set of this system. [2]

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

a Find the solution set:

$$\frac{5}{x} + 3x = \frac{17}{x} \qquad [5]$$

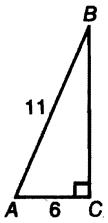
b Express as a single fraction in *lowest terms*:

$$\left(\frac{y^2 - 9}{y^2 - 3y - 18}\right)\left(\frac{y - 6}{2y - 6}\right) \qquad [5]$$

33. The length of a rectangle is 12 less than 3 times its width. The perimeter of the rectangle is 136. Find the dimensions of the rectangle. [*Only an algebraic solution will be accepted.*] [5,5]

34. A clerk wishes to mix candy selling for 65 cents per pound with candy selling for 90 cents per pound in order to produce 40 pounds of candy which can be sold for 75 cents per pound. How many pounds of *each* kind should be used? [*Only an algebraic solution will be accepted.*] [5,5]

35. In right triangle ABC shown in the accompanying diagram, hypotenuse $AB = 11$ and leg $AC = 6$.



a Find angle *B* to the *nearest degree.* [5]

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

36. Find *two* consecutive positive integers such that the square of the first decreased by 25 equals three times the second. [*Only an algebraic solution will be accepted.*] [5,5]

37. The replacement set for x for each of the open sentences below is $\{-2,-1,0,1,2\}$. On your answer paper write the letters *a* through *e*, and next to *each* write the solution set of each open sentence. [*Each answer must be a subset of the replacement set.*] [10]

a $(x + 1)(x + 2) = 0$

b $-1 < x \leq 1$

c $5x + 1 > 3x + 1$

d $x - 1 = 5$

e $|x| = 2$