June 17, 1969

Part I

Answer all questions in this part. Each correct answer will receive 2 credits No partial credit will be allowed.

1. What number is the reciprocal of 3?   1_____

2. What is the slope of the line whose equation is
   $y = \frac{2}{3}x + \frac{1}{2}$?   2_____

3. Express as a single term in radical form: $\sqrt{32} + \sqrt{8}$ 3_____

4. The legs of a right triangle are 5 inches and 8 inches. Express, in radical form, the number of inches in the length of the hypotenuse.   4_____

5. What is the solution set of the equation $2(x + 5) = 10 - x$?   5_____

6. Solve for d: $3 + \dfrac{15}{d} = \dfrac{27}{4}$ 6_____

7. A car travels at an average rate of r miles per hour. Express in terms of r and t the number of miles the car will travel in t hours.   7_____

8. The cosine of an angle is .8750. Find the measure of the angle to the *nearest degree*.   8_____

9. A tree casts a shadow 25 feet long at the same time that a man 6 feet tall casts a shadow 5 feet long. How many feet high is the tree?   9_____

10. If $X = Y$, what is the numerical value of $X(X - Y)$?   10_____

11. The sum of two angles is 180° and the angles are in the ratio 1:8. What is the number of degrees in the *smaller* angle?   11_____

12. A circle has a diameter of 28 inches. Find the number of inches in its circumference. [Use the approximation $\pi = 22/7$.] 12_____

13. The area of a rectangle is $(x^2 + 5)$ and the width is $(x - 3)$. Find the length of the rectangle when $x = 5$.   13_____

14. If 20% of x is 8, what is the value of x?   14_____

15. Find the value of $\left| \dfrac{x - y}{y - x} \right|$ when $x = 3$ and $y = 7$.   15_____

16. On the graph of $y = 3x - 2$ the abscissa of a point is 2. Find the ordinate of this point.

17. Find $\sqrt{67}$ to the *nearest tenth*.   17_____

18. Express the product $(1 + x)(1 - x)(1 + x^2)$ as a binomial.   18_____

19. For what value of x is $\dfrac{8}{x - 5}$ undefined or meaningless?   19_____

Directions (20-29): Write in the space provided the *number* preceding the expression that best completes *each* statement or answers *each* question.

20. The expression $\dfrac{3a(6-a)}{9}$ is equivalent to

(1) $\dfrac{6a - a^2}{3}$

(2) $\dfrac{6 - 4a}{9}$　　　(3) $\dfrac{a^2 - 6}{3}$　　　(4) $2a - a^2$　　20＿＿＿＿

21. The inequality $3 + 2x > 5$ is equivalent to　　(1) $x < 1$

(2) $x > 1$　　　　(3) $x < 4$　　　　(4) $x > 4$　　21＿＿＿＿

22. If $a = b$ and $b = c$, then　　(1) $a > c$　　(2) $a + b < c$

(3) $a - b = c$　　　　(4) $a = c$　　22＿＿＿＿

23. The expression $\dfrac{(-2b)^2}{4} \div \dfrac{1}{b}$ is equivalent to　　(1) 1

(2) b　　　(3) b^2　　　(4) b^3　　23＿＿＿＿

24. The binomial factors of $2x^2 - x - 6$ are　　(1) $(2x + 3)$ $(x - 2)$　　(2) $(2x - 3)$ $(x + 2)$　　(3) $(2x - 1)$ $(x + 6)$ (4) $(x - 3)$ $(x + 2)$　　24＿＿＿＿

25. If $c = 10d + 25q$ is solved for q, then q is equal to

(1) $c - 10d - 25$　(2) $\dfrac{c - 2d}{5}$　(3) $\dfrac{c - 10d}{25}$　(4) $\dfrac{10d - c}{25}$　25＿＿＿＿

26. The value of $3xy^2$ when $x = -2$ and $y = 3$ is　　(1) 36

(2) 54　　　(3) -36　　　(4) -54　　26＿＿＿＿

27. The sum of $\dfrac{x + 4}{x}$ and $\dfrac{x - 4}{4}$ is　(1) $\frac{1}{2}$　(2) $4 + x$

(3) $\dfrac{16 + x^2}{4x}$　　　(4) $\dfrac{2x}{x + 4}$　　27＿＿＿＿

28. If the replacement set is the set of *integers*, what is the solution set of $3x^2 - 4x + 1 = 0$?　　(1) $\{1\}$　　　(2) $\{-\frac{1}{3}, -1\}$ (3) $\{\frac{1}{3}, 1\}$　　　(4) $\{-1\}$　　28＿＿＿＿

29. The average of two numbers is $2y - 5$. One of the numbers is y; the other number is　　(1) $3y - 5$　　　(2) $3y - 10$

(3) $\dfrac{3y - 5}{2}$　　　(4) $\dfrac{4y - 10}{y}$　　29＿＿＿＿

Directions (30): The solution set for this question is to be indicated on the drawing of a number line.

30. On the number line draw the graph of:　　$x \geq -3$
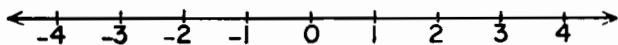
Part II

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

31. *a* On the same set of axes graph the solution set of the following system of inequalities: [8]
$$x + y < 6$$
$$x - y > 3$$

   b Name an ordered number pair in the solution set of this system. [1]

   c Name an ordered number pair which is in the solution set of $x + y < 6$ but *not* in the solution set of $x - y > 3$. [1]

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

   a Solve for *n* and check:
$$\frac{n-1}{2} + \frac{n-2}{3} - \frac{n-3}{4} = 6 \quad [5, 1]$$

   b Solve the system of equations for *x* and *y*: [4]
   $$3x - 5y = -9$$
   $$2x - y = 1$$

33. A grocer wishes to mix coffee worth 40 cents per pound with coffee worth 70 cents per pound to make a mixture worth 60 cents per pound. How many pounds of each kind should he use to make 90 pounds of the 60-cent mixture? [*Only algebraic solution will be accepted.*] [5, 5]

34. Write an equation or a system of equations which 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 A boy started walking at 3 miles per hour. Another boy started from the same point $2\frac{1}{2}$ hours later and traveled the same route by bicycle at a rate of 8 miles per hour. In how many hours did the second boy overtake the first boy? [5]

   b Find three consecutive even integers such that twice the largest is 2 less than 3 times the smallest. [5]

35. Answer *either* *a* or *b* but *not* both:

   a In the accompanying figure, the legs of the right triangle are *n* and $n + 3$. The hypotenuse is $2n - 3$. Find the length of the shorter leg. [10]
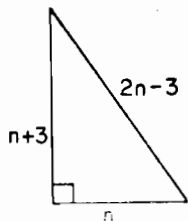
OR

   b (1) The legs of a right triangle are 6 and 8. Find to the *nearest degree* the measure of the angle which the hypotenuse makes with the shorter leg. [6]

   (2) Solve for *x* to the *nearest integer*:
$$\sin 13° = \frac{100}{x} \quad [4]$$

36.   The sum of the digits of a two-digit number is 7. If the digits of this number are reversed, the new number is 2 more than twice the original number. Find the original number. [*Only an algebraic solution will be accepted.*]   [5, 5]

37.   For this question the universal set is set $\cup = \{0, 1, 2, 3, 4, 5\}$. On your answer paper write the letters *a* through *e* and next to *each* letter list the set of elements which is the correct answer to that question: [10]

   a What is the subset of all positive integers in set $\cup$?

   b What is the subset of all prime numbers in set $\cup$?

   c What subset of $\cup$ is the solution set of $x = |-1|$?

   d What subset of $\cup$ is the solution set of $2x - 1 < 7$?

   e What subset of $\cup$ is the solution set of $x^2 - x - 12 = 0$?