June 15, 1981

## 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 $a$: $12a - 5 = 10a - 3$ 1_____

2. Solve for $y$: $3(4 + y) = 4y$ 2_____

3. If the sum of two consecutive integers is 13, find the *smaller* integer. 3_____

4. Factor: $x^2 - 100$ 4_____

5. A copying machine can make 40 copies per minute. How many copies can the machine make in $3\frac{1}{4}$ minutes? 5_____

6. What is the slope of the line whose equation is $y = \frac{2}{3}x + 7$? 6_____

7. If 20% of a number is 8, find the number. 7_____

8. Solve the following system of equations for $x$:
$$5x - y = 20$$
$$y = 3x$$
8_____

9. Multiply and express as a trinomial: $(x + 6)(x - 3)$ 9_____

10. If $a^2 + b^2 = c^2$, find the positive value of $b$ when $a = 12$ and $c = 13$. 10_____

11. Solve for $m$: $\frac{m}{5} + 5 = 14$ 11_____

12. What is the greatest common factor of $18x$ and $12x^2$? 12_____

13. A vertical pole casts a shadow 10 feet long at the same time that a man 6 feet tall casts a shadow 4 feet long. What is the number of feet in the height of the pole? 13_____

14. Solve for $x$ in terms of $a$, $c$, and $y$: $ax + y = c$ 14_____

15. Find the value of $\sqrt{86}$ to the *nearest tenth*. 15_____

16. If $a = 3$ and $b = -2$, find the value of $ab^2$. 16_____

17. Subtract $3x - 2$ from $4x + 3$. 17_____

18. The length of a side of an equilateral triangle is 2. What is the perimeter? 18_____

19. Express $\frac{5}{x-3} \div \frac{5}{x}$ as a single fraction in *simplest form*. 19_____

20. Two numbers are in the ratio of 5 to 13. If the sum of the two numbers is 36, what is the *larger* number? 20_____

*Directions* (21-30): Write in the space provided the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

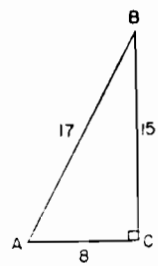
21. The reciprocal of $\frac{1}{5}$ is (1) $-\frac{1}{5}$ (2) 1/25 (3) $-5$ (4) 5 21____

22. If $2x + 7 > 23$ then (1) $x > 8$ (2) $x < 8$ (3) $x > 15$ (4) $x < 15$ 22____

23. The expression $\frac{14}{2} + 3(4 - 2)$ is equal to (1) 20 (2) 17 (3) 13 (4) 10 23____

24. A point on the line whose equation is $3x - 2y = 7$ is (1) $(0, -3)$ (2) $(1, -2)$ (3) $(3, 2)$ (4) $(-2, 1)$ 24____

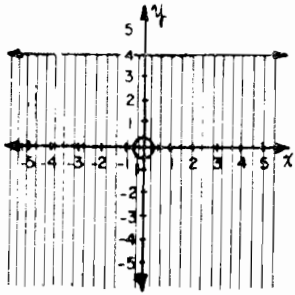
25. In the accompanying diagram, the legs of right triangle $ABC$ are 15 and 8, and the hypotenuse is 17. Sin $A$ equals (1) $\frac{15}{8}$ (2) $\frac{15}{17}$ (3) $\frac{3}{17}$ (4) $\frac{8}{15}$



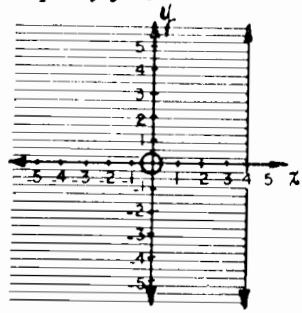

25____

26. The solution set of $x^2 - 5x - 6 = 0$ is (1) $\{6, -1\}$ (2) $\{-6, 1\}$ (3) $\{3, -2\}$ (4) $\{-2, -3\}$ 26____

27. Which graph represents the inequality $y < 4$?




(1)

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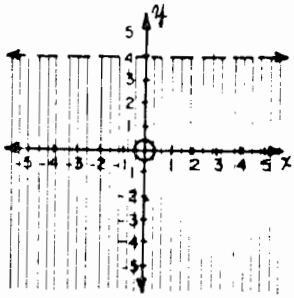


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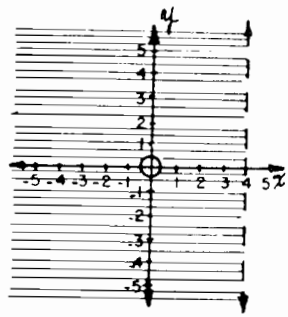



(4)

27____

28. The expression $\dfrac{x^2 + 2x - 3}{x^2 + 3x}$ is equivalent to (1) $\dfrac{x - 1}{x}$ (2) $\dfrac{2x - 3}{3x}$ (3) $-\dfrac{1}{3}$ (4) $\dfrac{3}{x}$

28____

29. The expression $(\sqrt{5})(\sqrt{12})$ is equivalent to (1) $\sqrt{7}$ (2) $2\sqrt{15}$ (3) $\sqrt{17}$ (4) $4\sqrt{15}$

29____

30. Which is equivalent to the empty set? (1) the set of all even natural numbers greater than 12 (2) the set of integers that are multiples of 3 (3) the set of all natural numbers that are greater than 9 and less than 10 (4) the set of ordered pairs that satisfy the equation $x + y = 10$

30____

## Part II

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

31. On the same set of coordinate axes, graph the following system of inequalities and label the solution set $A$.

$$x + y > 6$$
$$y \leq 2x - 5$$

[8, 2]

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

*a* Perform the indicated multiplication and express the result in *simplest form*:

$$\frac{a^2 - 25}{5a^2} \cdot \frac{a^2 - 5a}{a^2 - 10a + 25} \qquad [5]$$

*b* Solve for $n$ and check: $n - 4 = \frac{n - 1}{4}$ [4, 1]

33. Part of \$4,000 is deposited in a credit union at 7%, and the remainder is put in a bank at 6%. The total annual interest from both investments is \$265. Find the amount deposited at each rate. [*Only an algebraic solution will be accepted.*] [5, 5]

34. When the first of three consecutive positive integers is multiplied by the third, the result is 1 less than 6 times the second. Find the three integers. [*Only an algebraic solution will be accepted.*] [5, 5]

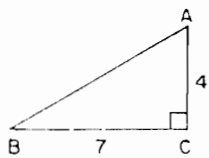
35. Write an equation or system of equations that can be used to solve *each* of the following problems. In *each* case state what the variable or variables represent. [*Solution of the equations is not required.*]

*a* Two automobiles leave a certain place at the same time and travel in opposite directions. The rate of one is three-fourths the rate of the other. If they are 364 miles apart after 4 hours, what is the rate of each? [5]

*b* Working alone, Maria can mow a lawn in 2 hours, and Adolf can do the job alone in 3 hours. How long will it take them to do the job if they work together? [5]

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

In right triangle $ABC$, $C$ is a right angle, $AC = 4$, and $BC = 7$.




*a* Find, to the *nearest degree*, the measure of angle $B$. [5]

*b* Find, the the *nearest integer*, the length of $\overline{AB}$. [5]

37. Write the letters *a* through *e* on your answer paper and after *each* letter write the answer to the corresponding question below. [10]

*a* What value of $x$ will make $\frac{3}{x + 2}$ undefined?

*b* What number is the additive identity element?

*c* The equation $x^2 - 4 = 0$ has two roots. What is the *smaller* of these roots?

*d* What is the additive inverse of $-6$?

*e* Solve for $x$: $|x| = 9$