

1. If $\frac{3}{5-x} = 1$, find the value of x .
2. If $(x^2 - y^2) = 0$ and $x + y = 17.534$, find the value of $x - y$.
3. If x is 75% of y , then $y = kx$. Find the value of k . Express your answer as an improper fraction reduced to lowest terms.
4. Find the **ordered pair** that represents the point at which the line whose equation is $7x + 3y = 84$ intersects the x -axis.
5. Let x , y , and z represent integers greater than 1. If $(x^7)^y = x^7 x^z$, find the sum of the two smallest distinct values of $|z - y|$.
6. Let x and y be positive integers such that the arithmetic mean (average) of $5x$ and $7y$ is 60. Find the sum of all distinct possible values of x .
7. Gusher invested part of his \$100,000 in oil bonds, which earned interest at 6% annual percentage rate and invested the rest of his \$100,000 in natural gas bonds, which earned interest at 5% annual percentage rate. At the end of one year his interest income from these two investments came to a total of \$5320. Find the number of dollars Gusher invested in natural gas bonds.
8. If $kx + 11.2 = 106.4$ and $wx + 15.4 = 1738.52$, find the value of $\frac{w}{k}$. Express your answer as a **decimal**.

9. If twice the sum of the squares of the roots for the equation $x^2 - 70x + k = 0$ is added to the product of the roots for the equation, the result is 6632. Find the smaller of the two roots for x .
10. The sum, the product, and the average (arithmetic mean) of three different numbers are equal. If two of the numbers are 7.486 and -7.486 , find the third number.
11. Bob sells x articles at 4 cents each, with a profit of $\frac{2}{5}$ cents on each article. On the same day, Bob sells y articles at 2 for 5 cents (must be sold in multiples of 2), with a profit of $\frac{1}{7}$ cents on each article. Judy tells him it would be simpler just to mix the articles and sell them at 3 cents each. So the next day, Bob does sell $(x + y)$ articles at 3 cents each. Obviously, x and y are positive integers. If the overall profit was the same each day, find the smallest possible value of $(x + y)$.
12. There are two numbers formed by the same two digits in reverse order. The sum of the two numbers is 22 times the difference between the two digits, and the difference between the squares of the two numbers is k where $k > 1000$. If none of the digits of k is the same as any of the digits of the two original numbers, find the larger of the two original numbers.
13. An auto was originally priced at \$25,000. The auto's price was reduced by $x\%$ to y dollars. Then the price of y dollars was reduced by $k\%$ to \$16170. If both x and k are positive integers such that $x < k$, find the smallest possible value of $2k$.
14. A woman bought a 36-ounce Pepsi at the Big Pep. On the first day, she drank 1 ounce from the container and refilled the remainder of the container with 7-up. On the second day, she drank 2 ounces from the container and refilled the remainder of the container with 7-up. On the third day, she drank 3 ounces from the container and refilled the remainder of the container with 7-up. This procedure was continued for succeeding days until the container was empty. Find the total number of ounces of 7-up that the woman drank during this process.

15. Find the value of a such that the solution set for x of $|x - a| < 16$ is $\{x : -34 < x < -2\}$.
16. How many integers in the set of all integers from 1 to 100 (including 1 and 100) are **not** the cube of an integer?
17. To a 30 gallon mixture that is 30% silver nitrate are added an x gallon mixture that is 25% silver nitrate and a y gallon mixture that is 42% silver nitrate. If the resulting $(30 + x + y)$ mixture is 35% silver nitrate and if x and y are positive integers, find the ordered pair (x, y) such that $(x + y)$ is a minimum. Be sure to express your answer as an ordered pair of the form (x, y) .
18. A village had a large tank that contained k gallons of water. If each person in the village consumed an equal amount each day, there would be enough water in the tank to last for 11 days. If the village had 400 more persons, each person would need to consume 2 fewer **ounces** per day than the original allotment for the water in the tank to last for 11 days. If the village had 600 fewer persons, each person could consume 2 more **ounces** per day than the original allotment, and there would be enough water in the tank to last for 12 days. Find the value of k . **Note:** Remember that k is the number of gallons of water. Express your answer as a **decimal**.
19. The slope of the line whose equation is $10x + ky - 70 = 0$ is 5. Find the value of k .
20. A number is five more than the product of two consecutive positive integers and is also an integral multiple of both 55 and 121. Let the smaller of the two consecutive positive integers be represented by k . Find the sum of all distinct values of k if $k < 157$.

2009 SA

Algebra I

Name ANSWERS

School _____

(Use full school name – no abbreviations)

_____ Correct X 2 pts. ea. =

Note: All answers must be written legibly in simplest form, according to the specifications stated in the Contest Manual. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required.

1. 2

11. 3

2. 0

12. 93

3. $\frac{4}{3}$ (Must be this reduced improper fraction.)

13. 46

4. (12, 0) (Must be this ordered pair.)

14. 630 (“ounces” optional.)

5. 16

15. -18

6. 30

16. 96

7. 68,000 (\$ optional.)

17. (6, 30) (Must be this ordered pair.)

8. 18.1 (Must be decimal answer.)

18. 6187.5 (Must be decimal answer, “gallons” optional.)

9. 22

19. -2

10. 0

20. 169