

## Systems of Equations – Problem Solving

For each of the following problems:

1. define each variable
2. translate the related facts into two equations

### Number Problems

1. The sum of two numbers is 45 and their difference is 7. Find the numbers.  
 **$x + y = 45, x - y = 7$**
2. The sum of two numbers is -33 and their difference is -1. Find the numbers.  
 **$x + y = -33, x - y = -1$**
3. The difference between two numbers is 12 and their sum is 24. Find the numbers.  
 **$x - y = 12, x + y = 24$**
4. The difference between two numbers is -20 and their sum is 36. Find the numbers.  
 **$x - y = 20, x + y = 36$**
5. The sum of two numbers is 22. Five times one number is equal to six times the second number. Find the numbers.  
 **$x + y = 22, 5x = 6y$**
6. The sum of two numbers is 40. Three times one number is equal to four times the second number. Find the numbers.  
 **$x + y = 40, 3x = 4y$**
7. The difference between two numbers is 12. Four times one number is equal to three times the second number. Find the numbers.  
 **$x - y = 12, 4x = 3y$**
8. The difference between two numbers is 8. Two times one number is equal to three times the second number. Find the numbers.  
 **$x - y = 8, 2x = 3y$**
9. One number is 4 more than a second number. The sum of the two numbers is 22. Find the numbers.  
 **$x = y + 4, x + y = 22$**
10. One number is 4 less than a second number. The sum of the two numbers is 30. Find the numbers.  
 **$x = y - 4, x + y = 30$**
11. One number is 2 more than three times a second number. The sum of the two numbers is 30. Find the numbers.  
 **$x = 3y + 2, x + y = 30$**
12. One number is 5 less than four times a second number. The sum of the two numbers is 26. Find the numbers.  
 **$x = 4y - 5, x + y = 26$**
13. One number is 10 more than five times a second number. The difference of the two numbers is 8. Find the numbers.  
 **$x = 5y + 10, x - y = 8$**
14. One number is 8 less than three times a second number. The difference of the two numbers is 14. Find the numbers.  
 **$x = 3y - 8, x - y = 14$**
15. Three times one number is 8 more than 2 times the second number. The sum of the two numbers is 40. Find the numbers.  
 **$3x = 2y + 8, x + y = 40$**

16. Four times one number is 6 less than five times the second number. The sum of the two numbers is 55. Find the numbers.  
 $4x = 5y - 6, x + y = 55$
17. Five times one number is 12 more than three times the second number. The difference of the two numbers is 13. Find the numbers.  
 $5x = 3y + 12, x - y = 13$
18. Six times one number is 5 less than three times the second number. The difference of the two numbers is -8. Find the numbers.  
 $6x = 3y - 5, x - y = -8$
19. One number is 6 more than the second number. Three times the first number plus twice the second number is equal to 36. Find the numbers.  
 $x = y + 6, 3x + 2y = 36$
20. One number is 9 less than the second number. Three times the second number plus four times the first number is equal to 48. Find the numbers.  
 $x = y - 9, 3y + 4x = 36$
21. One number is 14 more than the second number. Four times the first number minus twice the second number is equal to 6. Find the numbers.  
 $x = y + 14, 4x - 2y = 6$
22. One number is 16 less than the second number. Five times the second number minus three the first number is equal to 14. Find the numbers.  
 $x = y - 16, 5y - 3x = 14$
23. The sum of four times the first number and 2 times the second is 58. Three times the first number added to the second number is 34. Find the numbers.  
 $4x + 2y = 58, 3x + y = 34$
24. The difference of four times the first number and 3 times the second is 6. Three times the first number subtracted from 2 times the second number is 12. Find the numbers.  
 $4x - 3y = 6, 2y - 3x = 12$
25. One number is 6 more than the second. Five more than the second number is the same as the first number less 3. Find the numbers.  
 $x = y + 6, y + 5 = x - 8$
26. One number is 3 more than three times the second. Four more than twice the second number is the same as the first number increased by 8. Find the numbers.  
 $x = 3y + 3, 2y + 4 = x + 8$

### Angle Problems

1. One complementary angle is 10 degrees more than the second. Find the two angles.  
 $x + y = 90, x = y + 10$
2. One complementary angle is 8 degrees less than the second. Find the two angles.  
 $x + y = 90, x = y - 8$
3. Three times one complementary angle is 8 degrees more than the second. Find the angles.  
 $x + y = 90, 3x = y + 8$
4. Two times one complementary angle is 4 degrees less than the second. Find the angles.  
 $x + y = 90, 2x = y - 4$
5. Four times one complementary angle decreased by three times the second is 8 degrees. Find the angles.  
 $x + y = 90, 4x - 3y = 8$

6. Five times one complementary angle increased by two times the second is 340 degrees. Find the angles.  
 **$x + y = 90, 5x + 2y = 340$**
7. One supplementary angle is 20 degrees more than the second. Find the two angles.  
 **$x + y = 180, x = y + 20$**
8. One supplementary angle is 16 degrees less than the second. Find the two angles.  
 **$x + y = 180, x = y - 16$**
9. Five times one supplementary angle is 4 degrees more than the second. Find the angles.  
 **$x + y = 180, 5x = y + 4$**
10. Three times one supplementary angle is 15 degrees less than the second. Find the angles.  
 **$x + y = 180, 3x = y - 15$**
11. Four times one supplementary angle decreased by two times the second is 24 degrees. Find the angles.  
 **$x + y = 180, 4x - 2y = 24$**
12. Six times one supplementary angle increased by three times the second is 840 degrees. Find the angles.  
 **$x + y = 180, 6x + 3y = 840$**
13. The difference between 2 times one complementary angle and the second is 90 degrees. Find the angles.  
 **$x + y = 90, 2x - y = 90$**
14. The difference between 4 times one supplementary angle and twice the second is 360 degrees. Find the angles.  
 **$x + y = 180, 4x - 2y = 360$**
15. If one of two complementary angles measures 30 degrees less than twice the other angle, what is the measure of each of the angles?  
 **$x + y = 90, x = 2y - 30$**
16. If one of two supplementary angles measures 16 degrees more than three times the other, what is the measure of each of the angles?  
 **$x + y = 180, x = 3y + 16$**

#### Money Problems

1. There are five times as many \$2 bills as \$5 bills. The total number of bills is 48. How many \$2 bills are there?  
 **$x + y = 48, x = 5y$**
2. Maria has 41 coins. She has 3 more nickels than pennies. How many nickels and how many pennies has she?  
 **$x + y = 41, x = y + 3$**
3. Mike has \$1.55 in nickels and dimes. He has 7 more nickels than dimes. Find the number of each kind of coin.  
 **$x = y + 7, .05x + .10y = 1.55$**
4. James has \$1.25 in nickels and dimes. He has three times as many nickels as dimes. Find the number of each kind of coin.  
 **$x = 3y, .05x + .10y = 1.25$**
5. Ester has 16 coins, some quarters and the rest nickels. The total value of all the coins is \$1.40. Find the number of each kind of coin.  
 **$x + y = 16, .25x + .05y = 1.40$**

6. Stewart has 25 stamps; some 15 cents and the rest 18 cents. The value of all the stamps is \$4.05. How many stamps of each kind does he have?  
 **$x + y = 25, .15x + .18y = 4.05$**
7. There were 3000 people at a football game. Some paid \$10 for their tickets while the rest paid \$5. The total receipts amounted to \$25,000. How many tickets of each kind were sold?  
 **$x + y = 3000, 10x + 5y = 25000$**
8. A total of 10,000 people attended a concert with gate receipts of \$175,000. Adults tickets cost \$20 and student tickets cost \$15. How many adults attended the concert?  
 **$x + y = 10000, 20x + 15y = 175000$**
9. A total of \$290 was spent on the purchase of CDs and DVDs. If 7 CDs and 5 DVDs were purchased and DVDs cost \$10 more than CDs, how much was spent on each DVD?  
 **$x = y + 10, 5x + 7y = 290$**
10. Walnuts cost 60 cents more a pound than peanuts. If Mr. Carroll paid \$15.60 for 4 pounds of peanuts and 6 pounds of walnuts, what did he pay for a pound of each?  
 **$x = y + 60, 4x + 6y = 15.60$**
11. A farmer sent 500 bags of potatoes to a commission merchant; some at \$9 a bag and the rest at \$5 a bag. If he received \$3940 in payment, how many bags of each did he send?  
 **$x + y = 500, 9x + 5y = 3940$**
12. Seats in the reserved section at the school play cost \$6.50 each and in the regular section \$4 each. How many tickets of each kind were sold if the total receipts for 980 tickets amounted to \$6,540?  
 **$x + y = 980, 6.50x + 4.00y = 6540$**

### Geometry Problems

1. The length of a rectangle is 4 meters more than the width. The perimeter of the rectangle is 40 meters. What do the length and the width each measure?  
 **$x = y + 4, 2x + 2y = 40$**
2. The length of a rectangle is 14 meters more than the width. The perimeter of the rectangle is 264 meters. What do the length and the width each measure?  
 **$x = y + 14, 2x + 2y = 264$**
3. The perimeter of a rectangle is 168 meters. Its length is five times its width. Find the length and the width.  
 **$2x + 2y = 168, x = 5y$**
4. The width of a rectangle is 5 meters less than the length. Find the dimensions of the rectangle if its perimeter is 90 meters.  
 **$x = y - 5, 2x + 2y = 90$**
5. The length of a rectangle is 8 centimeters more than six times its width. The perimeter of the rectangle is 156 centimeters. What do the length and the width each measure?  
 **$x = 6y + 8, 2x + 2y = 156$**
6. The base of an isosceles triangle is 7 meters longer than each of the other equal sides. What does each side of the triangle measure if the perimeter is 58 meters?  
 **$x = y + 7, x + 2y = 58$**

7. In a right triangle the measure of one acute angle is 6 more than twice the other acute angle. What is the measure of each angle?

$$x = y + 6, x + y = 90$$

8. The difference between the length and width of a rectangle is 7 centimeters. The perimeter of the rectangle is 50 centimeters. Find the length and width.

$$x - y = 7, 2x + 2y = 50$$

### Investment Problems

1. A woman invested \$4,000; part at 5% and the rest at 9% per year. If she receives \$260 income for the year from these investments, how much did she invest at each rate?

$$x + y = 4000, .05x + .09y = 260$$

2. Mr. Adams invested a part of his savings at 8% and the rest at 6% per year. If he receives an annual income of \$240 from a total investment of \$3,400. How much did he invest at 8%?

$$.08x + .06y = 240, x + y = 3400$$

3. A 7% investment brings an annual return of \$36 more than a 9% investment. The total amount invested is \$1,200. Find the amount invested at each rate.

$$.07x = .09y + 36, x + y = 1200$$

4. A man invested a certain amount of money at 8% per year and \$2,000 more than that amount at 10% per year. If the total annual income is \$524, how much did he invest at 10%?

$$x = y + 2000, .08x + .10y = 524$$

5. Mr. Jones invested \$500 more at 7% per year than he did at 12% per year. If the annual income he receives from the 12% investment is \$90 more than the income from the 7% investment, how much did he invest at each rate?

$$x = y + 500, .12x = .07y + 90$$

6. A man invested \$1,800; part at 4% and the rest at 6% per year. If he receives an annual income of \$84 from these investments, how much did he invest at each rate?

$$x + y = 1800, .04x + .06y = 84$$

### Age Problems

1. A man is twice as old as his son. Together the sum of their ages is 63 years. What are their ages?

$$x = 2y, x + y = 63$$

2. Ed is 5 years older than Jim. Four times Jim's age increased by 3 years equals three times Ed's age diminished by 2 years. Find Ed's age.

$$x = y + 5, 4y + 3 = 3x - 2$$

3. The difference in ages of 2 girls is 1 year. The sum of their ages is 27 years. What are their ages?

$$x - y = 1, x + y = 27$$

4. Mr. Whitney is three times as old as his son. Twelve years from now he will only be twice as old. What are their ages now?

$$x = 3y, (x + 12) = 2(y + 12)$$

5. Richard is twice as old as his brother. Four years ago he was four times as old. What are their ages now?

$$x = 2y, (x - 4) = 4(y - 4)$$

6. Arthur is 12 years younger than Robert. Three years ago Robert was five times as old as Arthur. How old is Robert now?  
 **$x = y - 12, 5(x - 3) = (y - 3)$**
7. Lucy is 5 years older than Dorothy. Four years ago eight times Dorothy's age equaled three times Lucy's age. What is Lucy's age now?  
 **$x = y + 5, 3(x - 4) = 8(y - 4)$**
8. The sum of the ages of a mother and daughter is 45 years. Five years ago the mother was six times the daughter's age. What are their ages now?  
 **$x + y = 45, (x - 5) = 6(y - 5)$**
9. The sum of the ages of a father and son is 46 years. In 2 years four times the son's age will equal the father's age. Find their present age.  
 **$x + y = 46, (x + 2) = 4(y + 2)$**
10. Eight years ago Jim was three times as old as Tom. However, eight years from now Jim will only be twice as old as Tom. What are their present ages?  
 **$(x - 8) = 3(y - 8), (x + 2) = 2(y + 2)$**

#### Mixture Problems

1. A grocer mixes cookies worth 80 cents a kg with cookies worth 95 cents a kg making a mixture selling at 85 cents a kg. If he mixes 60 kilograms, how many kilograms of each kind does he use?  
 **$x + y = 60, .80x + .95y = .85(60)$**
2. A confectioner wishes to make 80 kilograms of mixed candy to sell at 90 cents a kg. If he mixes candy worth 79 cents a pound with candy worth a \$1.21 a kg, how many kilograms of each kind does he use?  
 **$x + y = 80, .79x + 1.21y = .90(80)$**
3. How many kilograms of tea worth \$4.95 a kg should be blended with tea worth \$3.87 a kg to make 40 kilograms of blended tea to sell at \$4.35 a kg?  
 **$x + y = 40, 4.95x + 3.87y = 4.35(40)$**
4. The cooling system in Ann's car contains 19 liters of 30% antifreeze. How much coolant must be drained out and replaced with 80% antifreeze so that the system will contain 50% antifreeze. How much of the original coolant will be left in the car?  
 **$x + y = 19, .3x + .8y = .5(19)$**
5. A certain alloy contains 8% silver. Another alloy contains 16% silver. How many kilograms of each alloy must be mixed to make 10 kg of an alloy that is 12% silver?  
 **$x + y = 10, .08x + .16y = .12(10)$**