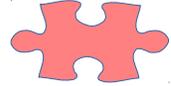
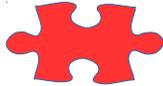


# Tough Algebra Problems Solved!



- 1.** The cost of petrol rises by 2 cents a liter. last week a man bought 20 liters at the old price. This week he bought 10 liters at the new price. Altogether, the petrol costs \$9.20. What was the old price for 1 liter?
- 2.** Teachers divided students into groups of 3. Each group of 3 wrote a report that had 9 pictures in it. The students used 585 pictures altogether. How many students were there in all?
- 3.** Vera and Vikki are sisters. Vera is 4 years old and Vikki is 13 years old. What age will each sister be when Vikki is twice as old as Vera?
- 4.** A can do a work in 14 days and working together A and B can do the same work in 10 days. In what time can B alone do the work?
- 5.** 7 workers can make 210 pairs of cup in 6 days. How many workers are required to make 450 pairs of cup in 10 days?
- 6.** Ten years ago the ratio between the ages of Mohan and Suman was 3:5. 11 years hence it will be 11:16. What is the present age of Mohan?
- 7.** The ratio of girls to boys in class is 9 to 7 and there are 80 students in the class. How many girls are in the class?
- 8.** One ounce of solution X contains only ingredients a and b in a ratio of 2:3. One ounce of solution Y contains only ingredients a and b in a ratio of 1:2. If solution Z is created by mixing solutions X and Y in a ratio of 3:11, then 2520 ounces of solution Z contains how many ounces of a?

- 9.** This week Bob puts gas in his truck when the tank was about half empty. Five days later, Bob puts gas again when the tank was about three fourths full. If Bob bought 24 gallons of gas, how many gallons does the tank hold?
- 10.** A commercial airplane flying with a speed of 700 mi/h is detected 1000 miles away with a radar. Half an hour later an interceptor plane flying with a speed of 800 mi/h is dispatched. How long will it take the interceptor plane to meet with the other plane?
- 11.** There are 40 pigs and chickens in a farmyard. Joseph counted 100 legs in all. How many pigs and how many chickens are there?
- 12.** The top of a box is a rectangle with a perimeter of 72 inches. If the box is 8 inches high, what dimensions will give the maximum volume?
- 13.** You are raising money for a charity. Someone made a fixed donation of 500. Then, you require each participant to make a pledge of 25 dollars. What is the minimum amount of money raised if there are 224 participants.
- 14.** The sum of two positive numbers is 4 and the sum of their squares is 28. What are the two numbers?
- 15.** Flying against the jet stream, a jet travels 1880 mi in 4 hours. Flying with the jet stream, the same jet travels 5820 mi in 6 hours. What is the rate of the jet in still air and what is the rate of the jet stream?
- 16.** Jenna and her friend, Khalil, are having a contest to see who can save the most money. Jenna has already saved \$110 and every week she saves an additional \$20. Khalil has already saved \$80 and every week he saves an additional \$25. Let  $x$  represent the number of weeks and  $y$  represent the total amount of money saved. Determine in how many weeks Jenna and Khalil will have the same amount of money.
- 17.** The sum of three consecutive terms of a geometric sequence is 104 and their product is 13824. Find the terms.

18. The sum of the first and last of four consecutive odd integers is 52. What are the four integers?
19. A health club charges a one-time initiation fee and a monthly fee. John paid 100 dollars for 2 months of membership. However, Peter paid 200 for 6 months of membership. How much will Sylvia pay for 1 year of membership?
20. The sum of two positive numbers is 4 and the sum of their cubes is 28. What is the product of the two numbers?
21. A man selling computer parts realizes that when he sells 16 computer parts, his earning is \$1700. When he sells 56 computer parts, his earning is \$4300. What will the earning be if the man sells 30 computers parts?
22. A man has 15 coins in his pockets. These coins are dimes and quarters that add up 2.4 dollars. How many quarters and how many dimes does the man have?
23. The lengths of the sides of a triangle are in the ratio 4:3:5. Find the lengths of the sides if the perimeter is 18 inches.
24. The ratio of base to height of a equilateral triangle is 3:4. If the area of the triangle is 6, what is the perimeter of the triangle?
25. The percent return rate of a growth fund, income fund, and money market are 10%, 7%, and 5% respectively. Suppose you have 3200 to invest and you want to put twice as much in the growth fund as in the money market to maximize your return. How should you invest to get a return of 250 dollars in 1 year?
26. A shark was caught whose tail weighted 200 pounds. The head of the shark weighted as much as its tail plus half its body. Its body weighted as much as its head and tail. What is the weight of the shark?
27. The square root of a number plus two is the same as the number. What is the number?

- 28.** Suppose you have a coupon worth 6 dollars off any item at a mall. You go to a store at the mall that offers a 20% discount. What do you need to do to save the most money?
- 29.** Suppose your grades on three math exams are 80, 93, and 91. What grade do you need on your next exam to have at least a 90 average on the four exams?
- 30.** Peter has a photograph that is 5 inches wide and 6 inches long. She enlarged each side by the same amount. By how much was the photograph enlarged if the new area is 182 square inches?
- 31.** The cost to produce a book is 1200 to get started plus 9 dollars per book. The book sells for 15 dollars each. How many books must be sold to make a profit?
- 32.** Store A sells CDs for 2 dollars each if you pay a one-time fee of 104 dollars. Store B offers 12 free CDs and charges 10 dollars for each additional CD. How many CD must you buy so it will cost the same under both plans?
- 33.** When 4 is added to two numbers, the ratio is 5:6. When 4 is subtracted from the two numbers, the ratio is 1:2. Find the two numbers.
- 34.** A store owner wants to sell 200 pounds of pistachios and walnuts mixed together. Walnuts cost 4 dollars per pound and pistachio cost 6 dollars per pounds. How many pounds of each type of nuts should be mixed if the store owner will charge 5 dollars for the mixture?
- 35.** A cereal box manufacturer makes 32-ounce boxes of cereal. In a perfect world, the box will be 32-ounce every time is made. However, since the world is not perfect, they allow a difference of 0.06 ounce. Find the range of acceptable size for the cereal box.
- 36.** A man weighing 600 kg has been losing 3.12% of his weight each month with some heavy exercises and eating the right food. What will the man weigh after 20 months?

**37.** An object is thrown into the air at a height of 60 feet. After 1 second and 2 second, the object is 88 feet and 84 feet in the air respectively. What is the initial speed of the object?

**38.** A transit is 200 feet from the base of a building. There is man standing on top of the building. The angles of elevation from the top and bottom of the man are 45 degrees and 44 degrees. What is the height of the man?

**39.** A lemonade consists of 6% of lemon juice and a strawberry juice consists of 15% pure fruit juice. How much of each kind should be mixed together to get a 4 Liters of a 10% concentration of fruit juice?

**40.** Ellen can wash her car in 60 minutes. Her older sister Sarah can do the same job in 45 minutes. How long will it take if they wash the car together?

**41.** A plane flies 500 mi/h. The plane can travel 1100 miles with the wind in the same amount of time as it travels 900 miles against the wind. What is the speed of the wind?

**42.** A company produces boxes that are 5 feet long, 4 feet wide, and 3 feet high. The company wants to increase each dimension by the same amount so that the new volume is twice as big. How much is the increase in dimension?

**43.** James invested half of his money in land, a tenth in stock, and a twentieth in saving bonds. Then, he put the remaining 21000 in a CD. How much money did James saved or invested?

**44.** The motherboards for a desktop computer can be manufactured for 50 dollars each. The development cost is 250000. The first 20 motherboard are samples and will not be sold. How many salable motherboards will yield an average cost of 6325 dollars?

**45.** How much of a 70% orange juice drink must be mixed with 44 gallons of a 20% orange juice drink to obtain a mixture that is 50% orange juice?

46. A company sells nuts in bulk quantities. When bought in bulk, peanuts sell for \$1.20 per pound, almonds for \$ 2.20 per pound, and cashews for \$3.20 per pound. Suppose a specialty shop wants a mixture of 280 pounds that will cost \$2.59 per pound. Find the number of pounds of each type of nut if the sum of the number of pounds of almonds and cashews is three times the number of pounds of peanuts. Round your answers to the nearest pound.
47. A Basketball player has successfully made 36 of his last 48 free throws. Find the number of consecutive free throws the player needs to increase his success rate to 80%.
48. John can wash cars 3 times as fast as his son Erick. Working together, they need to wash 30 cars in 6 hours. How many hours will it takes each of them working alone?
49. In a college, about 36% of student are under 20 years old and 15% are over 40 years old. What is the probability that a student chosen at random is under 20 years old or over 40 years?
50. Twice a number plus the square root of the number is twelve minus the square root of the number.
51. The light intensity,  $I$  , of a light bulb varies inversely as the square of the distance from the bulb. A a distance of 3 meters from the bulb,  $I = 1.5 \text{ W/m}^2$  . What is the light intensity at a distance of 2 meters from the bulb?
52. The lengths of two sides of a triangle are 2 and 6. find the range of values for the possible lengths of the third side.
53. Find three consecutive integers such that one half of their sum is between 15 and 21.
54. After you open a book, you notice that the product of the two page numbers on the facing pages is 650. What are the two page numbers?

- 55.** Suppose you start with a number. You multiply the number by 3, add 7, divide by  $\frac{1}{2}$ , subtract 5, and then divide by 12. The result is 5. What number did you start with?
- 56.** You have 156 feet of fencing to enclose a rectangular garden. You want the garden to be 5 times as long as it is wide. Find the dimensions of the garden.
- 57.** The amount of water a dripping faucet wastes water varies directly with the amount of time the faucet drips. If the faucet drips 2 cups of water every 6 minutes, find out how long it will take the faucet to drip 10.6465 liters of water.
- 58.** A washer costs 25% more than a dryer. If the store clerk gave a 10% discount for the dryer and a 20% discount for the washer, how much is the washer before the discount if you paid 1900 dollars.
- 59.** Baking a tray of blueberry muffins takes 4 cups of milk and 3 cups of wheat flour. A tray of pumpkin muffins takes 2 cups of milk and 3 cups of wheat flour. A baker has 16 cups of milk and 15 cups of wheat flour. You make 3 dollars profit per tray of blueberry muffins and 2 dollars profit per tray of pumpkin muffins. How many trays of each type of muffins should you make to maximize profit?
- 60.** A company found that  $-2p + 1000$  models the number of TVs sold per month where  $p$  can be set as low as 200 or as high as 300. How can the company maximize the revenue?
- 61.** Your friends say that he has \$2.40 in equal numbers of quarters, dimes, and nickels. How many of each coin does he have?
- 62.** I am a two-digit number whose digit in the tenth place is 1 less than twice the digit in the ones place. When the digit in the tenth place is divided by the digit in the ones place, The quotient is 1 and the remainder is 4. What number am I?

- 63.** A two-digit number is formed by randomly selecting from the digits 2, 4, 5, and 7 without replacement. What is the probability that a two-digit number contains a 2 or a 7?
- 64.** Suppose you interview 30 females and 20 males at your school to find out who among them are using an electric toothbrush. Your survey revealed that only 2 males use an electric toothbrush while 6 females use it. What is the probability that a respondent did not use an electric toothbrush given that the respondent is a female?
- 65.** An employer pays 15 dollars per hour plus an extra 5 dollars per hour for every hour worked beyond 8 hours up to a maximum daily wage of 220 dollars. Find a piecewise function that models this situation.
- 66.** Divide me by 7, the remainder is 5. Divide me by 3, the remainder is 1 and my quotient is 2 less than 3 times my previous quotient. What number am I?
- 67.** A company making luggages have these requirements to follow. The length is 15 inches greater than the depth and the sum of length, width, and depth may not exceed 50 inches. What is the maximum value for the depth if the manufacturer will only use whole numbers?
- 68.** To make an open box, a man cuts equal squares from each corner of a sheet of metal that is 12 inches wide and 16 inches long. Find an expression for the volume in terms of  $x$ .
- 69.** Ten candidates are running for president, vice-president, and secretary in the students government. You may vote for as many as 3 candidates. In how many ways can you vote for 3 or fewer candidates?
- 70.** The half-life of a medication prescribed by a doctor is 6 hours. How many mg of this medication is left after 78 hours if the doctor prescribed 100 mg?
- 71.** Suppose you roll a red number cube and a yellow number cube. Find  $P(\text{red } 2, \text{ yellow } 2)$  and the probability to get any matching pairs of numbers.

72. A movie theater in a small town usually open its doors 3 days in a row and then closes the next day for maintenance. Another movie theater 3 miles away open 4 days in a row and then closes the next day for the same reason. Suppose both movie theaters are closed today and today is Wednesday, when is the next time they will both be closed again on the same day?

73. An investor invests 5000 dollars at 10% and the rest at 5%. How much was invested at 5% if the yield is one-fifth of the amount invested at at 10%?

74. 20000 students took a standardized math test. The scores on the test are normally distributed, with a mean score of 85 and a standard deviation of 5. About how many students scored between 90 and 95?

75. A satellite, located 2400 km above Earth's surface, is in circular orbit around the earth. If it takes the satellite 3 hours to complete 1 orbit, how far is the satellite after 1 hour?

76. In a group of 10 people, what is the probability that at least two people in the group have the same birthday?

77. During a fundraising for cancer at a gala, everybody shakes hands with everyone else in the room before the event and after the event is finished. If  $n$  people attended the gala, how many different handshakes occur?

78. Two cubes have side lengths that are equal to  $2x$  and  $4x$ . How many times greater than the surface of the small cube is the surface area of the large cube?

79. Suppose you have a job in a restaurant that pays \$8 per hour. You also have a job at Walmart that pays \$10 per hour. You want to earn at least 200 per week. However, you want to work no more than 25 hours per week . Show 3 different ways you could work at each job.

- 80.** Two company offer tutoring services. Company A realizes that when they tutor for 3 hours, they make 45 dollars. When they tutor for 7 hours they make 105 hours. Company B realizes that when they tutor for 2 hours, they make 34 dollars. When they tutor for 6 hours they make 102 hours. Assuming that the number of hours students sign for tutoring is the same for both company, which company will generate more revenue?
- 81.** You want to fence a rectangular area for kids in the backyard. To save on fences, you will use the back of your house as one of the four sides. Find the possible dimensions if the house is 60 feet wide and you want to use at least 160 feet of fencing.
- 82.** When a number in increased by 20%, the result is the same when it is decreased by 10% plus 12. What is the number?
- 83.** The average of three numbers is 47. The biggest number is five more than twice the smallest. The range is 35. What are the three numbers?
- 84.** The percent of increase of a number from its original amount to 36 is 80%. What is the original amount of the number?
- 85.** When Peter drives to work, he averages 45 miles per hour because of traffic. On the way back home, he averages 60 miles per hour because traffic is not as bad. The total travel time is 2 hours. How far is Peter's house from work?
- 86.** An advertising company takes 20% from all revenue that it generates for its affiliates. If the affiliates were paid 15200 dollars this month, how much revenue did the advertising company generate this month?
- 87.** A company's revenue can be modeled with a quadratic equation. The company noticed that when they sell either 2 or or 12 items, the revenue is 0. How much is the revenue when they sell 20 items?
- 88.** A ball bounced 4 times, reaching three-fourths of its previous height with each bounce. After the fourth bounce, the ball reached a height of 25 cm. How high was the ball when it was dropped?

**89.** A rental company charges 40 dollars per day plus \$0.30 per mile. You rent a car and drop it off 4 days later. How many miles did you drive the car if you paid 325.5 dollars which included a 5% sales tax?

**90.** Two students leave school at the same time and travel in opposite directions along the same road. One walk at a rate of 3 mi/h. The other bikes at a rate of 8.5 mi/h. After how long will they be 23 miles part?

**91.** Brown has the same number of brothers as sisters. His sister Sylvia as twice as many brothers as sisters. How many children are in the family?

**92.** Ethan has the same number of male classmates as female classmates. His classmate Olivia has three-fourths as many female classmates as male classmates. How many students are in the class?

**93.** Noah wants to share a certain amount of money with 10 people. However, at the last minute, he is thinking about decreasing the amount by 20 so he can keep 20 for himself and share the money with only 5 people. How much money is Noah trying to share if each person still gets the same amount?

**94.** The square root of me plus the square root of me is me. Who am I?

**95.** A cash drawer contains 160 bills, all 10s and 50s. If the total value of the 10s and 50s is \$1,760. How many of each type of bill are in the drawer?

**96.** You want to make 28 grams of protein snack mix made with peanuts and granola. Peanuts contain 7 grams of protein per ounce and granola contain 3 grams of protein per ounce. How many ounces of granola should you use for 1 ounce of peanuts?

**97.** The length of a rectangular prism is quadrupled, the width is doubled, and the height is cut in half. If  $V$  is the volume of the rectangular prism before the modification, express the volume after the modification in terms of  $V$ .

**98.** A car rental has CD players in 85% of its cars. The CD players are randomly distributed throughout the fleet of cars. If a person rents 4 cars, what is the probability that at least 3 of them will have CD players?

**99.** Jacob's hourly wage is 4 times as much as Noah. When Jacob got a raise of 2 dollars, Noah accepted a new position that pays him 2 dollars less per hour. Jacob now earns 5 times as much money as Noah. How much money do they make per hour after Jacob got the raise?

**100.**

You own a catering business that makes specialty cakes. Your company has decided to create three types of cakes. To create these cakes, it takes a team that consists of a decorator, a baker, and a design consultant. Cake A takes the decorator 9 hours, the baker 6 hours, and the design consultant 1 hour to complete. Cake B takes the decorator 10 hours, the baker 4 hours, and the design consultant 2 hours. Cake C takes the decorator 12 hours, the baker 4 hour, and the design consultant 1 hour. Without hiring additional employees, there are 398 decorator hours available, 164 baker hours available, and 58 design consultant hours available. How many of each type of cake can be created?