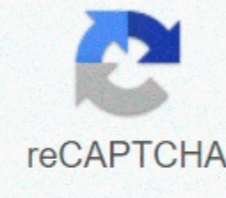I'm not robot

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Quadratic functions word problems worksheet with answers

Quadratic-based word problems are the third type of word problems addressed in MATQ 1099, the first linear equations of a variable and the second linear equations of two or more variables. Quadratic equations can be used in the same types of word problems you encountered before, except that when working through data data, you will end up building a quadratic equation. To find the solution, you will be required to factor the quadratic equation or use the substitution. The sum of two numbers is 18, and the product of these two numbers is 56. What are the numbers? First, we know two things: Replace in the second equation gives: Multiply this gives: What reorganizes to: Second, this quadratic factor to get our solution: Therefore: The difference of squares of two consecutive integers is 68. What are these numbers? The variables used for two consecutive integers (odd or even) are and . The equation to use for this problem is . Simply put: This means that the two integers are 16 and 18. The product of the Ages of Sally and Joey is now 175 more than the product of their ages 5 years before. If Sally is 10 years older than Joey, what are her current ages? The equations are: Replace with S gives us: That means Joey is 10 years old and Sally is 30 years old. For Questions 1 through 12, write and resolve the equation describing the relationship. The sum of two numbers is 22, and the product of these two numbers is 120. What are the numbers? The difference of two numbers is 4, and the product of these two numbers is 140. What are the numbers? The difference of two numbers is 8, and the sum of the squares of these two numbers is 320. What are the numbers? The sum of the squares of two consecutive integers is 244. What are these numbers? The difference of the squares of two consecutive integers is 60. What are these numbers? Find three consecutive integers, such that the product of the first two is 38 more than the third integer. Find three consecutive strange integers in such a way that the product of the first two is 52 more than the whole third. Alan and Terry Ages product is 80 more than the product of their ages 4 years before. If Alan is 4 years older than Terry, what are his current ages? Cally and Katy Ages product is 130 less than the product of their ages at 5 years. If Cally is 3 years older than Katy, what are her current ages? James and Susan Ages product at 5 years is 230 more than the product of their ages today. How old are they if James is a year older than Susan? The product of the ages (in days) of two newborns Simran and Jessie in two days will be 48 more than the product their ages today. How old are the babies if Jessie is 2 days older than Simran? Doug went to a conference in a town 70 miles away. On the way back, due to the construction of the road, he had to drive 10 km/h slower, which resulted in the return trip taking 2 hours longer. How fast did he drive on his way to the conference? The first equation is, which means that or. For the second equation, it's 10 km/h slower and it's 2 hours longer. That means the second equation is. Let's eliminate the variable in the second equation by substitution: Multiply both sides to eliminate the fraction, which leaves us with: Multiply everything gives us: This equation can be reduced by a common factor of 2, which leaves us with: Mark rows downstream for 30 km, then turns and returns to its original location. The total trip took 8 hours. If the current flows at 2 km/h, how fast would Mark redirect in still water? If we leave the time to go back is, the first equation is, the flow accelerates the boat, which means, and the second equation is when the flow slows down the boat. We will eliminate the variable in the second equation replacing : Multiply both sides to eliminate the fraction, which leaves us with: Multiply everything gives us: This equation can be reduced by a common factor of 4, which will leave us: Questions for Questions 13 to 20, write and solve the equation describing the relationship. A train traveled 150 miles at a certain speed. When the engine was replaced by an improved model, the speed was increased by 20 km/h and the travel time for the trip was reduced by 1 hour. What was the rate of each engine? Jones visits his grandmother, who lives 100 km away, regularly. Recently, a new highway was opened, and although the route of the highway is 120 km, it can drive 20 km/h faster on average and takes 30 minutes less to make the trip. What is Mr. Jones's fee on both the old route and the freeway? If a cyclist had travelled 5 km/h faster, she would need 1.5 hours less to travel 150 km. Find the speed of the cyclist. By traveling 15 km/h faster, a transit bus would have required 1 hour less to travel 180 km. What was the average speed of this bus? A cyclist goes to a cabin 72 km away to the valley and then returns at 9 o'clock. Its return speed is 12 km/h faster than its speed in going. Find his speed back and forth. A cyclist made a 120 km journey and then returned in 7 hours. Returning, the rate increased 10 km/h. Find the speed of this cyclist traveling in each direction. The distance between two bus stations is 240 km. If a bus's speed increases by 36 km/h, the journey would take 1.5 hours less. What is the usual speed of the bus? A pilot flew at a constant speed for 600 km. Returning in the day the pilot flew against a head wind of 8e km/h to return to your starting point. If the plane was in the air for a total of 7 hours, what was the average speed of this plane? Find the length and width of a rectangle whose length is 5 cm longer than its width and whose area is 50 cm2. First, the area of this rectangle is given by, which means that for this rectangle, or . Multiplying this gives us: Second, we factor this quadratic to get our solution: We reject the solution . Does that mean that. If the length of each side of a square is increased by 6, the area is multiplied by 16. Find the length of one side of the original square. There are two areas to consider: the area of the smaller square, which is, and the area of the larger square, which is . The relationship between these two is: Simplify this yield: Because it is a problem that requires factoring, it is easier to use the quadratic equation: Replace these values in yields or (reject). Nick and Chloe want to surround their 60-by-80 cm wedding photo with equal width matting. The resulting photo and coating should be covered by a sheet of 1 m2 of expensive filing glass. Find the width of the coating. First, the area of this rectangle is given by , which means that for this rectangle: Or, in cm: Multiply this gives us: What is reorganized to: What reduces to: Second, we factor this quadratic to get our solution. It is easier to use the quadratic equation to find our solutions. Replacing income values: Questions For Questions 21 through 28, write and resolve the equation describing the relationship. Find the length and width of a rectangle whose length is 4 cm longer than its width and whose area is 60 cm2. Find the length and width of a rectangle whose width is 10 cm shorter than its length and whose area is 200 cm2. A large rectangular garden in a park is 120 m wide and 150 m long. A contractor is called upon to add a brick walkway to surround this garden. If the area of the walkway is 2800 m2, what is the runway? A park swimming pool is 10 m wide and 25 m long. A pool cover is purchased to cover the pool, overlapping all 4 sides by the same width. If the covered area outside the pool is 74 m2, what is the overlap area? On a landscapeplane, a rectangular flowerbed is designed to be 4 m longer than it is wide. If 60 m2 is required for the plants in the bed, what should be the dimensions of the rectangular bed? If the side of a square is increased by 5 units, the area is increased by 4 square units. Find the length of the sides of the original square. A rectangular file is 20 m longer than it is wide and its area is 2400 m2. Find the dimensions of the batch. The length of a room is 8 m larger than its width. If length and width are increased by 2 m, the area will increase by 60 m2. Find the dimensions of the room. Key 10.7 Question 1. A train travels at a certain average speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6 km/h at more than its original speed. If it takes 3 hours to complete the total journey, what is your original average speed? Solution Let the original speed of train is x km/h Time taken to cover 63 km with speed x km/h, $Time = \frac{distance}{speed} = \frac{63}{x}$ hours After 63 km, speed of train becomes $(x + 6)$ km/h Time taken to cover 72km with speed $(x + 6)$ km/h $Time = \frac{distance}{speed} = \frac{72}{x +6}$ hours Now as per the question $\frac{63}{x} + \frac{72}{x +6} = 3$ $\frac{21}{x} + \frac{24}{x +6} = 1$ $\frac{((21x + 126 + 24x)}{x(x+6)} = 1$ $45x + 126 = x^2 + 6x$ $x^2 - 39x - 126 = 0$ $(x + 3)(x - 42) = 0$ $\therefore x = 42$ and -3, but $x \neq -3$ as speed cannot be negative, Hence original speed of train = 42 km/h Question 2. Determine two consecutive negative integers whose product is 24? Let n and n-2 solution be the two consecutive negative integers, then $n(n-2)=24$ $n^2 -2n-24=0$ or $(n-6)(n-4) =0$ n=6 or -4 Since we only want negative integers, n=-4 other number =n-2= -4-2 = -6 Then the numbers are (-6,-4) Question 3 One has a rectangle that is 2 less than 3 times the width. If the area of this rectangle is 16, find the dimensions and perimeter. Solution Let x= the length of the rectangle and y= its width As per the question $x = 3y - 2$ Given ,The area of this rectangle is 16 Now $Area = xy = 16$ $ or $ (3y-2)y=16$ $3y^2- 2y-16=0$ Factoring $(3y-8)(y+2)=0$ y = 8/3 and -2 Since we can't have a negative width, y= 8/3 Now x=3y-2 = 6 Perimeter = 2x + 2y = 12 + 16/3 = 64/3 Question 4 The difference of two number is 2 and product of them is 224.Find the Numbers Solution Let x be the smaller number x+2 could be the larger x number $(x+2)=224$ $x^2+2x-224=0$ Factoring the quadratics $(x+16)(x-14)=0$ x= -16 or 14 For positive Numbers x= 14 Second number= x+2= 16 So the numbers are 14 and 16 For Negative Numbers x=-16 Second number= x+2= -14 So the numbers are -16 and -14 Question 5 X and Y working together can complete a particular project is 6 days. If X alone works on the project, it will take 5 days less than Y to complete. Find the days it takes for X and Y to complete the project on their own? Solution Leave p and q are days required for X and Y to complete the project alone Now p =q-5 Also $\frac{1}{p} + \frac{1}{q} = \frac{1}{6}$ or $\frac{1}{q-5} + \frac{1}{q} = \frac{1}{6}$ $\frac{ q + q-5}{q(q-5)} = \frac{1}{6}$ $6(2q-5) = q^2 -5q$ $q^2 -17q +30=0$ factoring this quadragática q=15 or 2 Can not be 2 as then p will be negative So q=15 days and p=10 days Question 6 A motor boat whose speed is 18 km/h in water for dais takes 1 hour longer to go 24 km upstream than return downstream to the same location. The speed of the stream. Solution Let the flow speed be x km/h. km/h. upstream = Distance downstream = 24 km Boat speed up river=18 - x Boat speed downstream=18+x Time taken upstream = 24/18 x Time taken downstream = 24/18+x Now as per question $\frac{24}{18-x} = 1 + \frac{24}{18+x}$ $\frac{24}{2 18-x} = \frac{42+x}{18+x}$ $24(18+x) = (42+x) (18-x)$ $x^2 + 48x-182=0$ x=-54 or 6 Rejecting negative value, flow speed is 6 km/h Question 7 The altitude of a right triangle is 7 cm smaller than its base. If the hypotenuse is 13 cm, find the other two sides Solution that is the base, the altitude will be x-7 Now as per pythagoras theorem $x^2 +(x-7)^2 = 13^2$ $x^2 -7x -69=0$ x=12 or -5 Since x can't be negative x=1 22 $kx\s {5}) + 10 =0$ $kx(x-2 \sqrt {5}) + 10 =0$or $kx^2 -2 \sqrt {5} k-x +10 =0$ For equal roots, Discriminant must be zero $b^2 -4ac=0$ here $b= -2 \sqrt {5} k$, a=k,c=10 $(-2 \sqrt {5} k)^2 -4 \times k \times 10=0$ $20k^2 -40k=0$ or k=0 or 2 can't be zero , Then the correct value of k=2 Question 9 The numerator of a fraction is 3 less than its denominator. If 2 is added to the numerator and its denominator, the sum of the new fraction and original fraction is 29/20. Find the original solution let denominator be x fraction, the x-3 numerator. Fraction will be = $\frac{x-3}{x}$ Now when 2 is added New fraction= $\frac{x-3+2}{x+2}=\frac{x-1}{x+2}$ $\frac{29}{20}$ $\frac{((x-3)(x+2) + x(x-1)}{x(x+2)} =\frac{29}{20}$ $\frac{2x^2 -2x-6}{x(x+2)} =\frac{29}{20}$ $20(2x^2 -2 2x-6) = 29x (x+2)$ $40x^2 -4 0x -120 =29x^2 + 58x$ $11x^2 -98x -120=0$ Factoring the quadratics x=10 or -12/11 So fraction is $\frac{x-3}{x} = \frac{7}{10}$ Question 10 To fill a pool are used two tubes if the largest diameter tube used for 4 hours and the tube of a smaller diameter for 9 hours only half of the pool can be filled .find how long it would take for each tube to fill the pool separately if the pool of a smaller diameter takes 10 hours longer than the larger diameter pool to fill the pool? Solution Let x and y time be the time taken by larger tube and smaller tube to fill the pool Now it is given $y - x = 10$ or $y = x + 10$ If the smaller tube takes x hours to fill the pool, it will fill 1/x part in 1 hour SimilaryAnd the larger tube takes y hours to fill the pool, it will fill 1/y part in 1 hour According to question $4 \times \frac{1}{x} + 9 \times \frac{1}{y} = \frac{1}{2}$ or $ \frac{4}{x} + \frac{9}{y} = \frac{1}{2}$ Now putting y = x + 10 in this $\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$ $\frac{4x+ 40 + 9x}{x(x+10)} = \frac{1}{2}$ $2 6x + 80 =x^2+10x$ $X^2 - 16x - 80 = 0$ OR (x -20)(x+4) = 0 Neglect negative root , x = 20 h E y = 30 h Question 11 Five times of a positive is less than twice your square by 3. Find the whole one. Solution Let x be the number,then $5x= 2x^2 -3$ $2x^2 -5x-3=0$ $2x^2 -6x + x-3=0$ $2x (x-3) + 1(x-3)=0$ or $(2x+1)(x-3)=0$ or x=3 as x is a positive integer Question 12 Determine the positive Values of P for which equation $x^2+2px+64=0$ and $x^2-8x+2p=0$ both will have real roots Solution For an equation to have real roots , your discriminant must be greater than or equal to 0. $D=b^2 -4ac \geq 0$ For equation (1) $x^2+2px+64=0$ $ $(2p)^2- 4\times 64 \geq 0 $ p \geq 64 $ p \geq 8$ or $p \leq -8$ For equation (2) $x^2-8x+2p=0$ $64 -8p \geq0$ $8 \geq p$ Answer is $(-\infty , -8) \cup {8}$ Question 13 If zeba were younger for 5 years than she really is then the square of her age would have been 11 more than five times her really age. How old is she now? Solution Let the age of zeba be x years According to question $ (x-5)^2=11+5x $ $x^2+25-10x=11+5x$ $x^2-15x+14=0 $ $x^^^2-14x-x+14=0$ $(x-1)(x-14)$ Then Zeba's age will be 14 years because if she were 1 year old, the 5 years younger can not happen Question 14 The sum of the squares of the two consecutive multiples of 7 is 637 , find the multiples? Let x and x+7 solution are the two consecutive multiples of 7 Now as per question $x^2 + (x+7)^2 =637$ $x^2 + x^2 + 49 + 14x =637$ $x^2 + 7x -294=0$ x=-21 and 14 So the answer is -21,-14 or 14.17 Download Quadratic Word spreadsheet problems.pdf link to this page by copying the following text Dramatic Formula Worksheet; Lesson 10 Mathematics Also Read Class 10 Mathematics Class 10 Science Practice Question Question Question