I'm not a robot

Quadratic equation practice

A quadratic equation has no real solution if the value of the discriminant is negative.When we find the roots of a quadratic equation, we usually come across one or two real solutions, but it is also possible that we don’t get any real solutions. In this article, we will discuss quadratic equations in detail and what happens when they don’t have real solutions, along with numerical examples.There are three different ways to tell whether the solution to a given quadratic equation is real or not, and these methods are calculating the discriminant, looking at the graph, and looking at the coefficients.Calculating the DiscriminantThe easiest way to tell that the given quadratic equation or function has no real roots is to calculate the value of the discriminant. If it is negative, then the quadratic equation does not have any real solutions. If the quadratic equation is given as $ax^{2}+bx +c = 0$, then we can write the standard form of the quadratic formula as:$x = \dfrac{-b \pm \sqrt{b^{2}-4ac }}{2a}$In this formula, the term $b^{2}- 4ac$ is called discriminant, denoting it as “D”. The quadratic equation can have three solutions depending on the value of “D”.1. The solution is real if “D” is > 0. This means we have two distinct solutions.2. If “D” is equal to zero, then we have a single real solution.3. If “D” < 0, we will have two complex solutions. In this case, we do not get a real solution.So, for a quadratic equation with complex solutions, the value of $b^{2}-4ac$ will be less than zero or $b^{2}< 4ac$. Let us compare examples for each case of the discriminant.$x^{2}+ 3x + 5$$x^{2}-2x + 1$$x^{2}-3x + 2$$a = 1$, $b = 3$ and $c = 5$$a = 1$, $b = -2$ and $c = 1$$a = 1$, $b = -3$ and $c = 2$$b^{2}= 3^{2}= 9$$b^{2}= (-2)^{2}= 4$$b^{2}= (-3)^{2}= 9$$4ac = 4(1)(4) = 20$4ac = 4(1)(1) = 44ac = 4(1)(2) = 8$b^{2}< 4ac$$b^{2}= 4ac$ and $D = 0$$b^{2}> 4ac$ and $D > 0$Hence, this quadratic equation has complex roots.Hence, this quadratic equation has one real root.Hence, this quadratic equation will have two real roots.The roots of the equation are $x = -1.5 + 1.6658i$ and $-1.5 – 1.6658i$The root of the equation is $x =1$The roots of the equation are $x = 2,1$You can verify these solutions by putting the values of a, b, and c in the quadratic formula. From the above table, we can deduce that whenever $b^{2}< 4ac$, we will only get complex roots.Looking at the GraphThe second method to tell whether the quadratic equation or function has any real solution or not is by looking at the graph of the function or equation. The graph of any quadratic equation will be a parabola or bell-shaped, and we know the most important feature of a parabola is its vertex.The shape of the vertex of the parabola depends upon “a”; if the value of “a” is negative, then the shape of the vertex is like a mountain top or peak. If the value of “a” is positive, then the shape is like a valley bottom at the bottom of the mountain. A quadratic equation graph with complex solutions will not touch the x-axis.The parabola can be completely above or below the x-axis if the equation has complex solutions. When the value of $a0$, the parabola will be above the x-axis. Let us draw the graph for three equations discussed in the previous section.For the equation $x^{2}+ 3x + 5$, we know all solutions are complex, and as we can see below, the graph is above the x-axis as “a” is greater than zero. The graph is not touching the x-axis, so if you are provided with a graph and you are asked to tell whether the function has real solutions or not, you can instantly tell if the graph is not touching the x-axis then it will only have complex solutions.For the equation $x^{2}-2x +1$, we know the value of the discriminant is equal to zero; for this case, the parabola peak will always touch the x-axis. It will not go across the x-axis; the peak will land on the x-axis, as shown in the figure below.For the equation $x^{2}-3x +2$, we know the value of the discriminant is greater than zero; for this case, the parabola peak will cross the x-axis. If the value of $a > 0$, then the peak value or mountain top will be going down the x-axis and if the value of $a < 0$, then the peak value or mountain top will be above the x-axis. We show the graph below.Looking at the CoefficientsIn the third method, we look at the coefficients of the given equation. Remember the equation should be given in the normal quadratic equation form as $ax^{2}+bx + c = 0$.We can only use this method in special circumstances, for example, when we are not provided with the value of “b” or the value of “b” is equal to zero. Furthermore, the sign of the coefficients “a” and “c” must also be the same. For $b = 0$, if both “c” and “a” are positive then $\dfrac{c}{a}$ is positive and similarly if both “c” and “a” are negative then $\dfrac{c}{a}$ is positive and $-\dfrac{c}{a}$ is negative. In both cases, taking the square root will give us two complex solutions.Let us take an example of the quadratic equation $x^{2}+ 6 = 0$, we can see that in this equation $a = 1$, $b = 0$ and $c = 6$. The roots for given equation are $2.449i$ and $-2.449i$.Similarly, if we take the example of quadratic equation $-3x^{2}- 6 = 0$, we can see that in this equation $a = -3$, $b = 0$ and $c = -6$. The roots for the given equations are $1.41i$ and $-1.41i$. So, we can see that when signs of coefficients “a” and “c” were the same and b was equal to zero, we only get complex solutions.Does the Quadratic Equation Always Have a Solution?Yes, the quadratic equation will always have a solution that can either be complex or real. The quadratic equation can have a maximum of 2 real solutions. So the real solution for a quadratic equation can be 0,1, or 2, depending upon the type of quadratic equation. Similarly, the quadratic equations’ complex roots can be 2 or zero. We can summarize the roots of the quadratic equation as follows:• When the value of the discriminant is positive, then we will have two real solutions.• When the value of the discriminant is equal to zero, we will have a single real solution.• When the value of the discriminant is negative, we will have two complex solutions.Examples of Quadratic EquationsLet us now study examples by solving quadratic equations having real or complex solutions. We will study no real solution quadratic equation examples and real solution quadratic equation examples.Example 1: Solve the quadratic equation $x^{2}+ 2x + 2$Solution:We know for the given quadratic equation the value of $a =1$, $b = 2$ and $c =24$The value of $b^{2}= 2^{2}= 4$$4ac = 4 (1)(2) = 8$$b^{2}- 4ac = 4 – 8 = -4$.As the value of discriminant is less than zero, then this equation will only have complex solutions. Let us put the value of a, b and c in quadratic formula and solve for the roots to verify.$x = \dfrac{-2 \pm \sqrt{-4 }}{2(1)}$$x = -1 \pm 1i$Example 2: Will the quadratic equation $-2x^{2}+4 = 0$ have real roots or not?Solution:We know for the given quadratic equation the value of $a = -2$, $b = 0$ and $c =4$.We have studied that if a quadratic equation does not have the coefficient “b” or the value of “b” is equal to zero and the sign of coefficient “a” and “b” are the same as well, then it will not have a real solution. But in this case, the sign of “a” and “b” are opposite, so this equation should have real roots.$b = 0$$4ac = 4 (-2)(4) = -32$$b^{2}- 4ac = 0 – (-32) = 32$.As the value of the discriminant is positive, it is the second indicator that tells us that this quadratic equation will have real roots. Let us put the value of a, b, and c in the quadratic formula and solve for the roots to verify.$x = \pm\dfrac{ \sqrt{32 }}{2(-2)}$$x = \pm \sqrt{2}$Hence, we have proved the equation has real roots.Example 3: Will the quadratic equation $-2x^{2}- 4 = 0$ have real roots or not?Solution:We can tell by just looking at the equation that it is a no real roots.We know for the given quadratic equation the value of $a = -2$, $b = 0$ and $c = – 2$.As discussed earlier, if the value of $b = 0$ and “a” and “b” have same sign, then there will be no real roots for the given equation and this equation fulfills all the criteria.$b = 0$$4ac = 4 (-2)(-4) = 32$$b^{2}- 4ac = 0 – (32) = -32$.As the value of the discriminant is negative, it is the second indicator that this quadratic equation will not have real roots. Let us put the value of a, b and c in the quadratic formula and solve for the roots to verify.$x = \pm\dfrac{ \sqrt{-32 }}{2(-2)}$$x = \pm \sqrt{2}i$Hence proved the equation has no real rootsExample 4: Solve the quadratic equation $x^{2}+ 5x + 10 = 0$Solution:We know for the given quadratic equation the value of $a =1$, $b = 5$ and $c = 10$The value of $b^{2}= 5^{2}= 25$$4ac = 4 (1)(10) = 40$$b^{2}- 4ac = 25 – 40 = -15$.As the value of discriminant is less than zero, then this equation will not have any real solutions. Let us put the value of a, b and c in quadratic formula and solve for the roots to verify.$x = \dfrac{-5 \pm \sqrt{-15 }}{2(1)}$$x = -2.5 \pm 1.934i$You can verify your answer quickly by using a no-real solution calculator online.How To Write a Quadratic Equation Using the Complex RootsIt is quite easy to write a quadratic equation if you are provided with the complex roots. Suppose we are given the roots of the equation as $4i$ and $-4i$ and we are asked to find the original quadratic equation. We can do that by using the formula $(x-a) (x-b)$ let $a = 4i$ and $b = -4i$.$(x- 4i) (x-(-4i)$$(x-4i) (x+4i)$$x^{2}- 16i^{2}$$x^{2}-16(-1) = x^{2}+ 16$. So the quadratic equation for roots $4i$ and $-4i$ is $x^{2} +16$.Frequently Asked QuestionsWhat Is a Real Solution?A real solution is a solution to an equation that only contains real numbers. In literature, you will often learn that if a quadratic equation discriminant is less than zero, it does not have a solution. It means that it does not have a real solution.What Is a Non-real Solution?A solution that contains imaginary numbers or is written in the form $a+bi$ is called a non-real or complex solution. Here, “a” is real, and the coefficient “b” has iota attached to it, which makes the term imaginary.How Can a Quadratic Equation Have No Solution?The quadratic equation will always have a solution. It will either be real or complex, but there will always be roots for the equation.ConclusionLet us conclude our topic discussion and summarize what we have learned so far.• Quadratic equation will always have a solution, and it can either be real or complex depending upon the value of the discriminant.• There will be no real roots if the value of discriminant is less than zero or $b^{2}-4ac < 0$ or $b^{2} < 4ac$.• When the value of the discriminant is less than zero, we will have two complex solutions and no real rootsAfter studying this guide, we hope you can quickly identify when a quadratic has real solutions and when it only has complex solutions. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. The Motorsport Images Collections captures events from 1895 to today’s most recent coverage.Discover The CollectionCurated, compelling, and worth your time. Explore our latest gallery of Editors’ Picks.Browse Editors' FavoritesExperience AI-Powered CreativityThe Motorsport Images Collections captures events from 1895 to today’s most recent coverage.Discover The CollectionCurated, compelling, and worth your time. Explore our latest gallery of Editors’ Picks.Browse Editors' FavoritesExperience AI-Powered CreativityThe Motorsport Images Collections captures events from 1895 to today’s most recent coverage.Discover The CollectionCurated, compelling, and worth your time. Explore our latest gallery of Editors’ Picks.Browse Editors' FavoritesExperience AI-Powered Creativity arrow_back Back to Solving Quadratic Equations Whether you want a homework, some cover work, or a lovely bit of extra practise, this is the place for you. And best of all they all (well, most!) come with answers. Contents Mathster is a fantastic resource for creating online and paper-based assessments and homeworks. They have kindly allowed me to create 3 editable versions of each worksheet, complete with answers. Worksheet Name 1 2 3 Quadratic Equations - Basic Factorisation 1 2 3 Quadratic Equations - Advanced Factorisation 1 2 3 Quadratic Equations - Difference of 2 Squares 1 2 3 Quadratic Equations - Completing the Square 1 2 3 Quadratic Equations - Quadratic Formula 1 2 3 Quadratic Equations - Solving by Graph 1 2 3 Quadratic Equations - All skills together 1 2 3 Corbett Maths keyboard_arrow_up Back to Top Corbett Maths offers outstanding, original exam style questions on any topic, as well as videos, past papers and 5-a-day. It really is one of the very best websites around. *Misfit Mama Bear Haven is reader supported. This means that when you purchase through affiliate links on this site, I may receive a small commission, at no cost to you. Misfit Mama Bear Haven is a participant in the Amazon Services LLC Associates Program, an affiliate advertising program designed to provide a means for sites to earn advertising fees by advertising and linking to amazon.com.* As we have been changing up some of our homeschool routine, we recently added IXL Learning to the mix. Before having the opportunity to review of IXL, I heard great things from a few friends who used it with their kids for math, language arts, social studies, and science. My friends were not wrong! IXL has been a super beneficial edition to our homeschool mix! For this review, I will be sharing about the IXL Annual Membership which we received for each of the older kids in exchange for this honest review. What is IXL? IXL is a comprehensive K-12 curriculum providing education for Language Arts, Math, Science, Social Studies, and even Spanish! It is adaptive in that it adjusts its difficulty to fit your child’s needs. It’s interactive and offers incentives to your child to keep going. For homeschooling families, it works as a nice addition to your homeschooling routine as it provides a way for your child to get extra practice on various subjects. You can also get notifications via email and can track your child’s progress via the website. If you are concerned about state standards, IXL is a super handy tool to have at your disposal because this program is set to state standards. We were provided an annual membership for each of my older kids to IXL. How We Use It with Bubby My son has been using IXL primarily to help with his math capabilities. While he excels at many subjects, math has not come to him naturally. He hopes to go into engineering someday, so he wants to do all he can to catch up and excel in math. Currently he is at 8th/9th level with most of his subjects. He has been using it to test his math skills and find out where he needs more practice. He actually looks forward to spending time every day doing this, and he loves the rewards system. He says it is easy to use, and he likes the interface. How we Use it with Sissy My older daughter is at a 6th/7th grade level with her subjects. She mostly uses IXL for Language Arts and Math practice. She loves the pins, and she says that getting a new pin is motivation for her to do more. She uses IXL for practice, and I don’t even have to tell her to get on the computer and do it. She likes it enough to log on independently. She also likes how simple it is to use. Final Thoughts I love using IXL as a tool to enhance the kids’ education. The design, structure and fact that they teach state standards helps my kids learn and gain confidence in learning. While we don’t use this as a core curriculum, having this as a supplement has helped my kids enhance their skills and gain confidence! You can find out more by checking out their website and also finding them on Facebook, Pinterest, Twitter, and You Tube. Also, don’t forget to check out some of the other reviews by the Homeschool Review Crew about IXL Learning! If you are having a hard time solving problems on a quadratic formula worksheet, then you will likely find this quick review very helpful.In algebra, the quadratic formula, x= (-b ± [√(b² - 4ac)]) / 2a, is a handy tool that you can use to find the roots, or solutions, of a quadratic equation of the form ax² + bx + c = 0 (where a ≠ 0). Additionally, if a given equation is not in ax² + bx + c = 0 form, you can often rearrange the terms using some simple algebra so that it is in ax² + bx + c = 0, which would then allow you to use the quadratic formula.Why is the quadratic formula so useful? As you may know, some quadratic functions can be very easy to factor and solve, while others can be very difficult. The quadratic formula, however, can be used to find the solutions to any quadratic equation, whether it is easy to factor or not. So, if you struggle with factoring quadratic equations, then the quadratic formula is an awesome tool that you can use to solve a variety of problems involving quadratics.The quadratic formula is also incredibly useful because it can be used to find not only real solutions to quadratic functions, but imaginary and complex solutions as well, making it one of the most important and helpful algebra formulas that you will ever learn.The quadratic formula is illustrated using color coding in Figure 01 below. Make sure that you memorize this formula correctly and that you know it by heart so that you can recall it and use it correctly whenever you need to. The following math revision questions are provided in support of the math tutorial on Quadratic Equations. In addition to this tutorial, we also provide revision notes, a video tutorial, revision questions on this page (which allow you to check your understanding of the topic) and calculators which provide full, step by step calculations for each of the formula in the Quadratic Equations tutorials. The Quadratic Equations calculators are particularly useful for ensuring your step - by - step calculations are correct as well as ensuring your final result is accurate.Not sure on some or part of the Quadratic Equations questions? Review the tutorials and learning material for Quadratic EquationsEquations Learning MaterialTutorial IDTitleTutorialVideoTutorialRevisionNotesRevisionQuestions9.5Quadratic EquationsQuadratic Equations Revision Questions1. . The constant of the quadratic equation 3x2 - 2x = 6 is ...Correct Answer: C2. . Which is true for the equation x2 - 2x - 5 = 0.a = 1; b = 2; c = 5a = -2; b = 1; c = -5 a = 1; b = -2; c = 5a = 1; b = -2; c = -5Correct Answer: D3. . Which of the following is a root of the quadratic equation 2x2 - 5x + 2 = 0? Correct Answer: B4. . Which of the following numbers is the smallest root of the quadratic equation 4x2 + 8x - 1 = - 1? Correct Answer: D5. . What is the factorized form of the quadratic equation 3x - 2x2 = 0? x(3x - 2) = 03x(x - 2) = 0x(3 - 2x) = 02x(3 - x) = 0Correct Answer: C6. . What is the factorized form of the quadratic equation x2 - x - 6 = 0? (x - 2)(x - 3) = 0(x - 2)(x + 3) = 0 (x + 2)(x + 3) = 0(x + 2)(x - 3) = 0Correct Answer: D7. . What is the regular form of the quadratic equation (3x - 2)(x - 4) = 0? 3x2 - 14x + 8 = 03x2 - 6x + 8 = 03x2 - 14x + 6 = 0x2 - 6x + 6 = 0Correct Answer: A8. . What is the new form of the quadratic equation x2 + 4x - 3 = 0 after completing the square? (x - 2)2 - 7 = 0(x - 2)2 + 1 = 0(x + 2)2 - 7 = 0(x + 2)2 + 1 = 0Correct Answer: C9. . One of the roots of the quadratic equation (x - m)2 - 1 = 0 is x = 3. What is the other root of this equation? Correct Answer: B10. . What are the roots of the quadratic equation (x - 4)2 - 9 = 0? x = 5 and x = 13 x = 1 and x = 7x = -1 and x = 13x = 7 and x = 13Correct Answer: BWhats next?Enjoy the "Quadratic Equations" practice questions? People who liked the "Quadratic Equations" practice questions found the following resources useful:Practice Questions Feedback. Helps other - Leave a rating for this practice questions (see below)Equations Math tutorial: Quadratic Equations. Read the Quadratic Equations math tutorial and build your math knowledge of EquationsEquations Video tutorial: Quadratic Equations. Watch or listen to the Quadratic Equations video tutorial, a useful way to help you revise when travelling to and from school/collegeEquations Revision Notes: Quadratic Equations. Print the notes so you can revise the key points covered in the math tutorial for Quadratic EquationsCheck your calculations for Equations questions with our excellent Equations calculators which contain full equations and calculations clearly displayed line by line. See the Equations Calculators by iCalculator™ below.Continuing learning equations - read our next math tutorial: The Quadratic FormulaHelp others Learning Math just like youWe hope you found this Math tutorial "Quadratic Equations" useful. If you did it would be great if you could spare the time to rate this math tutorial (simply click on the number of stars that match your assessment of this math learning aide) and/or share on social media, this helps us identify popular tutorials and calculators and expand our free learning resources to support our users around the world have free access to expand their knowledge of math and other disciplines.Equations Calculators by iCalculator™ Quadratic equation is one of the most important and potentially high-scoring topics asked in different banking and insurance exams, such as IBPS PO, SBI PO, SBI Clerk, IBPS Clerk, RRB Assistant, RRB Scale 1, LIC Assistant, LIC AAO, etc. You can expect a set of 5 questions on this topic in the prelims of every banking and insurance examination. Achieving proficiency in this topic demands keen observational skills. Nonetheless, with dedicated practice, you can attain mastery and achieve a perfect score in this area. Smartkeeda offers a diverse range of Quadratic Equation questions with solutions to facilitate effective practice and enhance your prospects of achieving a high score. Identifying Quadratic Patterns Question A quadratic equation, denoted by the variable x, takes the form of ax2 + bx + c = 0, where a, b, and c represent real numbers, with a ≠ 0. For instance, 2x2 + x - 300 = 0 is a quadratic equation. However, to establish the standard representation of this equation, we arrange the terms of p(x) in descending order of their degrees, resulting in ax2 + bx + c = 0, with a ≠ 0. This particular form, ax2 + bx + c = 0, where 'a' is not equal to zero, is referred to as the standard form of a quadratic equation. Understanding the Quadratic Formula Also known as the Sridharacharya formula, the quadratic formula is a formula that provides the two solutions to a quadratic equation. The Quadratic formula stands as the most straightforward method for determining the roots of a quadratic equation. In cases where certain quadratic equations resist easy factorization, the Quadratic formula offers a convenient and efficient means to swiftly calculate the roots. The Quadratic Formula The Quadratic Formula is a rule that says that, in any equation of the form ax2 + bx + c = 0, the solution x-values of the equation are given by: Example Solve using Quadratic formula 2x2 - 7x + 3 = 0 Solution: Comparing the equation with the general form ax2 + bx + c = 0 gives, a = 2, b = -7, and c = 3 Now, calculate the discriminant (b2 - 4ac): b2 - 4ac = (-7)2 - 4 * 2 * 3 = 49 - 24 = 25 Now, substitute the values into the quadratic formula: x1 = (-b + √(b2 - 4ac)) / (2a) x1 = (-(-7) + √25) / (2 * 2) x1 = (7 + 5) / 4 = 3 x2 = (-b - √(b2 - 4ac)) / (2a) x2 = (-(-7) - √25) / (2 * 2) x2 = (7 - 5) / 4 = 1/2 So, the roots of the equation 2x2- 7x + 3 = 0 are x1 = 3 and x2 = 1/2. Factoring Quadratic Equations Factoring quadratics is a technique used to represent the quadratic equation ax^2 + bx + c = 0 as a multiplication of its linear factors in the form (x - p) (x - q), where p and q represent the roots of the quadratic equation ax^2 + bx + c = 0. Factoring Techniques Quadratic equations can be factorized through various methods such as Splitting the middle term, Using quadratic formula or Shridharacharya formula Completing the square or square root method Understanding the pattern of Quadratic Equations asked in bank exams Understanding the pattern of Quadratic Equations asked in bank exams Bank exams often include these types of Quadratic Equation questions to assess candidates' problem-solving skills and their ability to discern relationships between variables, making it a critical component of the quantitative section. Questions on Quadratic Equations are asked in the form of inequalities in the Quantitative Aptitude section. Generally, two quadratic equations in two different variables are given. You have to solve both of the Quadratic equations to get to know the relation between both variables. Suppose we have two variables ‘x’ and ‘y’. The relationship between the variables can be any one of the following: x > y x < y x = y or relation can’t be established between x & y x ≥ y x ≤ y Practice Exercises I. x2 – 25x + 114 = 0 II. y2 – 10y + 24 = 0 if x > y if x < y if x ≥ y if x ≤ y if x = y or relationship between x and y can't be established Correct Option: C I. x2 – 25x + 114 = 0 ∴ x2 – 19x – 6x + 114 = 0 ∴ (x – 6)(x – 19) = 0 ∴ x = 19 or x = 6 II. y2 – 10y + 24 = 0 ∴ y2 – 6y – 4y + 24 = 0 ∴ (y – 4)(y – 6) = 0 ∴ y = 6 or y = 4 When x = 19, x > y When x = 6, x ≥ y Hence, x ≥ y Hence, option C is correct. Tips for Efficient Quadratic Equation Solving When solving quadratic equations, it's important to keep the following points in mind to ensure accurate and efficient problem-solving: Recognize that a quadratic equation is in the form ax^2 + bx + c = 0 After finding potential solutions, ensure they satisfy the original equation. Carefully handle the signs (+/-) in the quadratic formula to avoid calculation errors. Observe carefully while comparing the roots of given equations Regular practice is key to improving your proficiency in solving quadratic equations efficiently. Smartkeeda offers a wealth of free resources and materials for Quadratic equations, providing invaluable assistance to help you excel in mastering this topic in the easiest manner possible. You can visit our website to practice free Quadratic Equation Questions Now!