QUADRATIC EQUATION

CONCEPT, TIPS, EXAMPLES & QUESTIONS FOR PRACTICE

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How to solve Quadratic Equation in less time

Quadratic equation is considered to one of the most complex and tricky part of any exam having a section Quantitative Aptitude. It is seen that students, generally, tends to make mistake and at times take more time in solving questions. Considering the time available in any competitive exam, it is important that question on Quadratic Equation is solved quickly. Hence, in this article we shall talk about some tricks and strategies that may come handy to solve questions on quadratic equation quickly and correctly.

Before we get into the tricks, let us be clear that the basic equation of in case of a quadratic equation is a$x^2 + bx + c = 0$, where this equation is equal to zero, with **a**,**b**,**c** being a constant number.

In order to better explain, let us consider an example:

$$6x^2 + 11x + 3 = 0$$

Step 1: The first step is to identify the coefficient. Here, the coefficient of x^2 is 6, x is 11 and constant number is 3

Step 2: After the coefficient is identified, let us now apply the middle term break method, by applying the following steps:

a. Multiply the coefficient of x^2 with the constant. In this case, it is (6) X (3) = 18
b. Break the result obtained in previous step into two parts, such that their addition/subtraction results in the middle number, while the multiplication results in the answer obtained in previous step. Hence, in this example, break 18 into two numbers, i.e. 9 and 2. If you notice, the summation of 9 and 2 is 11 (i.e. the coefficient of the middle number), while if we multiple 9 and 2, then we get 18 (i.e. the answer obtained in previous step).
c. The trick to break down the number is by first dividing the result of "a" by 2. If you don't get a whole number then divide by 3, and so on and forth, until you get a whole number. In this case, divided 18 by 2 first and got the result of 9. Hence the coefficient is 9 and 2.
d. Now change the sign of the factor that you got in "b", i.e. in this example, change +9 to –9 and +2 to -2. The sign of the coefficient should be change mandatorily.
e. Once the sign is changed, you should now divide both the factors with the coefficient of x^2. In this example, divide -9 with 6 (i.e. -9/6) and -2 with 6 (i.e. -2/6). On doing so, you will get the answer -3/2 and -1/3.

f. You may cross check the validity of the equation by replacing x^2 and x with either -3/2 or -1/3. If you get the result 0, then your answer is correct.

Let us quickly take another example and see if this method can work or not. Below is equation given:

$$x^2 + 6x - 9 = 0$$

Step 1: The coefficient of x^2 is 1, x is 6 and constant number is 9

Step 2: Now let us apply the middle term break method, by applying the following steps:

a. Multiply the coefficient of x^2 with the constant. In this case, it is (1) X (9) = 9
b. Break the result obtained in previous step into two parts, such that their addition/subtraction results in the middle number, while the multiplication results in the answer obtained in previous step. Hence, in this example, break 9 into two numbers, i.e. 3 and 3. If you notice, the summation of 3 and 3 is 6 (i.e. the coefficient of the middle number), while if we multiple 3 and 3, then we get 9 (i.e. the answer obtained in previous step).
c. The trick to break down the number is by first dividing the result of "a" by 2. If you don't get a whole number then divide by 3, and so on and forth, until you get a whole number. In this case, divided 9 by 2 first but the result was in decimal. Hence, we then divided 9 by 3 and got the result of 3. Hence the coefficient is 3 and 3.
d. Now change the sign of the factor that you got in "b", i.e. in this example, change +3 to –3 and +3 to -3. The sign of the coefficient should be change mandatorily.
e. Once the sign is changed, you should now divide both the factors with the coefficient of x^2. In this example, divide -3 with 1 (i.e. -3/1) and -3 with 1 (i.e. -3/1). On doing so, you will get the answer -3 and -3. Coincidentally the value of x^2 and x is -3 in both situations.
f. You may cross check the validity of the equation by replacing x^2 and x with either -3 or -3. If you get the result 0, then your answer is correct.

Solved Example

Now that you have understood how to solve the equation quickly, let us look at how the question is asked in the exam. Here as well, we shall take an example:

Two equations I and II are given. Solve both the equations and give answer by selection the correct option:

$$x^2 - 11x + 28 = 0$$

$$y^2 - 18y + 81 = 0$$

A. x > y

B. x < y

C. x=y, or relation cannot be established between x and y

D. x ≥ y

E. x ≤ y

Solution:

Steps	**Solving for x**	**Solving for y**
Step 1	the coefficient of x^2 is 1, x is 11 and constant number is 28	the coefficient of y^2 is 1, y is 18 and constant number is 81
Step 2	Apply middle term break method	Apply middle term break method
Step 2.a	Multiply the coefficient. The result here is 28	Multiply the coefficient. The result here is 81
Step 2.b	Break the result into two parts. Here it will be 7 and 4. This is obtained by dividing 28 by 4 Summation of -7 and -4 is -11 (the middle number), while multiplying the same gives 28	Break the result into two parts. Here it will be 9 and 9. This is obtained by dividing 81 by 3 Summation of -9 and -9 is -18 (the middle number), while multiplying the same gives 81
Step 2.c	Change the sign of the factors. The number will now be +7 and +4, as earlier it was -7 and -4	Change the sign of the factors. The number will now be +9 and +9, as earlier it was -9 and -9
Step 2.d	Divide both the factors with the coefficient of x^2. Here the coefficient is 1. Hence, the result will be +7 and +4 only	Divide both the factors with the coefficient of y^2. Here the coefficient is 1. Hence, the result will be +9 and +9 only
Step 2.e	The value of x will be either +7 or +4	The value of y will be either +9 or +9

Now to arrive at the final option, compare both the value of x with both the value of y, as given below:

Value of x	Value of y	Conclusion
+7 (1st value)	+9 (1st value)	x < y
+7 (1st value)	+9 (2nd value)	x < y
+4 (2nd value)	+9 (1st value)	x < y
+4 (2nd value)	+9 (2nd value)	x < y

In all the four combination, the value of x < y, hence the correct answer is **Option B**.

Disclaimer:

You may find that there are too many steps involved in solving this question. But if you practise several question using this method, then it will not even take a minute to solve question as you will be able to do almost all the steps mentally without using pen and paper. Further the accuracy rate will be high as well.

General tips:

1. The first and foremost thing you should be doing is to practise as many question as possible, because you can increase your speed only when you practise. For that you may subscribe to mock test series on Quadratic Equation, as through that you will get exposed to variety of questions.
2. Avoid jumping into the options at the first instance as the options will not make any sense until you have solved the value of x and y. Solving quadratic equation questions can be time consuming if followed the traditional method. Hence, that is the reason why we suggest you follow the aforesaid technique.
3. However, in case you are comfortable following the traditional way or are more confident about it then you may follow that.

Questions for Practice

Question 1: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $x^2 + 2x - 63 = 0$

II. $y^2 - 12y + 35 = 0$

a) $x > y$

b) $x < Y$

c) $x = y$ or the relationship cannot be determined

d) $x \geq y$

e) $x \leq y$

Answer: c

Solution:

From I:

$x^2 + 2x - 63 = 0$

$x^2 + 9x - 7x - 63 = 0$

$x(x + 9) - 7 (x + 9) = 0$

$(x + 9) (x - 7) = 0$

$x = -9, 7$

From II:

$y^2 - 12y + 35 = 0$

$y^2 - 7y - 5y + 35 = 0$

$y(y - 7) - 5(y - 7) = 0$

$(y - 7) (y - 5) = 0$

$y = 7, 5$

X	Relation	Y
-9	<	7
-9	<	5
7	=	7
7	>	5

So, no relation can be established between x and y.

Hence, option c.

Question 2: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $24x^2 + 7x - 6 = 0$

II. $5y^2 - 34y + 24 = 0$

a) $x > y$

b) x < Y

c) x = y or the relationship cannot be determined

d) x ≥ y

e) x ≤ y

Answer: b

Solution:

From I:

$24x^2 + 7x - 6 = 0$

$24x^2 + 16x - 9x - 6 = 0$

$8x(3x + 2) - 3(3x + 2) = 0$

$(8x - 3)(3x + 2) = 0$

$x = 3/8, -2/3$

From II:

$5y^2 - 34y + 24 = 0$

$5y^2 - 30y - 4y + 24 = 0$

$5y(y - 6) - 4(y - 6) = 0$

$(y - 6)(5y - 4) = 0$

$y = 6, 4/5$

X	Relation	Y
3/8	<	6
3/8	<	4/5
-2/3	<	6
-2/3	<	4/5

So, x < y.

Hence, option b.

Question 3: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $x = \sqrt{441}$

II. $y^2 - 20y - 69 = 0$

a) x > y

b) x < Y

c) x = y or the relationship cannot be determined

d) x ≥ y

e) x ≤ y

Answer: c

Solution:

From I:

$x = \sqrt{441}$

x = 21

From II:

$y^2 - 20y - 69 = 0$

$y^2 - 23y + 3y - 69 = 0$

$y(y - 23) + 3(y - 23) = 0$

$(y - 23)(y + 3) = 0$

y = 23, -3

X	Relation	Y
21	<	23
21	>	-3

So, no relation can be established between x and y.

Hence, option c.

Question 4: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $5x^2 + 7x - 6 = 0$

II. $7y^2 - 32y - 15 = 0$

a) x > y

b) x < Y

c) x = y or the relationship cannot be determined

d) x ≥ y

e) x ≤ y

Answer: c

Solution:

From I:

$5x^2 + 7x - 6 = 0$

$5x^2 + 10x - 3x - 6 = 0$

$5x(x + 2) - 3(x + 2) = 0$

$(5x - 3)(x + 2) = 0$

x = 3/5, -2

From II:

$7y^2 - 32y - 15 = 0$

$7y^2 - 35y + 3y - 15 = 0$

$7y(y - 5) + 3(y - 5) = 0$

(y - 5) (7y + 3) = 0

y = 5, -3/7

X	Relation	Y
3/5	<	5
3/5	>	-3/7
-2	<	5
-2	<	-3/7

So, no relation can be established between x and y.

Hence, option c.

Question 5: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $x^2 + 16x + 48 = 0$

II. $y^2 + 17y + 66 = 0$

a) x > y

b) x < Y

c) x = y or the relationship cannot be determined

d) x ≥ y

e) x ≤ y

Answer: c

Solution:

From I:

$x^2 + 16x + 48 = 0$

$x^2 + 12x + 4x + 48 = 0$

x(x + 12) + 4 (x + 12) = 0

(x + 4) (x + 12) = 0

x = -4, -12

From II:

$y^2 + 17y + 66 = 0$

$y^2 + 11y + 6y + 66 = 0$

y(y +11) + 6 (y + 11) = 0

(y + 11) (y + 6) = 0

y = -11, -6

X	Relation	Y
-4	>	-11
-4	>	-6
-12	<	-11
-12	<	-6

So, no relation canbe established between x and y.

Hence, option c.

Question 6: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $6x - y = 22$

II. $3x + 2y = 46$

a) $x > y$

b) $x < Y$

c) $x = y$ or the relationship cannot be determined

d) $x \geq y$

e) $x \leq y$

Answer: b

Solution:

From I:

$6x - y = 22$

$6x - 22 = y$ ……1

From II:

$3x + 2y = 46$

$3x + 2(6x - 22) = 46$

$3x + 12x - 44 = 46$

$15x = 90$

$x = 6$

$6 \times 6 - 22 = y$

$y = 14$

So, $x < y$

Hence, option b.

Question 7: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $x^2 - 4x - 165 = 0$

II. $y^2 - 5x - 176 = 0$

a) $x > y$

b) $x < Y$

c) $x = y$ or the relationship cannot be determined

d) $x \geq y$

e) $x \leq y$

Answer: c

Solution:

From I:

$x^2 - 4x - 165 = 0$

$x^2 - 15x + 11x - 165 = 0$

$x(x - 15) + 11(x - 15) = 0$

$(x - 15)(x + 11) = 0$

$x = -11, 15$

From II:

$y^2 - 5y - 176 = 0$

$y^2 - 16y + 11y - 176 = 0$

$y(y - 16) + 11(y - 16) = 0$

$(y - 16)(y + 11) = 0$

$y = 16, -11$

x	Relation	y
-11	<	16
-11	=	-11
15	<	16
15	>	-11

So, no relation can be established between x and y.

Hence, option c.

Question 8: In the question, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $x^2 - 37x + 336 = 0$

II. $y^2 - 31y + 240 = 0$

a) $x > y$

b) $x < Y$

c) $x = y$ or the relationship cannot be determined

d) $x \geq y$

e) $x \leq y$

Answer: d

Solution:

From I:

$x^2 - 37x + 336 = 0$

$x^2 - 21x - 16x + 336 = 0$

$x(x - 21) - 16(x - 21) = 0$

$(x - 21)(x - 16) = 0$

$x = 16, 21$

From II:

$y^2 - 31y + 240 = 0$

$y^2 - 16y - 15y + 240 = 0$

$y(y - 16) - 15(y - 16) = 0$

$(y - 16)(y - 15) = 0$

$y = 15, 16$

x	Relation	y
16	=	16
16	>	15
21	>	16
21	>	15

So, $x \geq y$

Hence, option d.

Question 9: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $2048y^3 + 500 = 0$

II. $6x^2 + 19x + 8 = 0$

a) $x > y$

b) $x < Y$

c) $x = y$ or the relationship cannot be determined

d) $x \geq y$

e) $x \leq y$

Answer: c

Solution:

From I:

$2048y^3 + 500 = 0$

Or, $512y^3 + 125 = 0$

Or, $512y^3 = -125$

Or, $y^3 = -125/512$

Or, $y = -5/8$

From II:

$6x^2 + 19x + 8 = 0$

Or, $6x^2 + 16x + 3x + 8 = 0$

Or, $2x(3x + 8) + 1(3x + 8) = 0$

Or, $(2x + 1)(3x + 8) = 0$

Or, x = -1/2 or x = -8/3

Y	Relation	X
-5/8	<	-1/2
-5/8	>	-8/3

So, no relation can be established between 'x' and 'y'.

Hence, option c.

Question 10: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

I. $8x^2 = 6x^2 + 31x - 120$

II. $80y^2 = 37 \times 16y$

a) x > y

b) x < Y

c) x = y or the relationship cannot be determined

d) x ≥ y

e) x ≤ y

Answer: a

Solution:

From I:

$8x^2 = 6x^2 + 31x - 120$

$2x^2 - 31x + 120 = 0$

$2x^2 - 16x - 15x + 120 = 0$

$2x(x - 8) - 15(x - 8) = 0$

$(2x - 15)(x - 8) = 0$

x = 8, 15/2

x = 8, 7.5

From II:

$80y^2 = 37 \times 16y$

$5y^2 = 37y$

y = 0, 7.4

X	Relation	y
8	>	7.4
8	>	0
7.5	>	7.4
7.5	>	0

So, x > y

Hence, option a.

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