QUADRATIC EQUATIONS

The standard form of a quadratic equation:

ax^2 + bx + c = 0

a, b and c are known values. a can’t be 0.

x is the variable we don’t know yet

Factoring

Factoring: the process of finding the factors. It’s like *splitting* an expression into a multiplication of similar expressions.

*Example:*

2y + 6

// both 2y and 6 have a common factor of 2

2y is 2 \* y

6 is 2 \* 3

This can be factored in to:

2(y + 3)

Quadratic equations by factoring

X^2 – 49 = 0 // these are perfect squares (7\*7 = 49)

(x + 7)(x – 7) // this is factored

// we now solve these 2 algebraic equations:

X + 7 = 0 x – 7 = 0

X = -7 x = 7

Answer: x = -7, 7

3x^2 – 75 = 0 // not perfect squares

What is multiplied by 3 (the coefficient), to get 75?

3(x^2 – 25) = 0 // we now have our perfect square of 25

3(x + 5)(x – 5) = 0

// we now solve these 2 algebraic equations:

X + 5 = 0 x – 5 = 0

X = -5 x = 5

Answer: x = -5, 5

9x^2 – 64 = 0 // perfect square, 9 and 64

(3x – 8)(3x + 8) = 0

3x – 8 = 0 3x + 8 = 0

3x = 0 3x = -8

X = 8/3 x = -8/3

X^2 – 2x – 15 = 0 // in the quadratic equation blueprint listed at the top

// we need to find 2 numbers that multiply to -15, and add to -2 (the coefficient): -5, 3

(x – 5)(x + 3) = 0

X – 5 = 0 x + 3 = 0

X = 5 x = -3

Answer: -3, 5

X^2 + 3x – 28 = 0

(x + 7)(x – 4) = 0

X + 7 = 0 x – 4 = 0

X = -7 x = 4

Answer: -7, 4

8x^2 + 2x – 15 = 0

// when the leading coefficient is not 1, we need to multiply 8 and -15 = -120

Now, what 2 numbers multiply to 120, but add to 2?

|  |  |
| --- | --- |
|  | -120 |
| 1 | -120 |
| 2 | -60 |
| 3 | -40 |
| 4 | -30 |
| 5 | -24 |
| 6 | -20 |
| 8 | -15 |
| **-10** | **12** |

8x^2 + 12x – 10x – 15 = 0

Split this in to 2 terms: 8x^2 + 12x, -10x – 15

The greatest common factor in the first term is 4, in the second it is 5

4x(2x + 3) – 5(2x + 3) = 0 // notice the common terms: 2x + 3

(2x + 3)(4x – 5) // the 2nd term, is the *stuff* on the outside, above

// solve the answer

2x + 3 = 0 4x – 5= 0

2x = - 3 4x = 5

X = -1.5 x = 5/4

Answers: -1.5, 5/4

Challenges

1. X^2 + 14x – 95 = 0 (answer: -19, 5)
2. X^2 + 9x – 190 = 0 (answer: -19, 10)
3. X^2 + 10x – 200 = 0 (answer: -20,10)
4. X^2 – 2x + 168 = 0 (answer: -12, 14)

Quadratic formula

Quadratic equations can also be solved using the quadratic formula:

