Solving Quadratic Equations

Solving by factorising

Solve the equation : $12x^2 - 14x = 0$

$2x(6x - 7) = 0$

Set each part equal to 0

$2x = 0$ $6x - 7 = 0$
$x = 0$ $+7 + 7$
          $6x = 7$
          $\div 6$ $\div 6$
          $x = \frac{7}{6}$

Solve $x^2 - 7x + 12 = 0$

$(x - 3)(x - 4) = 0$

$x - 3 = 0$ $x - 4 = 0$
$+3 + 3$ $+4 + 4$
$x = 3$ $x = 4$

Solve: $4x^2 - 9 = 0$

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

$2x + 3 = 0$ $2x - 3 = 0$

$x = -\frac{3}{2}$ $x = \frac{3}{2}$

Steps:

Factorise the equation

Set each bracket equal to 0

Solve for x

Solving by using the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve the following quadratic equation, giving your answer to two decimal places.

$4x^2 - 10x - 7 = 0$

$a = 4$ $b = -10$ $c = -7$

$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(4)(-7)}}{2(4)}$

$x = \frac{10 + \sqrt{212}}{8}$ $x = \frac{10 - \sqrt{212}}{8}$

$x_+ = 3.07$ **(2dp)** $x_- = -0.57$ **(2dp)**

1) Compare with $ax^2 + bx + c$ to identify a, b and c

2) Substitute a, b and c into the **quadratic formula.**

3) Simplify the three sections.

4) Split into two and solve.

Solving by Elimination

Steps:

1) Make the x's or the y's the same using LCM

2) Label the equations 1 and 2

3) If the signs are the same <u>subtract</u> if not add

4) Isolate the variable by dividing

5) Find the unknown variable by substituting the known variable into one of the 2 equations.

$2x + 5y = 24$
$4x + 3y = 20$

x2

LCM of 2 and 4 is 4

$4x + 10y = 48$ ①
$4x + 3y = 20$ ②
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$7y = 28$
$\div 7$ $\div 7$
$y = 4$

$4x + 3(4) = 20$
$4x + 12 = 20$
-12 -12
$4x = 8$
$\div 4$ $\div 4$
$x = 2$

$x = 2, y = 4$

Simultaneous Equations

$3x - 2y = 0$ ①
$2x + y = 7$ ②

$y = 7 - 2x$ ②

$3x - 2(7 - 2x) = 0$

$3x - 14 + 4x = 0$

$7x - 14 = 0$

$7x = 14$

$x = 2$

$2(2) + y = 7$

$4 + y = 7$

$y = 3$

$x = 2, y = 3$

Solving by Substitution

Step 1: Rearrange the equation for x or y

Step 2: Substitute the equation into the other equation

Step 3: Solve the equation for x or y

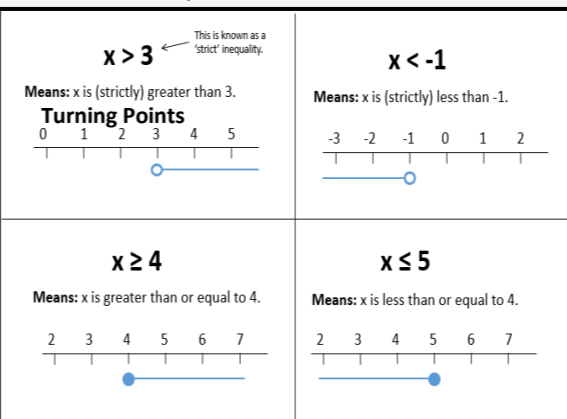Step 4: Substitute the value into the first equation

Unit 9:

Equations and Inequalities

Solving linear inequalities

$4x + 7 > 35$
-7 -7
$4x > 28$
$\div 4$ $\div 4$
$x > 7$

$-4x + 7 > 35$
-7 -7
$-4x > 28$
$\div -4$ $\div -4$
$x < -7$

Inequalities on a number line

x > 3   This is known as a 'strict' inequality.

Means: x is (strictly) greater than 3.

Turning Points

0   1   2   3   4   5

x < -1

Means: x is (strictly) less than -1.

-3   -2   -1   0   1   2

x ≥ 4

Means: x is greater than or equal to 4.

2   3   4   5   6   7

x ≤ 5

Means: x is less than or equal to 4.

2   3   4   5   6   7

Completing the Square

Inequalities