Today's Learning Goal(s):

By the end of the class, I will be able to:

a) Use different factoring strategies to solve quadratic equations

MCF 3MI

3.4 Solving Quadratic Equations by Factoring

Date: Mar. 20/19

Solving quadratic equations *by graphing* can be time-consuming and is often inaccurate. However, solving by factoring is more accurate and usually quicker.

You get to apply the factoring skills you've been practising:
common factoring, trinomial factoring (various methods), difference of squares, etc.

$ax^2+bx+c=0$

*Make sure the quadratic equation is in STANDARD FORM!

Concept: If an equation is in the form: A x B = 0, then A=0 or B=0 (or both).
Factoring allows us to get equations into "product" (A x B) form.

Ex.1: Solve by factoring.

a) $x^2+2x-15=0$

P: -15
S: $+2$
$-3+5$

$x^2-3x+5x-15=0$

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

$\overset{A}{(x-3)}\overset{B}{(x+5)}=0$

$x-3=0$ or $x+5=0$

$x=3$ $\quad x=-5$

b) $8x^2-4x=0$

$4x(2x-1)=0$

$4x=0$ or $2x-1=0$

$\frac{4x}{4}=\frac{0}{4}$ $\quad \frac{2x}{2}=\frac{1}{2}$

$x=0$ $\quad x=\frac{1}{2}$

c) $x^2=25$

$x^2-25=0$

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

$x+5=0$ or $x-5=0$

$x=-5$ $\quad x=5$

d) $4x^2=9$

$4x^2-9=0$

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

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

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

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

e) $2x(3x+2)=4-x$

$6x^2+4x=4-x$

$6x^2+4x-4+x=0$

$6x^2+5x-4=0$

$6x^2-3x+8x-4=0$

$3x(2x-1)+4(2x-1)=0$

$(2x-1)(3x+4)=0$

$2x-1=0$ $\quad 3x+4=0$

$2x=1$ $\quad 3x=-4$

$x=\frac{1}{2}$ $\quad x=\frac{-4}{3}$

P: -24
1 24
2 12
$-3+8$

Ex.2: Solve by factoring. Verify your solutions.

$$x(3x-4)=-2(7x-4)$$

$$3x^2-4x=-14x+8$$

$$3x^2-4x+14x-8=0$$

$$3x^2+10x-8=0$$

$$3x^2-2x+12x-8=0$$

$$x(3x-2)+4(3x-2)=0$$

$$(3x-2)(x+4)=0$$

$$3x-2=0 \qquad x+4=0$$

$$x=\frac{2}{3} \qquad x=-4$$

-24

$1 \quad -24$

$-2 \quad +12$

$\left\{ x=\frac{2}{3} \right.$

Verify $x=-4$

$$LS=x(3x-4)$$
$$=(-4)(3(-4)-4)$$
$$=-4(-12-4)$$
$$=-4(-16)$$
$$=64$$

$$RS=-2(7x-4)$$
$$=-2(7(-4)-4)$$
$$=-2(-28-4)$$
$$=-2(-32)$$
$$=64$$

$\therefore LS=RS$

$\therefore x=-4$ is a solution.

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

$$LS=x(3x-4)$$
$$=\left(\frac{2}{3}\right)\left(\cancel{3}\left(\frac{2}{\cancel{3}}\right)-4\right)$$
$$=\frac{2}{3}(2-4)$$
$$=\frac{2}{3}(-2)$$
$$=\frac{-4}{3}$$

$$RS=-2(7x-4)$$
$$=-2\left(7\left(\frac{2}{3}\right)-4\right)$$
$$=-2\left(\frac{14}{3}-\frac{12}{3}\right)$$
$$=-2\left(\frac{2}{3}\right)$$
$$=\frac{-4}{3}$$

$\therefore LS=RS$

$\therefore x=\frac{2}{3}$ is a solution.

Ex. 3 (p.163 #12)

A helicopter drops an aid package.
The height of the package above the ground at any time is modelled by the function,

$$h(t) = -5t^2 - 30t + 675$$

where $h(t)$ is the height in metres and t is the time in seconds.
How long will it take the package to hit the ground?

The package hits the ground when its height above the ground is zero

$\therefore$ Let $h(t) = 0$

$$0 = -5t^2 - 30t + 675$$
$$= -5(t^2 + 6t - 135)$$
$$= -5(t-9)(t+15)$$

1 135
$\cancel{2}$
3 45
$\cancel{4}$
5 27
$\cancel{6}$
-9 $+15$

$\therefore t = 9$ or $t = -15$

inadmissible
$\because$ time ≥ 0.

$\therefore$ it will take 9 seconds for the package to hit the ground.

Today's Homework: pp. 161-163 #1cd, 2, 3ac, 4def, 5f, 6de, 9, 11, 13