Day 3 Completing the Square: Notes

CLUE: WHEN ONLY AN x^2 TERM

1. Some quadratics can be solved by taking the square roots of both sides:

no x term ☺ $\sqrt{\ }$

e.g. $x^2 = 64$

$\sqrt{x^2} = \sqrt{64}$

$x = \pm 8$

$2x^2 - 8 = 0$

$2x^2 = 8$

$x^2 = 4$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

x

2. Others, where there is a linear term included, must be solved by factoring or graphing or by completing the square.

$\sqrt{20}$

$\sqrt{4 \cdot 5}$

$\sqrt{4} \cdot \sqrt{5}$

$2\sqrt{5}$

e.g. Solve $x^2 - 8x - 4 = 0$ by completing the square. "DNF"

$x^2 - 8x = 4$ move the "c" term to other side

☺ → $x^2 - 8x + 16 = 4 + 16$

$(x-4)^2 = 20$

$\sqrt{(x-4)^2} = \sqrt{20}$

☹ → $x - 4 = \pm\sqrt{20}$

$x = 4 \pm \sqrt{20}$

EXACT ROOTS

$4 \pm 2\sqrt{5}$

$4 + 2\sqrt{5}$ & $4 - 2\sqrt{5}$

DECIMAL 8.47 & −0.47

Solve $x^2 - 21 = -10x$ by completing the square.

$x^2 + 10x = 21$

$x^2 + 10x + 25 = 21 + 25$

$(x+5)^2 = 46$

$\sqrt{(x+5)^2} = \sqrt{46}$

$x + 5 = \pm\sqrt{46}$

$x = -5 \pm \sqrt{46}$

EXACT ROOTS

$-5 + \sqrt{46}$ & $-5 - \sqrt{46}$

Decimals 1.78 −11.78

b) Check your answers by graphing. c) Can you solve these by factoring?

Part II.

How to solve a quadratic equation by completing the square when a ≠ 1

1. Determine the roots of $-2x^2 - 3x + 7 = 0$.

Grade 7

$\frac{3}{2} \times \frac{1}{2} = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

$\frac{7}{2} + \frac{9}{16}$

$\frac{56}{16} + \frac{9}{16} = \frac{65}{16}$

$-2x^2 - 3x = -7$

$-2\left(x^2 + \frac{3}{2}x\right) = -7$

$x^2 + \frac{3}{2}x = \frac{-7}{-2}$

$x^2 + \frac{3}{2}x = \frac{7}{2}$

$x^2 + \frac{3}{2}x + \frac{9}{16} = \frac{7}{2} + \frac{9}{16}$

$\sqrt{\left(x + \frac{3}{4}\right)^2} = \sqrt{\frac{65}{16}}$

$x + \frac{3}{4} = \pm\sqrt{\frac{65}{16}}$

$x = \frac{-3}{4} \pm \frac{\sqrt{65}}{16}$

$x = \frac{-3}{4} \pm \frac{\sqrt{65}}{4}$

$x = \frac{-3 \pm \sqrt{65}}{4}$ exact

1.27 & -2.77

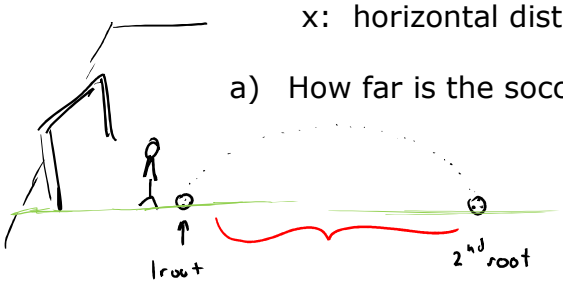
The path of a soccer ball kicked by a goalie is approximated by quadratic function:

$$h(x) = -0.06x^2 + 3.168x - 35.34$$

— Use decimals

h: height (m)

x: horizontal distance travelled from the goal line (m)



a) How far is the soccer ball from the goal line when it is kicked?

16.00 m 36.79

$35.34 = -0.06x^2 + 3.168x$

$35.34 = -0.06(x^2 - 52.8x)$

$696.96 - 589 = x^2 - 52.8x + 696.96$

$107.96 = (x - 26.4)^2$

$\pm\sqrt{107.96} = x - 26.4$

$26.4 \pm \sqrt{107.96} = x$

36.79 & 16.00

b) How far does the ball travel before it hits the ground?

$$\begin{array}{r} 36.79 \\ -\ 16.00 \\ \hline 20.79\ m \end{array}$$