## Do Now:

1) A student is asked to solve the equation $4(3x - 1)^2 - 17 = 83$. The students solution to the problem starts as

$4(3x - 1)^2 = 100$

$(3x - 1)^2 = 25$

A correct next step in the solution of the problem is

A) $3x - 1 = \pm 25$

B) $3x - 1 = \pm 5$

C) $9x^2 - 1 = 25$

D) $9x^2 - 6x + 1 = 5$

2) When solving the equation $x^2 - 8x - 7 = 0$ by completing the square, which one of the following equations is a step in the process?

A) $(x - 8)^2 = 9$

B) $(x - 4)^2 = 9$

C) $(x - 4)^2 = 23$

D) $(x - 8)^2 = 23$

3) What are the solutions to the equation $3x^2 + 10x = 8$?

A) $\frac{4}{3}$ and -2

B) $\frac{2}{3}$ and -4

C) $-\frac{4}{3}$ and 2

D) $-\frac{2}{3}$ and 4

$x^2 - 8x + 16 = 7 + 16$

$(x-4)^2 = 23$

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

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

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

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

$3x - 2 = 0$ | $x + 4 = 0$

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

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## HW Answers

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10) $t^2 + 2t - 224 = 0$

$t^2 + 2t = 224$

$t^2 + 2t + 1 = 224 + 1$

$(t+1)^2 = 225$

$t + 1 = \pm 15$

$\{14, -16\}$

12) $g^2 + 3g = -6$

$g^2 + 3g + \left(\frac{9}{4}\right) = -6 + \frac{9}{4}$

$\left(g + \frac{3}{2}\right)^2 = \frac{-15}{4}$

*No real solutions*

14) $z^2 - 6z = -2$

$z^2 - 6z + 9 = -2 + 9$

$(z-3)^2 = 7$

$z - 3 = \pm\sqrt{7}$

$z = 3 \pm \sqrt{7}$

11) $x^2 + 18x = 175$

$x^2 + 18x + 81 = 175 + 81$

$(x+9)^2 = 256$

$x + 9 = \pm 16$

$\{-25, 7\}$

13) $p^2 - 3p = 18$

$p^2 - 3p + \frac{9}{4} = 18 + \frac{9}{4}$

$\left(p - \frac{3}{2}\right)^2 = \frac{81}{4}$

$p - \frac{3}{2} = \pm\frac{9}{2}$

$\{6, -3\}$

15) $x^2 + 25 = 10x$

$x^2 - 10x = -25$

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

$(x-5)^2 = 0$

$x - 5 = 0$

$\{5\}$

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# Practice Solving Quadratics

**Example 1:** $x^2 - 7x - 30 = 0$

| *Factoring* | *Quadratic Formula* | *Completing the Square* |
|---|---|---|
| $x^2 - 7x - 30 = 0$<br>$(x+3)(x-10) = 0$<br>$x+3=0 \quad x-10=0$<br>$x=-3 \quad x=10$ | $x^2 - 7x - 30 = 0$<br>$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(-30)}}{2(1)}$<br>$x = \frac{7 \pm \sqrt{49+120}}{2}$<br>$x = \frac{7 \pm \sqrt{169}}{2}$<br>$x = \frac{7 \pm 13}{2}$<br>$x = \frac{7+13}{2} \quad x = \frac{7-13}{2}$<br>$x = 10 \quad x = -3$ | $x^2 - 7x - 30 = 0$<br>$x^2 - 7x + \_\_ = 30 + \_\_$<br>$x^2 - 7x + \frac{49}{4} = 30 + \frac{49}{4}$<br>$(x - \frac{7}{2})^2 = 42\frac{1}{4}$<br>$\sqrt{(x - \frac{7}{2})^2} = \sqrt{42\frac{1}{4}}$<br>$x - \frac{7}{2} = \pm 6\frac{1}{2}$<br>$x - \frac{7}{2} = -6\frac{1}{2} \quad x - \frac{7}{2} = 6\frac{1}{2}$<br>$x = -3 \quad \neq 10$ |
| *If you can factor easily, it is the quickest method* | *Quadratic formula always works, but is a lot of writing* | *Completing the square with an odd "b" can be messy* |

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# Practice Solving Quadratics

**Example 2:** $x^2 + 8x = -3$

| *Factoring* | *Quadratic Formula* | *Completing the Square* |
|---|---|---|
| $x^2 + 8x = -3$<br>$x^2 + 8x + 3 = 0$<br>not factorable<br>(no factors of 3 that sum tc | $x^2 + 8x = -3$<br>$x^2 + 8x + 3 = 0$<br>$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(1)(3)}}{2(1)}$<br>$x = \frac{-8 \pm \sqrt{52}}{2}$<br>$x = \frac{-8 \pm \sqrt{4}\sqrt{13}}{2}$<br>$x = \frac{-8 \pm 2\sqrt{13}}{2}$<br>$x = -4 \pm \sqrt{13}$ | $x^2 + 8x = -3$<br>$x^2 + 8x + \_\_ = -3 + \_\_$<br>$x^2 + 8x + 16 = -3 + 16$<br>$(x+4)^2 = 13$<br>$\sqrt{(x+4)^2} = \sqrt{13}$<br>$x + 4 = \pm\sqrt{13}$<br>$x = -4 \pm \sqrt{13}$ |
| *Can't use this method if your roots are irrational* | *Quadratic formula always works, but is a lot of writing* | *Completing the square with an even "b" works out well* |

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# Practice Solving Quadratics

**The Discriminant:** $\sqrt{b^2-4ac}$

| *One solution* | *Two Solutions* | *No Solution* |
|---|---|---|
| $x^2-8x+16=0$<br>$\frac{-(-8)\pm\sqrt{(-8)^2-4(1)(16)}}{2(1)}$<br>$\frac{8\pm\sqrt{64-64}}{2}$<br>$\frac{8\pm\sqrt{0}}{2}=\frac{8}{2}=4$ | $3x^2=12-6x$<br>$3x^2+6x-12=0$<br>$\frac{-6\pm\sqrt{(6)^2-4(3)(-12)}}{2(3)}$<br>$\frac{-6\pm\sqrt{36+144}}{6}$<br>$\frac{6\pm\sqrt{180}}{6}$<br>$\frac{6\pm6\sqrt{5}}{6}=1\pm\sqrt{5}$ | $x^2+2x=-10$<br>$x^2+2x+10=0$<br>$\frac{-2\pm\sqrt{(2)^2-4(1)(10)}}{2(1)}$<br>$\frac{-2\pm\sqrt{4-40}}{2}$<br>$\frac{-2\pm\sqrt{-36}}{2}$ |
| *Occurs whenever the radicand is 0* | *Occurs whenever the radicand is a positive #* | *Occurs whenever the radicand is a negative #* |

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# Practice Solving Quadratics

Questions 12 & 13: Solve the given equations using any method of your choice and express your answer in simplest radical form if needed:

12) $\frac{x^2+2x+4}{x}=\frac{2x}{1}$

$1(x^2+2x+4)=x(2x)$

$x^2+2x+4=2x^2$

$-2x^2 \quad -2x^2$

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

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

$x^2-2x+1=4+1$

$\sqrt{(x-1)^2}=\sqrt{5}$

$x-1=\pm\sqrt{5}$

$+1 \quad +1$

$x=1\pm\sqrt{5}$

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# Practice Solving Quadratics

Questions 12 & 13: Solve the given equations using any method of your choice and express your answer in simplest radical form if needed:

13) $\frac{1}{x} = \frac{x+2}{2x+3}$

$x(x+2) = 1(2x+3)$

$x^2 + 2x = 2x + 3$

$-2x \quad -2x$

$\sqrt{x^2} = \sqrt{3}$

$x = \pm\sqrt{3}$

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