COLLEGE REVIEW MATH
SECTION 1F

QUADRATIC EQUATIONS

Name the (4) ways you have learned to solve a quadratic equation:

1) factoring

2) complete the square

3) quadratic formula

4) graph (x-intercepts)

by FACTORING…

1) $x^2 - 4x - 21 = 0$

$(x - 7)(x + 3) = 0 \qquad x = 7, -3$

2) $6y^2 + 19y + 8 = 0$

$(2y + 1)(3y + 8) = 0 \quad y = -1/2, -8/3$

3) $12n^2 - 16n = 0$

$4n(3n - 4) = 0 \qquad n = 0, 4/3$

4) $(x - 10)(x + 2) = -35$

$x^2 + 2x - 10x - 20 = -35$
$x^2 - 8x - 20 + 35 = 0$
$x^2 - 8x + 15 = 0$
$(x - 3)(x - 5) = 0 \qquad x = 3, 5$

by COMPLETING THE SQUARE…

5) $b^2 + 12b = 28$

$b^2 + 12b + 36 = 28 + 36$
$(b + 6)^2 = 64$
square root both sides
$b + 6 = \pm 8$
$b = \pm 8 - 6$
$b = 8 - 6$ and $b = -8 - 6$
$b = 2$ and $b = -14$

6) $y^2 - 8y - 2 = 0$

$y^2 - 8y \_\_\_\_ = 2 \_\_\_\_$
$y^2 - 8y + 16 = 2 + 16$
$(y - 4)^2 = 18$
$y - 4 = \sqrt{18}$
$y - 4 = \sqrt{9}\sqrt{2}$
$y - 4 = \pm 3\sqrt{2}$
$y = 4 \pm 3\sqrt{2}$

7) $3x^2 - 12x + 18 = 0$

Must have a leading coefficient of 1, so divide by 3
$x^2 - 4x + 6 = 0$
$x^2 - 4x \_\_\_\_ = -6 \_\_\_\_$
$x^2 - 4x + 4 = -6 + 4$
$(x - 2)^2 = -2$
$x - 2 = \pm i\sqrt{2}$
$x = 2 \pm i\sqrt{2}$

by THE QUADRATIC FORMULA… $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

8) $8x^2 + 18x - 5 = 0$

$= \dfrac{-18 \pm \sqrt{18^2 - 4(8)(-5)}}{2(8)}$
$= \dfrac{-18 \pm \sqrt{484}}{16}$
$= \dfrac{-18 \pm 22}{16}$
$= \dfrac{-18 + 22}{16}$ and $\dfrac{-18 - 22}{16}$
$b = 1/4$ and $b = -5/2$

9) $4x^2 + 4x + 1 = 0$

$= \dfrac{-4 \pm \sqrt{4^2 - 4(4)(1)}}{2(4)}$
$= \dfrac{-4 \pm \sqrt{16 - 16}}{8}$
$= \dfrac{-4 \pm \sqrt{0}}{8} = \dfrac{-4}{8}$

$x = -1/2$

10) $x^2 + 3x + 8 = 5$

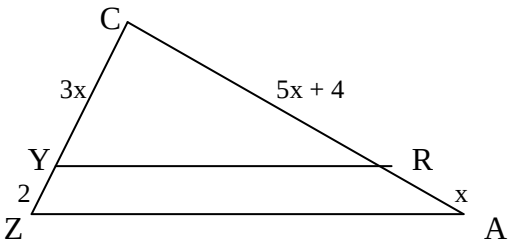
$x^2 + 3x + 3 = 0$
$= \dfrac{-3 \pm \sqrt{3^2 - 4(1)(3)}}{2(1)}$
$= \dfrac{-3 \pm \sqrt{9 - 12}}{2}$
$= \dfrac{-3 \pm \sqrt{-3}}{2}$
$x = \dfrac{-3 \pm i\sqrt{3}}{2}$

More fun with quadratic equations:

11) Solve with whichever method you feel is best $\frac{1}{a+4} = \frac{a-4}{6a}$

$(1)(6a) = (a + 4)(a - 4)$
$6a = a^2 - 16$
$0 = a^2 - 6a - 16$
$0 = (a - 8)(a + 2)$
$a = 8$ and $a = -2$

12) Find the value of x if $\overline{YR} \parallel \overline{ZA}$



$\frac{3x}{2} = \frac{5x+4}{x}$

$3x(x) = 2(5x + 4)$
$3x^2 = 10x + 8$
$3x^2 - 10x - 8 = 0$
$(x - 4)(3x + 2) = 0$
$x = 4$ and $x = -2/3$, but a distance cannot be negative, so $x = 4$ only!

To complete the square or not to complete the square (that is the question)…

Explain why #1 and #2 should probably be avoided with the complete the square method, but why #3 is a go?

1) $x^2 - 13x - 4 = 0$ 2) $5n^2 + 25n = 100$ 3) $7y^2 - 14y + 49 = 28$

#1 has an odd number as its middle term. Taking 1/2 and squaring would create several fractions. #2 must be divided by 5 first leaving 5n as the middle term, and therefore creating the same problem as #1. #3 must be divided by 7 first. Not only do all parts divide evenly, but the middle term would be – 2y which can easily be taken half of and squared.