NAME Student AMDG

Ms. Kresovic

Adv Geo – 1 9.1Review of Radicals and Quadratic Equations Monday 24 February 2014

Objectives

- Simplify radicals
- Solve Quadratic Equations
  - Method 1: Solve for x
  - Method 2: Factoring
  - Method 3: Factoring by grouping
  - Method 4: Area model
- Review of Pythagorean Theorem and radicals (below)

Class Examples

Problem 1 *Simplify* $\sqrt{48}$.

Solution

$$\begin{aligned}\sqrt{48} &= \sqrt{16 \cdot 3} \quad \text{(16 is a perfect square.)} \\ &= \sqrt{16} \cdot \sqrt{3} \\ &= 4\sqrt{3}\end{aligned}$$

$\sqrt{4 \cdot 4 \cdot 3}$

Problem 2 *Simplify* $\sqrt{18} + \sqrt{32} + \sqrt{75}$.

Solution

$$\begin{aligned}\sqrt{18} + \sqrt{32} + \sqrt{75} &= \sqrt{9 \cdot 2} + \sqrt{16 \cdot 2} + \sqrt{25 \cdot 3} \\ &= 3\sqrt{2} + 4\sqrt{2} + 5\sqrt{3} \\ &= 5\sqrt{3} + 7\sqrt{2}\end{aligned}$$

Problem 3 *Simplify* $\sqrt{\frac{5}{3}}$.

Solution

$$\begin{aligned}\sqrt{\frac{5}{3}} &= \frac{\sqrt{5}}{\sqrt{3}} \\ &= \frac{\sqrt{5}}{\sqrt{3}} \cdot \boxed{\frac{\sqrt{3}}{\sqrt{3}}} \quad \text{rationalize the denominator} \\ &= \frac{\sqrt{15}}{3} \text{ or } \frac{1}{3}\sqrt{15} \quad \text{(The two answers are equivalent simplifications.)}\end{aligned}$$

$\frac{1}{3}\sqrt{16} = \frac{4}{3}$

Problem 4. Simplify $\sqrt{98}$ $= \sqrt{49} \cdot \sqrt{2} = \pm 7\sqrt{2}$

Problem 5. Simplify $\sqrt{200}$ $= \sqrt{25}\sqrt{8} = 5\sqrt{8} \rightarrow 5\sqrt{4} \cdot \sqrt{2} = \pm 10\sqrt{2}$

$\sqrt{100} \cdot \sqrt{2} = \pm 10\sqrt{2}$

Problem 6. Simplify $\sqrt{4 + 9} = \pm\sqrt{13}$

Problem 7. Simplify $\sqrt{4 \cdot 9}$ $= 2 \cdot 3 = \pm 6$

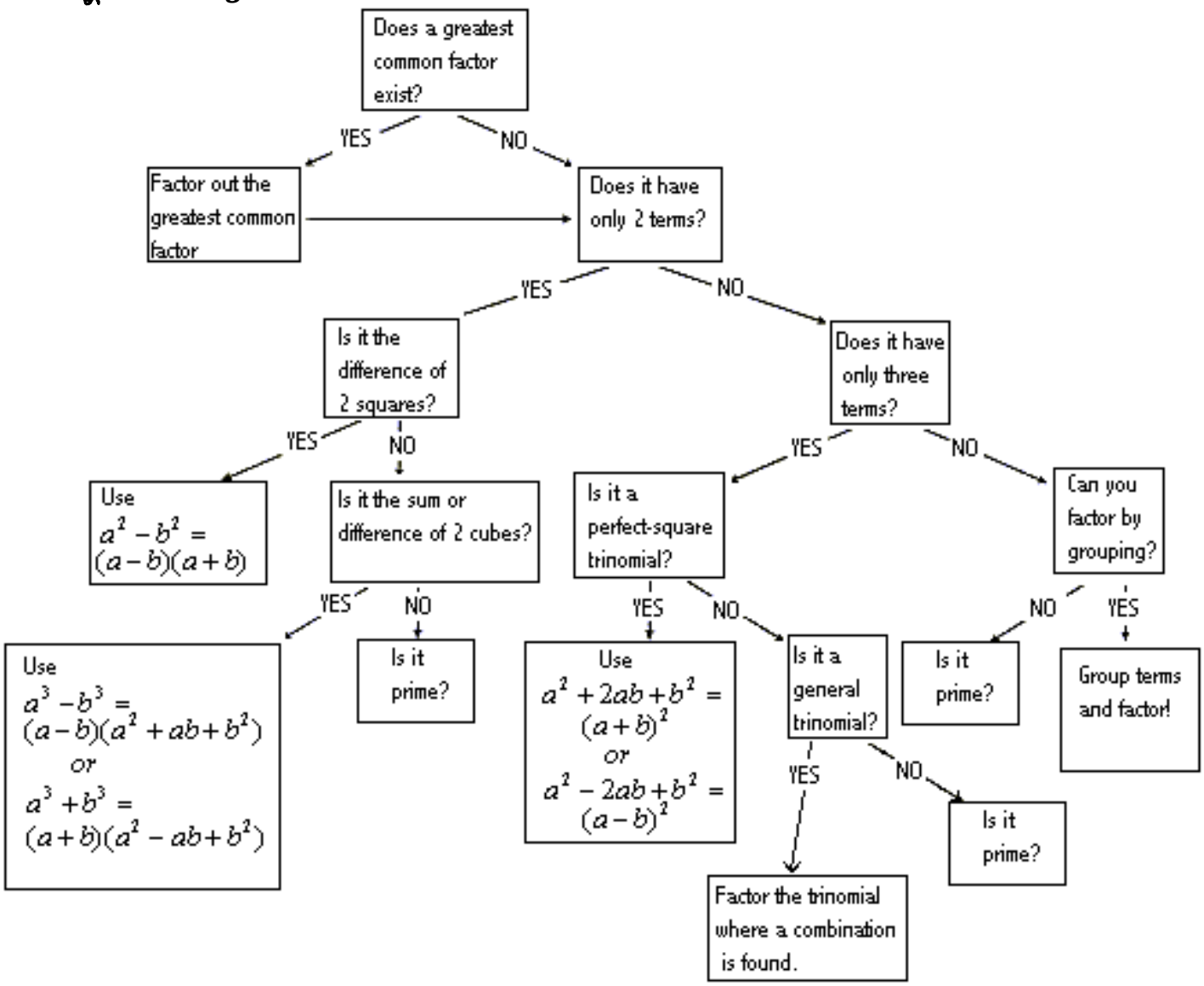
Problem 8. Simplify $\sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = \pm 5$

DON'T: $3 + 4 = 7$

Problem 9. Simplify $\frac{\frac{9}{\sqrt{3}}\sqrt{3}}{\sqrt{3}} = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$

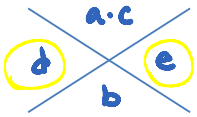
Problem 10. Simplify $7\sqrt{5} + \sqrt{7} + 6\sqrt{5} + \sqrt{7}$ $= 13\sqrt{5} + 2\sqrt{7}$

Method 3: Factoring Flowchart



Method 4: An area model

$0 = ax^2 + bx + c$



ax^2	d
e	c

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Solving Quadratics:

You may use any method that you are comfortable with, and that allows you to be successful.

You are in a unique position as I will survey you at the end of this class and after your homework about these methods. This information will be shared with the department at our meeting this Thursday.

Problem 11. Solve $x^2 + 9 = 25$

① $x^2 + 9 = 25$

$-9 \quad -9$

$\sqrt{x^2} = \sqrt{16}$

$x = \pm 4$

② $x^2 + 9 = 25$

$-25 \quad -25$

$x^2 - 16 = 0$ see flowchart DOTS

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

$x = 4$ or -4

③ $x^2 + 9 = 25$

$x^2 - 16 = 0$

↑ Adds to $0x$ ↖ Mult to $-16x^2$

$x^2 + 4x - 4x - 16$

$x \qquad -4$

$x(x+4) - 4(x+4)$

$(x-4)(x+4)$

④ $x^2 + 9 = 25$

$x^2 - 16 = 0$

$x^2 + 0x - 16 = 0$

what mult to $-16x^2$

$-4x \quad 4x$

$0x$

adds to ↑

	x	$+4$
x	x^2	$4x$
-4	$-4x$	-16

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

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

$x=-4 \qquad x=4$

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Problem 12. $x^2 + 13x + 42$

① $x^2+13x+42$

no equals

② $x^2+13x+42$

add, mult

$(x+6)(x+7)$

③ $x^2+13x+42$

$x^2+6x \quad +7x+42$

$x \qquad\quad 7$

$x(x+6)+7(x+6)$

$(x+6)(x+7)$

④ $x^2+13x+42$

what mult to $42x^2$

$6x \quad 7x$

$13x$ adds to ↑

	x	7
x	x^2	$7x$
6	$6x$	42

$(x+6)(x+7)$

Problem 13. $y^2 - 15y + 54$

① $y^2 - 15y + 54$

no equal sign

② $y^2 - 15y + 54$

what mult to 54

adds to -15

$(x-9)(x-6)$

③ $y^2 - 15y + 54$

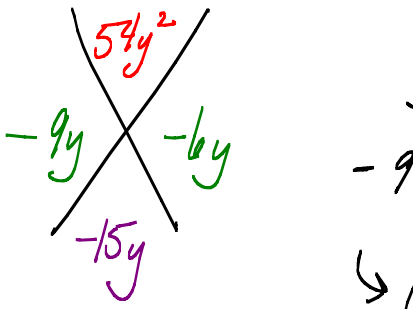
$y^2 - 9y - 6y + 54$

y -6

$y(y-9) - 6(y-9)$

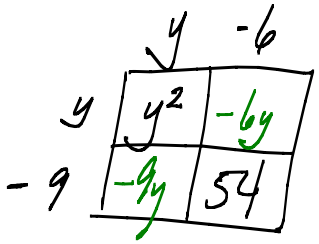
$(y-9)(y-6)$

④ $y^2 - 15y + 54$



What mult to $54y^2$

adds to $-15y$



$(y-6)(y-9)$

Problem 14. $z^2 - 3z - 28$

(1)

(2) $z^2 - 3z - 28$

$(z-7)(z+4)$

(3) $z^2 - 3z - 28$

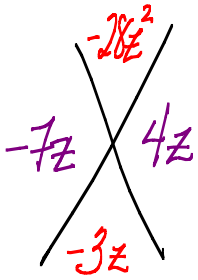
$z^2 - 7z + 4z - 28$

z $\quad$ 4

$z(z-7)$ $\quad$ $4(z-7)$

$(z-7)(z+4)$

(4) $z^2 - 3z - 28$



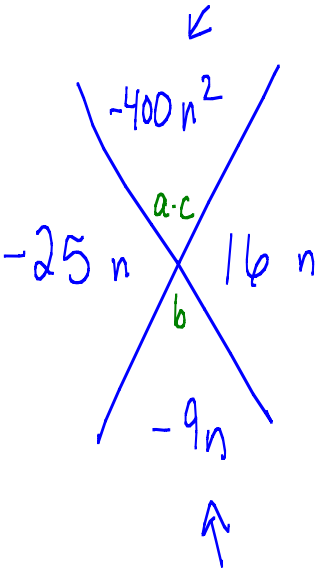
	z	4
z	z^2	$4z$
-7	$-7z$	-28

$(z+4)(z-7)$

Do 1-5 for homework

Problem 15. $-20n^2 + 9n + 20$

$-1(20n^2 - 9n - 20) = -1(5n+4)(4n-5)$



	5n	4
4n	$20n^2$	16n
-5	-25n	-20

Grouping $-1(20n^2 - 9n - 20)$

$-1(20n^2 - 25n + 16n - 20)$

$5n \qquad 4$

$-1[5n(4n-5) + 4(4n-5)]$

$-1(5n+4)(4n-5)$

Problem 16. *Solve* $(3\sqrt{5})^2 + (3\sqrt{2})^2 = x^2$ *for* x.

$3\sqrt{5} \cdot 3\sqrt{5} +$

$9\sqrt{25} +$

$9 \cdot 5 + 9 \cdot 2$

$45 + 18 = x^2$

$63 = x^2$

$9 \cdot 7 = x^2$

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

$9(5+2) = x^2$

$\pm 3\sqrt{7} = x^2$

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Problem 17. *Solve for x.* **a** $x^2 - 10x = -16$ **b** $x^2 + 5x = 0$

FTA ⇒ degree poly is exact number solutions. (x intercepts & imaginary numbers)

$+16$

$x^2 - 10x + 16 = 0$

$\frac{x^2 - 8x}{x} \quad \frac{-2x + 16}{-2} = 0$

$x(x-8) - 2(x-8) = 0$

$(x-8)(x-2) = 0$

$x - 8 = 0 \qquad x - 2 = 0$

$x = 8 \qquad x = 2$

$x(x+5) = 0$

$x = 0 \qquad x + 5 = 0$

$-5 \quad -5$

$x = -5$

$x = 0 \text{ & } -5$

Homework

1 Simplify. Expression (NOT an equation)

a $\sqrt{4}$ 2 **b** $\sqrt{27}$ $3\sqrt{3}$ **c** $\sqrt{72}$ $6\sqrt{2}$ **d** $\sqrt{32}$ $4\sqrt{2}$ **e** $\sqrt{98}$ $7\sqrt{2}$ **f** $\sqrt{200}$ $10\sqrt{2}$ **g** $\sqrt{20}$ $2\sqrt{5}$ **h** $\sqrt{24}$ $2\sqrt{6}$

$\sqrt{49}\cdot\sqrt{2}$

2 Simplify.

a $5\sqrt{18}$ $15\sqrt{2}$ **b** $\sqrt{4+9}$ $\sqrt{13}$ **c** $\sqrt{3^2+4^2}$ $\sqrt{9+16}=\sqrt{25}=5$ **d** $\sqrt{5^2+12^2}$ 13 **e** $\frac{1}{6}\sqrt{48}$ $\frac{\sqrt{16\cdot3}}{6}=\frac{4}{6}\sqrt{3}=\frac{2}{3}\sqrt{3}$ **f** $\sqrt{49\cdot3}$ $7\sqrt{3}$

3 Simplify.

a $\frac{1}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}}=\frac{\sqrt{2}}{2}$ **b** $\frac{1}{\sqrt{5}}\frac{\sqrt{5}}{\sqrt{5}}=\frac{\sqrt{5}}{5}$ **c** $\frac{4}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}}=2\sqrt{2}$ **d** $\frac{6}{\sqrt{3}}\frac{\sqrt{3}}{\sqrt{3}}=\frac{6\sqrt{3}}{3}=2\sqrt{3}$

4 Simplify.

a $4\sqrt{3}+7\sqrt{3}=11\sqrt{3}$

b $7\sqrt{2}+\sqrt{3}+6\sqrt{3}+\sqrt{2}$

$8\sqrt{2}+7\sqrt{3}$

$5\sqrt{3}$

$2\sqrt{3}+3\sqrt{3}$

$\sqrt{4}\cdot\sqrt{3}+\sqrt{9}\cdot\sqrt{3}$

c $\sqrt{12}+\sqrt{27}$

d $\sqrt{72}+\sqrt{75}-\sqrt{48}$

$\sqrt{36\cdot2}+\sqrt{25\cdot3}-\sqrt{16\cdot3}$

$6\sqrt{2}+5\sqrt{3}-4\sqrt{3}$

$6\sqrt{2}+\sqrt{3}$

↗ Equations → $\pm\sqrt{\ldots}$

5 Solve for x.

a $x^2 = 25$, $x = \pm 5$

b $x^2 = 144$ $x = \pm 12$

c $x^2 = 169$ $x = \pm 13$

d $x^2 = \frac{1}{4}$ $x = \pm \frac{1}{2}$

e $x^2 = 12$ $x = \pm 2\sqrt{3}$

f $x^2 = 18$ $x = \pm 3\sqrt{2}$

6 Solve for x.

a $x^2 + 16 = 25$ $-16 \quad -16$

b $x^2 + 6^2 = 100$ $-36 \quad -36$

c $12^2 + x^2 = 13^2$

d $x^2 + (3\sqrt{3})^2 = 36$ $3\cdot 3\sqrt{3}\cdot\sqrt{3}$ $9\sqrt{9}$ $x^2 + 27 = 36$ $-27 \quad -27$ $x^2 = 9$ $x = \pm 3$

e $(\sqrt{5})^2 + (\sqrt{11})^2 = x^2$

f $x^2 = (5\sqrt{3})^2 + (\sqrt{5})^2$

[a] $x^2 = 9$ $x = \pm 3$ [b] $x^2 = 64$ $x = \pm 8$

7 Solve for x.

a $x^2 - 5x - 6 = 0$

b $x^2 + 4x - 12 = 0$

c $x^2 - 8x + 15 = 0$

d $x^2 - 18 - 3x = 0$

e $x^2 - 36 = 9x$

f $-x^2 + 5x + 36 = 0$

8 Solve for x. Set = 0 first

a $x^2 - 4x = 0$

b $x^2 = 10x$

c $x^2 - 2x = 11x$

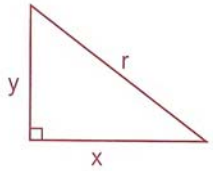
d $5x = x^2 - 3x$

9 If, in the given figure, $x^2 + y^2 = r^2$,

a Find x if $y = 21$ and $r = 29$

b Find y, in simplified radical form, if $x = 2$ and $r = 4$

c Find r to the nearest tenth if $x = 4.1$ & $y = 7.1$.



10 Solve for x.

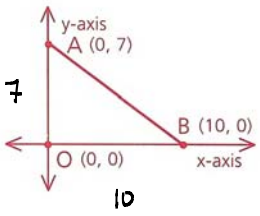
a $3x^2 + 5x - 7 = x^2 + 8x + 28$

b $12x^2 - 15 = -11x$

c $8x^2 - 7x + 9 = 2x^2 + 6x + 7$

11 Solve $\frac{7}{x+1} = \frac{2x+4}{3x-3}$ for x.

12 Find AB



Pyth Thm: In a rt Δ, $leg^2 + leg^2 = hyp^2$

$7^2 + 10^2 = AB^2$

$149 = AB^2$

$\sqrt{149} = AB$ EXACT

challenge

13 Simplify.

a $\sqrt{(h)^2}$, if h represents a negative number

b $\sqrt[2]{(x-3)^2}$, if $x < 3$

c $\sqrt{p^2q^2}$, if p and q both represent negative numbers

d $\sqrt{x^3y^2}$, if $x > 0$ and $y < 0$

$\sqrt[3]{27} = 27^{1/3} = (3^3)^{1/3} = 3$