7.3 Simplifying Radical Expressions.

72

$$\begin{array}{r} 16 \\ \times\ 27 \\ \hline 432 \end{array}$$

$$\sqrt{432} = \sqrt[2]{2^4 \cdot 3^3} = \sqrt{2^4 \cdot 3^{2+1}}$$

$$= \sqrt{2^4 \cdot 3^2 \cdot 3^1}$$

$$= \left(2^4 \cdot 3^2 \cdot 3^1\right)^{\frac{1}{2}}$$

$$= 2^{\frac{4}{2}} \cdot 3^{\frac{2}{2}} \cdot 3^{\frac{1}{2}}$$

$$= 2^2 \cdot 3^1 \sqrt{3}$$

$$= 12\sqrt{3}$$

Better for bigger problems

$$\begin{array}{r|l} 2 & 432 \\ 2 & 216 \\ 2 & 108 \\ 2 & 54 \\ 3 & 27 \\ 3 & 9 \\ & 3 \end{array}$$

$$\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3}$$

$$= 2 \cdot 2 \cdot 3\sqrt{3}$$

$$= 12\sqrt{3}$$

$$\sqrt{x^5 y^6 z^{27}} = \sqrt[2]{x^4 x^1 y^6 z^{26} z^1}$$

$$= x^{\frac{4}{2}} y^{\frac{6}{2}} z^{\frac{26}{2}} \sqrt{x^1 z^1}$$

$$= x^2 y^3 z^{13} \sqrt{xz}$$

$\sqrt[3]{x^5 y^6 z^{27}} = \sqrt[3]{x^3 x^2 y^6 z^{27}}$

$= x y^2 z^9 \sqrt[3]{x^2}$

$\sqrt[4]{x^5 y^6 z^{27}} = \sqrt[4]{x^4 x' y^4 y^2 z^{24} z^3}$

$x' y' z^6 \sqrt[4]{x y^2 z^3}$

$= x y z^6 \sqrt[4]{x y^2 z^3}$

#69 $\dfrac{3\sqrt{100x^2}}{2\sqrt{2x^{-1}}} =$

$= \dfrac{3 \cdot 10x}{2\sqrt{\frac{2}{x}}} = \dfrac{30x}{2\frac{\sqrt{2}}{\sqrt{x}}} = \dfrac{30x}{2} \cdot \dfrac{\sqrt{x}}{\sqrt{2}} = \dfrac{30x\sqrt{x}}{2\sqrt{2}}$

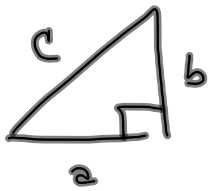
7.4

$= \dfrac{15x\sqrt{x}}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{15x\sqrt{x}\sqrt{2}}{2} = \dfrac{15x\sqrt{2x}}{2}$

$\sqrt{2 \cdot 2} = \sqrt{4} = 2$

Recall, we're assuming that all variables are nonnegative, else $\sqrt{100x^2} = 10|x|$, but we're not sweating $x<0$ situation, now.

An application:
Distance in the plane, courtesy of Pythagorus.



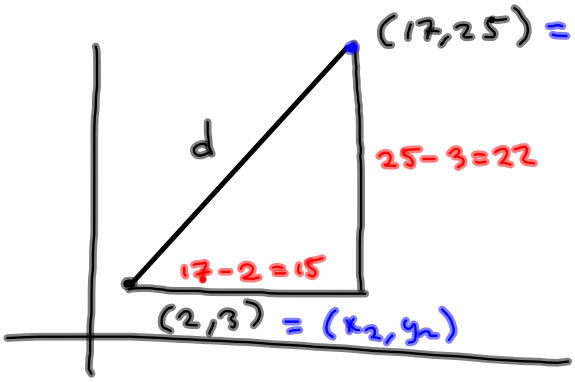
$c^2 = a^2 + b^2$

$\sqrt{c^2} = \sqrt{a^2+b^2}$

$|c| = \sqrt{a^2+b^2}$

$c = \pm\sqrt{a^2+b^2}$ & we always assume c is a positive distance, so

$c = \sqrt{a^2+b^2}$



$d = \sqrt{15^2 + 22^2}$

$= \sqrt{(17-2)^2 + (25-3)^2}$

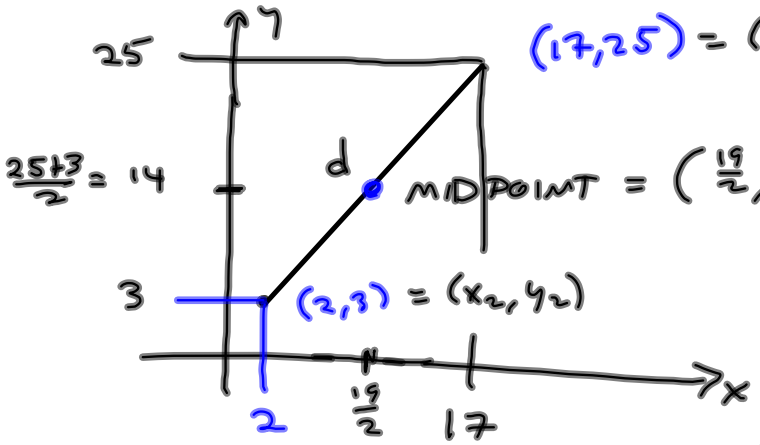
$= \sqrt{709}$

≈ 26.627

$\sqrt{(x_1-x_2)^2 + (y_1-y_2)^2} = \sqrt{(17-2)^2 + (25-3)^2}$

Distance between (x_1, y_1) & (x_2, y_2)

Midpoint



17+2/9 = 19/2

That's it for §7.3
Work a bunch of odds.

7.4 Adding & subtracting Radical Expressions.

2 Key skills

Collecting Like Terms

Simplifying Radicals

#s 1-44

$2\sqrt{50} + 3\sqrt{125} = 2 \cdot 5\sqrt{2} + 3 \cdot 5\sqrt{5}$

$= \boxed{10\sqrt{2} + 15\sqrt{5}}$

$\sqrt{2 \cdot 5 \cdot 5}$ $\sqrt{5^3}$ =

un-like terms

still unlike terms

$3\sqrt{3} - 2\sqrt{3} = \sqrt{3}$

Be careful how you write these!

$\frac{\sqrt{20x}}{9} + \sqrt{\frac{5x}{9}} = \frac{2\sqrt{5x}}{9} + \frac{\sqrt{5x}}{3}$

$\sqrt{\frac{5x}{9}}$ No

$= \frac{2\sqrt{5x}}{9} + \frac{\sqrt{5x}}{3} \cdot \frac{3}{3}$

$= \frac{2\sqrt{5x}}{9} + \frac{3\sqrt{5x}}{9} =$

$= \frac{2\sqrt{5x} + 3\sqrt{5x}}{9} = \boxed{\frac{5\sqrt{5x}}{9}}$

S 7.4 finish Friday

Quiz Monday

Scratch: $\sqrt{20x} = 2\sqrt{5x}$

$\sqrt{\frac{5x}{9}} = \frac{\sqrt{5x}}{\sqrt{9}} = \frac{\sqrt{5x}}{3}$

Radical of the quotient is the quotient of the radicals.