5.3 SQUARE ROOTS

Oct 12

Perfect squares are squares of positive integers.

n	1	2	3	4	5	6	7	8	9	10	11	12	13
n^2	1	4	9	16	25	36	49	64	81	100	121	144	169

A simplified square root has:

radical $\sqrt{\text{radicand}}$

- ☆ no perfect square factors > 1 in the radicand
- ☆ no fractions under the radical
- ☆ no radicals in the denominator of a fraction

examples

Simplify:

1. $\sqrt{160}$ $\quad \sqrt{16}\sqrt{10}$

   $4\sqrt{10}$

2. $2\sqrt{48} = 2\sqrt{16}\sqrt{3}$

   $2 \cdot 4\sqrt{3}$

   $= 8\sqrt{3}$

3. $5\sqrt{18} \cdot 3\sqrt{5}$

   $15\sqrt{90} = 45\sqrt{10}$

   $15\underbrace{\sqrt{9}}_{3}\sqrt{10}$

4. $\dfrac{6}{\underbrace{\sqrt{3}\cdot\sqrt{3}}_{\sqrt{9}}} \cdot \dfrac{\sqrt{3}}{} = \dfrac{6\sqrt{3}}{3} = 2\sqrt{3}$

5 $\sqrt{\frac{7}{20}} = \frac{\sqrt{7}}{\sqrt{20}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{35}}{\sqrt{100}} = \frac{\sqrt{35}}{10}$

$\frac{\sqrt{7}}{2\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{35}}{10}$

6 $\frac{4}{(\sqrt{5}-1)} \cdot \frac{(\sqrt{5}+1)}{(\sqrt{5}+1)} = \frac{}{5-1} = \frac{\cancel{4}(\sqrt{5}+1)}{\cancel{4}} = \sqrt{5}+1$

$(A-B)\ (A+B) = A^2 - B^2$

conjugates

$\frac{4\sqrt{5}+4}{\cancel{4}}$

7 $\frac{8}{(5+\sqrt{3})} \cdot \frac{(5-\sqrt{3})}{(5-\sqrt{3})} = \frac{}{25-3} = \frac{\overset{4}{\cancel{8}}(5-\sqrt{3})}{\underset{11}{\cancel{22}}} = \frac{20-4\sqrt{3}}{11}$

8 Factor over the real numbers: $3x^2 - 180$

$\sqrt{60}$

$\sqrt{4}\sqrt{15}$

$3(x^2-60)$

$3(x-2\sqrt{15})(x+2\sqrt{15})$

Solve for x over the real numbers:

9 $4x^2 + 7 = 135$

$4x^2 = 128$

$\sqrt{x^2} = \sqrt{32}$

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

10 $\frac{(x-4)^2}{5} = 10$

$\sqrt{(x-4)^2} = \sqrt{50}$

$\sqrt{25}\sqrt{2}$

$5\sqrt{2}$

$x-4 = \pm 5\sqrt{2}$

$x = 4 \pm 5\sqrt{2}$