8.5 Simplifying Radicals

List of the first 15 perfect squares:

1	4	9	16	25	36	49	64	81	100	121	144	169	196	225
1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2	13^2	14^2	15^2

$\sqrt{100} = \pm 10$ $\sqrt{16} = \pm 4$

$\sqrt{25} = \pm 5$

Simplify

1. $\sqrt{72} = 6\sqrt{2}$

$2 \quad 36$

$\sqrt{2} \cdot \sqrt{36}$

$= 6$

$\sqrt{72} = 2 \cdot 3\sqrt{2}$

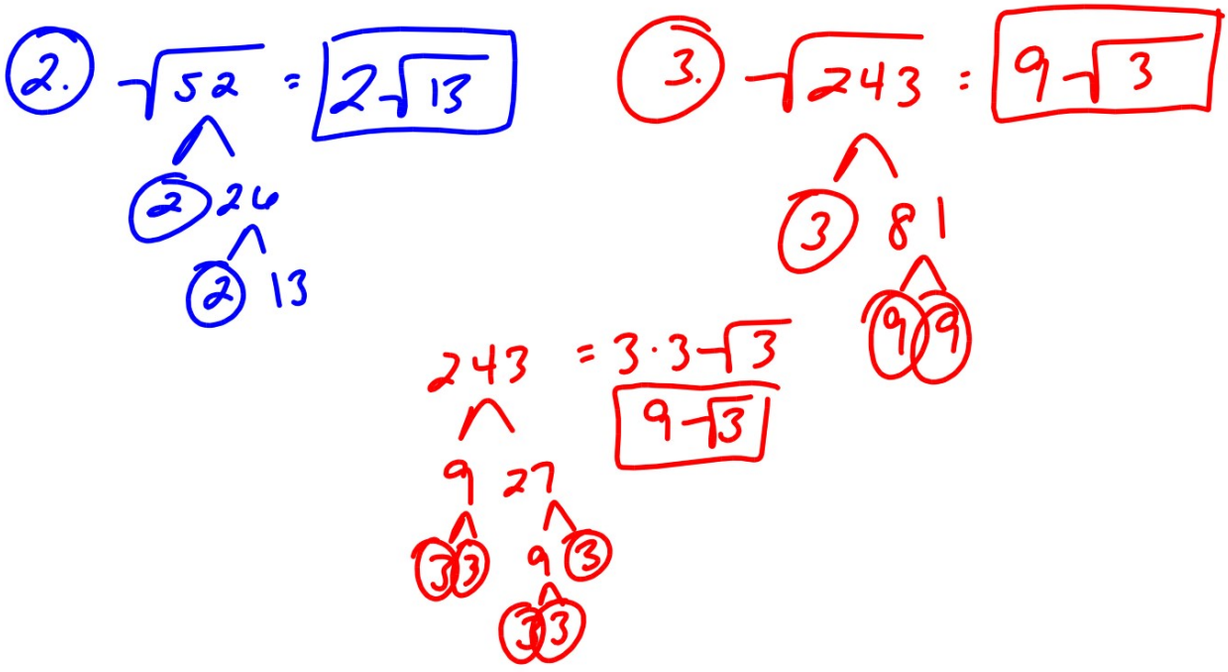
$6\sqrt{2}$

2 | 36

2 | 18

2 | 9

3 | 3


2. $\sqrt{52} = 2\sqrt{13}$
2 26
2 13
3. $\sqrt{243} = 9\sqrt{3}$
3 81
9 9
$243 = 3 \cdot 3\sqrt{3}$
$9\sqrt{3}$
9 27
3 3
9 3
3 3

4. $\sqrt{162} = \sqrt{2} \cdot \sqrt{81}$

$\sqrt{81} = 9$

$= 9\sqrt{2}$

$\sqrt{162} = \sqrt{6} \cdot \sqrt{27}$

$\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{3} \cdot \sqrt{9}$

$\sqrt{9} = 3$

3

$9\sqrt{2}$

5. $\sqrt{5} \cdot \sqrt{48} = 4\sqrt{15}$

$\sqrt{48}$

$\sqrt{2 \cdot 24}$

$\sqrt{(2 \cdot 2) \cdot 12}$

$\sqrt{(2 \cdot 2) \cdot 2 \cdot 6}$

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

$\sqrt{5} \cdot \sqrt{48}$

$\sqrt{240}$

$\sqrt{4} \cdot \sqrt{60}$

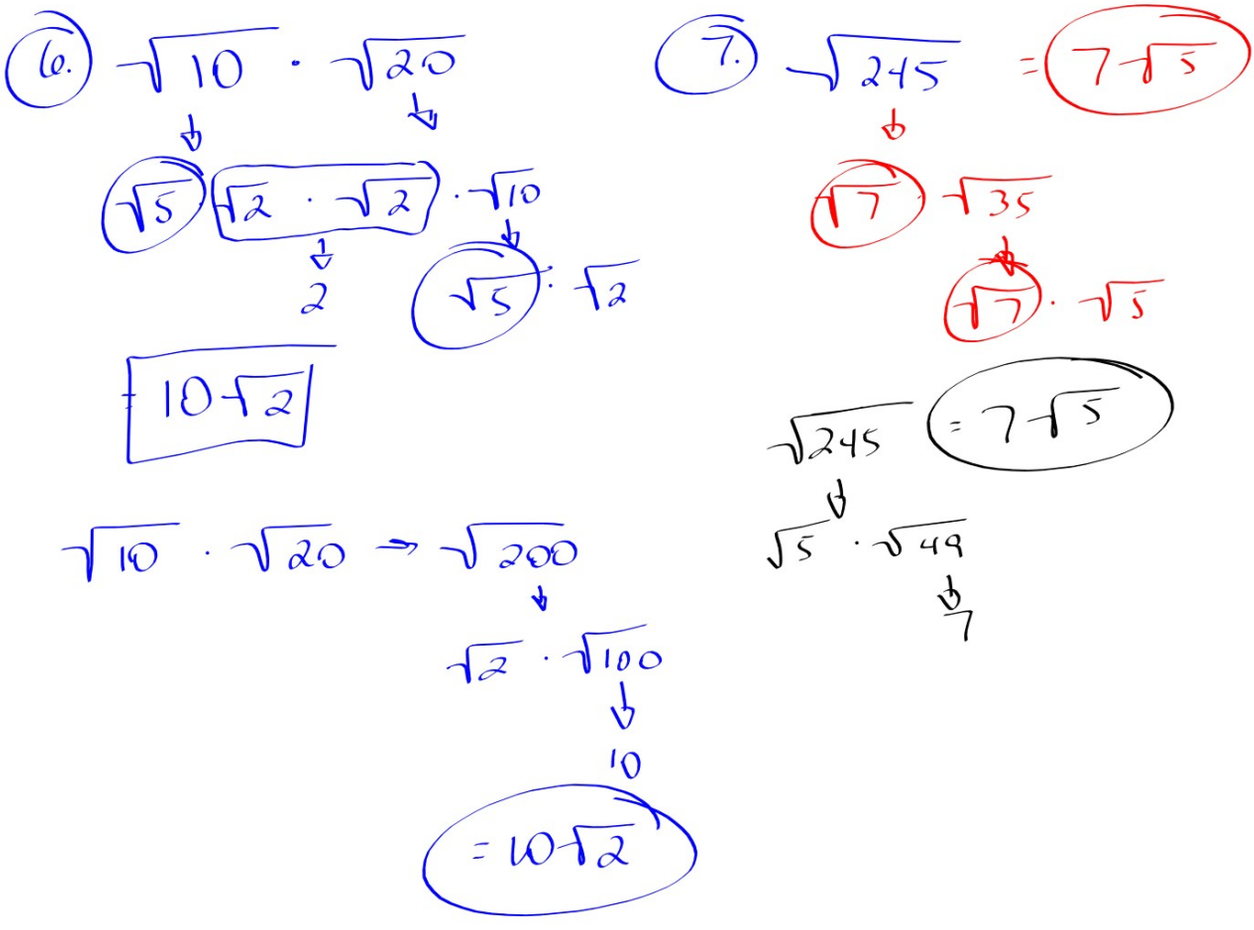
2

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

2

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

$4\sqrt{15}$


6.
√10 · √20
√5 √2 · √2 · √10
2
√5 · √2
10√2
√10 · √20 → √200
√2 · √100
10
= 10√2
7.
√245 = 7√5
√7 √35
√7 · √5
√245 = 7√5
√5 · √49
7

8. $\sqrt{\frac{24}{27}} \rightarrow \frac{\sqrt{24}}{\sqrt{27}} = \frac{2\sqrt{6}}{3\sqrt{3}}$

$\sqrt{24}$

$\sqrt{6} \cdot \sqrt{4}$

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

$\sqrt{27} = \sqrt{3} \cdot \sqrt{9}$

$= \sqrt{3} \cdot (3 \cdot 3)$

$\frac{\sqrt{24}}{\sqrt{27}} = \frac{\sqrt{8}}{\sqrt{9}} \rightarrow \sqrt{4} \cdot \sqrt{2} \rightarrow (2 \cdot 2) \cdot \sqrt{2}$

$\sqrt{9} \rightarrow (3 \cdot 3)$

Do not Reduce. $\frac{2\sqrt{2}}{3}$

9. $\sqrt{\frac{84}{121}} = \frac{2\sqrt{21}}{11}$

$\sqrt{84} = \sqrt{4} \cdot \sqrt{21}$

$= (2 \cdot 2) \cdot \sqrt{7} \cdot \sqrt{3}$