

*Simplifying Radicals

October 25, 2018 8:50 AM

SIMPLIFYING MIXED RADICALS...the extra stuff

NAME: _____

BLOCK: _____

Perfect Squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144 etc.

Perfect Cubes: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000 etc.

What is a mixed radical?? *simplified radical expression that includes BOTH an integer and a radical (eg. $3\sqrt{5}$)*
multiply

Write the following as a mixed radical (in simplest form)

1. $\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{4} \cdot \sqrt{2} = 2\sqrt{2}$
*2 * # that x to get 18... want at least 1 to be a perf. sq.*

2. $\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = 3\sqrt{2}$

3. $\sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$

4. $\sqrt{75} = \sqrt{25 \cdot 3} = \sqrt{25} \cdot \sqrt{3} = 5\sqrt{3}$

5. $3\sqrt{30}$
 Prime factorization of 30: $2 \cdot 3 \cdot 5$
all ready simplified. nothing is x^2

6. $\sqrt[3]{81} = \sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3} = \sqrt[3]{3 \cdot 3 \cdot 3} \cdot \sqrt[3]{3} = 3\sqrt[3]{3}$

7. $\sqrt{700} = \sqrt{7 \cdot 4 \cdot 25} = \sqrt{7} \cdot \sqrt{4} \cdot \sqrt{25} = \sqrt{7} \cdot 2 \cdot 5 = 10\sqrt{7}$

8. $8\sqrt{27} = 8\sqrt{9 \cdot 3} = 8\sqrt{9} \cdot \sqrt{3} = 8 \cdot 3 \cdot \sqrt{3} = 24\sqrt{3}$
2 perfect squares

9. $\sqrt[3]{6} \times \sqrt[3]{6} = \sqrt[3]{6 \cdot 6} = \sqrt[3]{36} = \sqrt[3]{9 \cdot 4} = \sqrt[3]{9} \cdot \sqrt[3]{4} = \sqrt[3]{9 \cdot 2} = \sqrt[3]{18} = \sqrt[3]{9 \cdot 2} = \sqrt[3]{9} \cdot \sqrt[3]{2} = 3\sqrt[3]{2}$

10. $\sqrt{36} = 6$

11. $6x\sqrt{8x^2} = 6 \cdot x \cdot \sqrt{8} \cdot \sqrt{x^2} = 6 \cdot x \cdot \sqrt{4 \cdot 2} \cdot x = 6 \cdot x \cdot 2 \cdot \sqrt{2} \cdot x = 12x^2\sqrt{2}$

12. $\sqrt[3]{64}$

13. $\sqrt{45}$

14. $\sqrt[3]{16}$

15. $\sqrt{1100}$

16. $\sqrt{64x^3}$

Answers on next page

SIMPLIFYING MIXED RADICALS...the extra stuff

NAME: Key.

BLOCK: _____

Perfect Squares: 4, 9, 16, 25, 36, 49, 64, 100, 121, 144, 169, 196, 225..

Perfect Cubes: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, ...

What is a mixed radical??

a simplified radical expression that includes both an integer + a radical. (eg. $3\sqrt{5}$)

Write the following as a mixed radical (in simplest form).

1. $\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{4} \cdot \sqrt{2} = 2\sqrt{2}$
pull out the perfect square

9. $\sqrt[3]{6} \times \sqrt[3]{6} = 6 \cdot 6 \cdot \sqrt[3]{6} \cdot \sqrt[3]{6}$
 $18 \cdot \sqrt[3]{6 \cdot 6} = 18 \cdot \sqrt[3]{36}$
 $18 \cdot \sqrt[3]{9 \cdot 4} = 18 \cdot 3 \cdot \sqrt[3]{4} = 54\sqrt[3]{4}$

2. $\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = 3\sqrt{2}$

10. $\sqrt{36} = 6$



3. $\sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$

11. $6x\sqrt{8x^2} = 6 \cdot x \cdot \sqrt{8} \cdot \sqrt{x^2}$
 $6 \cdot x \cdot \sqrt{4 \cdot 2} \cdot x$
 $6 \cdot x \cdot 2 \cdot \sqrt{2} \cdot x = 12x^2\sqrt{2}$
(Note: $x^2 = x$)

4. $\sqrt{75} = \sqrt{25 \cdot 3} = \sqrt{25} \cdot \sqrt{3} = 5\sqrt{3}$

12. $\sqrt[3]{64} = 4$ perfect cube.

5. $3\sqrt{30}$
 Prime factorization of 30: 3, 10, 2, 5. *no factoral 30 is a perfect square*
 $\therefore 3\sqrt{30}$

13. $\sqrt{45} = \sqrt{9 \cdot 5} = \sqrt{9} \cdot \sqrt{5} = 3\sqrt{5}$

cube root (checklist)

6. $\sqrt[3]{81} = \sqrt[3]{27 \cdot 3} = \sqrt[3]{27} \cdot \sqrt[3]{3} = 3\sqrt[3]{3}$

14. $\sqrt[3]{16} = \sqrt[3]{8 \cdot 2} = \sqrt[3]{8} \cdot \sqrt[3]{2} = 2\sqrt[3]{2}$

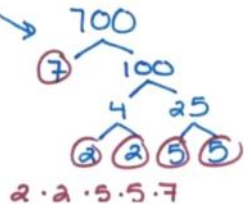
if you don't know the multiples.

7. $\sqrt{700} = 10\sqrt{7}$

15. $\sqrt{1100} = \sqrt{100 \cdot 11} = \sqrt{100} \cdot \sqrt{11} = 10\sqrt{11}$

8. $8\sqrt{27} = 8 \cdot \sqrt{9 \cdot 3} = 8 \cdot 3 \cdot \sqrt{3} = 24\sqrt{3}$

16. $\sqrt{64x^3} = \sqrt{64 \cdot x^3} = \sqrt{64} \cdot \sqrt{x^3} = 8 \cdot x\sqrt{x} = 8x\sqrt{x}$
NOTE: $\sqrt{x^3} = \sqrt{x^2 \cdot x} = x\sqrt{x}$



$\sqrt{700} = \sqrt{2 \cdot 2 \cdot 5 \cdot 5 \cdot 7}$
 $= \sqrt{4 \cdot 25 \cdot 7}$
 $= 2 \cdot 5 \cdot \sqrt{7} = 10\sqrt{7}$

SIMPLIFYING RADICAL EXPRESSIONS

Perfect Squares: 1, 4, 9, 16, 25, 36, 49, 64, 100, 121, 1, 144...

$x^2, x^4, x^6, \underline{x^8}, \underline{x^{10}}$... Exponents must be positive

$\sqrt{25}$ is read "the square root of 25".

$\sqrt{25} = 5$ because $5^2 = 25$ $\sqrt{36} = 6$ because $6^2 = 36$ $\sqrt{100} = \underline{10}$ $\sqrt{49} = \underline{7}$

$\sqrt{a^6} = a^3$ because $(a^3)^2 = a^6$ $\sqrt{m^{16}} = m^8$ because $(m^8)^2 = m^{16}$ $\sqrt{y^{10}} = \underline{y^5}$ $\sqrt{a^2} = \underline{a}$

Hint: Divide the exponent by 2.

In the expression \sqrt{a} , the $\sqrt{\quad}$ is called the radical and a is called the radicand.

Simplify (Simplifying Perfect Squares):

1. $\sqrt{4} = \underline{2}$ 2. $\sqrt{16} = \underline{4}$ 3. $-\sqrt{100} = \underline{-10}$ 4. $\sqrt{a^8} = a^4$ 5. $\sqrt{w^{12}} = w^6$

6. $\sqrt{a^6 b^{10}} = \underline{a^3 b^5}$ 7. $\sqrt{9a^2} = \underline{3a}$ 8. $-\sqrt{81m^{64}} = \underline{-9m^{32}}$ 9. $\sqrt{49a^4 b^{12}} = \underline{7a^2 b^6}$ 10. $\sqrt{121x^{14}y^6} = \underline{11x^7 y^3}$

Simplify (Simplifying Radicals that are not Perfect Squares):

1. $\sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5}$ 2. $\sqrt{27} = \sqrt{9 \cdot 3} = 3\sqrt{3}$ 3. $\sqrt{48} = \sqrt{16 \cdot 3} = 4\sqrt{3}$

4. $\sqrt{45} = \sqrt{9 \cdot 5} = \underline{3\sqrt{5}}$ 5. $\sqrt{12} = \sqrt{4 \cdot 3} = \underline{2\sqrt{3}}$ 6. $\sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$

7. $\sqrt{a^5} = \sqrt{a^4 \cdot a} = a^2\sqrt{a}$ 8. $\sqrt{x^9} = \sqrt{x^8 \cdot x} = \underline{x^4\sqrt{x}}$ 9. $\sqrt{x^3} = \sqrt{x^2 \cdot x} = x\sqrt{x}$

Simplify:

1. $\sqrt{18} = 3\sqrt{2}$ 2. $\sqrt{125} = \sqrt{25 \cdot 5} = 5\sqrt{5}$ 3. $\sqrt{72} = \sqrt{9 \cdot 8} = 3\sqrt{8}$ 4. $\sqrt{180} = \sqrt{36 \cdot 5} = 6\sqrt{5}$ 5. $\sqrt{a^3} = \sqrt{a^2 \cdot a} = a\sqrt{a}$

6. $\sqrt{b^7} = \sqrt{b^6 \cdot b} = b^3\sqrt{b}$ 7. $\sqrt{m^{11}} = \sqrt{m^{10} \cdot m} = m^5\sqrt{m}$ 8. $\sqrt{75x^7y^5} = \sqrt{25 \cdot 3 \cdot x^6 \cdot x \cdot y^4 \cdot y} = 5x^3y^2\sqrt{3xy}$ 9. $\sqrt{27a^{11}b^7} = \sqrt{9 \cdot 3 \cdot a^{10} \cdot a \cdot b^6 \cdot b} = 3a^5b^3\sqrt{3ab}$ 10. $\sqrt{32a^7b^4} = \sqrt{4 \cdot 8 \cdot a^6 \cdot a \cdot b^4} = 2a^3b^2\sqrt{8a}$

11. $\sqrt{9a^8} = 3a^4$ 12. $\sqrt{45a^7} = 3a^3\sqrt{5a}$ 13. $\sqrt{36x^2y^6} = 6xy^3$ 14. $\sqrt{12x^{20}y^8} = 2x^{10}y^4\sqrt{3}$ 15. $-\sqrt{200} = -10\sqrt{2}$

16. $\sqrt{196} = 14$ 17. $\sqrt{63x^4y} = \sqrt{9 \cdot 7 \cdot x^4 \cdot y} = 3x^2\sqrt{7y}$ 18. $\sqrt{6x^3} = x\sqrt{6x}$ 19. $\sqrt{100x^5y} = 10x^2\sqrt{xy}$ 20. $\sqrt{80x^{100}y^{49}} = \sqrt{16 \cdot 5 \cdot x^{100} \cdot y^{48} \cdot y} = 4x^{50}y^{24}\sqrt{5y}$