

Lesson 11-2b

Objective- To simplify square roots involving variables.

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

when $x = 3$

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

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

$$\sqrt{9} = 3$$

$$3 = 3$$

True!

$\sqrt{x^2} = x$ for non-negative values of x only!

when $x = -3$

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

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

$$\sqrt{9} = -3$$

$$3 \neq -3$$

False!

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

when $x = -3$

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

$$\sqrt{(-3)^2} = |-3|$$

$$\sqrt{9} = 3$$

$$3 = 3$$

True!

Follow the Pattern!

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

$$\sqrt{x^3} = x\sqrt{x}$$

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

$$\sqrt{x^5} = x^2\sqrt{x}$$

$$\sqrt{x^6} = |x^3|$$

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

$$\sqrt{x^8} = x^4$$

$$\sqrt{x^9} = x^4\sqrt{x}$$

$$\sqrt{x^{10}} = |x^5|$$

$$\sqrt{x^{11}} = x^5\sqrt{x}$$

$$\sqrt{x^{12}} = x^6$$

$$\sqrt{x^{13}} = x^6\sqrt{x}$$

Simplify.

$$\sqrt{x^{14}} = |x^7|$$

$$\sqrt{x^{15}} = x^7\sqrt{x}$$

$$\sqrt{x^{16}} = x^8$$

$$\sqrt{x^{17}} = x^8\sqrt{x}$$

$$\sqrt{x^{18}} = |x^9|$$

$$\sqrt{x^{19}} = x^9\sqrt{x}$$

$$\sqrt{x^{20}} = x^{10}$$

$$\sqrt{x^{21}} = x^{10}\sqrt{x}$$

$$\sqrt{x^{22}} = |x^{11}|$$

$$\sqrt{x^{23}} = x^{11}\sqrt{x}$$

$$\sqrt{x^{24}} = x^{12}$$

$$\sqrt{x^{25}} = x^{12}\sqrt{x}$$

Simplify.

$$1) \sqrt{x^{50}} = |x^{25}|$$

$$2) \sqrt{x^{84}} = x^{42}$$

$$3) \sqrt{x^{101}} = x^{50}\sqrt{x}$$

$$4) \sqrt{x^{103}} = x^{51}\sqrt{x}$$

$$5) \sqrt{x^{253}} = x^{126}\sqrt{x}$$

$$6) \sqrt{x^{482}} = |x^{241}|$$

Simplify.

$$1) \sqrt{18x^{10}}$$

$$\sqrt{9 \cdot 2 \cdot x^{10}}$$

$$3|x^5|\sqrt{2}$$

$$3|x^5|\sqrt{2}$$

$$2) \sqrt{24x^{11}}$$

$$\sqrt{4 \cdot x^{10} \cdot 6 \cdot x^1}$$

$$2x^5\sqrt{6x}$$

Simplify.

$$3) \sqrt{40a^{31}}$$

$$\sqrt{4a^{30} \cdot 10a}$$

$$2a^{15}\sqrt{10a}$$

$$4) \sqrt{8y^{50}}$$

$$\sqrt{4y^{50} \cdot 2}$$

$$2|y^{25}|\sqrt{2}$$

$$5) \sqrt{32x^3y^{10}}$$

$$\sqrt{16x^2y^{10} \cdot 2x}$$

$$4x|y^5|\sqrt{2x}$$

$$6) \sqrt{45a^9b^{20}}$$

$$\sqrt{9a^8b^{20} \cdot 5a}$$

$$3a^4b^{10}\sqrt{5a}$$

Lesson 11-2b (cont.)

Simplify. Assume all variables are non-negative.

$$7) \sqrt{12a^2b^7}$$

$$\sqrt{4a^2b^6 \cdot 3b}$$

$$2ab^3\sqrt{3b}$$

$$9) \sqrt{8x^5y^{19}}$$

$$\sqrt{4x^4y^{18} \cdot 2xy}$$

$$2x^2y^9\sqrt{2xy}$$

$$8) \sqrt{50m^6n^8}$$

$$\sqrt{25m^6n^8 \cdot 2}$$

$$5m^3n^4\sqrt{2}$$

$$10) \sqrt{75a^5b^{10}}$$

$$\sqrt{25a^4b^{10} \cdot 3a}$$

$$5a^2b^5\sqrt{3a}$$

Roots of Perfect Square Trinomials

If $\sqrt{x^2} = |x|$, then $\sqrt{(n+1)^2} = |n+1|$

Simplify.

$$1) \sqrt{(x-4)^2} = |x-4|$$

$$4) \sqrt{x^2 - 6x + 9} =$$

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

$$\sqrt{(x-3)^2} = |x-3|$$

$$5) \sqrt{m^2 + 10m + 25} =$$

$$3) \sqrt{(y-5)^2} = |y-5|$$

$$\sqrt{(m+5)^2} = |m+5|$$

Simplify. Assume all variables are non-negative.

$$6) \sqrt{x^2 - 8x + 16}$$

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

$$(x-4)$$

$$8) \sqrt{t^2 + 18t + 81}$$

$$\sqrt{(t+9)^2}$$

$$(t+9)$$

$$7) \sqrt{2y^2 - 12y + 18}$$

$$\sqrt{2(y^2 - 6y + 9)}$$

$$\sqrt{2(y-3)^2}$$

$$(y-3)\sqrt{2}$$

$$9) \sqrt{3m^2 - 6m + 3}$$

$$\sqrt{3(m^2 - 2m + 1)}$$

$$\sqrt{3(m-1)^2}$$

$$(m-1)\sqrt{3}$$