## 11-1a Simplifying Radicals

adical symbol  $\sqrt{\ }$  indicates a square root. The expression under the radical sign is the radicand. If the radicand is a <u>perfect square</u>, the result will be an integer (Ex.  $\sqrt{16} = 4$ ). You will need to memorize the perfect squares in order to simplify radicals that are not perfect squares.

The number 50 is not a perfect square, so if you evaluate  $\sqrt{50}$  you get 7.071067812.

The important thing to remember is that each of these radicals will have a decimal equal to it. Considering this fact, answer the following multiple choice Regents Question.

#### Example

- 1. What is  $2\sqrt{45}$  expressed in simplest radical form?
- (1)  $3\sqrt{5}$
- (2)  $5\sqrt{5}$



(4)  $18\sqrt{5}$ 

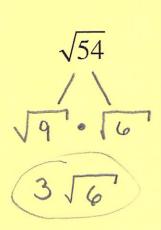
The reason we want to Simplify Radicals is the same reason why we reduce fractions into their lowest terms. You can simplify a radical expression by removing the perfect-square factors from the radicand. To do this we use:

#### Multiplication Property of Square Roots

For every number,  $a \ge 0$ , and  $b \ge 0$ ,

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

- 1. Start by dividing the radicand by 2. Continue with 3, 4, etc. until a perfect square appears.
- 2. Split the Square Root into two separate square roots, with the first being the perfect square.
- 3. Simplify the Perfect Square root.



## Perfect

## Squares

### Variable

# Square Roots

Practice:

## $1.\sqrt{192}$

$$2. \sqrt{98}$$

$$\sqrt{1} = 1$$

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

$$\sqrt{4} = 2$$

$$\sqrt{x^2} = (X^1)$$

$$\sqrt{9} = 3$$

$$\sqrt{x^3} = \chi^{0.5} = \chi \chi \chi$$

4. 
$$\sqrt{75}$$

$$\sqrt{16} = 4$$

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

$$\sqrt{25} = 5$$

$$\sqrt{36} = 6$$

$$\sqrt{x^5} = \chi^{2.5} \left( \chi^2 \right) \times \sqrt{x^6} = \left( \chi^3 \right)$$

$$\sqrt{49} = 7$$

$$\sqrt{x^7} = \chi^{3.5} = \chi^{3} \sqrt{x}$$

$$\sqrt{108b^4}$$

$$\sqrt{81} = 9$$

 $\sqrt{64} = 8$ 

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

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$$\sqrt{100} = 10$$

$$\sqrt{x^9} = \chi^{4.5} \left( \chi^{4} \sqrt{\chi} \right)$$

$$\sqrt{|z|} = 11$$

 $\sqrt{144} = 12$ 

 $\sqrt{169} = 13$ 

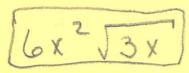
 $\sqrt{196} = 14$ 

$$\sqrt{x^{10}} = (\chi^5)$$

6. 
$$3\sqrt{12x^5}$$

$$\sqrt{225} = 15$$

$$\sqrt{256} = 16$$



<sup>1</sup>. What is  $3\sqrt{250}$  expressed in simplest radical form?

- (1)  $5\sqrt{10}$
- (2)  $8\sqrt{10}$
- (3)  $15\sqrt{10}$
- (4)  $75\sqrt{10}$

2. What is  $\sqrt{72}$  expressed in simplest radical form?

- (1)  $2\sqrt{18}$
- (2)  $3\sqrt{8}$

(3)  $6\sqrt{2}$ 

(4)  $8\sqrt{3}$ 

Simplify each Radical.

3. 
$$\sqrt{200}$$

4. 
$$\sqrt{28}$$

$$5. \sqrt{147}$$

6. 
$$\sqrt{320}$$

$$7. \sqrt{20a^5}$$

8. 
$$\sqrt{96x^8y^3}$$