EXAMPLE 6 Multiply radical expressions

a. $\sqrt{5}(4 - \sqrt{20}) = 4\sqrt{5} - \sqrt{5} \cdot \sqrt{20}$ **Distributive property**

$= 4\sqrt{5} - \sqrt{100}$ **Product property of radicals**

$= 4\sqrt{5} - 10$ **Simplify.**

b. $(\sqrt{7} + \sqrt{2})(\sqrt{7} - 3\sqrt{2})$

$= (\sqrt{7})^2 + \sqrt{7}(-3\sqrt{2}) + \sqrt{2} \cdot \sqrt{7} + \sqrt{2}(-3\sqrt{2})$ **Multiply.**

$= 7 - 3\sqrt{7 \cdot 2} + \sqrt{7 \cdot 2} - 3(\sqrt{2})^2$ **Product property of radicals**

$= 7 - 3\sqrt{14} + \sqrt{14} - 6$ **Simplify.**

$= 1 - 2\sqrt{14}$ **Simplify.**

REVIEW FOIL METHOD
For help with the FOIL method, see p. 562.

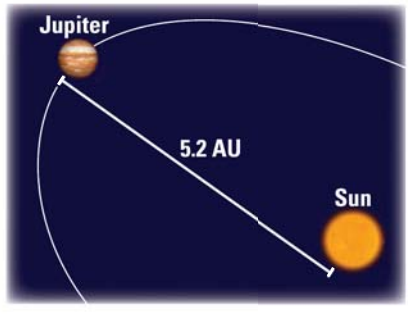
Animated Algebra at classzone.com

EXAMPLE 7 Solve a real-world problem

ASTRONOMY The orbital period of a planet is the time that it takes the planet to travel around the sun. You can find the orbital period P (in Earth years) using the formula $P = \sqrt{d^3}$ where d is the average distance (in astronomical units, abbreviated AU) of the planet from the sun.

a. Simplify the formula.

b. Jupiter's average distance from the sun is shown in the diagram. What is Jupiter's orbital period?



Not drawn to scale

Solution

a. $P = \sqrt{d^3}$ **Write formula.**

$= \sqrt{d^2 \cdot d}$ **Factor using perfect square factor.**

$= \sqrt{d^2} \cdot \sqrt{d}$ **Product property of radicals**

$= d\sqrt{d}$ **Simplify.**

b. Substitute 5.2 for d in the simplified formula.

$P = d\sqrt{d} = 5.2\sqrt{5.2}$

▶ The orbital period of Jupiter is $5.2\sqrt{5.2}$, or about 11.9, Earth years.

GUIDED PRACTICE for Examples 6 and 7

7. Simplify the expression $(4 - \sqrt{5})(1 - \sqrt{5})$.

8. **ASTRONOMY** Neptune's average distance from the sun is about 6 times Jupiter's average distance from the sun. Is the orbital period of Neptune 6 times the orbital period of Jupiter? *Explain*.