8 Algebra CC

**Essential Question:** What types of numbers result from multiplying rational and irrational numbers?

**Do Now:** Determine if each statement is true or false. Use the order of operations to evaluate each side of the equation.

a) $\sqrt{4}\cdot\sqrt{9}=\sqrt{36}$

$2\cdot3=6$

$6=6$

True

b) $5\cdot3\sqrt{4}=15\sqrt{4}$

$15\sqrt{4}=15\sqrt{4}$

True

c) $6\sqrt{9}\cdot2\sqrt{4}=12\sqrt{36}$

$6(3)\cdot2(2)=12(6)$

$18\cdot4=72$

$72=72$

True

**How do we multiply radical expressions?**

**Rule:** $a\sqrt{b}\cdot c\sqrt{d}=ac\sqrt{bd}$

1st: Multiply Coefficients

2nd: Multiply Radicands

***Never* multiply a coefficient and a radicand**

Multiply the radical expressions below. Simplify if possible.

1) $\sqrt{2}\cdot\sqrt{5}$

$\sqrt{10}$

2) $\sqrt{3}\cdot\sqrt{15}$

$\sqrt{45}$

$\sqrt{9}\sqrt{5}$

$3\sqrt{5}$

3) $6\sqrt{7}\cdot4\sqrt{2}$

$24\sqrt{14}$

What type of number is the result of the product of two rational numbers?

a) $5\times10$

50

rational

b) $\frac{1}{2}\times\frac{5}{9}$

$\frac{5}{18}$

rational

c) $-8.\overline{2}\times0$

0

rational

d) $\sqrt{4}\times\sqrt{25}$

$2\cdot5$

10

rational

**Conclusion:**

The **product** of two **rational** numbers is always a rational number.

What type of number is the result of the product of a rational number and an irrational number?

a) $6 \times \sqrt{2}$ — $6\sqrt{2}$ — irrational

b) $\pi \times 100$ — $100\pi$ — irrational

c) $\sqrt{4} \times \sqrt{5}$ — $2\sqrt{5}$ — irrational

d) $0 \times \sqrt{18}$ — $0$ — rational

**Conclusion:**

The **product** of a **non-zero rational** number and an **irrational** number is always an irrational number.

What type of number is the result of the product of two irrational numbers?

a) $\pi \times \pi$ — $\pi^2$ — irrational

b) $\sqrt{2} \times \sqrt{5}$ — $\sqrt{10}$ — irrational

c) $\sqrt{2} \times \sqrt{8}$ — $\sqrt{16}$ — $4$ — rational

d) $(\sqrt{7})^2$ — $\sqrt{49}$ — $7$ — rational

e) $\pi \times \frac{1}{\pi}$ — $\frac{\pi}{\pi}$ — $1$ — rational

**Conclusion:**

The **product** of **two irrational** numbers can result in a rational number or an irrational number.

**Remember:**

$R \bullet R =$ R

$I \bullet R =$ I $(R \neq 0)$

$I \bullet I =$ R or I

**The TAKE AWAY**

**Sums and Products of Rational and Irrational Numbers**

- Addition of two rational numbers will result in a sum that is a(n) rational number.
- Multiplication of two rational numbers will result in a product that is a(n) rational number.
- Addition of a rational number and an irrational number will result in a(n) irrational sum.
- Multiplication of a non-zero rational number and an irrational number results in a(n) irrational product.
- The sum or product of two irrational numbers may be rational or irrational.