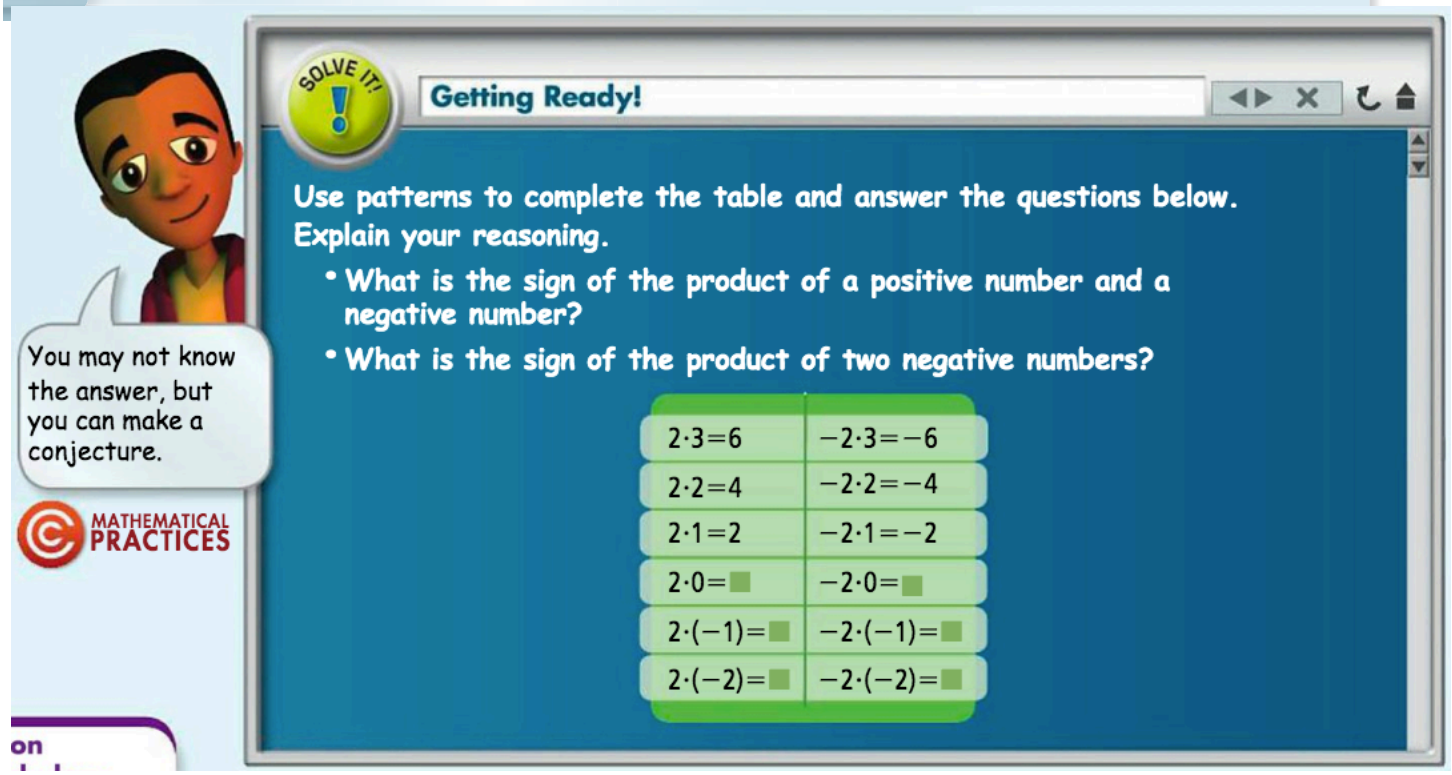
1-6 Multiplying and Dividing Real Numbers



The rules for multiplying real numbers are related to the properties of real numbers and the definitions of operations.

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KEY CONCEPT: MULTIPLYING REAL NUMBERS

The product of two real numbers with different signs is *negative*.

Examples: $2(-3) = -6$ $-2(3) = -6$

The product of two real numbers with the same sign is *positive*.

Examples: $2(3) = 6$ $(-2)(-3) = 6$

PROBLEM 1: MULTIPLYING REAL NUMBERS

What is each product?

a) 12(-8)

b). 24(0.5)

c). $-\frac{3}{4} \cdot \frac{1}{2}$

d). $(-3)^2$

e) 6(-15)

f). 12(0.2)

g). $\frac{7}{10}\left(-\frac{1}{2}\right)$

h). $(-4)^2$

Notice that $(-3)^2$ in part (d) of Problem 1. Recall from Lesson 1-3 that *a* is a square root of *b* if $a^2=b$. So -3 is a square root of 9. A negative square root is represented by $-\sqrt{\ }$. Every positive real number has a positive and a negative square root. The symbol $\pm$ in front of the radical indicates both square roots.

PROBLEM 2: SIMPLIFYING SQUARE ROOT EXPRESSIONS

What is the simplified form of each expression?

a) $-\sqrt{25}$

b). $\pm\sqrt{\frac{4}{49}}$

c). $\sqrt{81}$

d). $\sqrt{-16}$

e) $\sqrt{64}$

f). $\pm\sqrt{4}$

g). $-\sqrt{121}$

h). $\pm\sqrt{\frac{1}{36}}$

KEY CONCEPT: DIVIDING REAL NUMBERS

The quotient of two real numbers with different signs is *negative*.

Examples: $-20 \div 5 = -4$ $20 \div (-5) = -4$

The quotient of two real numbers with the same sign is *positive.*

Examples: $20 \div 5 = 4$ $-20 \div (-5) = 4$

PROBLEM 3: DIVIDING REAL NUMBERS

a) A sky diver's elevation changes by -3600 ft in 4 min after the parachute opens. What is the average change in the sky diver's elevation each minute?

b) You make five withdrawals of equal amounts from your bank account. The total amount you withdraw is $520. What is the change in your account balance each time you make a withdrawal?

PROPERTY: INVERSE PROPERTY OF MULTIPLICATION

For every nonzero real number *a*, there is a ***multiplicative inverse*** $\frac{1}{a}$ such that $a\left(\frac{a}{a}\right)$=1

Example: The multiplicative inverse of -4 is $-\frac{1}{4}$ because $-4\left(-\frac{1}{4}\right) = 1$.

The ***reciprocal*** *of a nonzero real number of the form* $\frac{a}{b}$ *is* $\frac{b}{a}$. The product of a number and its reciprocal is 1, so the reciprocal of a number is its multiplicative inverse. This allows are rule for dividing fractions.

KEY CONCEPT: DIVIDING FRACTIONS

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$$

When dividing with fractions, rewrite the problem as the multiplication by the reciprocal of the denominator.

PROBLEM 4: DIVIDING FRACTIONS

Simplify.

a) $\frac{-\frac{3}{4}}{-\frac{2}{3}}$ b). $\frac{\frac{4}{5}}{-\frac{5}{3}}$ c). $-7 \div \frac{7}{3}$ d). $\frac{3}{8} \div 3$

e) $\frac{\frac{2}{3}}{-\frac{1}{4}}$ f). $20 \div \frac{1}{4}$ g). $\frac{2}{7} \div \left(-\frac{20}{21}\right)$