KEY

2.6 Divide Real Numbers

Goal • Divide real numbers.

Your Notes

VOCABULARY

Multiplicative inverse means the same as a reciprocal.

DO NOT Change the sign!

ZERO HAS NO RECIPROCAL. WHY?

$\frac{0}{1} \rightarrow \frac{1}{0}$ UNDEFINED

What are the reciprocals for the following?

TRY THESE

(a) $-4/3 \rightarrow \boxed{-3/4}$

(b) $-5/1 \rightarrow \boxed{-1/5}$

(c) $2\frac{1}{2} \rightarrow \frac{5}{2} = \boxed{\frac{2}{5}}$

FLIP THE FRACTION

Keep the SIGN

INVERSE PROPERTY OF MULTIPLICATION

Words

The PRODUCT of a nonzero number and its multiplicative inverse is 1.

Algebra

$a \cdot \frac{1}{a} = 1$, $a \neq 0$

Numbers

$4 \cdot \frac{1}{4} = 1$

Example 1 ***Find multiplicative inverses of numbers***

Identify the multiplicative inverse and justify your answer.

Solution

The # times its reciprocal

Number	Multiplicative inverse	Reason
a. 9	$1/9$	$\frac{9}{1} \cdot \frac{1}{9} = \frac{9}{9} = 1$ ✓
b. $-\frac{5}{6}$	$-6/5$	$\frac{-5}{6} \cdot \frac{-6}{5} = \frac{+30}{30} = 1$ ✓

Your Notes

Checkpoint Find the multiplicative inverse.

1. $-\frac{2}{3}$	2. 3
$-3/2$	$1/3$

DIVISION RULE a and b are variables

Words

To divide a number "a" by a nonzero number "b," multiply "a" by the multiplicative inverse of "b". aka reciprocal

Algebra DEFINITION OF DIVISION

$a \div b = a \cdot \frac{1}{b}$, $b \neq$ 0

Division - Multiply by the reciprocal.

Numbers

$7 \div 3 = \frac{7}{1} \cdot \frac{1}{3} = \frac{7}{3} = 2\frac{1}{3}$

FRACTIONS - Can keep as improper but must reduce!!

You cannot divide a real number by 0, because 0 does not have a multiplicative inverse.

THE SIGN OF A QUOTIENT

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

The quotient of two real numbers with different signs is NEGATIVE.

The quotient of 0 and any nonzero real number is ZERO $\left(\frac{0}{\#}\right)$

DIVISION WITH ZERO

(a) $\frac{0}{5} = 0$

(b) $\frac{5}{0}$ = UNDEFINED

Example 2 *Divide real numbers*

Find the quotient.

Solution

RECIPROCAL

a. $25 \div 5 = \frac{25}{1} \cdot \frac{1}{5} = \frac{25}{5} = 5$

b. $-40 \div \frac{2}{3} = \frac{-40}{1} \cdot \frac{3}{2} = \frac{-120}{2} = -60$

Your Notes

Checkpoint Find the quotient.

3. $\frac{1}{2} \div \frac{3}{4} =$	4. $16 \div \left(-\frac{1}{4}\right) =$
$\frac{1}{2} \cdot \frac{4}{3} = \frac{4}{6}$	$16 \cdot \frac{-4}{1} =$
reduce → 2/3	−64

Example 3 ***Simplify an expression***

Simplify the expression $\frac{48y - 32}{8}$.

Solution METHOD I

$\frac{48y - 32}{8} = (48y - 32) \div 8$	Rewrite fraction as division.
$= (48y - 32) \cdot \frac{1}{8}$	Division rule
$= 48y \cdot \frac{1}{8} - 32 \cdot \frac{1}{8}$	Distributive property
$= 6y - 4$	Simplify.

METHOD II

$\frac{48y - 32}{8} = \frac{48y}{8} + \frac{-32}{8}$ mental step

$= 6y - 4$

Checkpoint Simplify the expression.

5. $\frac{3a + 4}{2}$	6. $\frac{12x - 8}{4}$
$\frac{3}{2}a + 2$ or $1.5a + 2$	$3x - 2$

Homework

2.7 Find Square Roots and Compare Real Numbers

Goal • Find square roots and compare real numbers.

Your Notes

VOCABULARY

Square root – SEE DEFINITION BELOW

EXAMPLES

(a) $5^2 = 25 \longrightarrow \sqrt{25} = 5 \rightarrow 5$ IS THE SQUARE ROOT OF 25

(b) $(-5)^2 = 25 \rightarrow -\sqrt{25} = -5 \rightarrow -5$ IS ALSO THE SQUARE ROOT OF 25.

Radicand IS THE NUMBER OR EXPRESSION INSIDE THE RADICAL SYMBOL $\sqrt{\ }$ $\sqrt{\text{RADICAND}}$

Radical Symbol is $\sqrt{\ }$

Perfect square INTEGERS

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144 and so on

ALSO $(1.2)^2 = 1.44 \rightarrow 1.2$ IS THE SQUARE ROOT OF 1.44.

Irrational number A NUMBER THAT CANNOT BE WRITTEN AS A FRACTION.

$\sqrt{2}$ = IRRAT

$\sqrt{4}$ = RAT. ← PERFECT SQUARES

Real number The set of all rational and IRRATIONAL NUMBERS. A NUMBER THAT CAN BE WRITTEN ON THE NUMBER LINE.

SQUARE ROOT OF A NEGATIVE NUMBER IS NOT REAL.

EX $\sqrt{-4} = 2i$

IMAGINARY NUMBER

$\sqrt{-1} = i$

SQUARE ROOT OF A NUMBER

Words

If $b^2 = a$, then B is a square root of A.

Numbers

$5^2 = 25$ and $(-5)^2 = 25$, so 5 and -5 are square roots of 25.

Your Notes

All positive real numbers have two square roots, a positive and a negative square root. The positive square root is called the *principal* square root.

Example 1 ***Find square roots***

Evaluate the expression.

Solution

a. $-\sqrt{36} =$ (-6) The negative square root of 36 is -6.

b. $\sqrt{16} =$ (4) The positive square root of 16 is 4.

c. $\pm\sqrt{64} =$ (±8) The positive and negative square roots of 64 are -8 and 8.

(-8, 8)

d) $\sqrt{-25}$ → NOT A REAL NUMBER

Checkpoint **Evaluate the expression.**

1. $\sqrt{100}$	2. $-\sqrt{1}$
10	-1

Example 2 ***Classify numbers***

Tell whether each of the following numbers is a real number, a rational number, an irrational number, an integer, or a whole number: $\sqrt{144}$, $-\sqrt{49}$, $\sqrt{32}$.

Solution

Number	Real Number?	Rational Number?	Irrational Number?	Integer?	Whole Number?
$\sqrt{144}$	Y	Y	N	Y	Y
$-\sqrt{49}$	Y	Y	N	Y	N
$\sqrt{32}$	Y	N	Y	N	N
ADD $\sqrt{-25}$	N	N	N	N	N

Your Notes

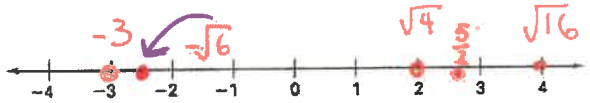
Example 3 ***Graph and order real numbers***

Order the numbers from least to greatest:

$\sqrt{16}, \frac{5}{2}, \sqrt{4}, -3, -\sqrt{6}.$

Solution

Graph the numbers on a number line.



Read the numbers from left to right:

$-3, -\sqrt{6}, \sqrt{4}, 5/2, \sqrt{16}$

Checkpoint **Complete the following exercises.**

3. Tell whether each of the following numbers is a real number, rational number, irrational number, integer, or whole number: $\sqrt{49}$, 0, $-\frac{6}{4}$, −2, $\sqrt{17}$.

They are all real numbers.

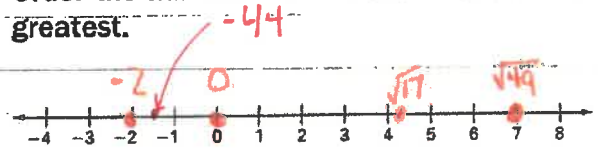
Rational: $\sqrt{49}, 0, -6/4, -2$

IRRATIONAL: $\sqrt{17}$

INTEGER: $-2, 0\ \sqrt{49}$

WHOLE NUMBERS: $0, \sqrt{49}$

4. Order the numbers from Exercise 3 from least to greatest.



$-2, \frac{-6}{4}, 0, \sqrt{17}, \sqrt{49}$

Homework