

2.6 Divide Real Numbers

Goal • Divide real numbers.

Your Notes

What are the reciprocals for the following?

a $-4/3 \rightarrow -3/4$

b $-5/1 \rightarrow -1/5$

c $2\frac{1}{2} \rightarrow \frac{5}{2} = \frac{2}{5}$

FLIP THE FRACTION
Keep the sign

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

TRY THESE

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

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

The # times its reciprocal

Your Notes

✓ Checkpoint Find the multiplicative inverse.

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

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

($\frac{0}{\#}$)

DIVISION WITH ZERO

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

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

Example 2 Divide real numbers

Find the quotient.

Solution

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

✓ RECIPROCAL

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

Your Notes

✓ **Checkpoint** Find the quotient.

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

Example 3 Simplify an expression

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

Solution

METHOD I

$$\frac{48y - 32}{8} = (48y - 32) \div \underline{8}$$

Rewrite fraction as division.

$$= (48y - 32) \cdot \underline{\frac{1}{8}}$$

Division rule

$$= 48y \cdot \underline{\frac{1}{8}} - 32 \cdot \underline{\frac{1}{8}}$$

Distributive property

$$= \boxed{6y - 4}$$

Simplify.

METHOD II

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

mental step

$$= \boxed{6y - 4}$$

✓ **Checkpoint** Simplify the expression.

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

Homework

2.7

Find Square Roots and Compare Real Numbers

Goal • Find square roots and compare real numbers.

Your Notes

Radical Symbol
is $\sqrt{\quad}$

VOCABULARY

Square root = SEE DEFINITION BELOW

EXAMPLES

- (a) $5^2 = 25 \rightarrow \sqrt{25} = 5 \rightarrow 5$ is the square root of 25
 (b) $(-5)^2 = 25 \rightarrow \pm\sqrt{25} = -5 \rightarrow -5$ is also the square root of 25.

Radicand is the number or expression inside the radical symbol.

$\sqrt{\quad}$ RADICAND

Perfect square INTEGERS

$\rightarrow 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144$ 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.

$\sqrt{2} = \text{IRRAT}$
 $\sqrt{4} = \text{RAT.}$ 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.

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.

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

IMAGINARY NUMBER

$i = \sqrt{-1}$

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. $\pm\sqrt{64} = \pm 8$

The positive and negative square roots of 64 are -8 and 8.

$-8, 8$

d. $\sqrt{-25} \rightarrow$ NOT A REAL NUMBER

✓ **Checkpoint** Evaluate the expression.

1. $\sqrt{100}$

100

2. $-\sqrt{1}$

-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:

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

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.

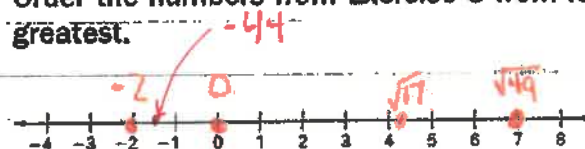
Rational: $\sqrt{49}$, 0, $-\frac{6}{4}$, -2

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