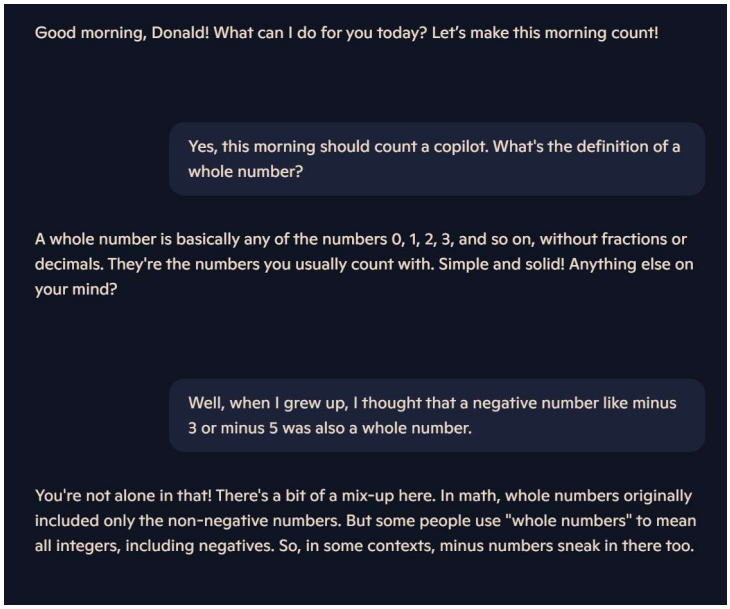
1. Operations with Real Numbers
1.1 Algebraic Expressions
1.1 Exercise Set, page 40 (22): 1, 3, 5, 7, 9, 10, 12, 22, 27

1.2 Integers
1.2 Exercise Set, page 69 (51): 1, 2, 6, 18, 25, 32, 39, 40, 48
1.4 Decimals
1.4 Exercise Set, page 112 (94): 1, 2, 4, 5, 9, 10, 18, 19, 25, 31, 33, 42, 44

Don Goral Home Page

https:/faculty.nvcc.edu/nvdgoral/

1.2



$$\sqrt{-1} = i$$
$$i^2 = -1$$

Complex numbers are not an official topic of MTH 111.

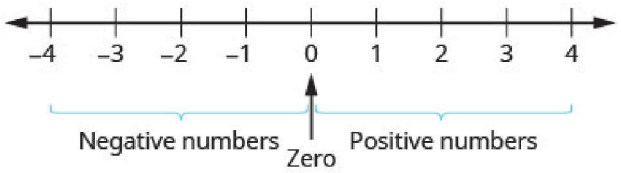


Figure 1 The number line shows the location of positive and negative numbers.

The numbers above are the integers.

Which number is larger?

100 3

Here, the answer depends on the interpretation of "larger" or on the context.

Opposite

The **opposite** of a number is the number that is the same distance from zero on the number line but on the opposite side of zero.

Memorize

Absolute Value

Geometric definition

The absolute value of a number is its distance from 0 on the number line.

The absolute value of a number n is written as $|n|$.

$|5| = 5$

$|-5| = 5$

algebraic definition

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$5 \geq 0 \Rightarrow$ use top formula $|5| = 5$

implies

$-5 < 0 \Rightarrow$ use bottom formula

$|-5| = -(-5) = 5$

Property of Absolute Value

$|n| \geq 0$ for all numbers

Absolute values are always greater than or equal to zero!

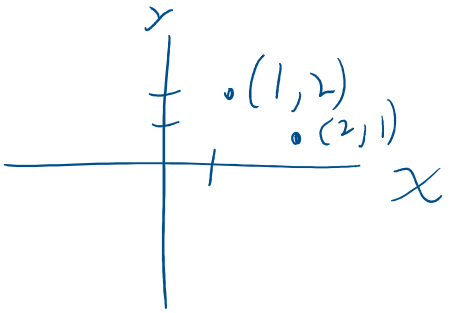
Grouping Symbols

Parentheses	( )
Brackets	[ ]
Braces	{ }
Absolute value	| |

list elements of a set

$A = \{1, 2, 3\} = \{3, 2, 1\} = \{1, 1, 2, 3\}$

$(1, 2)$ = the point with $x = 1$ and $y = 2$



Memorize

Subtraction Property

$a - b = a + (-b)$

Subtracting a number is the same as adding its opposite.

Multiplication is repeated addition

$(2)(3) = 2 \cdot 3 = 2 \times 3 = (3 \times 2)$

$= 3 + 3 = 6$ $\qquad 2 + 2 + 2 = 6$

$ab = a \cdot b = a \times b = (a)(b) = a * b$

Memorize

Multiplication of Signed Numbers

For multiplication of two signed numbers:

Same signs	Product	Example
Two positives Two negatives	Positive Positive	$7 \cdot 4 = 28$ $-8(-6) = 48$

Different signs	Product	Example
Positive \cdot negative Negative \cdot positive	Negative Negative	$7(-9) = -63$ $-5 \cdot 10 = -50$

Multiplication and Division of Signed Numbers

For multiplication and division of two signed numbers:

- If the signs are the same, the result is positive.
- If the signs are different, the result is negative.

Same signs	Result
Two positives	Positive
Two negatives	Positive

If the signs are the same, the result is positive.

Different signs	Result

Different signs	Result
Positive and negative	Negative
Negative and positive	Negative

951

1.4

Learning Objectives

By the end of this section it is expected that you will be able to:

- Round decimals
- Add and subtract decimals
- Multiply and divide decimals
- Convert decimals, fractions, and percent

Memorize

Decimals are another way of writing fractions whose denominators are powers of 10.

$$\begin{aligned} 0.1 &= \frac{1}{10} && 0.1 \text{ is “one tenth”} \\ 0.01 &= \frac{1}{100} && 0.01 \text{ is “one hundredth”} \\ 0.001 &= \frac{1}{1{,}000} && 0.001 \text{ is “one thousandth”} \\ 0.0001 &= \frac{1}{10{,}000} && 0.0001 \text{ is “one ten-thousandth”} \end{aligned}$$

$\frac{1}{10} = \frac{1}{10^1}$

$\frac{1}{100} = \frac{1}{10^2} = \frac{1}{10 \cdot 10}$

$\frac{1}{1000} = \frac{1}{10^3} = \frac{1}{10 \cdot 10 \cdot 10}$

Place Value											
Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths
						.					

Figure 1

10^5 10^4 10^3 10^2 10 1 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5}

round 18,765 to nearest hundred

18,800

HOW TO: Multiply Decimals

1. Determine the sign of the product.
2. Write in vertical format, lining up the numbers on the right. Multiply the numbers as if they were whole numbers, temporarily ignoring the decimal points.
3. Place the decimal point. The number of decimal places in the product is the sum of the number of decimal places in the factors.
4. Write the product with the appropriate sign.

multiply by hand

$(32.81) \times (0.34) \approx (30)(0.3)$

11.1554 correct

9.0

✓✓ 34.44

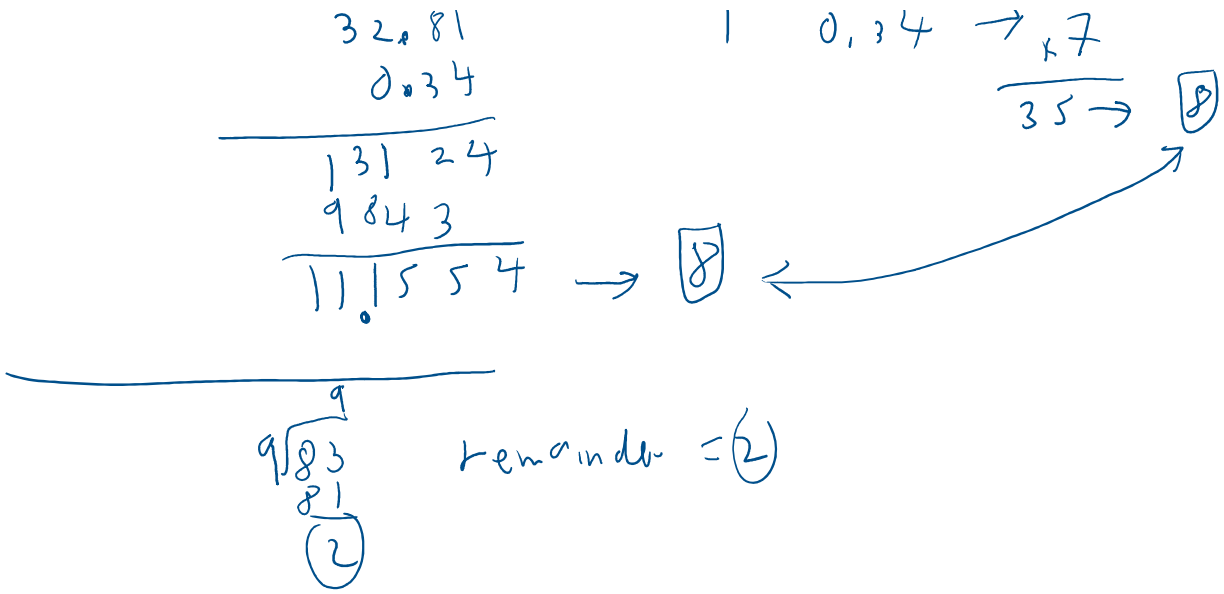
counting out 9's

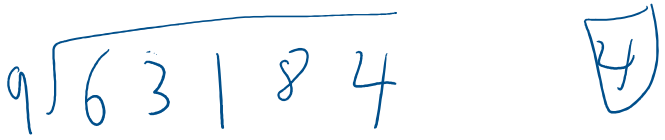
32.81 → 5

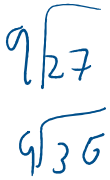
0.34 → x7

32.81

0.34







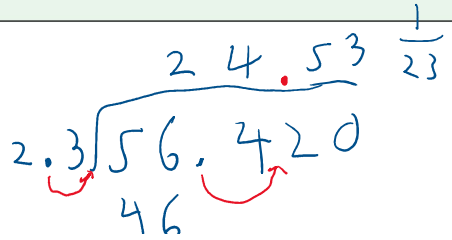
We review the notation and vocabulary for division:

$$\underset{\text{dividend}}{a} \div \underset{\text{divisor}}{b} = \underset{\text{quotient}}{c} \qquad \underset{\text{divisor}}{b}\overset{\overset{c}{\text{quotient}}}{\overline{)\underset{\text{dividend}}{a}}}$$

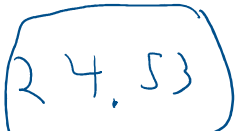
We'll write the steps to take when dividing decimals, for easy reference.

HOW TO: Divide Decimals

1. Determine the sign of the quotient.
2. Make the divisor a whole number by "moving" the decimal point all the way to the right. "Move" the decimal point in the dividend the same number of places—adding zeros as needed.
3. Divide. Place the decimal point in the quotient above the decimal point in the dividend.
4. Write the quotient with the appropriate sign.



Round answer to nearest hundredth



2.3)136.720 → 24.53

46
104
92
122
115
70
69
1

Write 0.374 as a fraction.

0.3	7	4
tenths	hundredths	thousandths

$0.374 = \frac{374}{1000}$

$\frac{2 \cdot 187}{2 \cdot 500}$

$\frac{187}{500}$

so, $0.374 = \frac{187}{500}$

Repeating Decimal

A **repeating decimal** is a decimal in which the last digit or group of digits repeats endlessly.

$\frac{1}{3}$

$3\overline{)1.00}$ = .33
9
10
9
1

$0.\overline{333} = 0.333...$

$\frac{1}{3} \approx 0.33$

$\frac{1}{3} \neq 0.33$

$0.999\ldots$

Let $x = 0.999\ldots$

$10x = 9.999\ldots$

$10x - x = 9$

$9x = 9$

$\frac{9x}{9} = \frac{9}{9}$

$x = 1$

$0.999\ldots = 1$

Your Name MTH 111 quiz 1 write each problem. Put a box around each answer. Show calculations. No calculator.

1. Add 567.82 +41.02

$$\begin{array}{r} 567.82 \\ +\ 41.02 \\ \hline 608.84 \end{array}$$

2. Multiply 43.1×92

$$\begin{array}{r} 43.1 \\ \times\ 92 \\ \hline 862 \\ 3879 \\ \hline 3965.2 \end{array}$$

3. Calculate: $(-3) + 4(6 - 8)$

$= -3 + 4(-2)$

$= -3 - 8$

$= \boxed{-11}$

4. Write the integers in the following set

$$\left\{0, -5, \frac{8}{4}, 16, \frac{1}{3}, \sqrt{25}\right\}$$

$= \{0, -5, 2, 16, \frac{1}{3}, 5\}$ not integer

integers $\{0, -5, 2, 16, 5\}$

5. Round 987.0345 to the nearest thousandth.

$987.0345 \approx 987.035$