



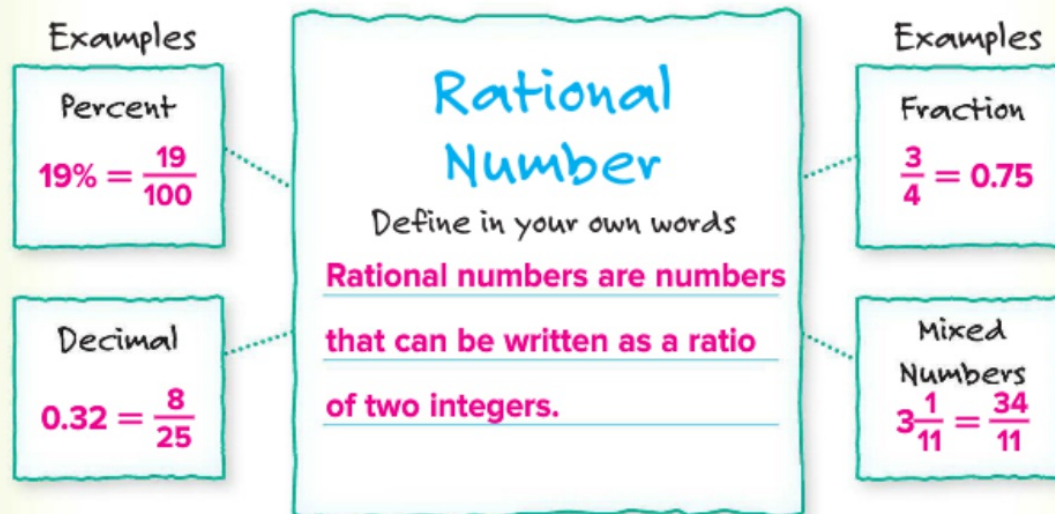
Rational Numbers

Vocabulary Start-Up



Numbers that can be written as a comparison of two integers, expressed as a fraction, are called **rational numbers**.

Complete the graphic organizer. **Sample answers are given.**



The root of the word *rational* is *ratio*. Describe the relationship between rational numbers and



Essential Question

WHY is it helpful to write numbers in different ways?



Vocabulary

rational number
 repeating decimal
 terminating decimal

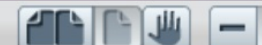


Common Core State Standards

Content Standards
 8.NS.1

MP Mathematical Practices
 1, 3, 4, 6, 7, 8

part



The root of the word *rational* is *ratio*. Describe the relationship

between rational numbers and ratios. **Sample answer:**

Rational numbers are written as ratios in the form $\frac{a}{b}$,

where a and b are integers, and $b \neq 0$.

part

whole



Real-World Link

During a recent regular season, a Texas Ranger baseball player had 126 hits and was at bat 399 times. Write a fraction in simplest form to represent the ratio of the number of hits to the number of at bats.

6

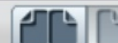
19

Which **MP** **Mathematical Practices** did you use?

Shade the circle(s) that applies.

- | | |
|--|---|
| <input type="checkbox"/> ① Persevere with Problems | <input type="checkbox"/> ⑤ Use Math Tools |
| <input type="checkbox"/> ② Reason Abstractly | <input type="checkbox"/> ⑥ Attend to Precision |
| <input type="checkbox"/> ③ Construct an Argument | <input type="checkbox"/> ⑦ Make Use of Structure |
| <input type="checkbox"/> ④ Model with Mathematics | <input type="checkbox"/> ⑧ Use Repeated Reasoning |





Guided Practice



Write each fraction or mixed number as a decimal. (Examples 1 and 2)

1. $\frac{9}{16} = \underline{0.5625}$

2. $-1\frac{29}{40} = \underline{-1.725}$


3. $4\frac{5}{6} = \underline{4.8\bar{3}}$

4. Monica won 7 of the 16 science competitions she entered. To the nearest thousandth, find her winning average. (Example 3) 0.438

Write each decimal as a fraction or mixed number in simplest form. (Examples 4–6)

5. $0.32 = \underline{\frac{8}{25}}$

6. $-0.\bar{7} = \underline{-\frac{7}{9}}$

7.  **Building on the Essential Question** How can you determine if a number is a rational number?

Sample answer: If a number can be written as a fraction, it is a rational number.

Handwritten work for problem 4:

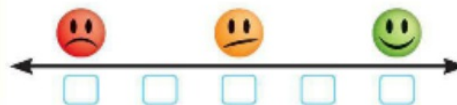
$$\begin{array}{r} 10x = 7.\overline{4375} \\ x = 0.\overline{4375} \\ \hline 9x = 3.\overline{9375} \\ \hline x = \frac{39375}{90000} = \frac{4375}{10000} = \frac{7}{2000} = 0.0035 \end{array}$$

Handwritten work for problem 6:

$$9x = -\overline{7} \Rightarrow x = -\frac{7}{9}$$

Rate Yourself!

I understand how to write a repeating decimal as a fraction.



For more help, go online to access a Personal Tutor.



Name _____

My Homework _____

Independent Practice

Go online for Step-by-Step Solutions



Write each fraction or mixed number as a decimal. (Examples 1 and 2)

1. $\frac{2}{5} = \underline{0.4}$

2. $2\frac{1}{8} = \underline{2.125}$

3. $\frac{33}{40} = \underline{0.825}$

4. $\frac{4}{33} = \underline{0.\overline{12}}$

5. $-\frac{6}{11} = \underline{-0.\overline{54}}$

6. $-7\frac{8}{45} = \underline{-7.\overline{17}}$

7. **MP Identify Repeated Reasoning** The table shows statistics about the students at Carter Junior High. (Example 3)

a. Express the fraction of students with no siblings as a decimal.

$\underline{0.0\overline{6}}$

Number of Siblings	Fraction of Students
None	$\frac{1}{15}$
One	$\frac{1}{3}$





7. **MP Identify Repeated Reasoning** The table shows statistics about the students at Carter Junior High. (Example 3)

Number of Siblings	Fraction of Students
None	$\frac{1}{15}$
One	$\frac{1}{3}$
Two	$\frac{5}{12}$
Three	$\frac{1}{6}$
Four or more	$\frac{1}{60}$

a. Express the fraction of students with no siblings as a decimal.

$0.0\bar{6}$

b. Find the decimal equivalent for the fraction of students with three siblings.

$0.1\bar{6}$

c. Write the fraction of students with one sibling as a decimal. Round to the nearest thousandth.

0.333

d. Write the fraction of students with two siblings as a decimal. Round to the nearest thousandth.

0.417

Write each decimal as a fraction or mixed number in simplest form.

(Examples 4–6)

8. $-0.4 = -\frac{2}{5}$

9. $-7.32 = -7\frac{8}{25}$

10. $0.\bar{2} = \frac{2}{9}$



Copy and Solve Write each decimal as a fraction or mixed number in simplest form. Show your work on a separate piece of paper. (Examples 4–6)

11. $-0.\overline{45} = -\frac{5}{11}$

12. $2.\overline{7} = 2\frac{7}{9}$

13. $5.55 = 5\frac{11}{20}$

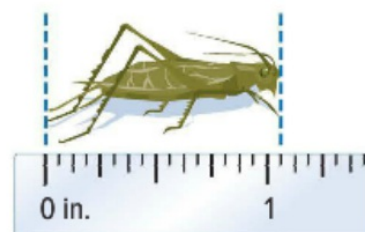
MP Be Precise Write the length of each insect as a fraction or mixed number and as a decimal.

14.



$\frac{7}{8}$ in.; 0.875 in.

15.



$1\frac{1}{16}$ in.; 1.0625 in.



H.O.T. Problems Higher Order Thinking

16. **MP Identify Structure** Give an example of a repeating decimal where two digits repeat. Explain why your number is a rational number.

Sample answer: $0.\overline{12}$; Since $0.\overline{12} = \frac{4}{33}$, it is a rational number.

17. **MP Reason with Problems** Expl...





H.O.T. Problems Higher Order Thinking

16. **MP Identify Structure** Give an example of a repeating decimal where two digits repeat. Explain why your number is a rational number.

Sample answer: $0.\overline{12}$; Since $0.\overline{12} = \frac{4}{33}$, it is a rational number.

17. **MP Persevere with Problems** Explain why any rational number is either a terminating or repeating decimal. Sample answer: When dividing, there

are two possibilities for the remainder. If the remainder is 0, the decimal terminates. If the remainder is not 0, then the decimal begins to repeat at the point where the remainder repeats or equals the original dividend.

18. **MP Make a Conjecture** Compare 0.1 and $0.\overline{1}$, 0.13 and $0.\overline{13}$, and 0.157 and $0.\overline{157}$ when written as fractions. Make a conjecture about expressing repeating decimals like these as fractions.

Sample answer: When the digits repeat, the repeating digits are the numerator and 1 less than the decimal place value is the denominator.

19. **MP Model with Mathematics** Write $\frac{a}{b}$  $\frac{a}{b}$ terminating with values between 0 and 1.



17. **MP Persevere with Problems** Explain why any rational number is either a terminating or repeating decimal. **Sample answer: When dividing, there are two possibilities for the remainder. If the remainder is 0, the decimal terminates. If the remainder is not 0, then the decimal begins to repeat at the point where the remainder repeats or equals the original dividend.**
18. **MP Make a Conjecture** Compare 0.1 and $0.\bar{1}$, 0.13 and $0.\overline{13}$, and 0.157 and $0.\overline{157}$ when written as fractions. Make a conjecture about expressing repeating decimals like these as fractions. **Sample answer: When the digits repeat, the repeating digits are the numerator and 1 less than the decimal place value is the denominator.**
19. **MP Model with Mathematics** Write two decimals, one repeating and one terminating, with values between 0 and 1. Then write an inequality that shows the relationship between your two decimals. **Sample answer: $0.5, 0.555\dots$; $0.5 < 0.555\dots$**

