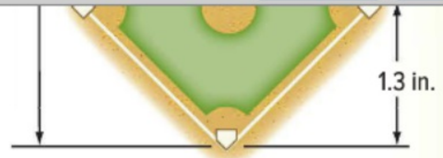

real number

Common Core State Standards

Content Standards
8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices
1, 3, 4, 6

1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

   Yes; it can be written as $\frac{13}{10}$.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

   Yes; it can be written as $\frac{2}{1}$.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?

   2.828427125; Sample answer: It does not repeat. It appears to terminate.

4. To determine if the number terminates, on your calculator, multiply your answer to $\sqrt{8}$ by itself. Do not use the x^2 button.

   Is the answer 8? **no**

5. Based on your results, can you classify $\sqrt{8}$ as a rational number? Explain.

   No; it is not a repeating decimal.

"irrational"

$\frac{1}{3} = .\overline{3}$ ← "repeating"

$\frac{1}{4} = .25$ ← terminate

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ATH COURSE 3 Standards

lition Glossary Index Answers: On Off 100%

a. irrational

b. rational

c. natural, whole, integer, rational

Examples

Tutor

Name all sets of numbers to which each real number belongs.

1. 0.2525... The decimal ends in a repeating pattern. It is a rational number because it is equivalent to $\frac{25}{99}$.

2. $\sqrt{36}$ Since $\sqrt{36} = 6$, it is a natural number, a whole number, an integer, and a rational number.

3. $-\sqrt{7}$ $-\sqrt{7} \approx -2.645751311...$ The decimal does not terminate nor repeat, so it is an irrational number.

Got it? **Do these problems to find out.**

a. $\sqrt{10}$ **b.** $-2\frac{2}{5}$ **c.** $\sqrt{100}$

Show your work.

90

Cortana. Ask me anything.

Guided Practice

Check

Name all sets of numbers to which each real number belongs. (Examples 1–3)

1. 0.050505... rational

2. $-\sqrt{64}$ integer, rational

3. $\sqrt{17}$ irrational

Show your work.

Fill in each ◯ with <, >, or = to make a true statement. (Examples 4 and 5)

4. $\sqrt{15}$ (>) 3.5

5. $\sqrt{2.25}$ (=) 150%

6. $\sqrt{6.2}$ (>) $2.\overline{4}$

7. Order the set $\{\sqrt{5}, 220\%, 2.25, 2.\overline{2}\}$ from least to greatest. Verify your answer by graphing on a number line. (Example 6)

220%, $2.\overline{2}$, $\sqrt{5}$, 2.25

8. The formula $A = \sqrt{s(s-a)(s-b)(s-c)}$

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$220\%, 2.\overline{2}, \sqrt{5}, 2.25$

8. The formula $A = \sqrt{s(s-a)(s-b)(s-c)}$ can be used to find the area A of a triangle. The variables a, b, and c are the side measures and s is one half the perimeter. Use the formula to find the area of a triangle with side lengths of 7 centimeters, 9 centimeters, and 10 centimeters. (Example 7) about 30.6 cm^2

9. **Building on the Essential Question** How are real numbers different from irrational numbers?

Sample answer: Real numbers contain the sets of rational and irrational numbers. So all irrational numbers are real numbers but not all real numbers are irrational numbers.

Rate Yourself!

How well do you understand real numbers? Circle the image that applies.

Clear | Somewhat Clear | Not So Clear

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

Tutor

Independent Practice

Go online for Step-by-Step Solutions eHelp

Name all sets of numbers to which each real number belongs. (Examples 1–3)

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

2. $-\sqrt{20}$ irrational

3. $7.\overline{2}$ rational

4. $\frac{12}{4}$ natural, whole, integer, rational

Show your work.

Fill in each ◯ with <, >, or = to make a true statement. (Examples 4 and 5)

5. $\sqrt{10}$ < 3.2

6. $5\frac{1}{6}$ = $5.1\overline{6}$

7. $2.\overline{21}$ < $\sqrt{5.2}$

Order each set of numbers from least to greatest. Verify your answer by graphing on a number line. (Exa…

8. $\{-415\%, -\sqrt{17}, -4.\overline{1}, -4.08\}$

$-415\%, -\sqrt{17}, -4.\overline{1}, -4.08$

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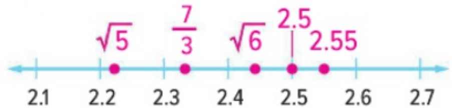

$\sqrt{5}, \frac{7}{3}, \sqrt{6}, 2.5, 2.55$

10. The equation $s = \sqrt{30fd}$ can be used to find a car's speed s in miles per hour given the length d in feet of a skid mark and the friction factor f of the road. Police measured a skid mark of 90 feet on a dry concrete road. If the speed limit is 35 mph, was the car speeding? Explain. (Example 7)

Yes; $\sqrt{30 \times 0.8 \times 90} \approx 46$, so the car was speeding.

Friction Factor		
Road	**Concrete**	**Tar**
Wet	0.4	0.5
Dry	0.8	1.0

11. The surface area in square meters of the human body can be found using the expression $\sqrt{\frac{hm}{3{,}600}}$ where h is the height in centimeters and m is the mass in kilograms. Find the surface area of a 15-year-old boy with a height of 183 centimeters and a mass of 74 kilograms. (Example 7)

about 1.9 m^2

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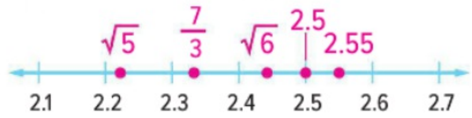

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12. MP **Be Precise** Write a brief description and give an example of each type of number in the graphic organizer shown. **Sample answer:**

natural	whole	integer	rational	irrational
the counting numbers; 1, 2, 3	the counting numbers and 0; 0	the whole numbers and their opposites; −2	integers, all +/− fractions and repeating decimals; −1.2	decimals that do not repeat; $\sqrt{35}$

Use estimation to fill in each ◯ with <, >, or = to make a true statement.

13. 3π (>) $\sqrt{78}$

14. π^2 (<) $3 \cdot \sqrt{15}$

15. $\sqrt{980}$ (<) $4\pi^2$

16. **MP Use a Counterexample** Give a counterexample for the statement *All square roots are irrational numbers.* Explain your reasoning.

Sample answer: $\sqrt{4}$; $\sqrt{4} = 2$ and 2 is a rational number

MP Persevere with Problems Tell whether the following statements are *always, sometimes,* or *never* true. If a statement is not always true, explain.

17. Integers are rational numbers. **always**

18. Rational numbers are integers. **sometimes; 3 or $\frac{3}{1}$ is a rational number and an integer, but $\frac{2}{3}$ is a rational number and not an integer.**

19. The product of a non-zero rational number and an irrational number is irrational. **always**

20. **MP Model with Mathematics** Identify two numbers, one rational number and one irrational number, that are between 1.4 and 1.6. Include the decimal approximation of the irrational number to the nearest hundredth.

Sample answer: 1.5; $\sqrt{2} \approx 1.41$