Order of Operations with Decimals and Fractions (A)

$3.9\times0.5+4\frac{5}{6}\div3\frac{3}{7}$

1.95 + $\frac{29}{6}\div\frac{24}{7}$

1.95 + $\frac{29}{6}\times\frac{7}{24}$

1.95 + $\frac{203}{144}$

1.95 + 1.409 = 3.359

$\left(9+\frac{1}{6}\right)\div\left(1.7+2\frac{3}{4}\right)$

9 1/6 ÷ (1.7 + 2.34)

9 1/6 ÷ 4.45

$9\frac{1}{6}\div4\frac{45}{100}$

$9\frac{1}{6}\div4\frac{9}{20}$

$\frac{55}{6}\div\frac{89}{20}$

$\frac{55}{6}\times\frac{20}{89}$

$\frac{1,100}{534}=2\frac{16}{267}$

$\left(\frac{5}{3}\times4\frac{5}{6}\right)\div1.75+\frac{5}{3}$

$\frac{5}{3}\times\frac{29}{6}\div1\frac{3}{4}+\frac{5}{3}$

$\frac{145}{18}\div\frac{7}{4}+\frac{5}{3}$

$\frac{145}{18}\times\frac{4}{7}+\frac{5}{3}$

$\frac{580}{126}+\frac{5}{3}$

$3\times42=126$

$5\times42=210$

$\frac{5}{3}\times42=\frac{210}{126}$

$\frac{580}{126}+\frac{210}{126}$

$\frac{790}{126}=6\frac{17}{63}$

$2\times\left(3\frac{6}{7}-2.3\right)\div5\frac{2}{9}$

$3\frac{6}{7}-2\frac{3}{10}$

$\times10$

$3\frac{60}{70}-2\frac{21}{70}$

$2\times1\frac{39}{70}\div5\frac{2}{9}$

$5.2+2.1\div\left(4.5-4\frac{1}{7}\right)$

$\left(0.75\times1\frac{4}{9}\right)\div\left(4\frac{1}{6}+1.75\right)$

$\left(\frac{3}{2}\right)^2 - 1 + 6$

$0.8 \div \left(1.5 + \frac{2}{3}\right)^2$

$\frac{2}{9}\left(10\frac{1}{6} - 3\frac{3}{7} - 1\right)$

$\left(\frac{7}{1} \times \frac{10}{7}\right) \div 1.2 + 1\frac{3}{4}$

$\frac{70}{7} \div 1.2 + 1\frac{3}{4}$

$10 \div 1.2 + 1.75$

$8.\overline{3} + 1.75$

$10.08\overline{3}$

SLIDE 1

Rational and Irrational Numbers

Digits Unit 1 - Topic 4

- What are Irrational Numbers
- Approximating Irrational Numbers
- Comparing and Ordering Irrational Numbers
- Converting Repeating Decimals to Fractions

SLIDE 2

Important Vocabulary

- Perfect Squares: a number that is the square of an integer
  - 5 x 5 = 25 or (-5)(-5) = 25 ---> in both cases 25 is the perfect square
- Square Root: a number that produces a specified quantity when multiplied by itself.
  - √49 = 7 → because 7 x 7 = 49
  - √36/25 = 6/5 → because 6 x 6 = 36 and 5 x 5 = 25

SLIDE 3

The Real Number System

Natural Numbers:
Starts at 1

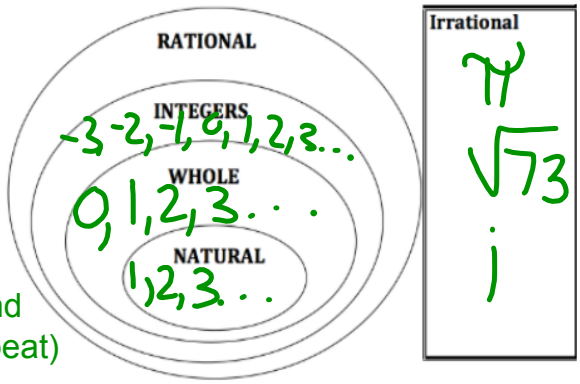
Whole Numbers:
Starts at 0

Integers:
Whole numbers and their opposites

Rational Numbers:
Includes Integers, fractions, and decimals (that terminate or repeat)

Irrational Numbers:
Decimals that do not terminate or repeat

Non perfect square root



SLIDE 4 The Number System: Practice

Place a check in the box to which each number belongs.

Indicate all of the possible names for each number.

-4 7

	15	−1.232	$\sqrt{45}$	$\frac{121}{35}$	$-\sqrt{16}$	$\frac{21}{3}$
Natural Number	X					X
Whole Number	X					X
Integer	X				X	X
Rational Number	X	X			X	X
Irrational Number			X	X		
Real Number	X	X	X	X	X	X

SLIDE 5 Irrational vs. Rational

Determine if each of the following numbers are rational or irrational. Justify your answer choice.

2.125 Rational -- It's a terminating Decimal

2.1111... Rational -- The one is repeating

2.01011011101111... Irrational -- does not end or repeat

2.12341234... Rational -- The 1, 2, 3, 4 is repeating

1.80333... Rational - 3 is repeating = $1.80\overline{3}$

3.202002000200002... Irrational -- does not end or repeat

3.213213213213... Rational -- The 2, 1, 3, repeats $3.\overline{213}$

3.121221222... Irrational -- does not end or repeat

SLIDE 6 Rational vs. Irrational: Self Check

Complete the three practice problems below. Show ALL steps/work used.

Do you know HOW?

1. Circle the irrational numbers.

$\sqrt{111}$ $\sqrt{400}$ $\sqrt{160}$

$\sqrt{144}$ $\sqrt{220}$ $\sqrt{200}$

12×12

2. Circle the rational numbers.

Assume each pattern continues.

4.014014	6.232342345
0.717717	1.594593592
12.12211222	9.96939693

.717

717717 96939693

6

	$\sqrt{36}$	$-\frac{1}{6}$	$\sqrt{11}$
Natural Number	X		
Whole Number	X		
Integer	X		
Rational Number	X	X	
Irrational Number			X
Real Number	X	X	X

SLIDE 7 Estimating Irrational Numbers:

Hint: To start these types of problems, begin by finding the two perfect squares closest to the square root given. (find one that is greater and one that is larger.

You are designing a booth for a comic convention. The booth is 7 ft wide and 6 ft deep. You plan to place a square rug in the booth, parallel to the walls. Each side of the rug is $\sqrt{33}$ ft long. Will the rug fit?

$5 < \sqrt{33} < 6$

$\sqrt{36} = 6$

$\sqrt{25} = 5$

On a number line, between which two consecutive whole numbers would $\sqrt{70}$ be located?

$8 < \sqrt{70} < 9$

$8 \times 8 = 64$ $9 \times 9 = 81$

The square root of an integer n is between 9 and 10. What are all the possible values for n? Explain.

$9^2 - 81$

$10^2 = 100$

82 through 99

SLIDE 8

Estimating Irrational Numbers

You may be asked to estimate a square root to the nearest tenth or hundreth rather than the nearest whole number. Use estimation as well as a guess and check method to find the best answer.

a. Use a number line to estimate $\sqrt{33}$ to the nearest tenth.

x	5.5	5.6	5.7	5.8	5.9	6.0
x^2	30.25	31.36	32.49	33.64	34.81	36

$\sqrt{33}$

$32.49 < 33 < 33.64$

$5.7^2 < 33 < 5.8^2$

$5.7 < \sqrt{33} < 5.8$

33

To see if $\sqrt{33}$ is closer to 5.7 or 5.8, compare 33 with 5.75^2.

- If $33 < 5.75^2$, then $5.7 < \sqrt{33} < 5.75$; round down to 5.7.
- If $33 > 5.75^2$, then $5.75 < \sqrt{33} < 5.8$; round up to 5.8.

$5.75^2 = 33.0625$ so $33 < 5.75^2$ and $\sqrt{33}$ rounded to the nearest tenth is 5.7. The rug is about 5.7 ft long.

SLIDE 9

Estimating Irrational Numbers

Let's try one together. First find the nearest perfect square whole numbers to start.

What is $\sqrt{50}$ to the nearest tenth?

7.1
x7.1
71
+4970
50.41

7.0
7.0
49

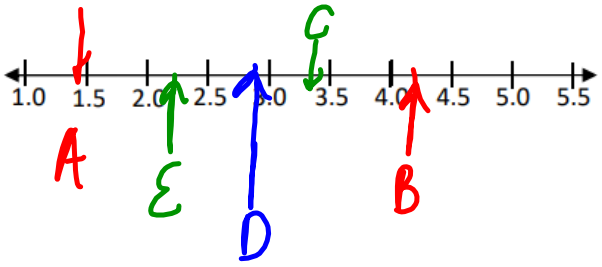
$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
5^2 25
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$

Break from slides to practice solving

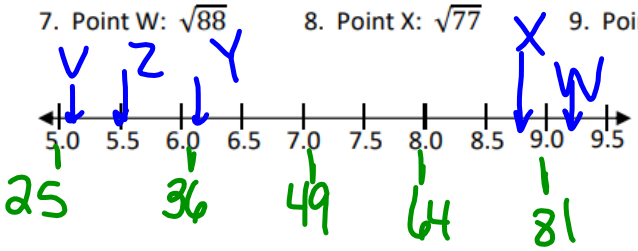
Lesson 7.4

Place a point on the number line given for each of the following irrational numbers.

1. Point A: $\sqrt{2}$
2. Point B: $\sqrt{17}$
3. Point C: $\sqrt{11}$
4. Point D: $\sqrt{8}$
5. Point E: $\sqrt{5}$



6. Point V: $\sqrt{26}$
7. Point W: $\sqrt{88}$
8. Point X: $\sqrt{77}$
9. Point Y: $\sqrt{37}$
10. Point Z: $\sqrt{30}$

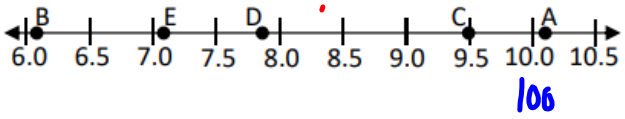


36 − 30 = 6

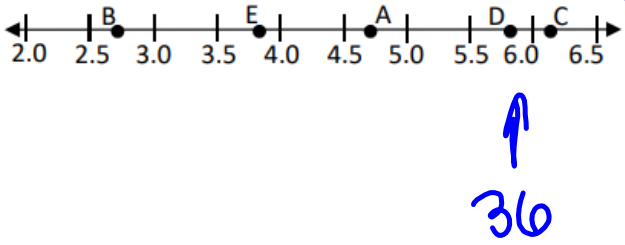
30 − 25 = 5

Name the point on the number line associated with each irrational number.

11. $\sqrt{50}$ E
12. $\sqrt{103}$ A
13. $\sqrt{62}$ D
14. $\sqrt{90}$ C
15. $\sqrt{37}$ B



16. $\sqrt{7}$ B
17. $\sqrt{22}$ A
18. $\sqrt{34}$ D
19. $\sqrt{38}$ C
20. $\sqrt{15}$ E



Compare the following numbers using < or >.

21. $\sqrt{32}$ [>] 5.1

22. $\sqrt{38}$ [<] $\sqrt{42}$

23. $\sqrt{17}$ [<] $\frac{9}{2}$

24. $\sqrt{49}$ [<] 7.1

7 7.1

25. $\sqrt{99}$ [>] $\frac{28}{3}$

9.9 $9.\overline{3}$

26. $\sqrt{17}$ [<] 4.5

27. $\frac{43}{5}$ [>] $\sqrt{65}$

$8\frac{3}{5}$ 8.1

8.6

28. $\sqrt{12}$ [<] $\sqrt{21}$

29. $\sqrt{16}$ [>] 3.9

4

30. $\sqrt{2}$ [<] $\frac{7}{4}$

$1\frac{3}{4}$

31. $\sqrt{50}$ [<] $\frac{15}{2}$

7.1 $7\frac{1}{2}$

32. $\sqrt{9}$ [<] 3.01

3

0.6
5 | 3.0
-30
0

List the following numbers in order from least to greatest.

33. $\sqrt{16}$, 4.2, $\frac{39}{8}$

4 4.8

34. $\sqrt{24}$, $\sqrt{33}$, 5.1

$\sqrt{26.01}$

$\sqrt{24}$, 5.1, $\sqrt{33}$

35. $\sqrt{100}$, $\sqrt{110}$, $\frac{32}{7}$

10 4.5

$\frac{32}{7}$, $\sqrt{100}$, $\sqrt{110}$

9
2 | 19
-18
1

36. 9.4, $\frac{19}{2}$, $\sqrt{80}$

9.4 9.5 7.9

$\sqrt{80}$, 9.4, $\frac{19}{2}$

4
3 | 13
-12

37. $\sqrt{35}$, $\sqrt{32}$, $\sqrt{37}$, $\frac{22}{3}$

7
3 | 22
-21
1

$\sqrt{32}$, $\sqrt{35}$, $\sqrt{37}$, $\frac{22}{3}$

38. $\sqrt{10}$, 3.5, $\sqrt{15}$, $\frac{13}{3}$

3.1 3.9

$\sqrt{10}$, 3.5, $\sqrt{15}$, $\frac{13}{3}$

39. $\sqrt{65}$, $\sqrt{60}$, 8.5, $\frac{37}{4}$

8.1 7.8 9 1/4

$\sqrt{60}$, $\sqrt{65}$, 8.5, $\frac{37}{4}$

40. $\sqrt{39}$, $\sqrt{25}$, 5.3, $\sqrt{26}$, $\frac{23}{4}$

41. $\sqrt{12}$, $\sqrt{15}$, 4.3, $\sqrt{9}$, $\frac{14}{5}$

42. $\sqrt{49}$, $\sqrt{63}$, 7.3, $\sqrt{38}$, $\frac{15}{2}$

Honors Math 7 Name_____

Approximating Square Roots

Date_____

Find each square root. Round to the nearest tenth.

1) $\sqrt{200}$

$14^2 = 196$

$200 - 196 = 4$

14.1 or 14.2

14.1 × 14.1 = 141 + 5640 + 14100 = 198.81

2) $\sqrt{136}$

$11^2 = 121$ $12^2 = 144$

$136 - 121 = 15$ $144 - 136 = 8$

11.7

3) $\sqrt{7}$

$2^2 = 4$ $3^2 = 9$

$7 - 4 = 3$ $9 - 7 = 2$

$2.6^2 = 6.76$

$2.7^2 = 7.29$

2.6 or 2.7

4) $\sqrt{74}$

$8^2 = 64$ $9^2 = 81$

$74 - 64 = 10$ $81 - 74 = 7$

$8.6^2 = 73.96$

5) $\sqrt{116}$

$10^2 = 100$ $11^2 = 121$

$116 - 100 = 16$ $121 - 116 = 5$

10.7 or 10.8

$10.7 = 114.49$ $10.8 = 116.64$

6) $\sqrt{119}$

10.8 or 10.9

7) $\sqrt{188}$

13.7

8) $\sqrt{12}$

$3.4 = 11.56$

$3.5 = 12.25$

9) $\sqrt{47}$

6.8 or 6.9

10) $\sqrt{65}$

8.1

11) $\sqrt{181}$

13.4 or 13.5

12) $\sqrt{16}$

4

13) $\sqrt{192}$

13.8 or 13.9

14) $\sqrt{194}$

13.9

15) $\sqrt{195}$

13.9

16) $\sqrt{189}$

13.7 or 13.8

17) $\sqrt{8}$ 2.8 or 2.9

18) $\sqrt{95}$

9.7

SLIDE 10

Estimating Irrational Numbers: Application

In your booth there is a square-shaped table. The table has an area of 26 ft^2. You want to hang a table skirt along the edge of the table. Approximately how long must the skirt be to wrap around the perimeter of the table?

$\sqrt{26} \approx 5.1$

$P = 4s$

$4 \cdot 5.1 = 20.4$

A square has an area of 112 cm^2. What is the approximate perimeter of the square?

$10^2 = 100$ $11^2 = 121$

$112 - 100 = 12$ $121 - 112 = 9$

100 121

$10.6 \times 4 = 42.4$

$10.7^2 = 114.49$

$10.6 = 112.36$

SLIDE 11

Estimating Irrational Numbers: Self Check

Complete the five practice problems below. Show ALL steps/work used.

Do you know HOW?

1. On a number line, between which two whole numbers would $\sqrt{136}$ be located? 11 & 12

2. The square root of an integer n is between 6 and 7. Write an inequality that expresses all the possible values for n. $36 < n < 49$

3. Which value is farther to the right on a number line?

2.5 2.5^2 $\sqrt{81}$

$2.5 \times 2.5 = 6.25$

$6.48 \times 4 = 25.92$ ft

4. A square sandbox has an area of 42 ft^2. What is the approximate perimeter of the sandbox to the nearest hundredth?

5. **Reasoning** Two classmates estimate the location of $\sqrt{60}$ on a number line. One student locates the point at 7.7. The other student says the point is located at 7.75. Can both students be correct? Explain.

yes,

SLIDE 12

Comparing and Ordering Irrational Numbers

Let's Try Together: Make sure to take all notes along the way when completing class examples

What symbol correctly completes the statement?

$\frac{4}{3}$ ☐ $\sqrt{2}$

Order the values from least to greatest.

π, $\sqrt{11}$, 3.4, 3.1

Order the values from least to greatest.

$-\sqrt{16}$, $-\frac{16}{6}$, $\sqrt{8}$, 2.6, $-\sqrt{10}$

SLIDE 13

Comparing/Ordering Irrational Numbers: Self Check

Complete the three practice problems below. Show ALL steps/work used.

Do you know HOW?

1. Use <, >, or = to complete each statement.

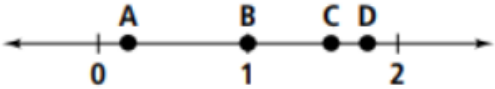
7	☐	$\sqrt{7}$
$\sqrt{121}$	☐	11
-16	☐	$-\sqrt{225}$
$\sqrt{8}$	☐	$\frac{21}{8}$

2. Order the values from least to greatest.

$\frac{25}{7}$ $\sqrt{3}$ 5.85 4^2 π

☐ ☐ ☐ ☐ ☐

3. Match each point on the number line to the nearest value.



$\sqrt{1}$	☐	$\frac{19}{12}$	☐
$\sqrt{3}$	☐	$\frac{2}{11}$	☐

SLIDE 14

Irrational Number: Problem Solving

Hint: think of the relationship between square roots and raising a number to the second power

If $x = 12$, what is the smallest natural number y that makes $\sqrt{x^2 + y^2}$ rational?

$12^2 \quad 5^2$

$\sqrt{144 + 25}$

$144 + ? = 169$

$169 - 144 = 25$

$y = 5$