

Day 1

1.1 Properties of Real Numbers

Real Numbers \mathbb{R}

Irrational Numbers

$\bar{\mathbb{Q}}$

#'s whose decimals never end and never repeat

$\pi, \sqrt{2}, \sqrt{5}$
1.1692...

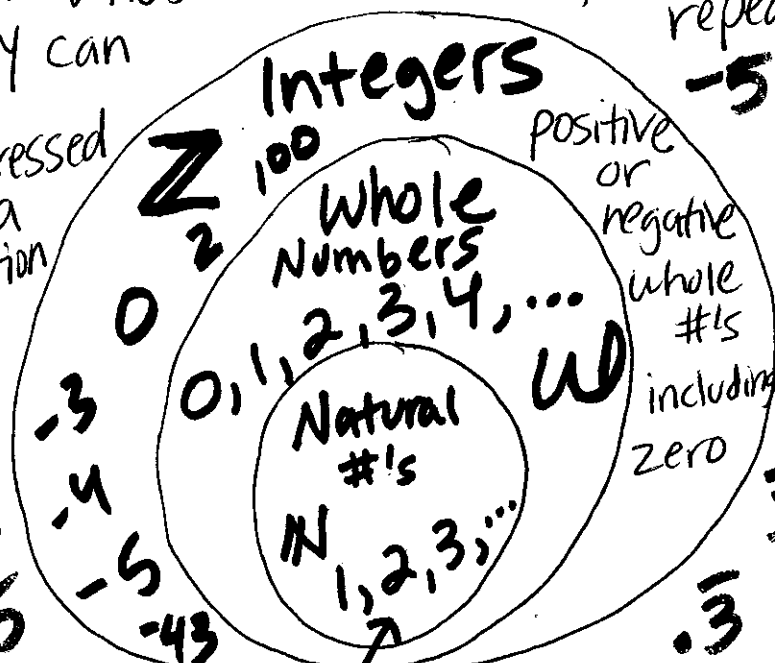
Rational #'s: \mathbb{Q}

#'s whose decimals end, can repeat they can be expressed as a fraction

$-\frac{1}{2}$

3.14

.75



counting #'s

\in "element of"

\subset "subset of"

- | | | | |
|-----------------------------|-------|------------------------------------|----------------------------------|
| 1. $5 \in W$ | True | 4. $\mathbb{N} \subset W$ | True |
| 2. $5 \in \bar{\mathbb{Q}}$ | False | 5. $W \subset \mathbb{N}$ | False
zero is not a natural # |
| 3. $-3 \in \mathbb{Z}$ | True | 6. $\mathbb{Q} \subset \mathbb{R}$ | True |

Properties of real #'s (only for addition + multiplication)

1. Commutative: order in which you add or multiply doesn't affect the answer

$$a + b = b + a$$

$$6 + 9 = 9 + 6$$

$$a \cdot b = b \cdot a$$

$$5 \cdot 3 = 3 \cdot 5$$

$$(4)(6) = (6)(4)$$

2. Associative: move the parentheses it will not change the answer.

$$(a + b) + c = a + (b + c)$$

$$(1 + 2) + 3 = 1 + (2 + 3)$$

$$(ab)c = a(bc)$$

$$(5 \cdot 6) \cdot 7 = 5(6 \cdot 7)$$

3. Identity: get the same # for the answer

$$b + 0 = b$$

$$a + 0 = a$$

$$4 \cdot 1 = 4$$

$$a \cdot 1 = a$$

4. Inverse:

$$a + (-a) = 0$$

$$3 + (-3) = 0$$

add opposites = zero

$$a \cdot \frac{1}{a} = 1$$

$$2 \cdot \frac{1}{2} = 1$$

multiply reciprocal = 1

5. Distributive :

$$a(b+c) = a \cdot b + a \cdot c \\ = ab + ac$$

$$5(x+2) = 5x + 5 \cdot 2 = 5x + 10$$

$$(x-4)7 = x \cdot 7 - 4 \cdot 7 = 7x - 28$$

Name the opposite and reciprocal.

(ex) 5 -5 \uparrow sign change $\frac{1}{5}$ \uparrow Flip

(ex) $-\frac{4}{9}$ $\frac{4}{9}$ $-\frac{9}{4}$

(ex) $4\frac{1}{5}$ $-4\frac{1}{5}$ $\frac{5}{21}$

\rightarrow improper $\frac{21}{5}$ \rightarrow Flip = reciprocal

(ex) -0.002 0.002 $-\frac{500}{1} = 500$

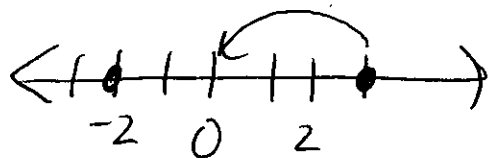
$0.4 = \frac{4}{10}$ $0.45 = \frac{45}{100}$ $0.002 = \frac{2}{1000} = \frac{1}{500}$

opposites :
their sum = 0

reciprocals :
their product = 1

FIVE STAR
FIVE STAR
FIVE STAR
FIVE STAR
FIVE STAR

Absolute Value $| |$



- distance a # is away from zero on a # line (it's always positive)

$$|4\frac{1}{3}| = 4\frac{1}{3}$$

$$|3| = 3$$

$$|-9.2| = 9.2$$

$$|-2| = 2$$

$$-|5| = -5$$

$$|3-8| =$$

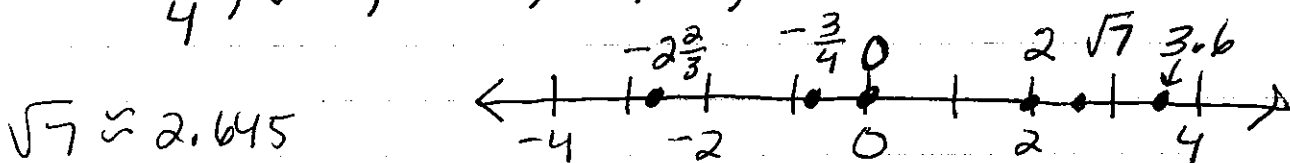
$$-|-4| = -4$$

$$|-5| = 5$$

(ex)

Graph on a # line.

$$-\frac{3}{4}, \sqrt{7}, 3.6, 0, 2, -2\frac{2}{3}$$



$$\sqrt{7} \approx 2.645$$

(ex)

Write in ascending order. (increases)

$$6.2, -4.2, 0, 3\frac{1}{4}, -0.8$$

$$-4.2, -0.8, 0, 3\frac{1}{4}, 6.2$$

(ex)

Write in descending order. (decreases)

$$-\sqrt{6}, \sqrt{4}, -2\frac{1}{4}, \frac{5}{4}, -\frac{2}{3}$$

$$\sqrt{4}, \frac{5}{4}, -\frac{2}{3}, -2\frac{1}{4}, -\sqrt{6}$$

(ex)

Compare -9 and $-\sqrt{9}$.

$<$, $>$ or $=$

$$\text{answer: } -9 < -3$$

Practice 1-1

Properties of Real Numbers

Simplify.

- | | | | |
|-------------------------------|----------------|--------------------------------|-----------------|
| 1. $- 4.2 $ | 2. $ 12 - 16 $ | 3. $\left -\frac{7}{6}\right $ | 4. $ 3 - -2 $ |
| 5. $\left \frac{2}{3}\right $ | 6. $0.3 -6 $ | 7. $ 14 - 8 $ | 8. $ -0.01 $ |

Replace each \$ with the symbol <, >, or = to make the sentence true.

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|-----------------------------|--------------------------|--------------------------|----------------------------|
| 9. $-\sqrt{6} \$ \sqrt{10}$ | 10. $\frac{3}{2} \$ 1.5$ | 11. $0.06 \$ 0.6$ | 12. $4 \$ -4 $ |
| 13. $-0.4 \$ 0$ | 14. $- -7 \$ -7 $ | 15. $0.9 \$ \frac{2}{3}$ | 16. $\sqrt{2} \$ \sqrt{5}$ |

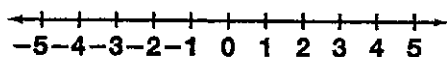
Name all the sets of numbers to which each number belongs.

- | | | | |
|----------|--------------------|-------------------------|--------------------|
| 17. -5 | 18. 0 | 19. $\sqrt{5}$ | 20. $2\bar{7}$ |
| 21. 9 | 22. $\frac{10}{7}$ | 23. $1.2345267831\dots$ | 24. $-\frac{4}{2}$ |

Name the property of real numbers illustrated by each equation.

- | | |
|---------------------------------|---|
| 25. $\pi + 3 = 3 + \pi$ | 26. $\sqrt{2} + 0 = \sqrt{2}$ |
| 27. $(2 + x) + 3 = 2 + (x + 3)$ | 28. $\frac{5}{9} \cdot \frac{9}{5} = 1$ |
| 29. $16(3t + 4v) = 48t + 64v$ | 30. $\sqrt{2} \cdot 3 = 3 \cdot \sqrt{2}$ |
| 31. $0.01 \cdot 1 = 0.01$ | 32. $\frac{3}{2} \cdot \frac{2}{3} = 1$ |
| 33. $7 + (-7) = 0$ | 34. $2(xy) = (2x)y$ |

Graph the number on the following number line. Estimate if necessary.



- | | | | |
|-----------------|-------------------|-----------|----------|
| 35. $-\sqrt{2}$ | 36. $\frac{3}{2}$ | 37. 0.5 | 38. -1 |
|-----------------|-------------------|-----------|----------|

Find the opposite and the reciprocal of each number.

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|---------------------|---------|-------------------|----------|
| 39. $-2\frac{1}{2}$ | 40. 3 | 41. $\frac{5}{9}$ | 42. -4 |
|---------------------|---------|-------------------|----------|

Which set of numbers best describes the values of each variable?

43. the number of stops N a commuter train makes on a certain day
44. the high H and low L for a certain stock during a period of n weeks
45. the average time per lap t it takes a race car to complete n laps