

4.



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

$$\left[\frac{1}{3} + \left(-\frac{3}{12}\right)\right]$$

Top:

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

$$\left(\frac{1}{4}\right) - \left(-\frac{2}{3}\right)$$

$$\frac{3}{12} + \left(\frac{+8}{12}\right)$$

$$= \frac{11}{12}$$

Bottom

$$\frac{1}{3} + \frac{-3}{12}$$

$$\frac{4}{12} + \frac{-3}{12}$$

$$\frac{1}{12}$$

$$\frac{\text{Top}}{\text{bottom}} = \frac{\frac{11}{12}}{\frac{1}{12}} = \frac{11}{12} \div \frac{1}{12}$$

$$= \frac{11}{12} \times \frac{12}{1}$$

$$= \frac{11}{1}$$

$$= 11$$

Hints for TEST:

To list or compare decimals, remember to add a zero to the end of your decimal.

Example $3.2\underline{1}0$ $3.22\underline{0}$

To list or compare fractions, remember use common denominators.

Example $-\frac{1}{3}$ $-\frac{3}{5}$

$\times 5$ $-\frac{5}{15}$ $-\frac{9}{15}$ $\times 3$

$-\frac{5}{15} > -\frac{9}{15}$

-5 is bigger than -9

Mixed to Improper

$$-3 \frac{1}{6} = \frac{(3 \times 6) + 1}{6} = \frac{-19}{6}$$

Improper to Mixed

$$\frac{36}{5} = (36 \div 5) = 7 \frac{1}{5}$$

$$(7 \times 5) = 35 + (1) = 36$$

Subtracting a Negative

-add the opposite $-8 - (-5)$

$$= -8 + 5$$

$$= -3$$

To add and subtract fractions you need common denominators

1) $\frac{-1}{4} + \frac{5}{7}$

$$= \frac{-7}{28} + \frac{20}{28}$$

$$= \frac{13}{28}$$

ALWAYS REDUCE WHEN POSSIBLE

2) $-2 \frac{1}{3} - 3 \frac{2}{5}$

$$= \frac{-7}{3} - \frac{17}{5}$$

$$= \frac{-35}{15} - \frac{51}{15}$$

$$= \frac{-86}{15}$$

$$= -5 \frac{11}{15}$$

Hints for TEST:

To Multiply fractions: $\frac{\text{top x top}}{\text{bottom x bottom}}$

DO NOT use
COMMON
DENOMINATORS

$$\begin{aligned}
 1) \quad & \frac{-1}{3} \times \frac{6}{5} \\
 & = \frac{(-1 \times 6)}{(3 \times 5)} \\
 & = \frac{-6}{15} \\
 & = \frac{-2}{5} \quad \text{then reduce}
 \end{aligned}$$

***ALWAYS REDUCE
WHEN POSSIBLE***

$$\begin{aligned}
 2) \quad & 2\frac{1}{3} \times -2\frac{2}{5} \\
 & = \frac{7}{3} \times \frac{-12}{5} \\
 & = \frac{(7 \times -12)}{(3 \times 5)} \\
 & = \frac{-84}{15}
 \end{aligned}$$

Question was in mixed so
answer should be in mixed

$$\begin{aligned}
 & = -5 \frac{12}{15} \\
 & \quad \text{then reduce} \\
 & = -5 \frac{3}{5}
 \end{aligned}$$

To DIVIDING fractions: FLIP AND MULTIPLY

DO NOT use
COMMON
DENOMINATORS

$$\begin{aligned}
 1) \quad & \frac{-2}{7} \div \frac{3}{10} \\
 & = \frac{-2}{7} \times \frac{10}{3} \\
 & = \frac{(-2 \times 10)}{(7 \times 3)} \\
 & = \frac{-20}{21}
 \end{aligned}$$

***ALWAYS REDUCE
WHEN POSSIBLE***

$$\begin{aligned}
 2) \quad & 5\frac{1}{4} \div -1\frac{2}{3} \\
 & = \frac{21}{4} \div \frac{-5}{3} \\
 & = \frac{21}{4} \times \frac{-3}{5} \\
 & = \frac{(21 \times -3)}{(4 \times 5)}
 \end{aligned}$$

Question was in mixed so
answer should be in mixed

$$= -3 \frac{3}{20}$$

as they appear

B	E	D	M	A	S
r	x	i	u	d	u
a	p	v	l	d	b
c	o	s	t		t
k	n	i	i		r
e	e	d	p		a
t	n	e	l		c
			y		t

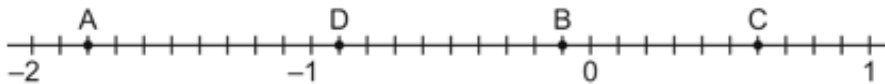
Lesson 3.1: What Is a Rational Number?

1. Which of the following numbers are equal to $-\frac{4}{5}$?

$\frac{4}{5}, -\frac{5}{4}, \frac{-4}{5}, \frac{-4}{-5}, -\frac{8}{10}$

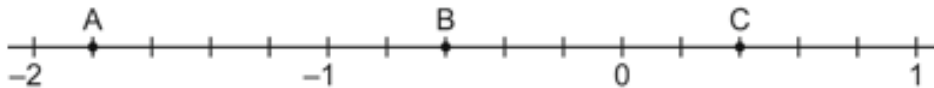
1. $-\frac{4}{5}, -\frac{8}{10}$

2. Write the rational number represented by each letter as a decimal.



2. A: -1.8, B: -0.1, C: 0.6, D: -0.9

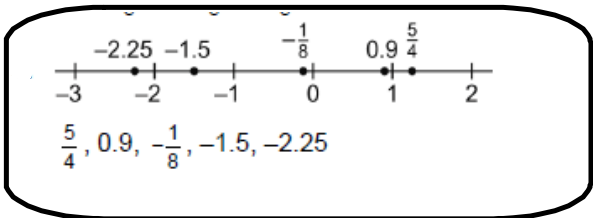
3. Write the rational number represented by each letter as a fraction.



3. A: $-1\frac{4}{5}$, B: $-\frac{3}{5}$, C: $\frac{2}{5}$

4. Order the numbers from greatest to least. (Explain how you know)

$-2.25, \frac{5}{4}, -1.5, -\frac{1}{8}, 0.9$



5. In each pair, which rational number is greater? Explain how you know.

a) $-7.3, -7.2$

$-7.30 < -7.20$

b) $\frac{4}{5}, \frac{5}{4}$

$0.8 < 1.25$

c) $1.2, -1.3$

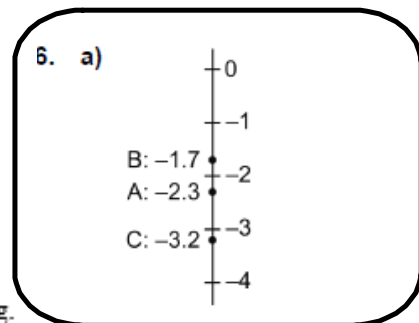
$1.20 > -1.30$

d) $-\frac{10}{13}, -\frac{10}{11}$

$-0.769 > -0.90$

6. Diver A is 2.3 m below sea level.
 Diver B is 1.7 m below sea level.
 Diver C is 3.2 m below sea level.

a) Draw a vertical number line to show the location of the divers.



b) Which diver is farthest from the surface? Explain your thinking.

b) Diver C because she is farthest from the number line

Lesson 3.2: Adding Rational Numbers

1. Determine each sum.

a) $-\frac{3}{4} + \frac{1}{2}$

$$-\frac{3}{4} + \frac{1}{2} = -\frac{1}{4}$$

b) $\frac{3}{4} + \frac{1}{2}$

$$\frac{3}{4} + \frac{1}{2} = 1\frac{1}{4}$$

c) $\frac{3}{4} + \left(-\frac{1}{2}\right)$

$$\frac{3}{4} + \left(-\frac{1}{2}\right) = \frac{3}{4} + \left(-\frac{2}{4}\right) = \frac{3-2}{4} = \frac{1}{4}$$

d) $-\frac{3}{4} + \left(-\frac{1}{2}\right)$

$$-\frac{3}{4} + \left(-\frac{1}{2}\right) = -\frac{3}{4} + \left(-\frac{2}{4}\right) = \frac{-3-2}{4} = \frac{-5}{4} = -1\frac{1}{4}$$

3. Sarah borrowed \$40.25 from her parents for a new sweater. She earns \$17.50 for a night of baby-sitting and gives this to her parents.

a) Write an addition statement to represent this situation. $-40.25 + 17.50 = -22.75$

b) How much does Sarah now owe? Sarah now owes \$22.75.

4. Determine each sum.

a) $2\frac{2}{5} + \left(-4\frac{1}{2}\right)$

$$2\frac{2}{5} + \left(-4\frac{1}{2}\right) = \frac{12}{5} + \left(-\frac{9}{2}\right) \\ = \frac{24}{10} + \left(-\frac{45}{10}\right) = \frac{24-45}{10} = \frac{-21}{10} = -2\frac{1}{10}$$

b) $-6\frac{3}{8} + \left(-1\frac{1}{5}\right)$

$$-6\frac{3}{8} + \left(-1\frac{1}{5}\right) = -\frac{51}{8} + \left(-\frac{6}{5}\right) = -\frac{255}{40} + \left(-\frac{48}{40}\right) \\ = \frac{-255-48}{40} = \frac{-303}{40} = -7\frac{23}{40}$$

5. Determine each sum.

a) $-3.6 + (-21.9)$

-25.5

b) $-0.81 + 2.4$

1.59

c) $9.78 + (-13.33)$

-3.55

d) $4.88 + (-12.26)$

-7.38

Lesson 3.3: Subtracting Rational Numbers

1. Determine each difference.

a) $-\frac{3}{4} - \frac{1}{2}$

$$-\frac{3}{4} - \frac{1}{2} = -1\frac{1}{4}$$

b) $3\frac{3}{5} - \left(-5\frac{1}{2}\right)$

$$\begin{aligned} 3\frac{3}{5} - \left(-5\frac{1}{2}\right) &= \frac{18}{5} - \left(-\frac{11}{2}\right) = \frac{36}{10} - \left(-\frac{55}{10}\right) \\ &= \frac{36 - (-55)}{10} = \frac{36 + 55}{10} = \frac{91}{10} = 9\frac{1}{10} \end{aligned}$$

c) $3\frac{2}{7} - 4\frac{3}{5}$

$$\begin{aligned} 3\frac{2}{7} - 4\frac{3}{5} &= \frac{23}{7} - \frac{23}{5} = \frac{115}{35} - \frac{161}{35} \\ &= \frac{115 - 161}{35} = -\frac{46}{35} = -1\frac{11}{35} \end{aligned}$$

d) $3\frac{1}{4} - \left(-2\frac{2}{3}\right)$

$$\begin{aligned} 3\frac{1}{4} - \left(-2\frac{2}{3}\right) &= \frac{13}{4} - \left(-\frac{8}{3}\right) = \frac{39}{12} - \left(-\frac{32}{12}\right) \\ &= \frac{39 - (-32)}{12} = \frac{39 + 32}{12} = \frac{71}{12} = 5\frac{11}{12} \end{aligned}$$

2. Two climbers leave base camp at the same time. Climber A ascends 20.4 m, while climber B descends 35.4 m. How far apart are the climbers? Write a subtraction statement using rational numbers to solve the problem.

$$20.4 - (-35.4) = 55.8; \text{ the distance between the climbers is } 55.8 \text{ m.}$$

3. Determine each difference.

a) $-4.7 - 5.9$

$$-10.6$$

b) $0.94 - 1.35$

$$-0.41$$

c) $-43.91 - (-9.44)$

$$-34.47$$

6. Determine the missing rational number in each addition statement.

a) $-\frac{2}{3} - \square = 3\frac{5}{6}$

$$-\frac{2}{3} - 3\frac{1}{6} = -3\frac{5}{6}$$

b) $\square - \left(-\frac{3}{4}\right) = -2\frac{1}{2}$

$$-3\frac{1}{4} - \left(-\frac{3}{4}\right) = -2\frac{1}{2}$$

Lesson 3.4: Multiplying Rational Numbers

1. Determine each product.

a) $(-1.2) \times 0.3$

$$-0.36$$

b) $0.34 \times (-0.5)$

$$-0.17$$

c) $(-0.6) \times (-0.15)$

$$0.09$$

d) $0.9 \times (-1.2)$

$$-1.08$$

e) $(1.19)(-13.2)$

$$-15.708$$

f) $(-8.65)(-1.6)$

$$13.84$$

2. Determine each product.

a) $\frac{2}{5} \times \left(-\frac{1}{2}\right)$

$$\frac{2}{5} \times \left(-\frac{1}{2}\right) = -\frac{1}{5}$$

b) $\left(-\frac{3}{2}\right) \times \left(\frac{1}{7}\right)$

$$\left(-\frac{3}{2}\right) \times \frac{1}{7} = -\frac{3}{14}$$

c) $\left(-\frac{3}{4}\right) \times \left(-\frac{4}{5}\right)$

$$\left(-\frac{3}{4}\right) \times \left(-\frac{4}{5}\right) = \frac{3}{5}$$

c) $\left(\frac{10}{7}\right)\left(-\frac{13}{8}\right)$

$$\left(\frac{10}{7}\right)\left(-\frac{13}{8}\right) = \left(-\frac{130}{56}\right) = -\frac{65}{28} = -2\frac{9}{28}$$

d) $\left(-4\frac{3}{5}\right)\left(-2\frac{5}{12}\right)$

$$\left(-4\frac{3}{5}\right)\left(-2\frac{5}{12}\right) = \left(-\frac{23}{5}\right)\left(-\frac{29}{12}\right) = \frac{667}{60} = 11\frac{7}{60}$$

3. From November 12th to November 21st, the temperature in Burnaby, B.C. dropped an average of 1.7°C each day. Suppose the temperature on the morning of November 12th was 11.4°C . What was the temperature on the morning of November 21st?

$$11.4 + [9 \times (-1.7)] = -3.9$$

It was -3.9°C on the morning of Nov. 21.

Lesson 3.5: Dividing Rational Numbers

1. Determine each quotient.

a) $(-1.6) \div 0.2$ b) $(-0.6) \div (-3)$ c) $16.4 \div (-5.5)$ d) $(-0.98) \div 12.4$

8 0.2 -2.98 -0.08

2. Calculate each quotient.

a) $\frac{1}{5} \div \left(-\frac{2}{5}\right)$ b) $\left(-\frac{2}{3}\right) \div \left(\frac{5}{6}\right)$ c) $\left(-\frac{3}{4}\right) \div \left(-\frac{5}{2}\right)$ d) $\frac{5}{9} \div \left(-\frac{2}{3}\right)$

$\left(-\frac{2}{3}\right) \div \left(\frac{5}{6}\right) = \left(-\frac{2}{3}\right) \times \left(\frac{6}{5}\right) = -\frac{12}{15} = -\frac{4}{5}$ $\frac{5}{9} \div \left(-\frac{2}{3}\right) = \frac{5}{9} \times \left(-\frac{3}{2}\right) = -\frac{15}{18} = -\frac{5}{6}$

$\frac{1}{5} \div \left(-\frac{2}{5}\right) = -\frac{1}{2}$ $\left(-\frac{3}{4}\right) \div \left(-\frac{5}{2}\right) = -\frac{3}{4} \times \left(-\frac{2}{5}\right) = \frac{-3}{-10} = \frac{3}{10}$

c) $3\frac{1}{2} \div \left(-2\frac{1}{6}\right)$

$3\frac{1}{2} \div \left(-2\frac{1}{6}\right) = \frac{7}{2} \div \left(-\frac{13}{6}\right)$
 $= \frac{21}{6} \div \left(-\frac{13}{6}\right) = -\frac{21}{13} = -1\frac{8}{13}$

d) $\left(-2\frac{1}{5}\right) \div \left(-4\frac{3}{4}\right)$

$\left(-2\frac{1}{5}\right) \div \left(-4\frac{3}{4}\right) = \left(-\frac{11}{5}\right) \div \left(-\frac{19}{4}\right)$
 $= \left(-\frac{11}{5}\right) \times \left(-\frac{4}{19}\right) = \frac{44}{95}$

3. A diver descends 3.2 m in 5 min. What was his average rate of descent in metres per minute?

$(-3.2) \div 5 = -0.64$; So, the average rate of descent is 0.64 m/min.

6. Replace each \square with a rational number to make each equation true.

$3 \times 4 = 12$ $15 \cdot 3 = 5$

a) $\square \times 2.5 = -1.6$

b) $(-5.7) \div \square = 1.5$

$(-0.64) \times 2.5 = -1.6$

$(-5.7) \div (-3.8) = 1.5$

$\square = \frac{-1.6}{2.5}$

$\square = \frac{-5.7}{1.5}$

Lesson 3.6: Order of Operations with Rational Numbers

1. Evaluate.

a) $4.5 + 5.1 \div 1.7$

$$4.5 + 5.1 \div 1.7 = 4.5 + 3 = 7.5$$

b) $-5.8 - 3.1 \times 0.5$

$$-5.8 - 3.1 \times 0.5 = -5.8 - 1.55 = -7.35$$

c) $\frac{2}{3} \times \left(-\frac{1}{2}\right) + \frac{5}{6}$

$$\frac{2}{3} \times \left(-\frac{1}{2}\right) + \frac{5}{6} = \left(-\frac{2}{6}\right) + \frac{5}{6} = \frac{3}{6} = \frac{1}{2}$$

d) $\frac{3}{8} - \frac{9}{4} \div \left[\left(-\frac{5}{4}\right) + \left(-\frac{1}{10}\right)\right]$

$$\begin{aligned} \frac{3}{8} - \frac{9}{4} \div \left[\left(-\frac{5}{4}\right) + \left(-\frac{1}{10}\right)\right] \\ &= \frac{3}{8} - \frac{9}{4} \div \left[-\frac{25}{20} - \frac{2}{20}\right] \\ &= \frac{3}{8} - \frac{9}{4} \div \left[-\frac{27}{20}\right] \\ &= \frac{3}{8} - \frac{9}{4} \times \left[-\frac{20}{27}\right] \\ &= \frac{3}{8} + \frac{5}{3} \\ &= \frac{9}{24} + \frac{40}{24} \\ &= \frac{49}{24} = 2\frac{1}{24} \end{aligned}$$

e) $-4\frac{2}{3} \div \left[\left(-\frac{1}{3}\right) + 4\frac{1}{6}\right] + \left(-3\frac{2}{5}\right)$

$$\begin{aligned} -4\frac{2}{3} \div \left[\left(-\frac{1}{3}\right) + 4\frac{1}{6}\right] + \left(-3\frac{2}{5}\right) \\ &= -\frac{14}{3} \div \left[\left(-\frac{1}{3}\right) + \frac{25}{6}\right] + \left(-\frac{17}{5}\right) \\ &= -\frac{14}{3} \div \left[\left(-\frac{2}{6}\right) + \frac{25}{6}\right] + \left(-\frac{17}{5}\right) \\ &= -\frac{14}{3} \div \frac{23}{6} + \left(-\frac{17}{5}\right) \\ &= -\frac{28}{6} \div \frac{23}{6} + \left(-\frac{17}{5}\right) \\ &= -\frac{28}{23} + \left(-\frac{17}{5}\right) = -\frac{531}{115} = -4\frac{71}{115} \end{aligned}$$

f) $1\frac{5}{9} - \left(-2\frac{1}{6}\right) + \left[4\frac{1}{4} + \left(-3\frac{1}{2}\right)\right]^2 \div \frac{2}{5}$

$$\begin{aligned} 1\frac{5}{9} - \left(-2\frac{1}{6}\right) + \left[4\frac{1}{4} + \left(-3\frac{1}{2}\right)\right]^2 \div \frac{2}{5} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \left[\frac{17}{4} + \left(-\frac{7}{2}\right)\right]^2 \div \frac{2}{5} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \left[\frac{17}{4} + \left(-\frac{14}{4}\right)\right]^2 \div \frac{2}{5} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \left(\frac{3}{4}\right)^2 \div \frac{2}{5} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \frac{9}{16} \div \frac{2}{5} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \frac{9}{16} \times \frac{5}{2} \\ &= \frac{14}{9} - \left(-\frac{13}{6}\right) + \frac{45}{32} \\ &= \frac{1477}{288} = 5\frac{37}{288} \end{aligned}$$

3. A formula for the area of a trapezoid is $A = a \left(\frac{b+c}{2} \right)$ where b and c are the lengths of the parallel sides and a is the perpendicular distance between these sides. Use the formula to determine the area of a trapezoid with: $a = 3.5$ cm, $b = 5.7$ cm, $c = 8.1$ cm.

$$A = 3.5 \left(\frac{5.7+8.1}{2} \right) = 3.5 \left(\frac{13.8}{2} \right) = 3.5(6.9) = 24.15$$

The area of the trapezoid is 24.15 cm^2 .

4. Evaluate this expression. Round the answer to the nearest hundredth.

$$\frac{9.6 \times 12.6 - 5.1 \div (-7.4) - 0.6}{(-2.9) \div 1.3 - (-6.5)}$$

Top:

$$\begin{aligned} & 9.6 \times 12.6 - 5.1 \div (-7.4) - 0.6 \\ & \underline{120.96} - 5.1 \div (-7.4) - 0.6 \\ & \quad \quad \quad \underline{0.6892} \\ & 120.96 - 0.6892 - 0.6 \\ & = 121.05 \end{aligned}$$

Bottom:

$$\begin{aligned} & (-2.9) \div 1.3 - (-6.5) \\ & -2.23 - (-6.5) \\ & = 4.27 \end{aligned}$$

Top \div bottom

$$\begin{aligned} & = 121.05 \div 4.27 \\ & = 28.3 \end{aligned}$$