

Math 45 1.4 and 1.5

Objectives: 1) Add

1.4

Subtract

Multiply

Divide

} integers, i.e. signed numbers

2) Additive inverse terminology

3) Multiplicative inverse terminology

Objectives:

1.5

1) Add, subtract, multiply
and divide fractions
and decimals.

Beginning in Math 45, improper fractions
are preferred answers.

2 handouts

1.4

1.5

Math 45 Handout for 1.4 Adding, Subtracting, Multiplying, and Dividing Integers

Objectives:

1. Add subtract, multiply and divide integers (signed numbers).

Adding: $(+) + (+) = (+)$
 $(-) + (-) = (-)$

$(+) + (-)$ } sign of # with larger
 $(-) + (+)$ } absolute value

Subtracting: Rewrite as add the additive inverse of the number being subtracted.
Then use rules for addition.

Ex. $-3 - 2 = -3 + (-2) = \boxed{-5}$

Multiplying: $(+) \times (+) = (+)$
 $(-) \times (-) = (+)$
 $(+) \times (-) = (-)$
 $(-) \times (+) = (-)$

Dividing: $\frac{(+)}{(+)} = (+)$ $\frac{(-)}{(-)} = (+)$ $\frac{(-)}{(+)} = (-)$ $\frac{(+)}{(-)} = (-)$

2. Find the additive inverse of a number.

"additive inverse" = "opposite"

3. In Math 35, we used mixed numbers. In Math 45, do not use mixed numbers. Instead use improper fractions or decimals.

Instead of $3\frac{3}{4}$, for your final answer write 3.75 or $\frac{15}{4}$.

Instead of $\times$ to mean multiply, use $\cdot$ or $(\times)$.

You should already know all of these problems from Math 35. If you are having trouble, get tutoring help right away from the Math Center (room 426), the ASC (room 420), or Ms. Carey's office hours.

Find the sum.

1) $46 + (-20) = 46 - 20 = \boxed{26}$

2) $22 + (-144) = -(144 - 22) = \boxed{-122}$

3) $-65 + (-140) = -(65 + 140) = \boxed{-205}$

4) $20 + (-20) = 20 - 20 = \boxed{0}$

5) $5 + (-2) + 18 + (-21) = 3 + 18 - 21$
 $= 21 - 21$
 $= \boxed{0}$

6) $-17 + (-10) + (-6) + (-24)$
 $= -(17 + 10 + 6 + 24)$
 $= \boxed{-57}$

Find the additive inverse (opposite) of the integer.

7) 4 $\boxed{-4}$

8) -9 $\boxed{9}$

Find the difference. (Add the additive inverse.)

9) $16 - 10 = 16 + (-10) = \boxed{6}$

Find the difference.

10) $3 - 14 = 3 + (-14) = \boxed{-11}$

11) $12 - (-5) = 12 + 5 = \boxed{17}$

12) $0 - (-10) = 0 + 10 = \boxed{10}$

13) $-8 - (-7) = -8 + 7 = \boxed{-1}$

14) $-17 - (-17) = -17 + 17 = \boxed{0}$

Note: There are often several ways to rewrite these; your goal is to do them no matter how they are written. But until you achieve that goal, you should write them in the way that makes the most sense to you.

Find the product.

$$15) 7(-2) = \boxed{-14}$$

$$16) (-2)(-3)(-6) = (6)(-6) = \boxed{-36}$$

$$17) 3 \cdot -4 \cdot -4 = (-12)(-4) = \boxed{48}$$

$$18) (-2)(-2)(0)(8) = 4 \cdot 0 \cdot 8 = 0 \cdot 8 = \boxed{0}$$

$$19) (-5)(4)(-3)(-3) = (-20)(-3)(-3) = (60)(-3) = \boxed{-180}$$

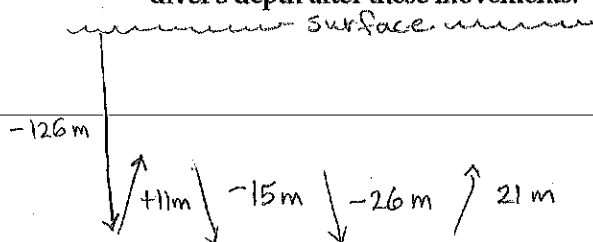
Evaluate the expression.

$$20) |-49| + 30 = 49 + 30 = \boxed{79}$$

absolute value $||$ makes the result non-negative

Solve the problem.

- 21) A deep-sea diver dives from the surface to 126 meters below the surface and then swims up 11 meters, down 15 meters, down another 26 meters, and then up 21 meters. Find the diver's depth after these movements.



$$\begin{aligned} & -126 + 11 - 15 - 26 + 21 \\ & = -(126 + 15 + 26) + (11 + 21) \\ & = -167 + 32 = \boxed{-135 \text{ m}} \text{ or } \boxed{135 \text{ m deep}} \end{aligned}$$

- 22) Jared borrowed \$264 from his friend Linda. He paid her back \$41, but then had to borrow another \$75. How much does he still owe her?

$$\begin{aligned} & -264 + 41 - 75 \\ & = -(264 + 75) + 41 \\ & = -339 + 41 \\ & = \boxed{\$298} \end{aligned}$$

always write the units on your answer \$, meters, etc.

Find the multiplicative inverse (or reciprocal) of the number.

$$23) 15 \quad \boxed{\frac{1}{15}}$$

$$24) 1 \quad \boxed{1}$$

Divide.

$$25) \frac{-28}{7} = -28 \div 7 = \boxed{-4}$$

$$26) \frac{21}{-3} = 21 \div (-3) = \boxed{-7}$$

$$27) \frac{-16}{-8} = -16 \div -8 = \boxed{2}$$

$$28) -16 \div 8 = \frac{-16}{8} = \boxed{-2}$$

$$29) 30 \div (-5) = \frac{30}{-5} = \boxed{-6}$$

$$30) -104 \div (-4) = \frac{-104}{-4} = \boxed{+26}$$

* Review GRS *

Math 45 Handout for 1.5 Adding, Subtracting, Multiplying, and Dividing Rational Numbers (Fractions & Decimals)

Objectives:

1. Add, subtract, multiply and divide fractions.
2. Add, subtract, multiply and divide decimals.

SOLUTIONS

You should already know all of these problems from Math 35. If you are having trouble, get tutoring help right away from the Math Center (room 426), the ASC (room 420), or Ms. Carey's office hours.

Find the product, and write in lowest terms, if necessary.

$$1) \frac{14}{15} \cdot \frac{6}{35} = \frac{2}{15} \cdot \frac{6}{5} \quad (\text{reduce by } 7)$$

$$= \frac{2}{5} \cdot \frac{2}{5} \quad (\text{reduce by } 3)$$

$$= \boxed{\frac{4}{25}}$$

$$2) 3 \cdot \frac{49}{15} = \frac{3}{1} \cdot \frac{49}{15} \quad (\text{write } 3 = \frac{3}{1})$$

$$= \frac{1}{1} \cdot \frac{49}{5} \quad (\text{reduce by } 3)$$

$$= \boxed{\frac{49}{5}}$$

$$3) -\frac{16}{56} \cdot \frac{7}{8} = -\frac{2}{7} \cdot \frac{7}{8} \quad (\text{reduce by } 8)$$

$$= -\frac{2}{1} \cdot \frac{1}{8} \quad (\text{reduce by } 7)$$

$$= -\frac{1}{1} \cdot \frac{1}{4} \quad (\text{reduce by } 2)$$

$$= \boxed{-\frac{1}{4}}$$

$$4) \frac{24}{5} \cdot \left(-\frac{20}{7}\right) = \frac{24}{1} \cdot \frac{-4}{7} \quad (\text{reduce by } 5)$$

(pos · neg = neg.)

$$= \boxed{-\frac{96}{7}}$$

$$5) -\frac{1}{13} \cdot \left(-\frac{4}{7}\right) = \boxed{+\frac{4}{91}} \quad (\text{neg} \cdot \text{neg} = \text{pos})$$

Find the quotient, and write in lowest terms, if necessary.

$$8) \frac{12}{10} \div \frac{15}{8} = \frac{12}{10} \cdot \frac{8}{15}$$

step 1: multiply by reciprocal of 2nd fraction

$$= \frac{6}{5} \cdot \frac{8}{15}$$

step 2: Reduce or divide out common factors (divide out 2, and 3)

$$= \frac{2}{5} \cdot \frac{8}{5}$$

step 3: Multiply numerators & multiply denominators.

$$= \boxed{\frac{16}{25}}$$

$$9) -\frac{1}{7} \div 5$$

$$= -\frac{1}{7} \div \frac{5}{1}$$

(rewrite $5 = \frac{5}{1}$)

$$= -\frac{1}{7} \cdot \frac{1}{5}$$

(multiply by reciprocal)

$$= \boxed{-\frac{1}{35}}$$

(multiply fractions)

$$10) 15 \div \left(-\frac{5}{3}\right)$$

$$= \frac{15}{1} \cdot \frac{-3}{5}$$

(write $15 = \frac{15}{1}$)

(multiply by reciprocal)

$$= \frac{3}{1} \cdot \frac{-3}{1}$$

(reduce by 5)

$$= \boxed{-9}$$

Note: $-\frac{9}{1}$ is not fully reduced.

$$11) -\frac{7}{5} \div \left(-\frac{10}{13}\right)$$

$$= -\frac{7}{5} \cdot \frac{-13}{10}$$

(multiply by reciprocal)

$$= \boxed{\frac{91}{50}}$$

(neg · neg = pos)

Solve the problem.

6) If Sam spends $\frac{3}{8}$ of his life exercising, how

many hours does he spend exercising each week?

his life $\Rightarrow$ each week $\Leftrightarrow$ hours

step 1: How many hours in one week?

$$1 \text{ week} \left(\frac{7 \text{ days}}{1 \text{ week}} \right) \left(\frac{24 \text{ hrs}}{1 \text{ day}} \right) = 168 \text{ hrs/week}$$

step 2: "of" means multiply: $\frac{3}{8}$ of 168

$$= \frac{3}{8} \cdot \frac{168}{1} \quad (\text{reduce by } 8) = \frac{3}{1} \cdot \frac{21}{1} = \boxed{63 \text{ hrs}}$$

step 3: write answer with units.

Find the reciprocal of the number.

$$7) \frac{5}{8} \quad \boxed{\frac{8}{5}}$$

reciprocal: "flip the fraction over" — write numerator in denominator and denominator as numerator.

$$12) -\frac{1}{9} \div (-5)$$

$$= -\frac{1}{9} \div \frac{-5}{1}$$

(write $-5 = \frac{-5}{1}$)

$$= -\frac{1}{9} \cdot \frac{-1}{5}$$

(multiply by reciprocal)

$$= \boxed{\frac{1}{45}}$$

(multiply fractions)

$$13) -9 \div \left(-\frac{4}{5}\right)$$

$$= -\frac{9}{1} \cdot \frac{-5}{4}$$

(write $-9 = \frac{-9}{1}$)

(multiply by reciprocal)

$$= \boxed{\frac{45}{4}}$$

(neg · neg = pos)

(multiply fractions)

Find the sum or difference, and write in lowest terms, if necessary.

$$14) -\frac{3}{4} + \frac{3}{8} = \frac{-3 \cdot 2}{4 \cdot 2} + \frac{3}{8}$$

$$= \frac{-6}{8} + \frac{3}{8}$$

$$= \frac{-6+3}{8} = \boxed{\frac{-3}{8}}$$

$$15) -\frac{7}{8} + \left(-\frac{1}{2}\right) = \frac{-7}{8} + \frac{-1 \cdot 4}{2 \cdot 4}$$

$$= \frac{-7}{8} - \frac{4}{8}$$

$$= \boxed{\frac{-11}{8}}$$

$$16) -\frac{2}{3} - \frac{1}{2}$$

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

$$= \frac{-4}{6} - \frac{3}{6} = \frac{-4-3}{6} = \boxed{\frac{-7}{6}}$$

$$17) -\frac{1}{8} - \left(\frac{5}{64}\right)$$

$$= \frac{-1 \cdot 8}{8 \cdot 8} - \frac{5}{64}$$

$$= \frac{-8}{64} - \frac{5}{64} = \frac{-8-5}{64} = \boxed{\frac{-13}{64}}$$

$$18) -\frac{5}{2} - (1)$$

$$= \frac{-5}{2} - \frac{1 \cdot 2}{1 \cdot 2}$$

$$= \frac{-5-2}{2} = \boxed{\frac{-7}{2}}$$

$$19) \frac{3}{5} - 5$$

$$= \frac{3}{5} - \frac{5 \cdot 5}{1 \cdot 5}$$

$$= \frac{3}{5} - \frac{25}{5} = \frac{3-25}{5} = \boxed{\frac{-22}{5}}$$

$$20) 4 - \left(-\frac{2}{3}\right) = \frac{4}{1} + \left(+\frac{2}{3}\right)$$

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

$$= \frac{12+2}{3} = \boxed{\frac{14}{3}}$$

$$21) \frac{1}{7} - \frac{1}{13} \quad (7 \cdot 13 = 91)$$

$$= \frac{1 \cdot 13}{7 \cdot 13} - \frac{1 \cdot 7}{13 \cdot 7}$$

$$= \frac{13}{91} - \frac{7}{91} = \frac{13-7}{91} = \boxed{\frac{6}{91}}$$

$$22) \frac{30}{13} - \frac{9}{13} - \frac{12}{13} \quad (\text{already has C.D.})$$

$$= \frac{30-9-12}{13}$$

$$= \frac{21-12}{13}$$

$$= \boxed{\frac{9}{13}}$$

step 1: Find the lowest common denominator (C.D.) (least common multiple)

step 2: Multiply numerator & denominator of each fraction by factor missing from denominator

step 3: Add or subtract numerators, with their signs.

step 4: Write new numerator over common denominator (unchanged)

step 5: Reduce final result if necessary.

$$23) -\frac{5}{3} + \left(-\frac{1}{3}\right) + \frac{2}{9} \quad \text{C.D.} = 9$$

$$= \frac{-5 \cdot 3}{3 \cdot 3} + \frac{-1 \cdot 3}{3 \cdot 3} + \frac{2}{9}$$

$$= \frac{-15}{9} - \frac{3}{9} + \frac{2}{9}$$

$$= \frac{-15-3+2}{9} = \frac{-18+2}{9} = \boxed{\frac{-16}{9}}$$

Perform the indicated operations.

$$24) -(-0.66) + 0.69$$

$$= 0.66 + 0.69$$

$$= \boxed{1.35}$$

$$25) 5.1 + (-5.4) + (-3.3)$$

$$= 5.1 - 5.4 - 3.3$$

$$= -0.3 - 3.3 = \boxed{-3.6}$$

$$26) 0.54 - (-0.49)$$

$$= 0.54 + 0.49$$

$$= \boxed{1.03}$$

$$27) -12.3 - (-11.5)$$

$$= -12.3 + 11.5$$

$$= \boxed{-0.8}$$

$$28) 49.1 - 11.72 - (-6.3) + 15.48$$

$$= 49.1 - 11.72 + 6.3 + 15.48$$

$$= \boxed{59.16}$$

$$29) 14.79 \times 0.0070$$

$$= \boxed{0.10353}$$

$$30) 3.2 \times (-7.20)$$

$$= \boxed{-23.04}$$

$$31) \frac{6.3832}{2.02} \cdot \frac{100}{100} = \frac{638.32}{202}$$

$$= \boxed{3.16}$$

$$32) \frac{-1.4}{0.07} \cdot \frac{100}{100} = \frac{-140}{7}$$

$$= \boxed{-20}$$

use your calculator! You should have a key for subtract and a different key $\boxed{+/-}$ or $\boxed{(-)}$ for making a negative number.