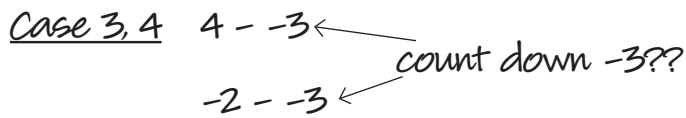
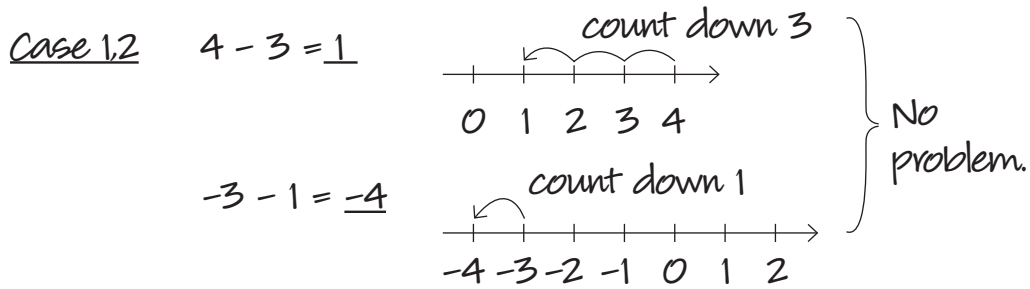


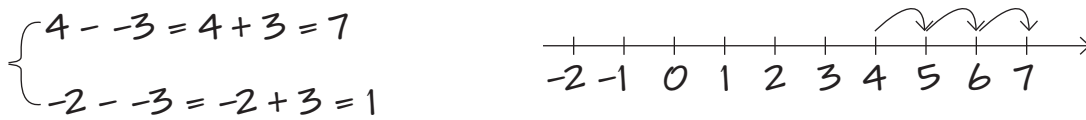
What to bring to class:  
 Ask students to bring PM  
 4A and 5A.

8.2 More integer basics

Subtraction



interpretation: Count down -3 = opposite of count down 3  
 = count up 3!

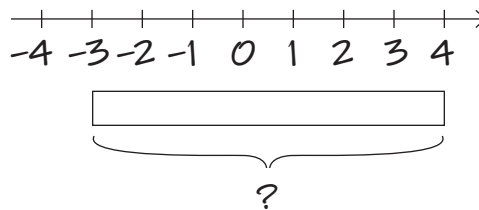


Principle: "Subtracting a negative is the same as adding the opposite."

Rule 2:  $a - (-b) = a + b$

Another way:  $4 - -3$

part-whole interpretation



Another way: Pattern

$$\begin{aligned} 4 - 2 &= 2 \\ 4 - 1 &= 3 \quad \leftarrow +1 \\ 4 - 0 &= 4 \quad \leftarrow +1 \\ 4 - (-1) &= \_ \quad \leftarrow +1 \\ 4 - (-2) &= \_ \quad \leftarrow +1 \\ 4 - (-3) &= \_ \quad \leftarrow +1 \end{aligned}$$

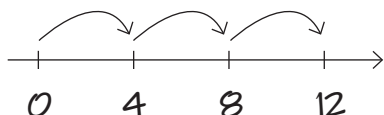
Another way: Missing addends:  $4 - (-3) = \_ \leftrightarrow 4 = -3 + \_$

Ans:  $-3 + \underline{7} = 4$

[ASK!! they should be very comfortable with this by now]

Multiplication of Integers

(1) pos x pos  $3 \times 4 = \underline{3 \text{ groups of } 4} = 4 + 4 + 4 = 12$



(2) pos x neg = neg

$$3 \times -4 = \underline{3 \text{ groups of } -4} = -4 + -4 + -4 = -12$$

(3) neg x pos = neg

$$-4 \times 3 = \underline{-4 \text{ groups of } 3}$$

?? what does this mean?

Need an interpretation. Want commutative property

$$-4 \times 3 = 3 \times -4 = -12$$

tells us what the answer should be.

Interpretation: "the opposite of 4" groups of 3  $\leftrightarrow$  the opposite of "4 groups of 3"

so

$$-4 \times 3 = \underline{-(4 \times 3)} = \underline{-(12)} = -12$$

interpretation      opposite operator

thus,

Rule 3:  $-a \times b = -(a \times b)$

Another way:

$$\begin{array}{l}
 2 \times 3 = 6 \\
 1 \times 3 = 3 \\
 0 \times 3 = 0 \\
 -1 \times 3 = \_ \\
 -2 \times 3 = \_
 \end{array}$$

$\left. \begin{array}{l} \leftarrow -3 \\ \leftarrow -3 \end{array} \right\}$

Case 4 neg x neg = pos.

Use the previous interpretation!

$$\begin{aligned}
 -3 \times -4 &= \text{"the opposite of 3" groups of -4} \\
 &= \text{the opposite of "3 groups of -4"} \quad \leftarrow \text{Inter.} \\
 &= -(3 \times -4) \\
 &= -(-12) \quad \leftarrow \text{Case 2} \\
 &= 12 \quad \leftarrow \text{Rule 1}
 \end{aligned}$$

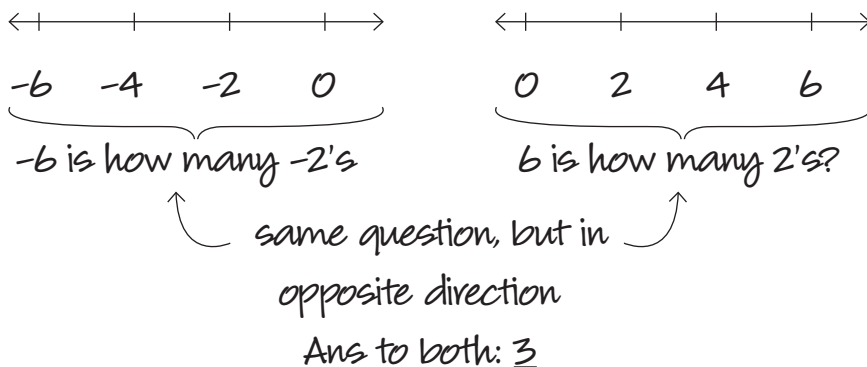
Hence,  $-a \times -b = a \times b$

Another way  
Pattern:

x	2	1	0	-1	-2
2	4	2	0	-2	-4
1	2	1	0	-1	-2
-1	-2	-1	0	1	2
-2	-4	-2	0	2	4

Division Follows from multiplication

Compare  $-6 \div -2$  to  $6 \div 2$  using M.D.



Rule 5  $-a \div -b = a \div b$

-or-  
 $\frac{-a}{-b} = \frac{a}{b}$

Next we show  $-6 \div 2$ ,  $6 \div -2$ ,  $-6 \div -2$  are equal.

$-6 \div 2 = -6 \times \frac{1}{2} = -6 \times \frac{1}{2} = -6 \div 2$

and

$-6 \div 2 = -6 \div -(-2) = 6 \div -2$

So,  $-6 \div 2 = -6 \div 2 = 6 \div -2$

Rule 6:  $-(a \div b) = -a \div b = a \div (-b)$  [ or  $\frac{a}{-b} = \frac{-a}{b} = \frac{a}{-b}$  ]

HW Read § 8.2 [It has a lot of nice teacher help.] Do HW set 35