Math 8 Chp 2.1

Note Title 2014-07-05

Using Models to Multiply Integers

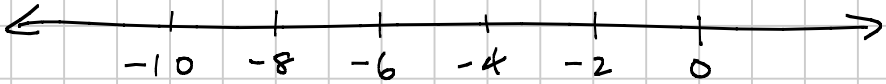
Recall: integers are positive and negative whole numbers. Negative numbers are used everywhere: business, sports, science, etc.

We can think of multiplication as repeated addition, but it is more than that (eg. multiplying by fractions or radicals).

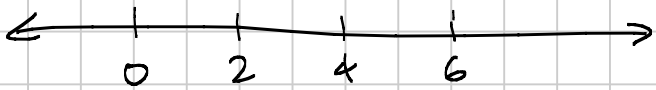
Using a Number Line: (always start at 0)

eg) 4×3

eg) $2 \times (-5)$ We always start by moving right, then we change direction for every negative sign.



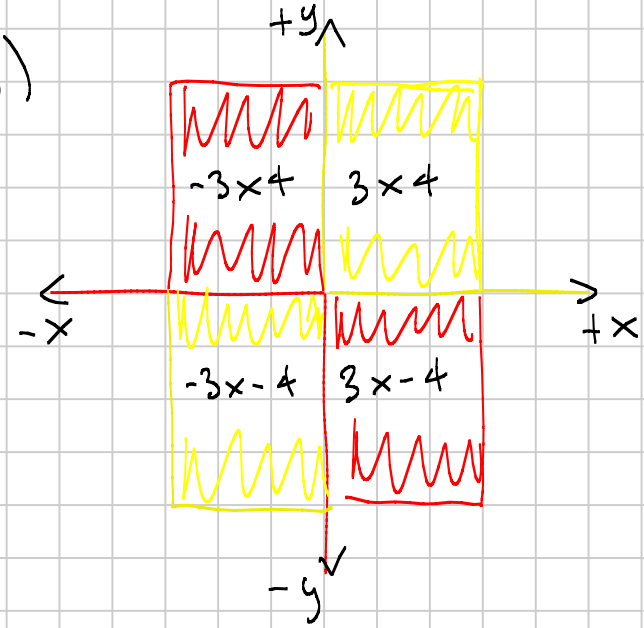
eg) $(-2) \times (-3)$



Using Tiles: Yellow tiles mean positive. Red tiles mean negative.

Use Cartesian coordinates. x for the first integer and y for the second.

eg)



Count Negatives: An even number of negative signs gives a positive answer. An odd number of negative signs give a negative answer.
An analogy is "not." I am not-not smart. Two nots make the answer positive so, I am smart! You are not-not-not dumb. Three nots make the answer negative, so you are not dumb!

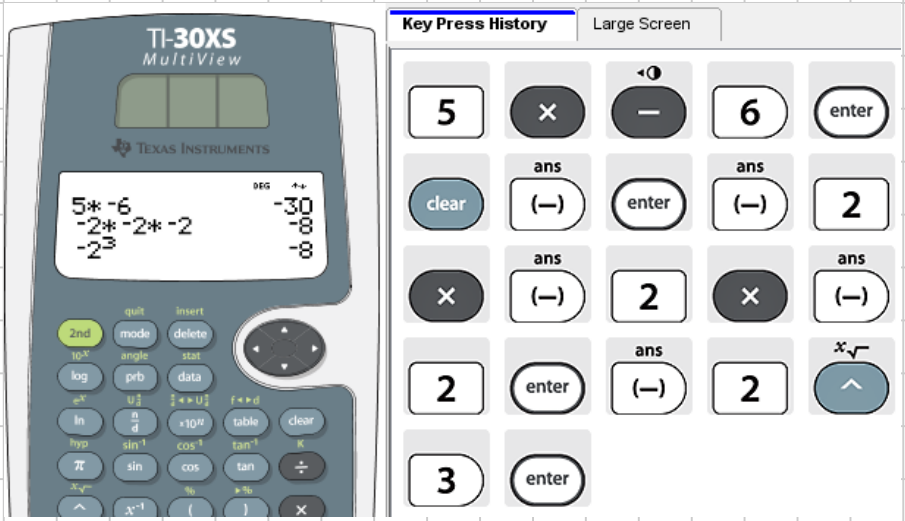
eg) $-2 \times -2 \times -2 =>$
$=$

eg) $-3 \times -3 \times 3 =>$
$=$

eg) $3 \times -4 \times 2 =$

eg) $-5 \times 2 \times -3 =$

HW: pp. 67-69: 5-8 (a,b), 10-11 (b,c), 12, 13, 16
Challenge: 14, 18, 20
Please solve 3 and 4 in person.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Math 8 Chp 2.2

Note Title 2014-07-05

Developing Rules to Multiply Integers

Zero Property (same as whole numbers): $0 \times a = a \times 0 = 0$

$0 \times 8 =$ $\quad -7 \times 0 =$ $\quad -1234 \times 0 =$

Multiplicative Identity (same as W): $1 \times a = a \times 1 = a$

$1 \times 8 =$ $\quad -7 \times 1 =$ $\quad -1234 \times 1 =$

Commutative Property (same as W): $a \times b = b \times a$

$-12 \times 13 =$ $\quad -345 \times (-567) =$

Distributive Property (same as W): $a(b+c) = ab + ac$

$-3(4-5) =$ $\quad -5 \times 7 - 5 \times (-8) =$

$6(-9+3) =$ $\quad 11 \times (-2) + 11 \times (17) =$

Recall Long Multiplication - use partial products.

$23 \times 457 = (20+3)(400+50+7)$

$= (20 \times 400 + 20 \times 50 + 20 \times 7) + (3 \times 400 + 3 \times 50 + 3 \times 7)$

$= (8000 + 1000 + 140) + (1200 + 150 + 21)$

$= 10511$

Easier Form:

$$\begin{array}{r} 457 \\ \times \quad 23 \\ \hline \end{array}$$

Long Multiplication with Integers - same rule as before: multiply the whole numbers, then count the number of negative signs.

$$\begin{array}{r} -27 \\ \times\ -34 \\ \hline \end{array} \qquad \begin{array}{r} -54 \\ \times\ \ 82 \\ \hline \end{array}$$

Solving Problems:

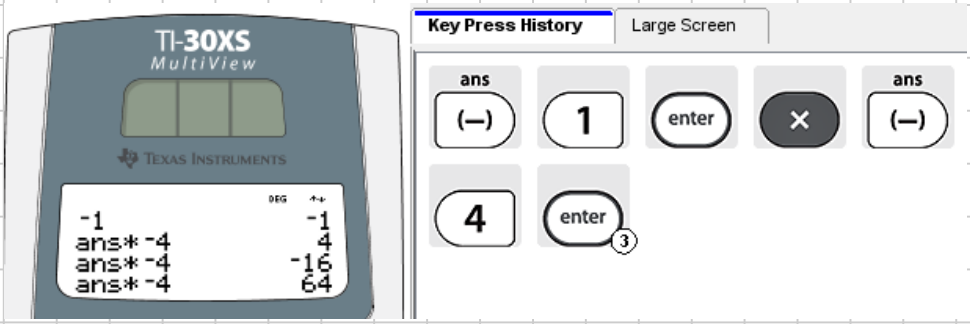
eg) $5 \times \square = -30$

eg) $\square \times (-6) = -42$

eg) Find the rule for the pattern (sequence):
$-1, 4, -16, 64, \ldots$

eg) Find the rule for the sequence:
$1, -5, 25, -125, \ldots$

HW: pp. 73 - 75: 3 - 9 (a, b), 11, 12, 14, 15
Challenge: 17 - 20
Please answer 1 & 2 in person.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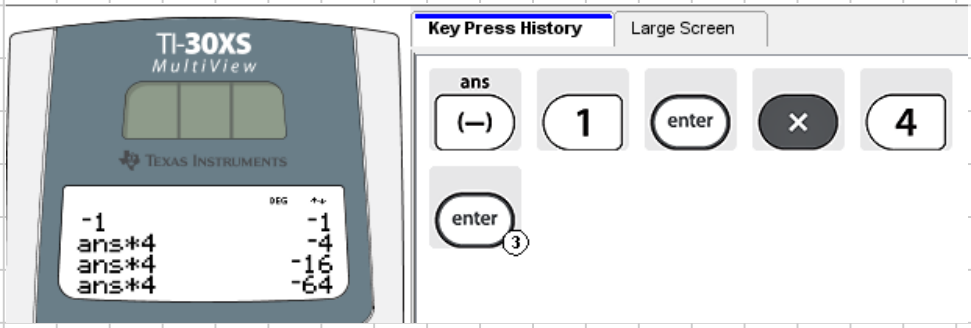
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Math 8 Chp 2.3

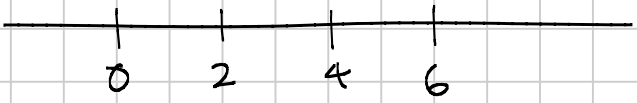
Note Title 2014-07-05

Using Models to Divide Integers

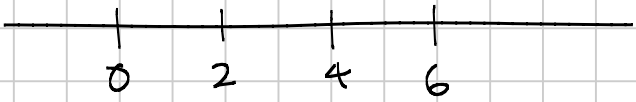
Recall that multiply and divide are inverse (opposite) of each other. So we can model with number lines or tiles.

Using a Number Line: Start at dividend and subtract the divisor until you get to zero.

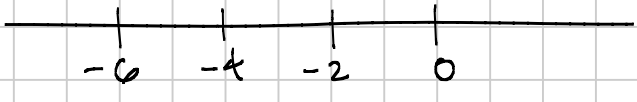
eg) $6 \div 2 =$



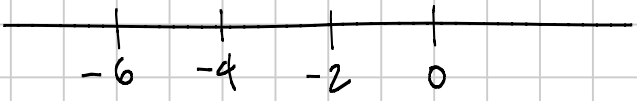
eg) $6 \div (-2) =$



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



eg) $-6 \div 2 =$

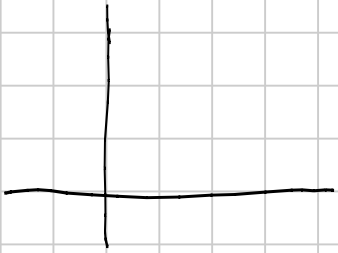


Use these visuals, or count negative signs as before.

Using Tiles: Yellow tiles mean positive.
Red tiles mean negative.

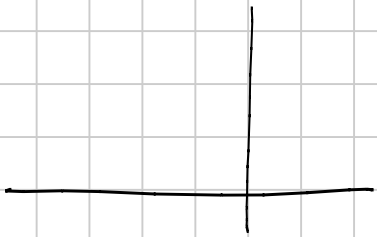
Draw groups of divisor (x) until you get the dividend. Your answer is (y).

eg) $12 \div 4 =$ (x, y)

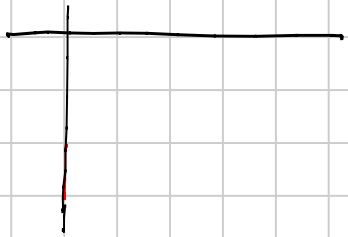


eg) $12 \div (-4) = -3$

eg) $-12 \div (-4) =$



eg) $-12 \div 4 =$



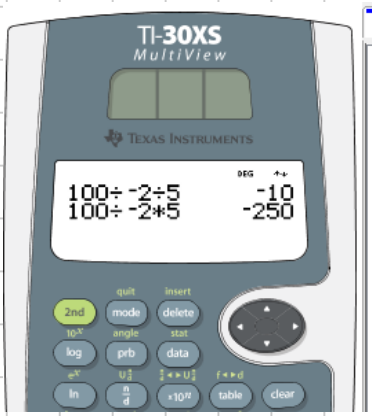
Count Negatives: An even number of negative signs gives a positive answer. An odd number of negative signs give a negative answer.
Recall fractions are another way to represent division.

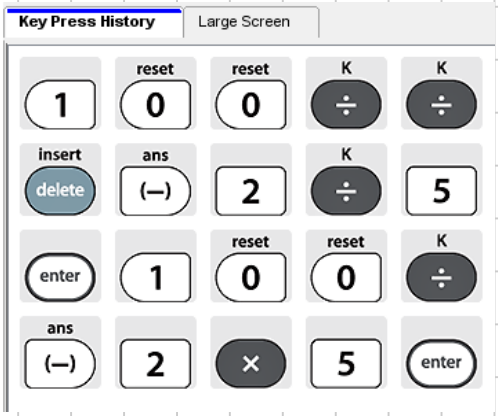
eg) $24 \div (-2) \div (-3) =$

eg) $100 \div (-2) \div 5 =$

Use models to get an understanding, but ultimately just count negative signs.

Hw: pp. 80-82: 3-4(a,b), 5, 6(b,e), 8, 10-12
Challenge: 16-18
Please solve 1 and 2 in person.





1: $\frac{100}{-2(-5)}$

2: $\frac{100}{-2}(5)$

Math 8 Chp 2.4

Note Title 2014-07-05

Developing Rules to Divide Integers

Division Identity (same as whole numbers): $a \div 1 = \frac{a}{1} = a$

Negating Property: $a \div (-1) = \frac{a}{-1} = -a$

Zero Property: $0 \div a = \frac{0}{a} = 0$, $a \neq 0$

Notes: Division is not commutative.

Review Long Division: Use extra zeroes for decimals

eg) $61 \div 11 =$

Word Problems: A common division problem involves averages. This is the total (may require adding) divided by the number of units. Average ≡ mean.

eg) John shot 2 birdies, 1 par, and 3 eagles on the first 6 holes of a golf course. What is his average score per hole?

double bogey	+2
bogey	+1
par	0
birdie	−1
eagle	−2

eg) The temperates at Whitehorse for the last 5 days were $-10^\circ C$, $3^\circ C$, $-12^\circ C$, $-6^\circ C$, and $2^\circ C$. What was the average temperature of the 5 days?

Other Problems: Recall that multiply and divide are inverses (opposite).

eg) Given: $-23 \times 64 = -1472$
What is $-1472 \div 64$?

eg) Given: $-97 \times (-31) = 3007$
What is $3007 \div (-97)$?

eg) What is $\square$? $\square \div -5 = -8$

eg) What is $\square$? $-55 \div \square = 11$

HW: pp. 87-89: 4, 5-6 (a-c), 7a, 9, 10 (a-d), 11-13
Challenge: 16, 22, 23
Please answer 1-3 in person.

Math 8 Chp 2.5

Note Title 2014-07-05

Order of Operations with Integers

We are still using BEDMAS - Brackets
- Exponents
- Division
- Multiplication
- Addition
- Subtraction.

} same order

} same order

The difference from before is that negative integers need brackets. This doesn't get treated as the highest order.

eg) $(-2)^2 + 3(-4) - (-5)$

eg) $(-6)(-5) + (-3)(4) - (-2)^2$

With multiplies and divides, we can rewrite all multiplies into numerator and all divides into the denominator.

eg) $(-2) \div 3 \times (-8) \times 9 \div (-4)$

eg) $6 \times (-2) \div (-4) \times 5 \div 3$

What to do when there are lots of brackets? Use square brackets, but make sure they match up.

eg) $((-3)(4)-(-2))((-14)\div 7+(-4))$

Never:

$[(-3](4)-(-2))([-14)\div 7+[-4]]$

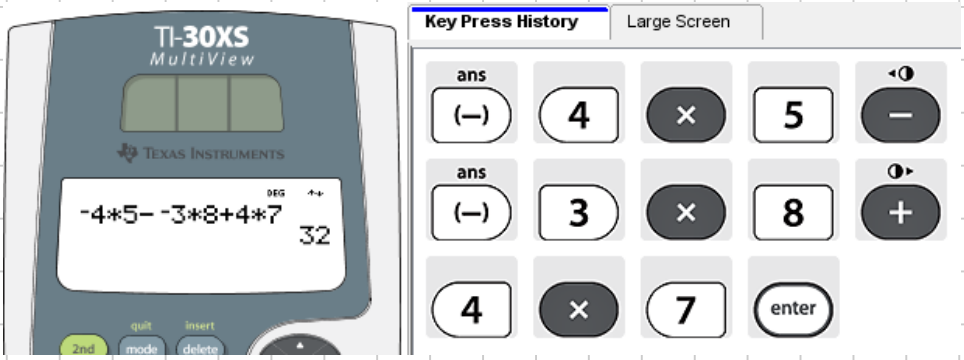
eg) $((-5)(6)\div 3+(-14))\div((-4)+(-2)(2))\times 7$

You may perform multiple multiplies and divides at each step as long as they are in separate terms. You don't have to do just one operation per step as long as you are CAREFUL!

$$\underbrace{(-4)(5)}_{\text{term}}-\underbrace{(-3)(8)}_{\text{term}}+\underbrace{4(7)}_{\text{term}}$$

Terms are separated by plus or minus. If there are multiple operators, the right one is a negative sign, not a subtract operator.

HW: pp. 92-93: (3,4)(b-d), (7-10)(a,c), 12
Challenge: 14-17
Please answer 1 and 2 in person.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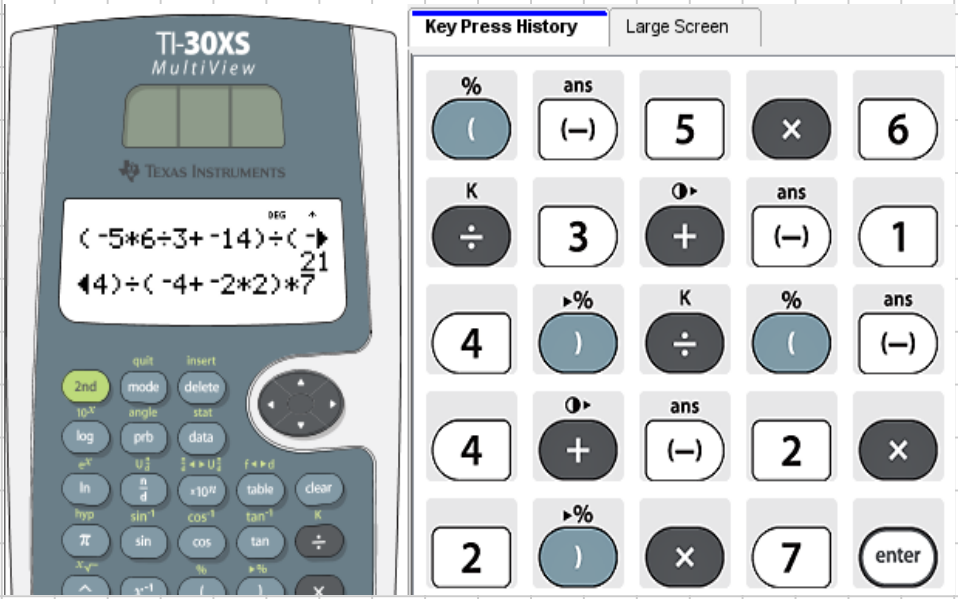
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(−5*6÷3+−14)÷(−4)÷(−4+−2*2)*7
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