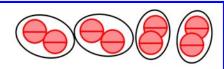# Dividing Integers

Divide a negative number by a positive

The image illustrates $(-8) \div 4$, or eight negatives divided into four groups. We can see the answer is -2.

Any time a negative integer is divided by a positive integer, we can illustrate it as so many negative counters divided evenly into groups. The answer will be negative.

Divide a positive integer by a negative. For example, $24 \div (-8) = ?$

Remember, multiplication is the opposite operation to division. Let's write the answer to $24 \div (-8)$ as s. Then from that we can write a multiplication:

$24 \div (-8) = s \quad \Rightarrow \quad (-8)s = 24$

(You could use an empty line instead of s, if the variable s confuses you.)

The only number that fulfills the equation $(-8)s = 24$ is $s = -3$. Therefore, $24 \div (-8) = -3$.

Similarly, each time you divide a positive integer by a negative integer, the answer is <u>negative</u>.

Divide a negative integer by a negative. For example, $(-24) \div (-8) = ?$

Again, let's denote the answer to $-24 \div (-8)$ with y, and then write a multiplication sentence.

$-24 \div (-8) = y \quad \Rightarrow \quad (-8)y = -24$

The only number that fulfills the equation $(-8)y = -24$ is $y = 3$. Therefore, $-24 \div (-8) = 3$.

Similarly, each time you divide a negative integer by a negative integer, the answer is <u>positive</u>.

Summary. The symbols below show whether you get a positive or negative answer when you multiply or divide integers. Notice that the <u>rules for multiplication and division are the same</u>!

Multiplication	Examples	Division	Examples
⊕ · ⊖ = ⊖	$4 \cdot (-5) = -20$	⊕ ÷ ⊖ = ⊖	$20 \div (-5) = -4$
⊖ · ⊕ = ⊖	$-4 \cdot 5 = -20$	⊖ ÷ ⊕ = ⊖	$-20 \div 5 = -4$
⊖ · ⊖ = ⊕	$-4 \cdot (-5) = 20$	⊖ ÷ ⊖ = ⊕	$-20 \div (-5) = 4$
⊕ · ⊕ = ⊕	$4 \cdot 5 = 20$	⊕ ÷ ⊕ = ⊕	$20 \div 5 = 4$

Here is a shortcut for *multiplication* and *division* (NOT for addition or subtraction):

- If both numbers have the same sign (both are positive *or* negative), the answer is positive.

- If the numbers have different signs, the answer is negative.

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1. Divide.

a. $-50 \div (-5) = $ _____	**b.** $(-8) \div (-1) = $ _____	**c.** $81 \div (-9) = $ _____
$-12 \div 2 = $ _____	$14 \div (-2) = $ _____	$-100 \div (-10) = $ _____

2. Multiply. Then use the same numbers to write an equivalent division equation.

a. $-5 \cdot (-5) =$ _____	**b.** $9 \cdot (-6) =$ _____	**c.** $-80 \cdot 8 =$ _____
_____ ÷ _____ = _____	_____ ÷ _____ = _____	_____ ÷ _____ = _____

3. Four people shared a debt of $280 equally. How much did each owe? Write an integer division.

4. In a math game, you get a negative point for every wrong answer and a positive point for every correct answer. Additionally, if you answer in 1 second, your negative points from the past get slashed in half!

Angie had accumulated 14 negative and 25 positive points in the game. Then she answered a question correctly in 1 second. Write an equation for her current "point balance."

5. Complete the patterns.

a.	**b.**	**c.**
$12 \div 4 =$ _____	_____ $\div (-7) = -3$	$60 \div$ _____ $= 2$
$8 \div 4 =$ _____	_____ $\div (-7) = -2$	$40 \div$ _____ $= 2$
$4 \div 4 =$ _____	_____ $\div (-7) = -1$	$20 \div$ _____ $= 2$
$0 \div 4 =$ _____	_____ $\div (-7) = 0$	$-20 \div$ _____ $= 2$
$(-4) \div 4 =$ _____	_____ $\div (-7) = 1$	$-40 \div$ _____ $= 2$
$(-8) \div 4 =$ _____	_____ $\div (-7) = 2$	$-60 \div$ _____ $= 2$
$(-12) \div 4 =$ _____	_____ $\div (-7) = 3$	$-80 \div$ _____ $= 2$
$(-16) \div 4 =$ _____	_____ $\div (-7) = 4$	$-100 \div$ _____ $= 2$

6. Here's a funny riddle. Solve the math problems to uncover the answer.

E _____ $\div (-8) = 2$

E $3 \cdot (-12) =$ _____

N $-15 \div$ _____ $= -5$

G $-1 \cdot (-9) =$ _____

S $-48 \div 6 =$ _____

N $-12 \cdot (-5) =$ _____

H _____ $\div 12 = -5$

E _____ $\cdot (-6) = 0$

I $-27 \div 9 =$ _____

N $3 \cdot$ _____ $= -24$

E $(-144) \div 12 =$ _____

T $-4 \cdot (-9) =$ _____

V $-45 \div$ _____ $= 5$

I $-7 \cdot$ _____ $= -84$

Why is six afraid of seven? Because….

-8	-12	-9	-36	60		0	12	9	-60	36		3	-3	-8	-16