

# Dividing Integers

Name: \_\_\_\_\_

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Good news—dividing integers follows the *exact same* sign rules as multiplying! First, divide the absolute values to find the size of the quotient. Then decide the sign: same signs → **positive**, different signs → **negative**. A great self-check is to multiply the quotient by the divisor; if you get the original dividend back, you know you are right. One rule never changes: division by zero is **undefined**—no number can undo that operation, so watch for it in every problem.

## Key Concepts & Quick Review

**Same signs** ⇒ **Positive quotient:**  $\frac{(+)}{(+)} = +$  and  $\frac{(-)}{(-)} = +$

**Different signs** ⇒ **Negative quotient:**  $\frac{(+)}{(-)} = -$  and  $\frac{(-)}{(+)} = -$     **Undefined:**  $\frac{a}{0}$  has no value for any  $a$ .



Check by multiplying quotient and divisor to get the dividend.

## Examples

① Evaluate  $(-56) \div 8$ .

**Think It Through:** Division follows the same sign rules as multiplication. Since the signs are different, the quotient will be negative. Divide the absolute values:  $56 \div 8 = 7$ . So the final answer is  $-7$ . You can check by multiplying:  $-7 \times 8 = -56$ .

**Answer:**  $-7$

② A submarine descends at a constant rate, reaching  $-270$  feet below the surface in  $9$  min. Write a division expression to find the rate of change in feet per minute, and evaluate it.

**Think It Through:** A rate is total change divided by time, so write  $\frac{-270}{9}$ . Divide the absolute values first:  $270 \div 9 = 30$ . Because the change is negative, the rate is also negative. So the submarine's rate of change is  $-30$  feet per minute.

**Answer:**  $-30$  feet per minute



**Practice Problems**

Find each quotient.

- |                          |       |                           |       |
|--------------------------|-------|---------------------------|-------|
| 1. $(-36) \div 9 =$      | _____ | 9. $(-63) \div 7 =$       | _____ |
| 2. $48 \div (-8) =$      | _____ | 10. $(-32) \div (-8) =$   | _____ |
| 3. $(-56) \div (-7) =$   | _____ | 11. $(-81) \div 9 =$      | _____ |
| 4. $(-24) \div 6 =$      | _____ | 12. $(-144) \div (-12) =$ | _____ |
| 5. $72 \div (-9) =$      | _____ | 13. $(-50) \div 5 =$      | _____ |
| 6. $(-45) \div (-5) =$   | _____ | 14. $(-78) \div (-6) =$   | _____ |
| 7. $(-18) \div 3 =$      | _____ | 15. $(-96) \div 8 =$      | _____ |
| 8. $(-100) \div (-10) =$ | _____ |                           |       |

**Study Tips**

- 👉 The sign rules for division are **identical** to those for multiplication: same signs → positive; different signs → negative.
- 👉 Always verify your answer by multiplying: quotient × divisor should equal the dividend.
- 👉 Division by zero is **undefined** — it is not zero, it is impossible. Division of zero by any nonzero integer equals 0.

**Word Problems**

16. A technology investment fund lost a total of \$1,260 over 12 equal monthly periods. Write a division expression to find the average monthly change in value, and evaluate it using integer division. If this loss rate continues for 5 more months, write a multiplication expression to find the additional loss and evaluate it.

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17. During a science experiment, a tank of water is cooled at a constant rate. The temperature drops 180 degrees Fahrenheit over 15 min. Write a division expression for the rate of temperature change in degrees per minute and evaluate it. If the experiment then runs for 7 more minutes at the same rate, what integer represents the total temperature change during the entire 22-minute experiment?

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18. A drone descends from 0 m to -12 m in equal-sized stages, as shown by the four arrows below. Write a division expression that gives the size of one stage, evaluate it, and explain what the sign of your answer represents.



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## Answer Keys

- |  |  |
|--|--|
| <p>1) -4<br/>2) -6<br/>3) 8<br/>4) -4<br/>5) -8<br/>6) 9<br/>7) -6<br/>8) 10<br/>9) -9<br/>10) 4</p> | <p>11) -9<br/>12) 12<br/>13) -10<br/>14) 13<br/>15) -12<br/>16) Average <math>-\\$105</math> per month; additional loss <math>-\\$525</math><br/>17) Rate <math>-12^\circ\text{F}/\text{min}</math>; total change <math>-264^\circ\text{F}</math><br/>18) <math>-3\text{ m}</math> per stage</p> |
|--|--|

### Step-by-Step Explanations

**Strategy:** For Dividing Integers, divide absolute values first, then decide the sign from whether the two signs match or differ. The integer-division answer should be checked against the original wording before moving on.

**Practice 1:**  $(-36) \div 9 =$  **Answer:** -4

In the opening example,  $36 \div 9 = 4$ ; one negative and one positive make the quotient negative.

**Practice 15:**  $(-96) \div 8 =$  **Answer:** -12

For the end-of-set item, divide 96 by 8 for the size and keep the negative sign because the signs differ.

**Word-problem notes:**

**16. Answer:** Average =  $-\$105/\text{month}$ ; additional loss =  $-\$525$ .

Find the average monthly change by dividing total loss by the number of months:  $-1260 \div 12 = -105$ . That means the fund lost \$105 each month on average. If the same rate continues for 5 more months, multiply:  $(-105) \times 5 = -525$ . So the additional loss would be \$525.

**17. Answer:** Rate =  $-12^\circ\text{F}/\text{min}$ ; total change =  $-264^\circ\text{F}$ .

First find the rate:  $-180 \div 15 = -12^\circ\text{F}$  per minute. The negative sign tells you the temperature is going down, not up. Then use that rate for the full 22 min:  $(-12) \times 22 = -264^\circ\text{F}$ . So the total temperature change over the experiment is a drop of  $264^\circ\text{F}$ .

**18. Answer:**  $-12 \div 4 = -3\text{ m}$  per stage; sign is negative because the drone descends.

The total displacement is  $-12\text{ m}$  and there are 4 equal stages, so the size of one stage is  $-12 \div 4 = -3\text{ m}$ . The negative sign means each stage moves the drone downward (left on the number line), so the drone descends 3 m per stage.



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