Dividing Integers

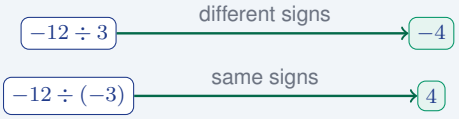
Name: _____	Date: _____	Score: _____ / 18

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

Study Tips

- The sign rules for division are **identical** to those for multiplication: same signs $\rightarrow$ positive; different signs $\rightarrow$ negative.
- Always verify your answer by multiplying: quotient $\times$ 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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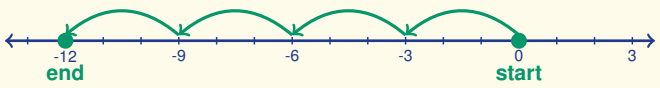
17. During a science experiment, a tank of water is cooled at a constant rate. The temperature drops 180 degrees Fahrenheit over $15\,min$. Write a division expression for the rate of temperature change in degrees per minute and evaluate it. If the experiment then runs for 7 more minutes at the same rate, what integer represents the total temperature change during the entire 22-minute experiment? _____

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

1) -4
2) -6
3) 8
4) -4
5) -8
6) 9
7) -6
8) 10
9) -9
10) 4
11) -9
12) 12
13) -10
14) 13
15) -12
16) Average $-\$105$ per month; additional loss $-\$525$
17) Rate $-12°$F/min; total change $-264°$F
18) $-3\,m$ per stage

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 $= -\$105$/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 $= -12°$F/min; total change $= -264°$F.
First find the rate: $-180 \div 15 = -12°$F per minute. The negative sign tells you the temperature is going down, not up. Then use that rate for the full $22\,min$: $(-12) \times 22 = -264°$F. So the total temperature change over the experiment is a drop of $264°$F.

18. Answer: $-12 \div 4 = -3\,m$ per stage; sign is negative because the drone descends.
The total displacement is -12 m and there are 4 equal stages, so the size of one stage is $-12 \div 4 = -3$ 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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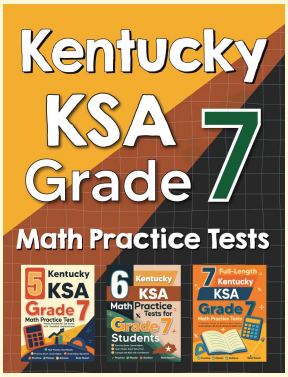

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