

MULTIPLYING AND DIVIDING INTEGERS

CHECK YOUR UNDERSTANDING

1) Write a multiplication statement to represent each of the following descriptions.

- a) 8 groups of 5 b) 12 groups of -4 c) 25 groups of -10

2) Use a number line to represent each of the following multiplications.

- a) 4×3 b) $(3)(4)$ c) $5 \times (-2)$ d) $(2)(-5)$

3) For each of the following, state whether the result will be positive, negative or zero.

- a) positive \times positive b) positive \times negative c) negative \times positive
d) negative \times negative e) zero \times positive f) negative \times zero

4) Multiply.

- a) 9×3 b) $2 \times (-6)$ c) $(5)(-7)$ d) -8×3 e) $-10 \times (-3)$
f) $5(12)$ g) $(0)(14)$ h) $(-8)(-2)$ i) $-24(0)$ j) $-1(-15)$

5) Multiply.

- a) $2 \times 3 \times 4$ b) $3 \times 2 \times 4$ c) $4 \times 3 \times (-5)$
d) $7 \times (-2) \times (-3)$ e) $(-1)(-8)(-4)$ f) $(-2)(-2)(-2)(-2)$



- 6) a) If six negative integers are multiplied, will the result be positive or negative?
b) If seven negative integers are multiplied, will the result be positive or negative?
c) In general, if n negative integers are multiplied, where n is a natural number (1,2,3,4, ...), when will the result be positive and when will the result be negative?

7) For each of the following multiplication statements, write a corresponding division statement.

- a) $3 \times 4 = 12$ b) $5 \times (-2) = -10$ c) $-7 \times 6 = -42$ d) $-5 \times (-4) = 20$
e) $(2)(8) = 16$ f) $7(-4) = -28$ g) $(-10)(-6) = 60$ h) $a \times b = c$

8) For each of the following, state whether the result will be positive, negative or zero.

- a) positive \div positive b) negative \div positive c) positive \div negative
d) negative \div negative e) zero \div positive f) zero \div negative

9) Divide.

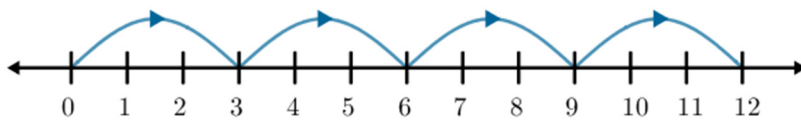
- a) $18 \div 6$ b) $-10 \div 2$ c) $\frac{42}{6}$ d) $38 \div (-19)$ e) $-15 \div (-3)$
f) $\frac{-44}{11}$ g) $\frac{-28}{-7}$ h) $0 \div 5$ i) $\frac{57}{-1}$ j) $\frac{0}{-12}$

10) Explain why we can divide zero by another number but cannot divide a number by zero.

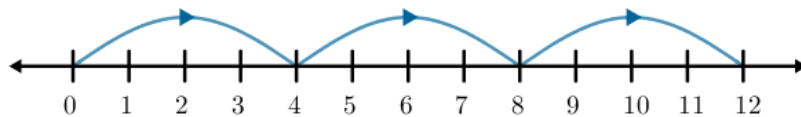
ANSWERS

1) a) 8×5 b) $12 \times (-4)$ c) $25 \times (-10)$

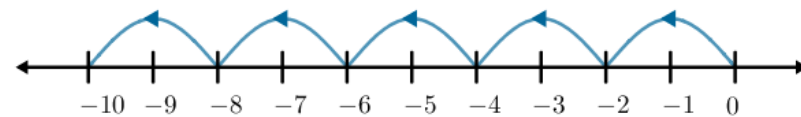
2) a)



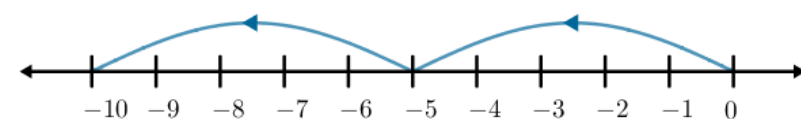
b)



c)



d)



3) a) positive b) negative c) negative d) positive e) zero f) zero

4) a) 27 b) -12 c) -35 d) -24 e) 30 f) 60 g) 0 h) 16 i) 0 j) 15

5) a) 24 b) 24 c) -60 d) 42 e) -32 f) 16

6) a) positive b) negative

c) If n is an even number, the result will be positive. If n is an odd number, the result will be negative.

7) a) $12 \div 3 = 4$ or $12 \div 4 = 3$

b) $-10 \div 5 = -2$ or $-10 \div (-2) = 5$

c) $-42 \div (-7) = 6$ or $-42 \div 6 = -7$

d) $20 \div (-5) = -4$ or $20 \div (-4) = -5$

e) $16 \div 2 = 8$ or $16 \div 8 = 2$

f) $-28 \div 7 = -4$ or $-28 \div (-4) = 7$

g) $60 \div (-10) = -6$ or $60 \div (-6) = -10$

h) $c \div a = b$ or $c \div b = a$

8) a) positive b) negative c) negative d) positive e) zero f) zero

9) a) 2 b) -5 c) 7 d) -2 e) 5 f) -4 g) 4 h) 0 i) -57 j) 0

10) *Informal explanation:*

If you divide 0 bananas among 5 people, each person gets 0 bananas. If you divide 5 bananas among 0 people, each person gets... wait a minute, there aren't any people to begin with! Based on this example, we can see why zero divided by another number is zero, whereas a number divided by zero is problematic.

Formal explanation:

Consider the statement $0 \div 5 = a$. A corresponding multiplication statement is $a \times 5 = 0$. We see that a must be 0, since the only number that we can multiply by 5 to get a result of 0 is 0. The same reasoning with any other non-zero number in place of the 5 shows why zero divided by another number gives a result of zero.

Now consider the statement $5 \div 0 = a$. Here, a corresponding multiplication statement is $0 \times a = 5$. Notice that there is no value of a such that $0 \times a$ gives a result of 5, since 0 times anything is 0. A similar result occurs when another non-zero number is used in place of the 5. We say that division by zero is *undefined*.

If you're wondering about $0 \div 0$, notice that the statement $0 \div 0 = a$ has an equivalent multiplication statement of $a \times 0 = 0$. Since multiplying anything by 0 gives a result of 0, a could be anything! For this reason, we say that $0 \div 0$ is *indeterminate*.