

WALT Multiply and divide integers

Success Criteria I know how to apply the following rules

1. (positive) x (positive) = positive
2. (Positive) x (Negative) = Negative
3. (Negative) x (Negative) = positive
4. (Negative) x (Positive) = Negative

1 Simplify:

a 2×3

b 2×-3

c -2×3

d -2×-3

e 8×-2

f 8×2

g -8×2

h -8×-2

i 7×11

j -7×-11

k 7×-11

l -7×11

m 0×3

n -2×0

o -3×-6

p -5×-5

2 Determine the missing integer for each of the following:

a $-2 \times \square = -16$

b $-2 \times \square = 16$

c $5 \times \square = 10$

d $-5 \times \square = 10$

e $\square \times 4 = -12$

f $\square \times -4 = 12$

g $-4 \times \square = 20$

h $-4 \times \square = -20$

i $3 \times \square = -15$

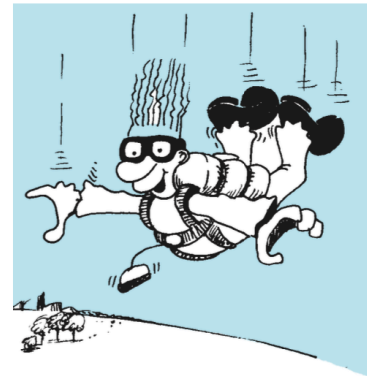
j $-3 \times \square = -15$

k $\square \times -6 = 18$

l $\square \times -6 = -18$

3 Use a negative sign as appropriate in the following questions and solve:

- A gambler loses \$8 per race for seven successive races. How much did she lose?
- A skydiver falls 200 metres per second for 30 seconds. How many metres did he fall?



Example 11

Simplify:

a $-2 \times 5 \times -3$

b $(-3)^2$

c $(-2)^3$

a $-2 \times 5 \times -3$
 $= -10 \times -3$
 $= 30$

b $(-3)^2$
 $= -3 \times -3$
 $= 9$

c $(-2)^3$
 $= -2 \times -2 \times -2$
 $= 4 \times -2$
 $= -8$

4 Simplify:

a $3 \times -2 \times 5$

b $-2 \times -1 \times -3$

c $-1 \times 3 \times -4$

d $(-7)^2$

e $(-1)^3$

f $4 \times -1 \times -5$

g $5 \times -2 \times -4$

h $-7 \times -2 \times 2$

i $(-2)^3$

j -2×5^2

k $-2 \times (-3)^2$

l $(-2)^2 \times -6$

5 Do $(-2)^2$ and -2^2 have the same value?

6 Calculate:

a $(-1)^2$

b $(-1)^3$

c $(-1)^4$

d $(-1)^5$

e $(-1)^6$

f $(-1)^7$

What do you notice?

7 Using the results of question 6 find:

a $(-1)^{26}$

b $(-1)^{87}$

c $(-1)^{\text{even number}}$

d $(-1)^{\text{odd number}}$

If $12 \div 4 = 3$, the questions arise:

- What is $12 \div -4$?
- What is $-12 \div 4$?
- What is $-12 \div -4$?

Rules for **division** are identical to those of multiplication.

This is not surprising as multiplication and division are **inverse operations**.

For example, \div by 2 is the same as \times by $\frac{1}{2}$.

RULES FOR DIVISION:

(positive) \div (positive) = (positive)

(positive) \div (negative) = (negative)

(negative) \div (positive) = (negative)

(negative) \div (negative) = (positive)

Notice that the division of numbers with **like** signs is **positive** and the division of numbers with **unlike** signs is **negative**.

Example 12

Calculate:

a $-6 \div 2$

b $8 \div -4$

c $\frac{-14}{-2}$

a $-6 \div 2$
 $= -3$

b $8 \div -4$
 $= -2$

c $\frac{-14}{-2}$
 $= 7$

1 Calculate:

a $14 \div 7$

b $14 \div -7$

c $-14 \div 7$

d $-14 \div -7$

e $30 \div 5$

f $-30 \div -5$

g $-30 \div 5$

h $30 \div -5$

i $8 \div 8$

j $8 \div -8$

k $-8 \div 8$

l $-8 \div -8$

m $24 \div 4$

n $24 \div -4$

o $-24 \div -4$

p $-24 \div 4$

2 Calculate:

a $\frac{12}{3}$

b $\frac{-12}{3}$

c $\frac{12}{-3}$

d $\frac{-12}{-3}$

e $\frac{22}{2}$

f $\frac{22}{-2}$

g $\frac{-22}{2}$

h $\frac{-22}{-2}$

i $\frac{18}{9}$

j $\frac{18}{-9}$

k $\frac{-18}{-9}$

l $\frac{-18}{9}$

The fraction bar acts like a division sign!



3 Find the missing integer for each of the following:

a $24 \div \square = -4$

b $24 \div \square = 4$

c $-18 \div \square = 9$

d $-18 \div \square = -9$

e $-27 \div \square = -3$

f $-27 \div \square = 3$

g $\square \div -5 = 7$

h $\square \div -5 = -7$

i $\square \div -2 = -8$

j $\square \div -2 = 8$

k $\square \div 3 = -5$

l $\square \div -3 = 5$

m $\square \div -4 = -4$

n $\square \div -4 = 4$

o $7 \div \square = -7$

p $-7 \div \square = 7$

q $\square \div \square = 1$

r $\square \div \square = -1$

4 Use a negative sign as appropriate in the following questions and solve:

a A company owned equally by four people has a debt of \$320 000. What is each person's share of the debt?

b One night in Siberia, the temperature drops 18°C in six hours. What is the average temperature change per hour?



Challenge combined operations

The order of operations rules also apply to negative numbers.

- Brackets are evaluated first.
- Exponents are calculated next.
- Divisions and Multiplications are done next, in the order that they appear (i.e., working from left to right).
- Addition and Subtractions are then done, in the order that they appear (i.e., working from left to right).

Example 13

Use the correct order of operations rules to calculate:

a $5 + -8 \times 3$

b $-5 - 15 \div -5$

$$\begin{aligned} \mathbf{a} \quad & 5 + -8 \times 3 \\ & = 5 + -24 && \{\text{multiplication first}\} \\ & = 5 - 24 && \{\text{simplify}\} \\ & = -19 \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad & -5 - 15 \div -5 \\ & = -5 - -3 && \{\text{division first}\} \\ & = -5 + 3 && \{\text{simplify}\} \\ & = -2 \end{aligned}$$

Remember to use
BEDMAS!**1** Find the answers, using the order of operations rules:

a $3 + -7 \times 2$

b $-2 - 3 \times -4$

c $-4 - 18 \div 3$

d $(5 - 10) \times (3 - 5)$

e $-10 + 2 \times -4$

f $3 \times -4 + -5 \times -2$

g $(8 - 12) \times 3 - 7$

h $8 - 12 \times (3 - 7)$

i $8 - 12 \times 3 - 7$

j $7 - 2 \times -3 + 4 \times -5$

2 Mac Ltd. makes a \$70 000 loss per month for four months and then a \$40 000 profit for each of the next eight months. What was the year's result?**3** Debbies Dresses show the following sales record over a six week period:

Week 1, \$1214 profit; Week 2, \$867 profit; Week 3, \$126 loss;

Week 4, \$992 profit; Week 5, \$543 loss; Week 6, \$2150 profit.

a What is Debbie's overall profit or loss during this period?**b** What is Debbie's average weekly earnings during this period?**4** The temperature of a bottle of water is 18°C . The bottle is placed in a freezer that cools the water at 5° per hour. What is its temperature after 4 hours?**5** To explore for gold, a mining company uses a drilling rig to take core samples from below the ground. Gold samples were found at the following levels:**a** Which sample is closest to ground level?**b** Which sample is the deepest?**c** What is the difference in depth between sample B and D?**d** The cost of drilling is \$60 per m. What was the cost of taking sample A?**e** What was the average depth of the gold samples?

Sample	Level
A	-113 m
B	-42 m
C	-119 m
D	-78 m

Extension

Example 14

Calculate:

a $\frac{5 \times -12}{7 - 3}$

b $\frac{-36}{-3 \times -4}$

a $\frac{5 \times -12}{7 - 3}$
 $= \frac{-60}{4}$
 $= -15$

b $\frac{-36}{-3 \times -4}$
 $= \frac{-36}{12}$
 $= -3$

For more complicated fractions, work out the numerator and the denominator first, and **then divide**.

**6** Calculate:

a $\frac{3 \times -2}{6}$

b $\frac{-4 \times -2}{-8}$

c $\frac{3 \times -4}{6}$

d $\frac{12}{-2 \times -3}$

e $\frac{3 \times -5}{7 - 2}$

f $\frac{-3 \times -4}{5 - 1}$

g $\frac{-3 \times -6}{5 - 7}$

h $\frac{3 \times -6}{-2 \times 3}$