

Integer Multiplication and Division

“To prepare for weightlessness in space, Astronauts train in diving airplanes. One plane dives 120 metres every second. How far will it dive in 20 seconds?”

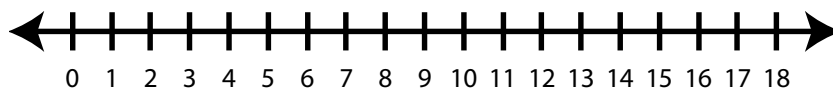
This is the kind of question you can answer by multiplying integers.

Multiplication means repeated addition or subtraction. To answer the question above, you could add -120 metres twenty times to get an answer, but that would take quite a long time. Instead, you can just multiply $(-120) \times 20$ to get an answer.

Integer chips can be used to model multiplication as well. Try to model the multiplication $3 \times (-4)$ using integer chips:

Now try $(-4) \times (-5)$

Multiplying integers can also be modelled using a number line. In the space below, show how to multiply 5×3 using a number line.



On the following number line, fill in your own numbers and try $4 \times (-2)$:



Using any model you like, try to solve the following problems:

1. Sam wants to buy four 15-cent candies. How much will it cost?
2. The temperature in Edmonton fell 3°C every hour for 6 straight hours. How much did the temperature fall in total?
3. A coupon lets you save 30¢ off the price of an apple. If you buy eight apples, how much are you saving?

4. Write a story to go along with the math expression $2 \times (-3)$.

5. When multiplying integers, there are some useful hints to remember for determining when the **product** is positive or negative. Discuss with your friends and come up with your version of these rules.

Dividing integers is the **opposite** of multiplication. Instead of combining smaller groups together to make a larger group, in division, a large group is divided into smaller groups.

Using integer tokens, there are two ways to think about division. In the space below, practice your notemaking by making notes about dividing integers using integer tokens.

Now, using your integer tokens, try to solve the following problems:

6. A submarine took 3 minutes to dive 18 metres. How many metres did it dive each minute?

7. A group of people owe \$360 to pay for a vacation. If each person owes \$12, how many people are there in the group?

CHALLENGE

8. The sum of two integers is +20. Dividing the larger integer by the smaller integer gives a quotient of -3 . What are the two integers?
9. Since the sun set six hours ago, the temperature in Brandon, Manitoba, has decreased from $+1^{\circ}\text{C}$ to -11°C . Predict what the temperature will be three hours from now. What assumptions did you make?

Summary