 Dividing negative numbers

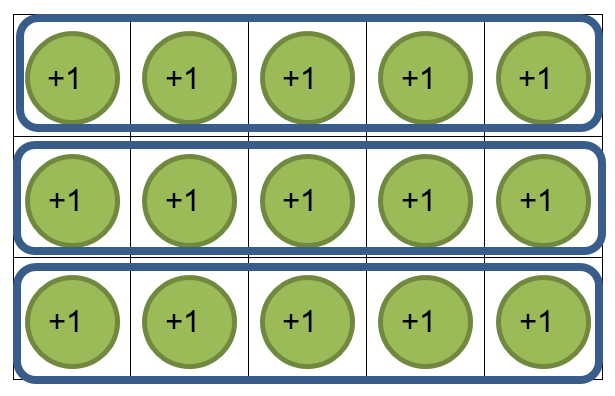
Background

Traditionally we think of dividing as sharing objects amongst people or into groups.

Consider 15 ÷ 3

Method 1

We can think of this as taking fifteen objects and dividing them into three groups.

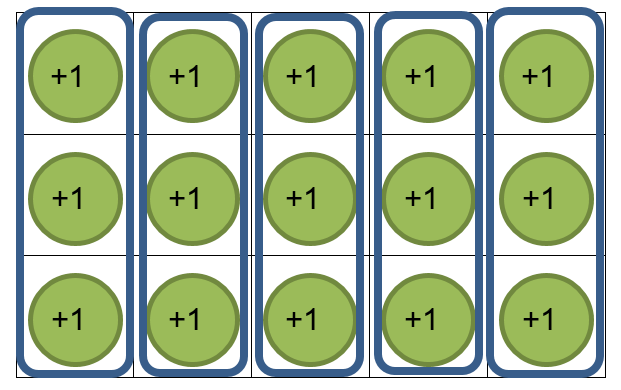


Which gives us five objects in each group.

So, 15 ÷ 3 = 5

Method 2

We can also think of 15 ÷ 3 as taking fifteen objects and dividing it into groups with three objects in each group.



This gives us five groups.

So 15 ÷ 3 = 5

Method 3

We can turn our division sum into a multiplication problem.

15 ÷ 3 is the same as “how many groups of three do a need to make 15?”

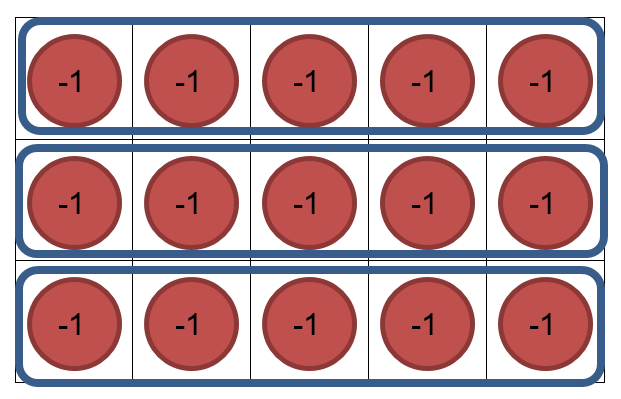
3 x ? = 15

3 x 5 = 15, so I need five groups

Sharing with negatives

Consider now, (-15) ÷ 3

Using Method 1, we can think of this as taking fifteen, (-1) counters and dividing them into three groups.

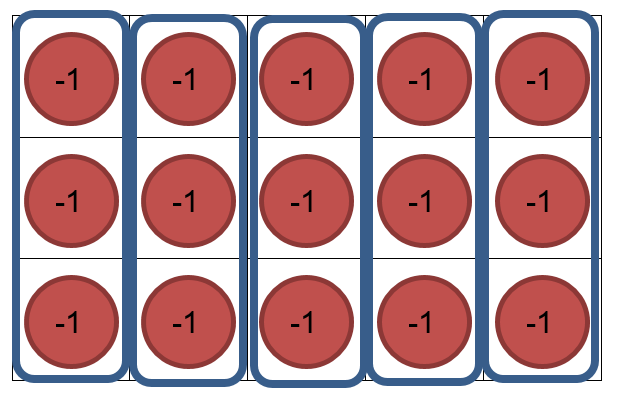


Which gives us (-5) in each group.

So, (-15) ÷ 3 = (-5)

What about, (-15) ÷ (-3)?

It doesn’t make sense to divide into (-3) groups, but we could make groups of (-3) counters, as in Method 2.



This would give us five groups of (-3) counters.

So, (-15) ÷ (-3) = 5

Task 1

1. Represent these questions with counters before writing your final answer.
2. (-12) ÷ 4
3. (-20) ÷ 2
4. (-16) ÷ 4
5. (-21) ÷ (-7)
6. (-18) ÷ (-6)
7. How could you write each of the sums above in a different way?
8. How many sums can you find with an answer of (-2)?
9. What do you notice? What do you wonder?

Even more negatives

What about 15 ÷ (-3)?

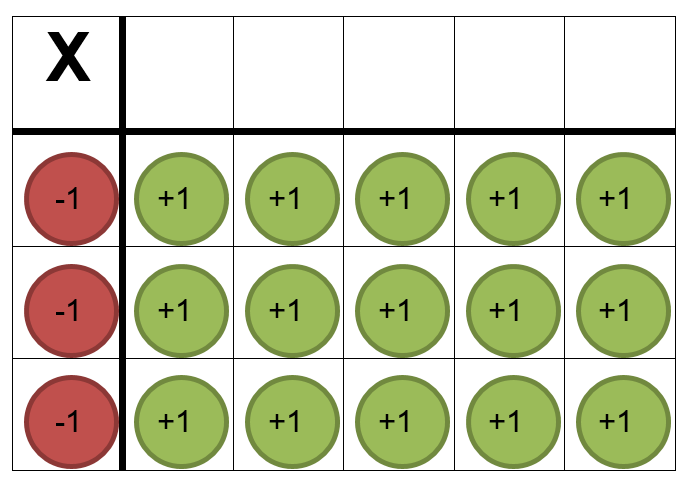
How can we divide fifteen, +1 counters into groups of (-3)?

The best way to tackle this problem is to turn it into a multiplication problem.

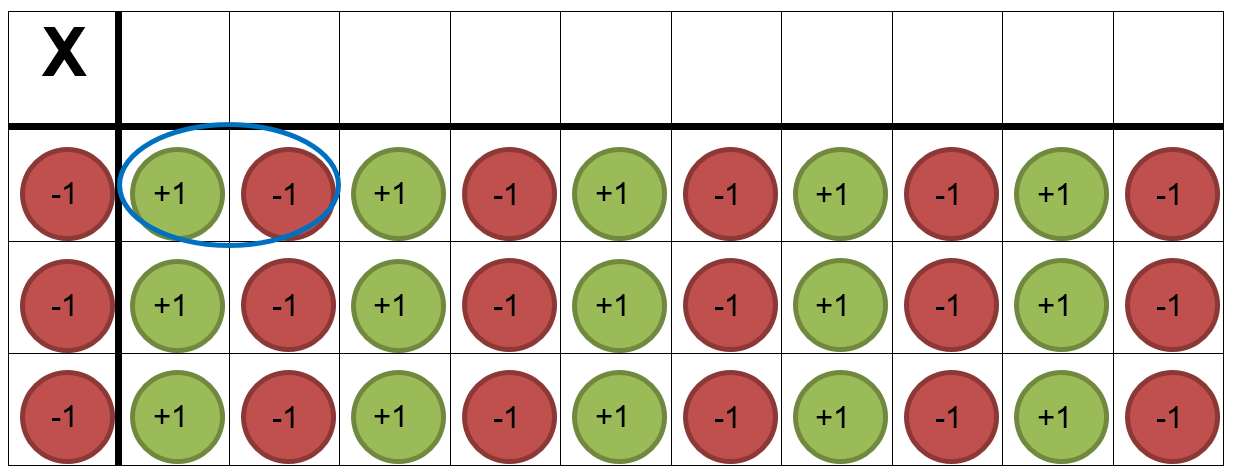
(-3) x ? = 15

When we did multiplication, we learnt that (-3) rows meant that we had to remove three rows.

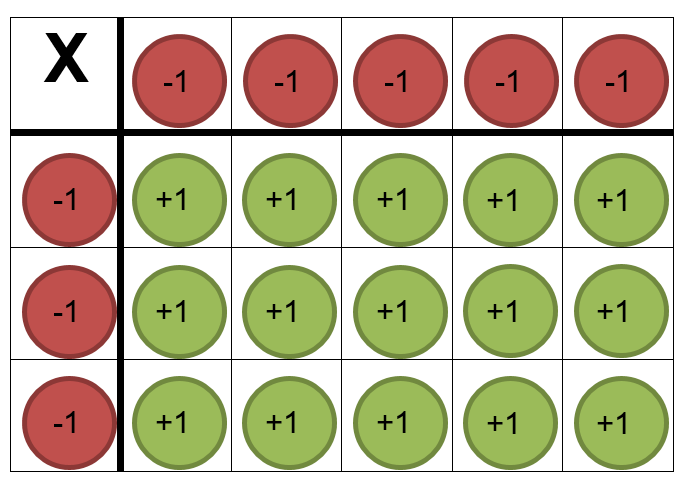
What do we need to remove three rows of, to leave us with fifteen +1 counters?



If we created fifteen zero pairs, we could then remove three rows of (-1) counters, to leave us with fifteen +1 counters.



So we can remove (-5) counters out of each row, to leave us with fifteen +1 counters.



So, (-3) x (-5) = 15

Or

15 ÷ (-3) = (-5)

Task 2

1. Represent these questions with counters before writing your final answer.
2. 12 ÷ (-4)
3. 20 ÷ (-2)
4. 16 ÷ (-4)
5. 21 ÷ (-7)
6. 18 ÷ (-6)
7. How could you write each of the sums above in a different way?
8. How do your answers compare to those in Task 1?
9. How many sums can you find now, with an answer of (-2)?
10. What do you notice? What do you wonder?

Task 3

Make a summary of how to divide with negative numbers (with or without counters). It should be in your own words and can use pictures of diagrams to assist you.

Outcomes

* MA4-4NA compares, orders and calculates with integers, applying a range of strategies to aid computation

Note to teacher

Questions could be completed with online algebra tiles

[s3-us-west-2.amazonaws.com/oervm/chipmodel/ChipModelOps.html](https://s3-us-west-2.amazonaws.com/oervm/chipmodel/ChipModelOps.html)

[support.mathies.ca/en/mainSpace/AlgebraTiles.php](https://support.mathies.ca/en/mainSpace/AlgebraTiles.php)

Interactive practice

[thewessens.net/ClassroomApps/Models/Tiles/muldivtiles.html?topic=models&id=3](http://thewessens.net/ClassroomApps/Models/Tiles/muldivtiles.html?topic=models&id=3)