

Negative Numbers

Language

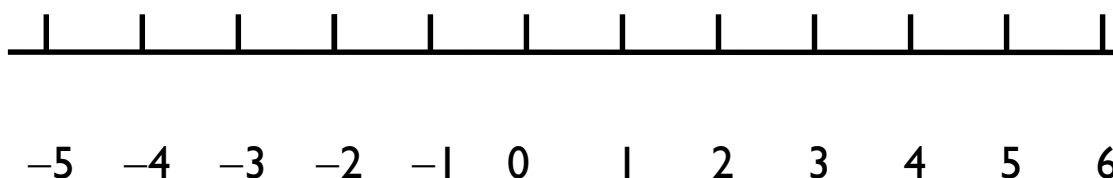
We discussed the language of numbers and produced the following chart :-

	Commands	Properties
+	<i>Add</i>	<i>Plus</i> <i>Positive</i>
−	<i>Subtract</i>	<i>Minus</i> <i>Negative</i>

We use the terms “plus” and “minus” sometimes as **Commands** and sometimes as **Properties**.

The Number Line

Then we introduced the number line :-



The number line is a good introduction to negative numbers but it's not a very practical tool.

Problem I When adding or subtracting a list of (*positive*) numbers, you end up bouncing backwards and forwards along the line and can easily make a mistake.

Solution We used the idea of “biscuit barrels” - label one



“positive” and put in all the positive numbers, the other “negative” and put in all the negatives, then take the negatives from the positives.

Actually when we do this we are taking a list of



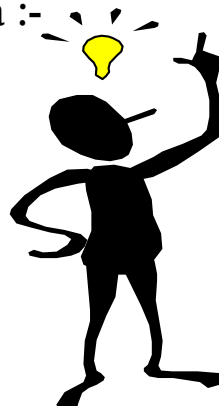
“instructions” (pluses and minuses) and using them as “properties”. This works because we can treat “minus 3” either as an instruction “subtract” and move back down the number line 3 units from zero, or “minus 3” directly as the property “negative”. Either way, we end up at “negative 3” on the number line.

Problem 2 The number line completely fails when we try to subtract “negative” numbers.

Solution We use different coloured cubes to emphasise “positive” and “negative” as “properties”. We then can solve all the possible sums of adding and subtracting positive and negative numbers - remembering that at any time we can add or subtract a “positive “ and “negative” cube together without changing the value.

(We found eight sums altogether using just “5” and “3”).

This gave us the idea :-



◆ Change the appearance

The Rule

In practice, we don't need to fish out a pocketful of coloured cubes when we hand in a credit voucher on a bottle of shampoo to the check-out assistant in the supermarket - even experienced mathematicians will simply use this rule.

	Plus	Minus
Plus	Plus	Minus
Minus	Minus	Plus

We went through our eight sums replacing pairs of signs with just one, using the rule above and all the sums th
So now everyone's happy
 simpler.



Details of Changing the Appearance

Using just two colour cubes, demonstrate the following sum

$$+5 + +3 = +8$$

$$+5 - +3 = +2$$

$$+3 + +5 = +8$$

$$+3 - +5 = -2$$

$$+5 + -3 = +2$$

$$-5 - +3 = -8$$

$$-3 + +5 = +2$$

$$+3 - -5 = +8$$

$$-5 + +3 = -2$$

$$-3 - +5 = -8$$

$$+3 + -5 = -2$$

$$+5 - -3 = +8$$

$$-3 + -5 = -8$$

$$-5 - -3 = -2$$

$$-5 + -3 = -8$$

$$-3 - -5 = +2$$

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