

Directed Numbers – Addition/Subtraction/Multiplication/Division – W/C 8th June 2020

A positive or negative **whole number** is called an **INTEGER**. Sometimes brackets are put around negative numbers to make them easier to read, e.g. (-2). If a number is positive, the + is usually missed out before the number. So, 3 is really (+3). Adding and multiplying combinations of positive and negative numbers can cause confusion and so care must be taken.

This is something that you have met before but negative numbers always seem to cause mistakes in calculations. In your GCSE you will not be given a number line to use but it is perfectly acceptable to draw **part** of one on your paper if it helps you.



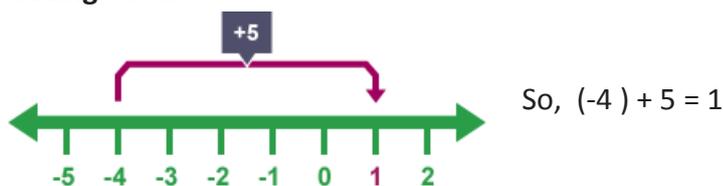
I have copied this one but the colours do not make sense to me...I like to think of the positive numbers being warmer and the negatives being colder ...would you have done the colours the other way around? I would!

Adding and subtracting negative numbers

A **number line** can be used to add and subtract negative numbers.

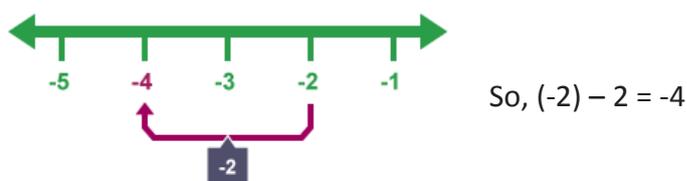
e.g 1. What is $(-4) + 5$?

To add -4 and 5, draw the starting number on a number line and count to the **right** when **adding** numbers.



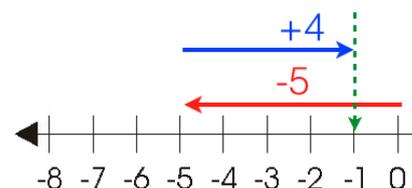
e.g. 2. What is $(-2) - 2$?

To subtract 2 from -2, start at -2 on a number line, and count to the **left** when **subtracting** numbers.

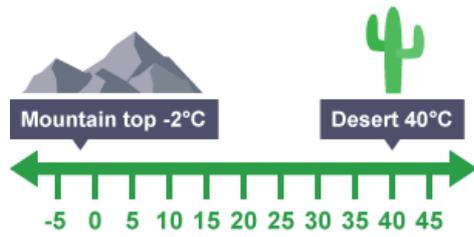


REMEMBER when you add you get bigger so go to the right, when you subtract you get smaller so you go to the left!

$(-5) + 4 = -1$ and $0 - 5 = -5$



e.g 3. What is the difference in temperature between a desert at 40 °C and a mountain top at -2 °C?



$$40 - (-2) = 42$$

This is where strange things start to happen, this is saying what is the difference between -2 and 40, or how much bigger is 40 than -2. So, the difference in temperature between the desert and the mountain top is 42 °C.

If you remember my Finger Exercises...Two Negatives make a Plus....IF THEY ARE TOUCHING when you add and subtract.

e.g 4. What is $4 - (-2)$?

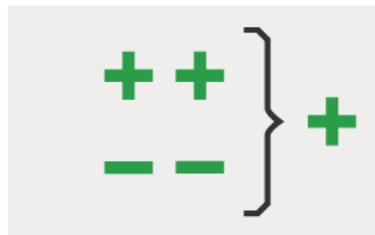
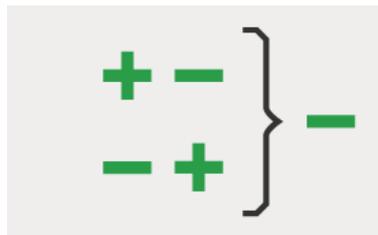
$$= 4 + 2 = 6 \quad (\text{in other words the difference between } -2 \text{ and } 4 \text{ is } 6)$$

Rules for adding and subtracting negative numbers

When two **signs** are written next to each other, the rules for adding and subtracting numbers are:

two signs that are **different** become a **negative** sign

two signs that are the **same** become a **positive** sign



A few more examples

Same signs give a positive: $3 + (+2) = 3 + 2 = 5$

Same signs give a positive: $3 - (-2) = 3 + 2 = 5$

Different signs give a negative: $3 + (-2) = 3 - 2 = 1$

Different signs give a negative: $3 - (+2) = 3 - 2 = 1$

Multiplication and Division with negative numbers

The same rules apply as above, the only difference is that the signs are not touching!

So, if two positive numbers are multiplied together or divided, the answer is positive.
If two negative numbers are multiplied together or divided, the answer is positive.
If a positive and a negative number are multiplied or divided, the answer is negative.

Examples

$$\begin{array}{ll} (-2) \div (-4) = \frac{1}{2} & - \div - = + \\ (8) \div (-2) = (-4) & + \div - = - \\ 2 \times (-3) = (-6) & + \times - = - \\ (-2) \times (-2) = 4 & - \times - = + \end{array}$$

Task 1: Watch the following clips on mathswatch

Clip 23	Negatives in Real life
Clip 68a	Negatives – adding and subtracting
Clip 68b	Negatives – Multiplication and Division

Task 2: Test yourself on the examples below: They get progressively more difficult – see how far you can get! Do not use a calculator. Write the questions in your book, where two signs are touching, rewrite the question and then show the answer

e.g. SET A $12 + - 9 = 12 - 9 = 3$

• Set A

$$12 + - 9 =$$

$$-15 - 5 =$$

$$16 + 17 =$$

$$-8 - - 4 =$$

$$32 + - 12 =$$

$$-3 \times - 4 =$$

$$18 \div - 2 =$$

• Set B

$$50 \div - 2 =$$

$$-13 \times - 2 =$$

$$12 \times - 7 =$$

$$-4 \times - 6 =$$

$$4 - - 6 =$$

$$2 \times - 2 \times 3 =$$

$$-10 \div - 2 \div 5$$

• Set C

$$2 \times - 3 \times 4 =$$

$$-100 \div - 4 \div 5 =$$

$$2 - - 8 + - 7 =$$

$$-2 \times - 10 + 3 =$$

$$-2 + 3 \times 5 =$$

What is the square root of 9?
Think carefully about our rules

One question they love on the GCSE paper is ordering decimals or ordering negative numbers. As the number becomes more negative it goes further to the left on the Number line so we think of it as SMALLER.

So, $-7 < -3$ (The inequality sign means -7 is smaller than or less than -3)

Task 3:

In your book rewrite the following numbers in ascending order (smallest to biggest)

- a. 9°C , -8°C , 0°C , 3°C
- b. -3°C , -1°C , -9°C , 2°C
- c. 16°C , -2°C , 0°C , -16°C
- d. -6°C , -2°C , -11°C , -3°C
- e. -2°C , 2°C , -6°C , 6°C

Task 4: Complete the assignment on mathswatch

Task 5: Have a go at the questions below:

NEGATIVE NUMBERS

Problem 1 (Addition Pyramid):
 Add, Subtract, Divide and Multiply this pair of numbers
 -8 -4
 Copy and complete this addition pyramid
 Each number is the sum of the two numbers below
 Pyramid structure:
 Top: -10
 Middle: -4 -1
 Bottom: -3 -1 -6

Problem 2 (Multiplication Pyramid):
 Copy and complete this multiplication pyramid
 Each number is the product of the two numbers below
 Pyramid structure:
 Top: (empty)
 Middle: 2 (empty)
 Bottom: -2 -1 3 -1

Problem 3 (Number Pairs):
 Add, Subtract, Divide and Multiply this pair of numbers
 -1 -1
 What pair of numbers.....
 Have a SUM of 2
 Have a PRODUCT of -35

Problem 4 (Consecutive Numbers):
 What three CONSECUTIVE numbers ADD to -12

Problem 5 (Comparison):
 What is greater
 $(-4)^2$ or -8×2 ?

Problem 6 (Number Pairs):
 What pair of numbers.....
 Multiply to give 12
 Add to give -7