1.1. Counting and Number Line

Mathematics begins with counting.

	-39	-38	-37	-36	-35	-34	-33	-32	-31
-30	-29	-28	-27	-26	-25	-24	-23	-22	-21
-20	-19	-18	-17	-16	-15	-14	-13	-12	-11
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39

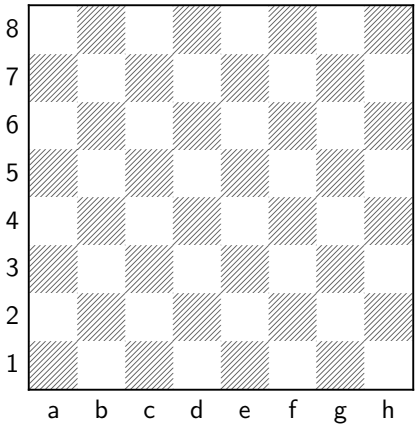
Practice 1: Count:

a) from 0 to 6

b) from -9 to 2

c) from -20 to -11

Practice 2: How many squares are there on a chessboard?



There are 8 rows and 8 columns, so the total number of fields is $8 \cdot 8 = 64$.

Important to remember

We use ten digits to write numbers: 0, 1, 2, ... 9. Numbers greater than 9 are written by using two or more digits. A number can have any amount of digits.

Example 1: Observe this **counting diagram**:

$$-6\rightarrow -5\rightarrow -4\rightarrow -3\rightarrow -2\rightarrow -1\rightarrow 0\rightarrow 1\rightarrow 2\rightarrow 3\rightarrow \ldots$$

How many steps → are needed to count from -5 to 2?

Solution:

$$-5\rightarrow -4\rightarrow -3\rightarrow -2\rightarrow -1\rightarrow 0\rightarrow 1\rightarrow 2$$

There are seven steps (arrows).

Practice 3: How many steps are needed to count from 4 to 14?

$$4\rightarrow 5\rightarrow 6\rightarrow 7\rightarrow 8\rightarrow 9\rightarrow 10\rightarrow 11\rightarrow 12\rightarrow 13\rightarrow 14$$

There are ten steps (arrows).

Practice 4: How many steps are needed to count from 4 to 24?

$$4\rightarrow 5\rightarrow 6\rightarrow 7\rightarrow 8\rightarrow 9\rightarrow 10\rightarrow 11\rightarrow 12\rightarrow 13\rightarrow 14\rightarrow 15\rightarrow 16\rightarrow 17\rightarrow 18\rightarrow 19\rightarrow 20\rightarrow 21\rightarrow 22\rightarrow 23\rightarrow 24$$

There are twenty steps (arrows).

Practice 5: How could you calculate the number of steps needed to count from some whole number to another whole number?

Subtract the smaller number from the larger number.

Practice 6: How many steps are needed to count from 4 to 34?

$34 - 4 = 30$. 30 steps are needed.

Practice 7: How many steps are needed to count from 4 to 134?

$134 - 4 = 130$. 130 steps are needed.

Practice 8: How many steps are needed to count from 4 to 9834?

$9834 - 4 = 9830$. 9830 steps are needed.

Example 2: Count by 2 **starting with 3**.

$$3 \to 5 \to 7 \to 9 \to 11 \to 13 \to 15 \to 17 \to 19 \to 21 \to \ldots$$

Practice 9: How many steps are needed to count by 2 from 8 to 28?

$$8 \to 10 \to 12 \to 14 \to 16 \to 18 \to 20 \to 22 \to 24 \to 26 \to 28$$

There are ten steps (arrows).

Practice 10: How many steps are needed to count by 5 from 15 to 50?

$$15 \to 20 \to 25 \to 30 \to 35 \to 40 \to 45 \to 50$$

There are seven steps (arrows).

Example 3: Count backwards from 4 to -3.

$$4 \to 3 \to 2 \to 1 \to 0 \to -1 \to -2 \to -3$$

Practice 11: Count backwards from 7 to 0.

$$7 \to 6 \to 5 \to 4 \to 3 \to 2 \to 1 \to 0$$

Practice 12: Count by 2 backwards from 12 to -6.

$$12 \to 10 \to 8 \to 6 \to 4 \to 2 \to 0 \to -2 \to -4 \to -6$$

Practice 13: Count by 10 backwards from 80 to -40.

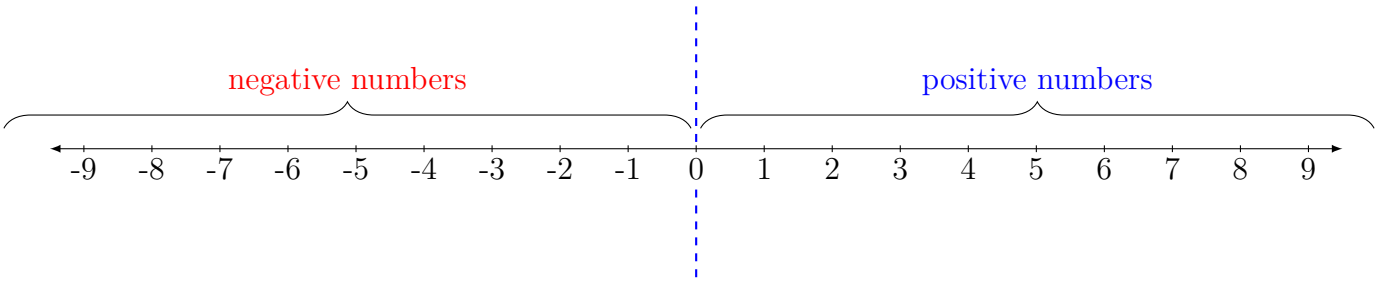
$$80 \to 70 \to 60 \to 50 \to 40 \to 30 \to 20 \to 10 \to 0 \to -10 \to -20 \to -30 \to -40$$

Warning

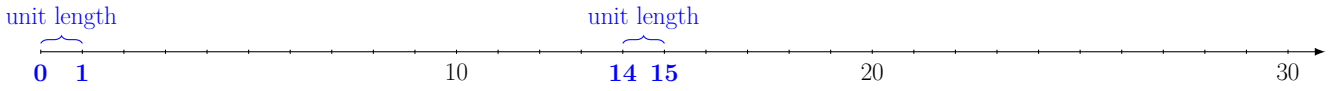
By now you should be comfortable counting by 1, 2, 5 and 10 in both directions. If not, practice some more counting!

Number Line

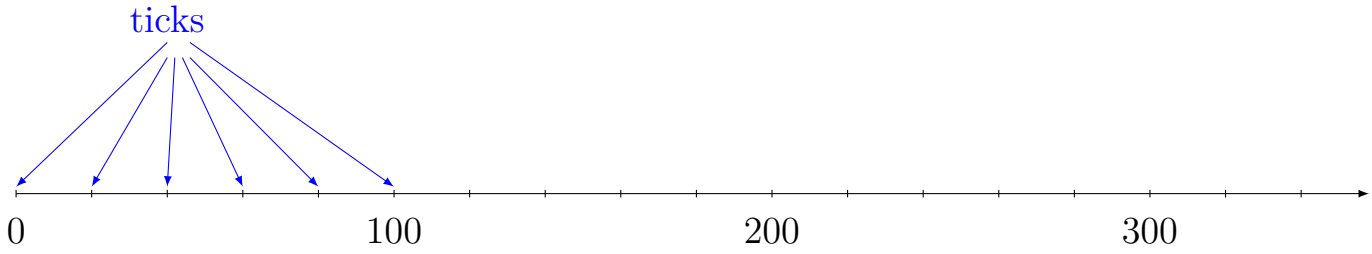
A **number line** is a straight line with numbers placed at their correct places.



The **unit length** is the distance between two consecutive integers.

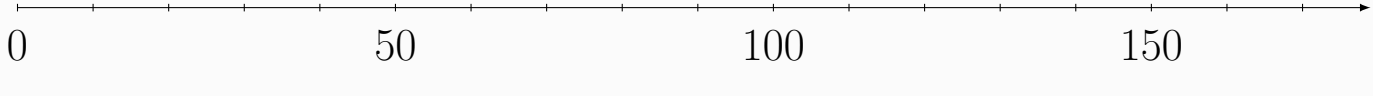


Short vertical line segments on a number line are called **ticks**.



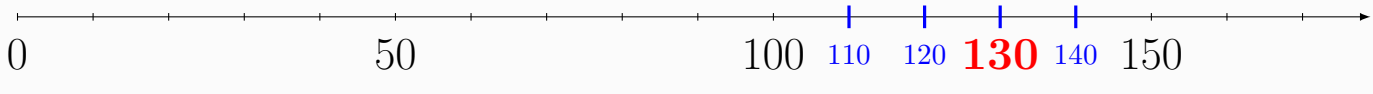
Each tick on this number line represents 20 units!

Example 4: Find number 130 on the number line.

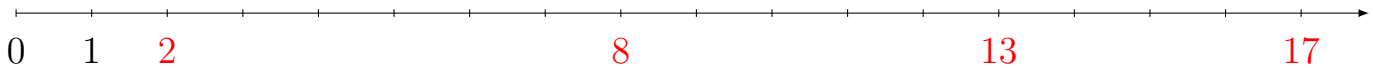


Solution: *Find the placements of the missing numbers.*

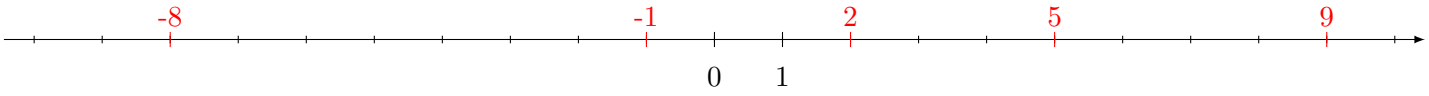
Each ***tick*** *represents a distance of 10.*



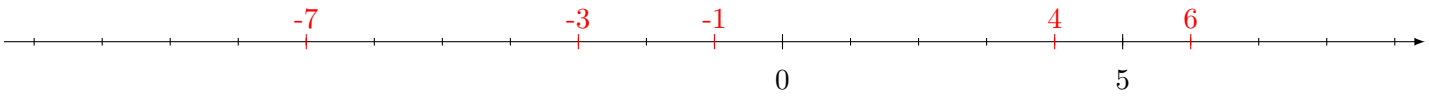
Practice 14: Add the following values to the number line: 2, 8, 13 and 17.



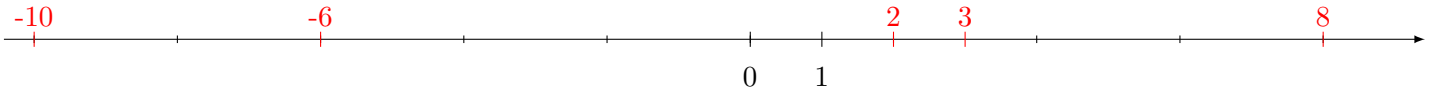
Practice 15: Add the following values to the number line: 2, -1, 5, -8 and 9.



Practice 16: Add the following values to the number line: 4, -3, 6, -1 and 7.



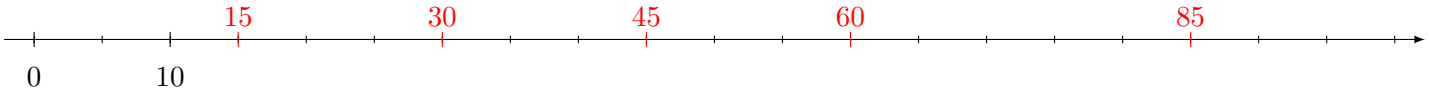
Practice 17: Add the following values to the number line: 2, -10, -6, 8 and 3.



Practice 18: Add the following values to the number line: 2, -10, -6, 8 and 3.



Practice 19: Add the following values to the number line: 15, 30, 45, 60 and 85.



Practice 20: Use a ruler to construct a number line that shows the following values: 0, 10, 20, 30, 40. Let the distance between consecutive ticks be 4 centimeters.

