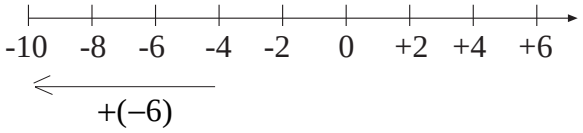
7: Calculations with Negative Numbers

Question: **What is the value that satisfies $-4+?=-10$?**

Misconception	**Correct**
There are several possible misconceptions including $?=6$ and $?=14$ or even $?=-14$	The correct answer is -6 as this satisfies the sum $-4+(-6)=-10$. It can be shown on a number line as given below.  *Starting* at negative 4 and adding negative 6 you get the answer negative 10. Hence $-4+(-6)=-10$

Further Explanation

As with the previous misconception (number 6), it is important to realise that there is no guessing, no doubts but straightforward logic. Here we can associate the meaning *owning* when the quantity is positive and *owing* if it negative.

Also, as before, we associate the *minus* sign with *opposite*.

In this example,

I start by owing 4 (i.e. the '-4')

What is this '+?' that must have happened if I ended up 'owing 10' ?
(i.e. the '-10')

Another *debt* of 6 must have been added to my plight

We write 'adding a debt of 6' as '$+(-6)$'

So in $-4+?=-10$ the ? must be -6

This is equivalent to the use of a number line as shown above; it does not matter which way you argue as long as you get the logic correct!

Follow-up Exercises

You might find a number line helpful when making or checking your calculations.

1. Complete the following:

   (a) $-5-3=\square$ (b) $-7-2=\square$ (c) $-9-8=\square$

   (d) $-4-4=\square$ (e) $-3-8=\square$ (f) $-5-9=\square$

2. Complete these calculations:

   (a) $-5+\square=-9$ (b) $-3+\square=-7$ (c) $-7+\square=-10$

   (d) $-8+\square=-6$ (e) $-4+\square=-1$ (f) $-10+\square=-6$

3. Calculate the value of each of these expressions:

   (i) $a+b$ (ii) $a-b$ (iii) $-a+b$ (iv) $-a-b$

   when

   (a) $a=-3$ and $b=-7$

   and

   (b) $a=5$ and $b=-6$

Answers

1. (a) -8 (b) -9 (c) -17 (d) -8 (e) -11 (f) -14

2. (a) -4 (b) -4 (c) -3 (d) 2 (e) 3 (f) 4

3. (a) -10, 4, -4 and 10 (b) -1, 11, -11 and 1