N2

Mathematics
Support Centre

Title: Directed Numbers

Target: On completion of this worksheet you should be able to use directed numbers

A directed number has either a $+$ or a $-$ in front of it. For example, in the winter, the temperature will drop below freezing and may be -3^oC. Usually if the temperature is above freezing we do not put in the $+$ sign. If it is $+7^o$C we just say 7^oC.

Suppose the temperature is -5^oC and rises by 2^oC then it is now -3^oC or

$$-5 + 2 = -3$$

If the temperature is 4^oC and drops by 7^oC then it is now -3^oC or

$$4 - 7 = -3$$

Using this idea we can add and subtract directed numbers.

Exercise
Work these out without using a calculator:

1. $8 - 3$
2. $5 - 8$
3. $-7 + 2$
4. $-4 - 5$
5. $-3 + 9$

(Answers: $5, -3, -5, -9, 6$)

Suppose you want to add -4 to 8 then we have $8 + (-4)$. This is the same as $8 - 4$ so the answer is 4. We use the following rules:

$(+)(-)$ is the same as $(-)$
$(-)(+)$ is the same as $(-)$
$(+)(+)$ is the same as $(+)$
$(-)(-)$ is the same as $(+)$

Examples

1. $4 + (+2) = 4 + 2 = 6$
2. $4 + (-2) = 4 - 2 = 2$
3. $4 - (+2) = 4 - 2 = 2$
4. $4 - (-2) = 4 + 2 = 6$

To enter a directed number in a calculator you use the $+/-$ or $(-)$ button.

You will probably use one of the following methods to enter the directed number -2:

$$\begin{array}{lll} 2 & +/- & \\ or & (-) & 2 \\ or & +/- & 2 \end{array}$$

Check with your calculator instructions if these do not work.

Note: The $-$ button on your calculator is used for the operation of subtraction. Take care not to confuse this button and the button referred to above.

Exercise
Use your calculator to check the answers to the examples above.

P.T.O.

Exercise
Work these out without using a calculator:

1. $6-(-4)$
2. $-3-(-5)$
3. $9+(-3)$
4. $-8-(+2)$
5. $6+(+4)$

(Answers: $10, 2, 6, -10, 10$)

When directed numbers are multiplied or divided the rules are:

$(+)\times(+)$ the result is $(+)$
$(-)\times(-)$ the result is $(+)$
$(+)\times(-)$ the result is $(-)$
$(-)\times(+)$ the result is $(-)$

$(+)\div(+)$ the result is $(+)$
$(-)\div(-)$ the result is $(+)$
$(+)\div(-)$ the result is $(-)$
$(-)\div(+)$ the result is $(-)$

Note: signs same $(+)$
signs different $(-)$

Exercise
Evaluate the following without using a calculator:

1. $(+4)\times(-3)$
2. $10\div(-2)$
3. $2\times 3\times(-4)\times(-1)$
4. $(-2)^3$
5. $(+2)\times(-2)\times(-3)\times(-1)$
6. $\frac{2\times(-3)\times(-3)}{(-6)}$
7. $\frac{(-9)\times(-2)^2\times(-1)}{(-3)\times(-2)}$
8. $\frac{(-1)^4\times(-2)^2\times(+3)}{(-1)^5\times 4}$

(Answers: $-12, -5, 24, -8, -12, -3, 6, -3$)

In the following exercise remember to use all the rules you have learnt so far including BIDMAS (see sheet N1).

Exercise
Evaluate the following:
a) without a calculator
b) with a calculator

1. $3+6-2\times(-3)$
2. $(-1)\times(-2-4)$
3. $-(-4)\times(-3)+2-3$
4. $20-2\times 3-10\div(-5)$
5. $(-1)^3\times(-6)-2\times 5-1-1$
6. $(+49)\div(-7)$
7. $25+(-5)-(-3)\times(-2)$
8. $\frac{11+(-1)\times(-2)}{-1^2}$
9. $\frac{11+(-1)\times(-2)}{(-1)^2}$
10. $\frac{20-2^2+(-3)\times(-4)}{(-1)^3\times 7}-2\times(-2)$
11. $\frac{-6+2\times(-3)}{(5-3)^2}$
12. $2\times 4+(-1)\times(-2)-\frac{2\times(-3)}{-1^5}$

(Answers:
1. 15 2. 6 3. -13
4. 16 5. -6 6. -7
7. 14 8. -13 9. 13
10. 0 11. -3 12. 4)