

UNIT 7.2

Directed Number

Revision slides: everything you need for the test, one idea per slide.

The number line and ordering

A **directed number** has a sign (+ or -) and a size. The sign says which side of zero; the number says how far.

-5 and 5 are the same distance from zero, on opposite sides.

Real examples: temperature below zero, floors below ground, money owed.

Order by position on the number line: numbers to the right are bigger. $-2 > -7$, even though $7 > 2$.

Use $<$ and $>$ carefully: $-7 < -2$ and $3 > -10$.

Adding directed numbers

Use **zero pairs**: one positive and one negative counter cancel to 0.

On a number line, a positive moves right and a negative moves left.

$-3 + 5 = 2$ and $-3 + (-4) = -7$.

Tidy double signs: $+ (-3)$ becomes $- 3$, so $5 + (-3) = 5 - 3 = 2$.

Subtracting directed numbers

Subtracting a negative is the same as **adding** the positive: $5 - (-3) = 5 + 3 = 8$.

Taking away a negative removes a debt, so you end with more. Build zero pairs to see why.

Four sign combinations: $+(+3) = +3$; $+(-3) = -3$; $- (+3) = -3$; $- (-3) = +3$.

Temperature change: from -4°C to 6°C is $6 - (-4) = 10$ degrees. Height and depth work the same way.

Multiplying and dividing

Same signs give a **positive**; different signs give a **negative**.

$(+) \times (+) = +$, $(-) \times (-) = +$, $(+) \times (-) = -$, $(-) \times (+) = -$. Division has the same rules.

$-4 \times 6 = -24$, $-4 \times (-6) = 24$, $-24 \div 4 = -6$, $-24 \div (-4) = 6$.

Three or more numbers: an **even** number of negatives gives a positive. $(-2) \times (-3) \times (-1) = -6$.

Order of operations

An agreed order stops different answers: **B**rackets, then squares and roots (**I**ndices), then **D**ivision and **M**ultiplication, then **A**ddition and **S**ubtraction.

Work left to right when operations tie, and set out one step per line.

Example: $3 + 4 \times 2 = 3 + 8 = 11$. And $(3 + 4) \times 2 = 14$.

$(-3)^2 = 9$ but $-3^2 = -9$: the brackets mean the -3 is squared; without them only the 3 is squared.

WATCH OUT · MISCONCEPTIONS

Don't fall for these

✗ "-7 is bigger than -2 because 7 is bigger than 2."

✓ -7 is further left on the number line, so $-7 < -2$.

✗ " $5 - (-3) = 2$."

✓ Subtracting a negative adds: $5 - (-3) = 5 + 3 = 8$.

✗ " $-3 \times -4 = -12$."

✓ Two negatives make a positive: $-3 \times (-4) = 12$.

✗ " $-3^2 = 9$."

✓ Without brackets only the 3 is squared: $-3^2 = -9$.
 $(-3)^2 = 9$.

✗ " $3 + 4 \times 2 = 14$."

✓ Multiply first: $3 + 8 = 11$.

TEST YOURSELF

Test yourself

1. Which is the smallest?

Answer -7 . -7 is furthest left on the number line.

2. Which sentence is true?

Answer $-7 < -2$. -7 is to the left of -2 .

3. What is -4×6 ?

Answer -24 . Different signs give a negative.

4. What is $-4 \times (-6)$?

Answer 24 . Two negatives give a positive.