



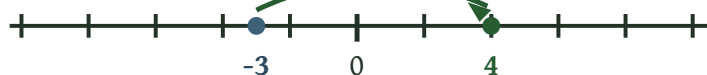
# Direction and Distance

The sign gives the direction. The number gives the distance. Start at the first number and jump.

## 1 Add on a number line

$$-3 + 7 = 4$$

*+ means right, 7 steps*



Owing \$3, then earning \$7: you cross zero and finish with 4. Adding a negative would jump left instead.

## 3 Rewrite subtraction as addition

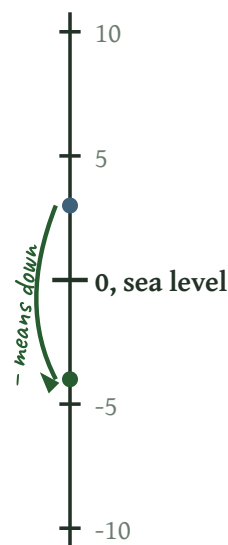
$$p - q = p + (-q)$$

$$3 - 8 \rightarrow 3 + (-8) \rightarrow -5$$

Every subtraction becomes an addition you can draw.

Subtracting 8 and adding -8 land on the same spot. Every time, for any p and q.

## 2 Add on a vertical number line



$$3 + (-7) = -4$$

A bird at 3 m dives 7 m: it passes the surface and ends 4 m under.

Same rule, vertical: + jumps up, - jumps down. Elevation and depth use this line.

## 4 Distance has no sign



Distance is  $|p - q|$ .  $|-3 - 4| = |-7| = 7$ . The change from -3 to 4 is +7; the change back is -7; the distance both ways is 7. Distance is never negative.