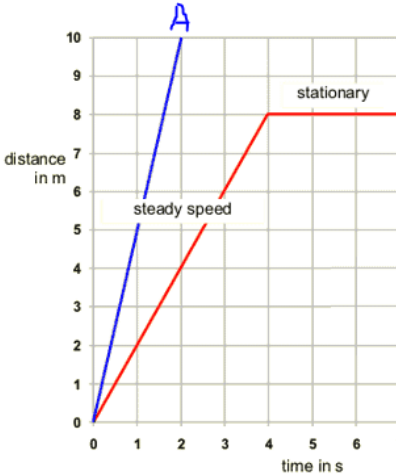


INTRODUCTION TO DISTANCE – TIME GRAPHS



Distance is the total length travelled by an object. Distance is plotted on the y-axis (dependent) and time is plotted on the x-axis (independent).

On the left, you can see that the object represented by line A has travelled 10m in 2s whereas the object represented by the line B has only travelled 4m in this time and is therefore travelling more slowly.

'**Straight lines**' on a distance-time graph tell us that the object is travelling at a **constant speed**. Note that you can think of a stationary object (not moving) as travelling at a constant speed of 0 m/s.

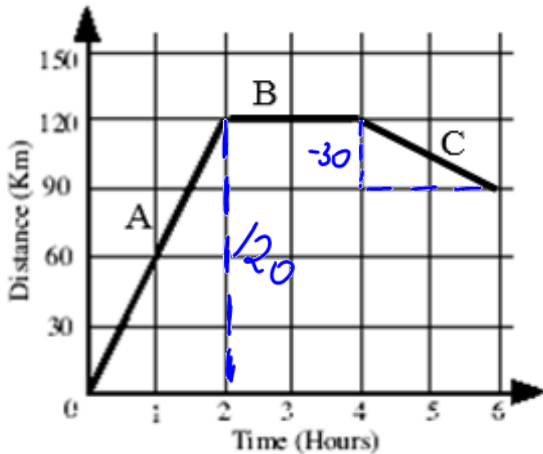
FROM
CALCULATING SPEED FOR THE GRAPH

The slope (gradient) of a distance-time graph indicates the speed of the object.

$$Speed = \frac{\text{change in distance}}{\text{change in time}} = \frac{\Delta d}{\Delta t} = \frac{\text{rise}}{\text{run}}$$

Δ = Greek Letter Delta represents change

*Note that if the graph slopes downwards, you will get a negative value indicating the object is travelling back towards its origin.



	Part A	Part B	Part C
Distance Travelled	120km	0km	-30km
Time Travelled	2h	2h	2h
Speed	$\frac{120}{2} = 60 \text{ km/h}$	0km/h	-15km/h

Total Distance travelled from the origin = $120 + 30 = 150$

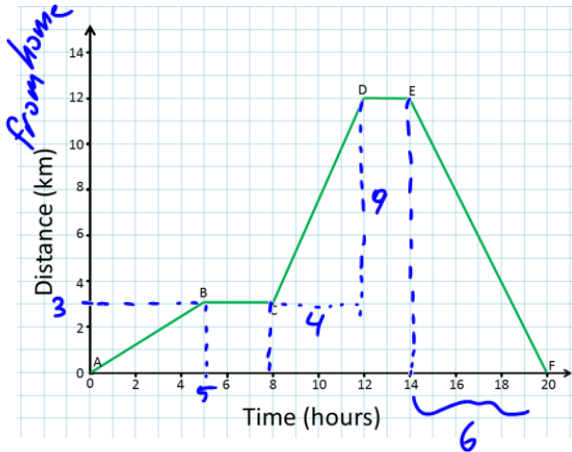
DESCRIBING THE MOTION

During **Part A** of the journey the object travels 120 km in 2 hours. It is travelling at a **constant velocity** (a fancy term for speed when you include the direction) of +60 km/h.

During **Part B** of the journey the object travels 0 km in 2 hours. It is **stationary for 2 hours**.

During **Part C** of the journey the objects travels -30 km in 2 hours. It is travelling at a constant velocity of -15 km/h back to its starting point, our reference point 0.

The graph below shows Cole’s journey between his home and a campsite. The origin indicates **home**.



	Part AB	Part BC	Part CD	Part DE	Part EF
Distance Travelled	+ 3km	0km	9km	0km	-12km
Time Travelled	5h	3h	4h	2h	6h
Speed	+0.60km/h OR 600m/h	0km/h	+2.25km/h 2250m/h	0km/h	-2km/h

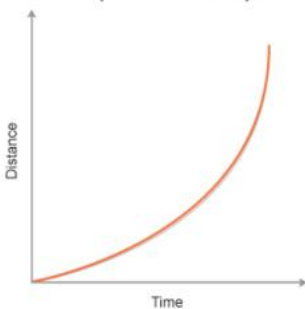
Note= + direction represents going towards campsite, - direction represents going back home (origin).

Describe the journey for each part using the words: constant velocity, direction, stationary

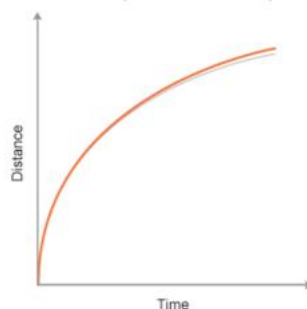
Part AB	Cole travelled 3km in 5 hours at a constant velocity of +0.60km/h towards the campsite.
Part BC	He had a break for 3 hours where he remained stationary.
Part CD	He travelled 9km in 4 hours at a constant velocity of +2.25km/h towards the campsite.
Part DE	After spending 2 hours at the campsite, he realized he forgot his fishing gear.
Part EF	Cole travelled back home -12km in 6 hours at a constant velocity of -2km/h.

CURVED LINES

Increasing Speed (acceleration)



Decreasing Speed (deceleration)



'Curved lines' on a distance time graph indicate that the speed is changing.

The object is either getting faster = 'accelerating' or slowing down = 'decelerating'. You can see that the distance moved through each second is changing.