Motion graphs worksheet

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Name:	Solutions by Addvance	Class:	

Match the term, definition and standard unit:

The rate at which an object moves in a specific direction.

The length between points without regard to direction.

The rate at which an object moves in any direction.

The rate of change of speed or velocity.

Acceleration

Speed

Velocity

Distance

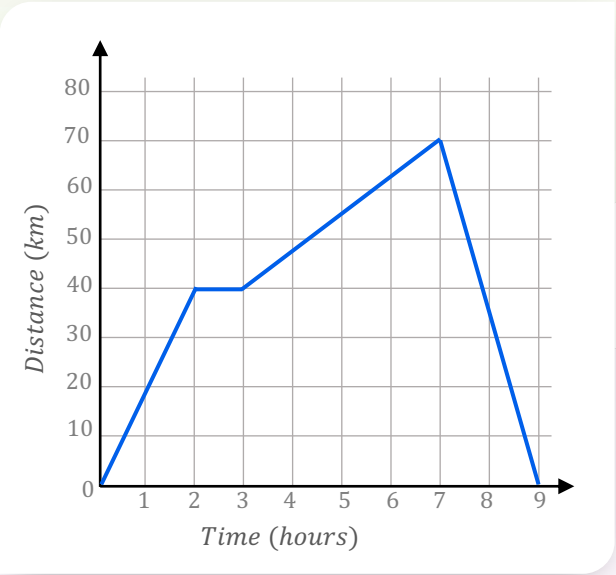
m

m/s

m/s

m/s^2

Study the distance-time graphs below and answer the questions:



Look at the graph on the left...

Describe the motion between 2 and 3 hours.

The object is at rest.

What happened between 7 and 9 hours?

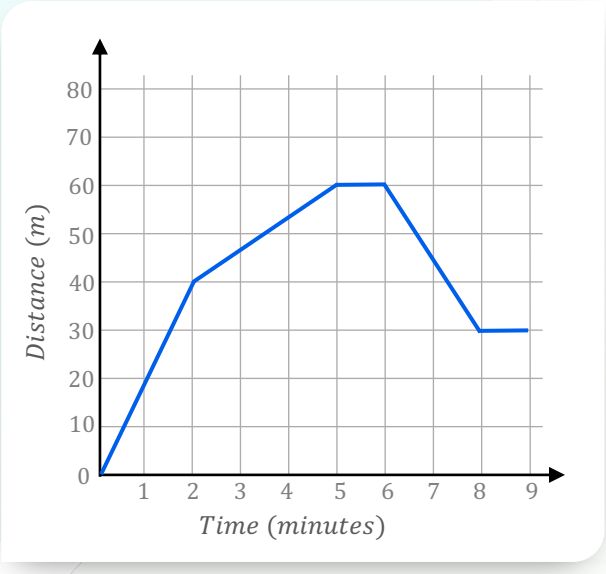
The object travels back to the start.

How far did the object travel in the first two hours?

40 km

Motion graphs worksheet

Look at the graph on the right...



How far had the object travelled in the first 5 minutes

60m

For how long did the object rest at $60m$ from the start?

1 minute

Did the object return to its original position? *(circle)*

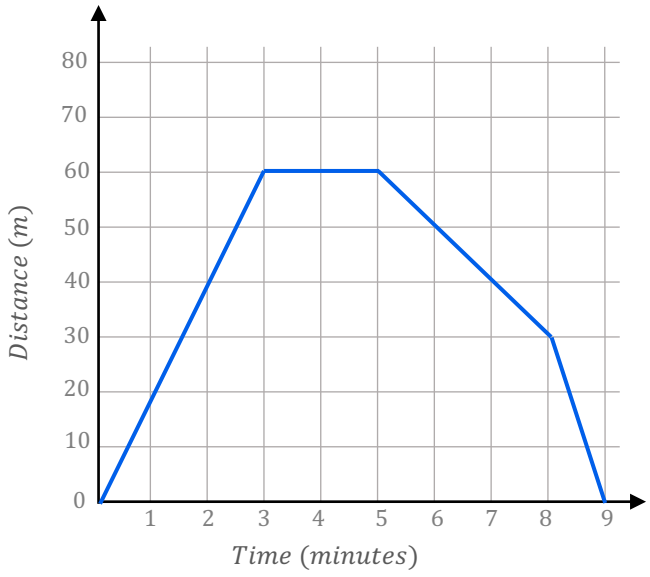
Yes

No

How do you know?

At the end the object is still 9 m away from the start.

David cycles from his house to the shop and back. Describe his journey using the distance-time graph below:



In the first 3 minutes, David...

Rides at constant speed.

After 3 minutes from the start, he...

Takes a rest.

At 9 minutes, David...

was back at the start.

David's full journey took...

9 minutes

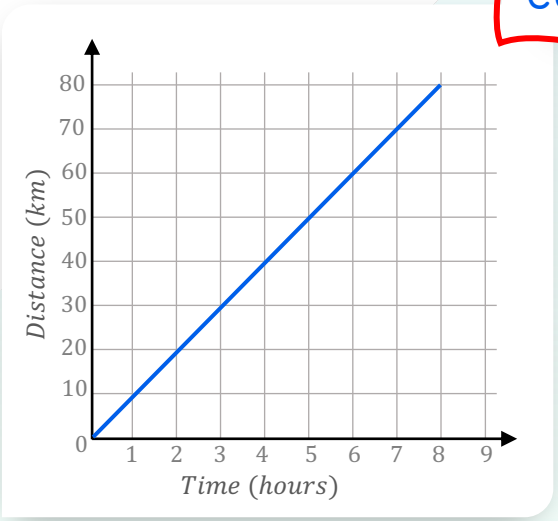
And he travelled a total distance of...

120m

Motion graphs worksheet

Write down what kind of motion each of these distance-time graphs indicate:

The first one has been done for you!

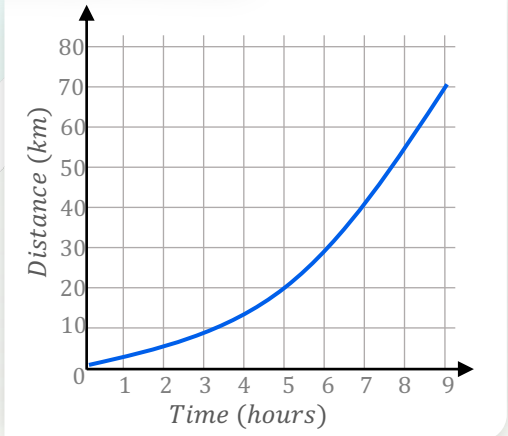


Constant speed

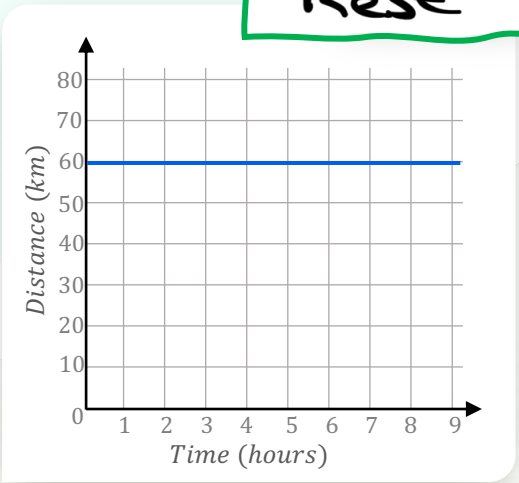
Acceleration

Key words:

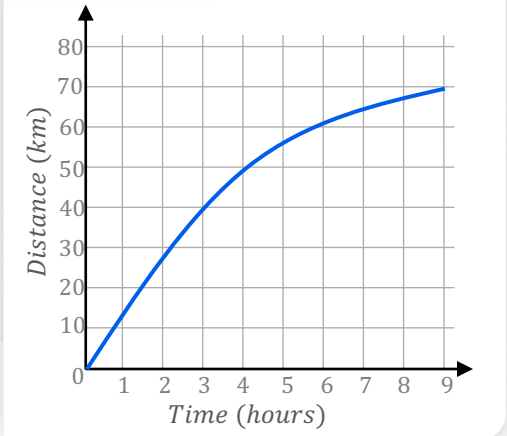
Deceleration
Acceleration
Constant speed
Rest (no movement)
Backward movement



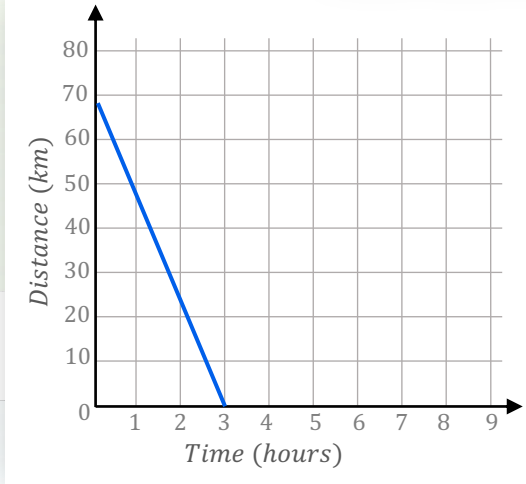
Rest



Deceleration



Backwards Movement



CHALLENGE

What does the gradient of the line on a **distance-time** graph represent?

The velocity of the object.

Motion graphs worksheet

Fill in the gaps in these formulas:

$$Speed = \frac{\text{distance}}{\text{time}}$$

$$\text{time} = \frac{Distance}{Speed}$$

$$Distance = \text{speed} \times \text{time}$$

Fill in the blanks in the sentence:

When the object is accelerating, the speed is increasing.

When the object is decelerating, the speed is decreasing.

Tick (✓) true or false for each statement:

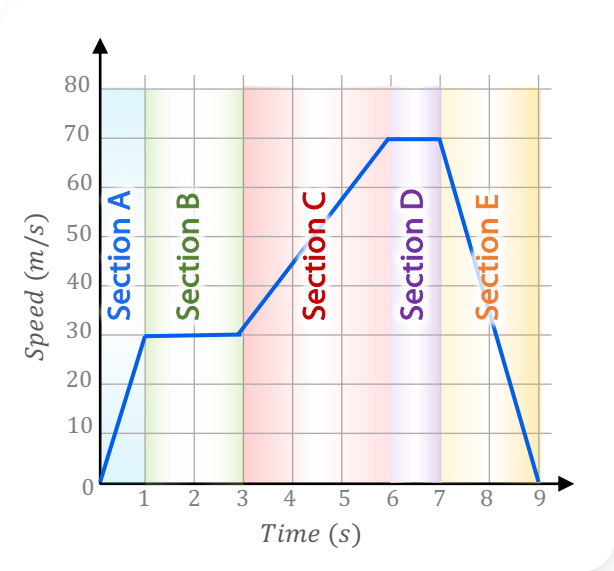
A horizontal line on a **distance-time** graph indicates a constant speed.	✓	
A downward curved line on a **distance-time** graph indicates deceleration.	✓	
An upward diagonal line on a **speed-time** graph always indicates an acceleration.	✓	
If a line is steep on a **distance-time** graph, it indicates that the object is moving at a slower speed.		✓
The velocity of an object can be negative or positive, whereas speed is always positive.	✓	

Motion graphs worksheet

Study the speed-time graphs below and answer the questions:

Look at the graph below on the left and tick the correct answer(s).

SPEED-TIME



In which sections did the object accelerate?

A ✓ B C ✓ D E

In which section did the object decelerate?

A B C D E ✓

In which sections did the object maintain a constant speed?

A B ✓ C D ✓ E

Look at the graph below on the right and answer the questions.

How far did the object travel in Section E?

0 *km*

What was the speed of the object in Section C?

40 *km/h*

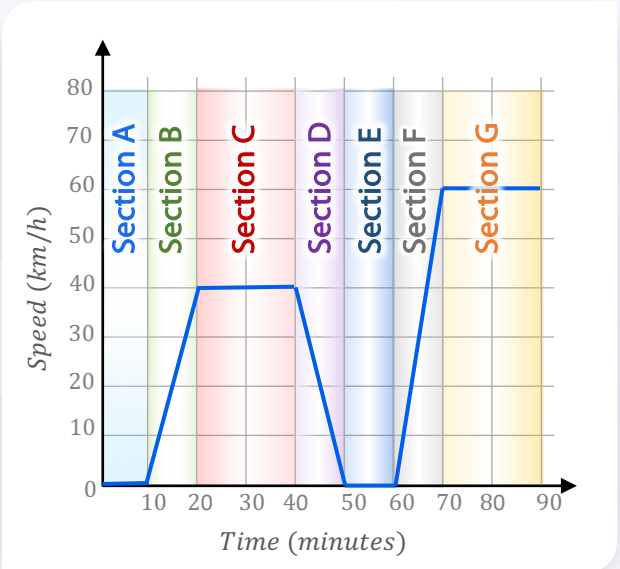
Did the object decelerate in Section F?

Yes No

How do you know?

The line is going up.
(The gradient is positive.)

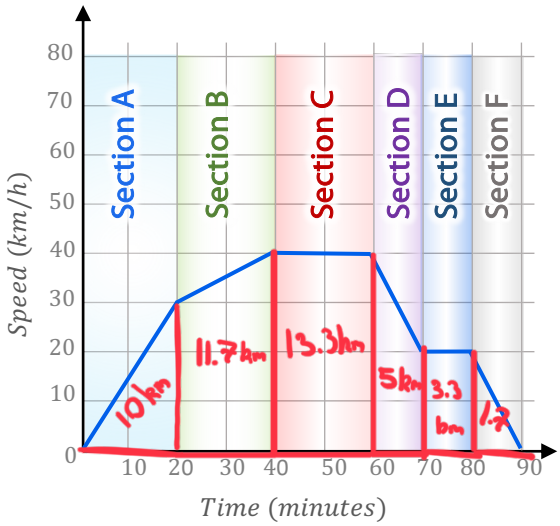
SPEED-TIME



Motion graphs worksheet

Look at the graph on the right...

SPEED-TIME



How far did the object travel in section C? distance = speed × time

speed = 40km/h

time = 20 mins = $\frac{1}{3}$ hours

$d = 40 \times \frac{1}{3}$

$= 13.3$ km

13.3 km

Did the object return to its original position? *(circle)*

Yes No Can't tell

Why?

The speed time graph doesn't show any information about position.

In which sections did the object accelerate? *(tick multiple)*

A ✓ B C D E

In which section did the object have the lowest constant speed?

A B C D E ✓

CHALLENGE

Calculate the total distance travelled!

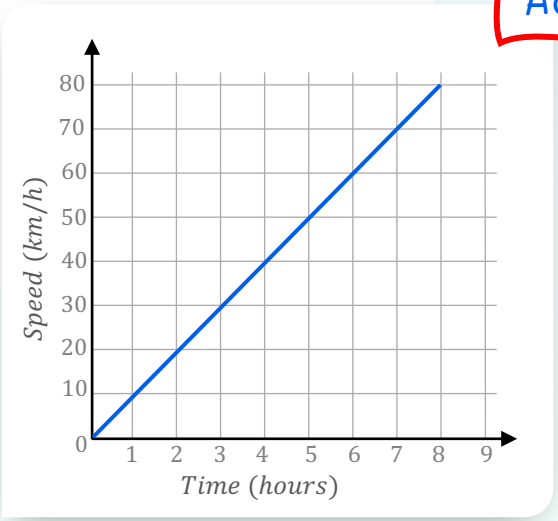
↖ Area under the graph.

48.4 km

Motion graphs worksheet

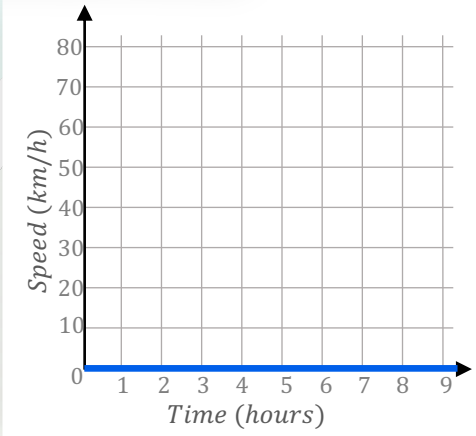
Write down what kind of motion each of these SPEED-time graphs indicate:

The first one has been done for you!



Acceleration

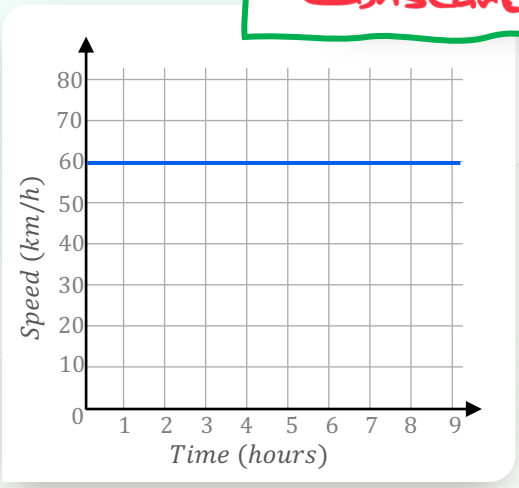
Rest



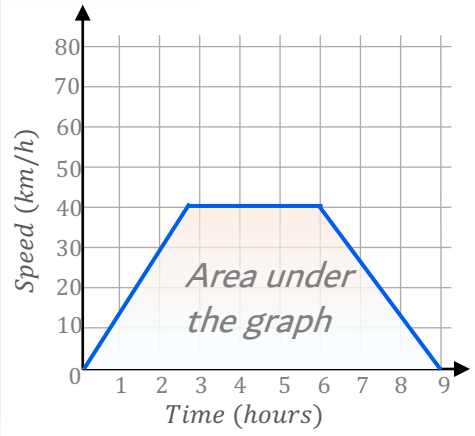
Key words:

Deceleration
Acceleration
Constant speed
Rest (no movement)
Total distance travelled

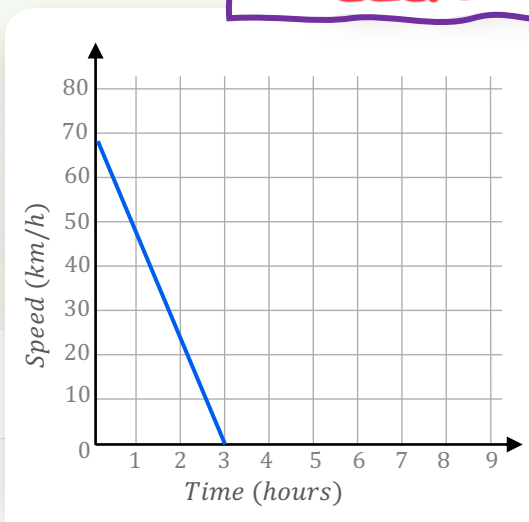
Constant Speed



Total Distance Travelled



Deceleration



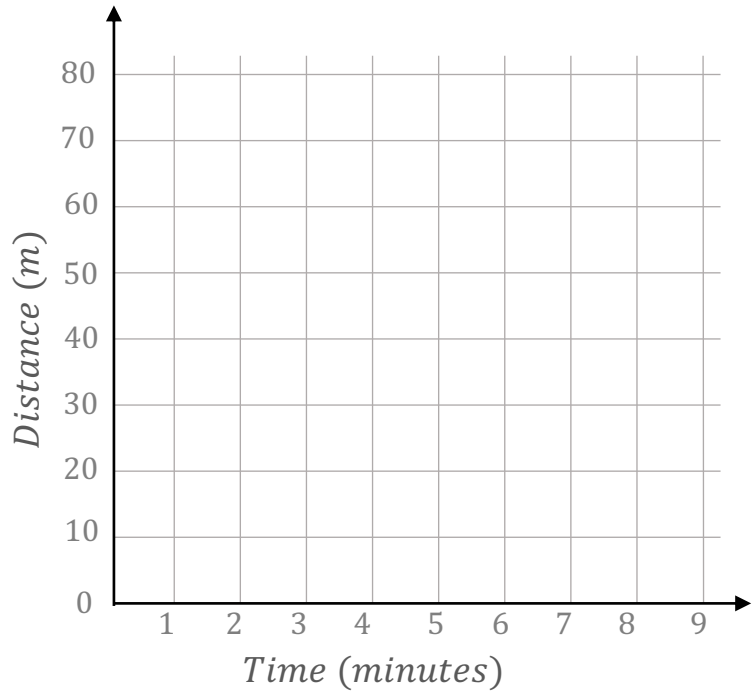
CHALLENGE

What does a curved line on a **speed-time** graph indicate?

Changing acceleration/ deceleration.

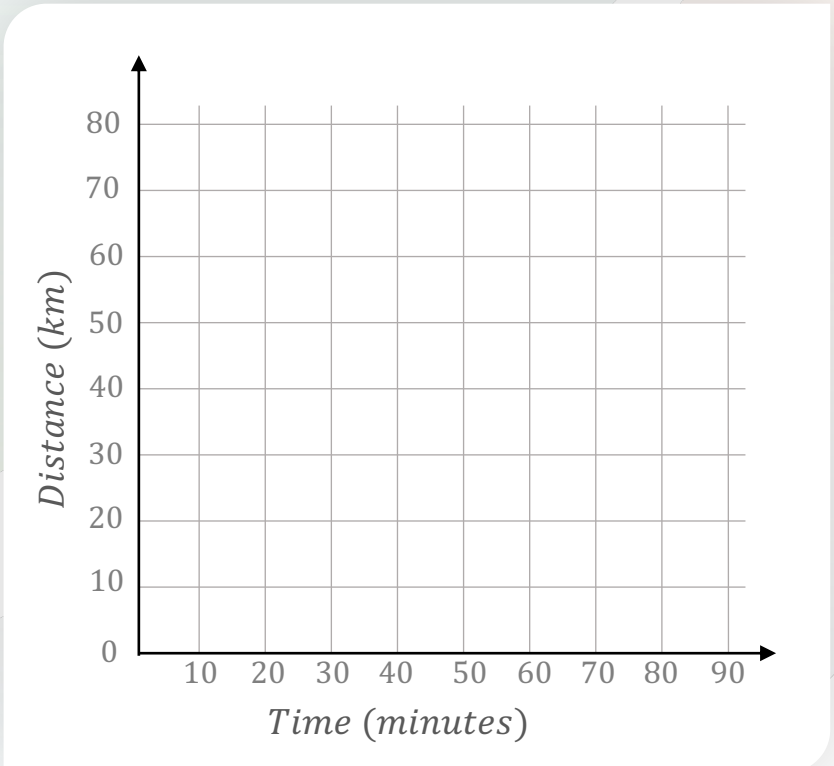
Motion graphs worksheet

Construct DISTANCE-TIME graphs based on the journey descriptions below.



Johnny starts off from his house and walks 30m in 2 minutes. He then speeds up and walks another 40m in the next 2 minutes. After stopping at the shop for 1 minute, he turns and walks all the way back to his house in the next 3 minutes.

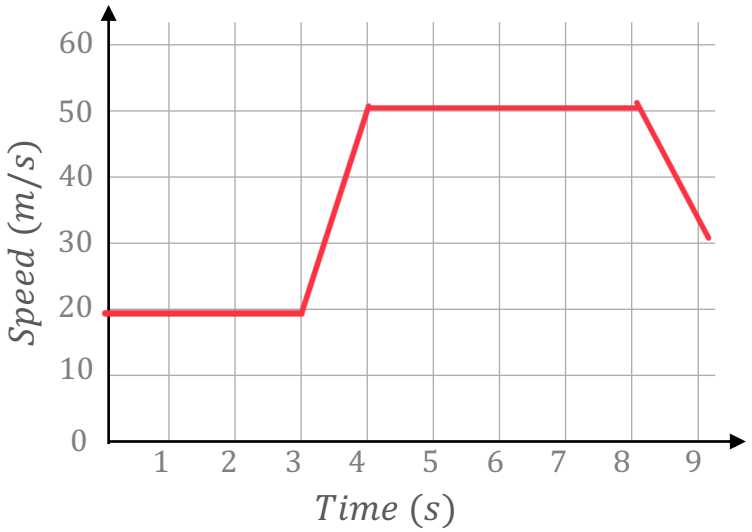
A car starts from the house and travels at a speed of 80km/h for the first 30 minutes. It then travels another 10 km in the next 20 minutes. After resting for 20 minutes, the car travels in the opposite direction, covering a distance of 20 km in 20 minutes.

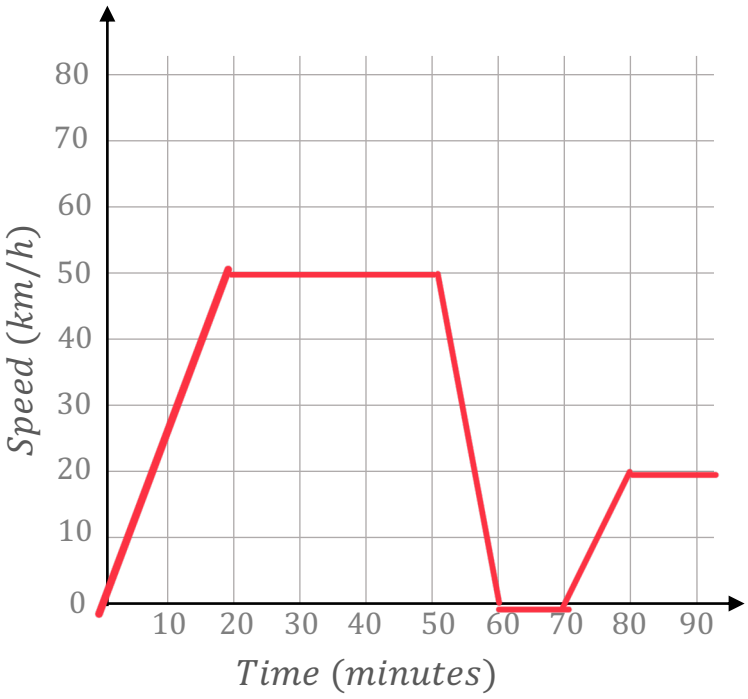


Motion graphs worksheet

Construct SPEED-TIME graphs based on the journey descriptions below.

Tanya cycles 60m in 3 seconds. She then accelerates to 50m/s in the next second and maintains that speed for the next 4 seconds. Finally, she slows down to 30m/s in the next second.



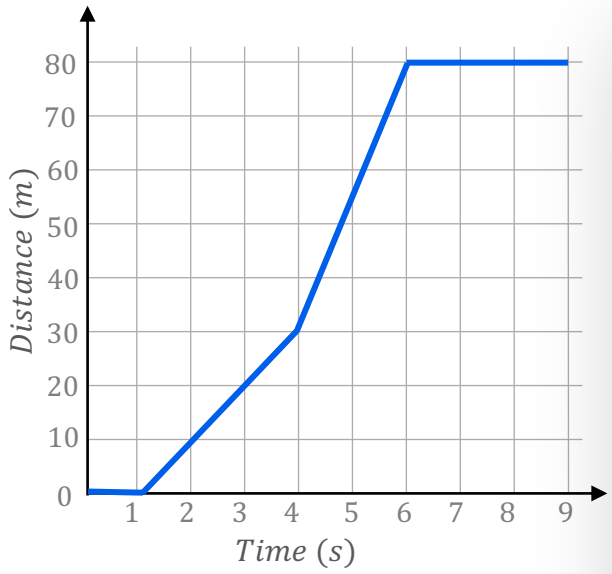


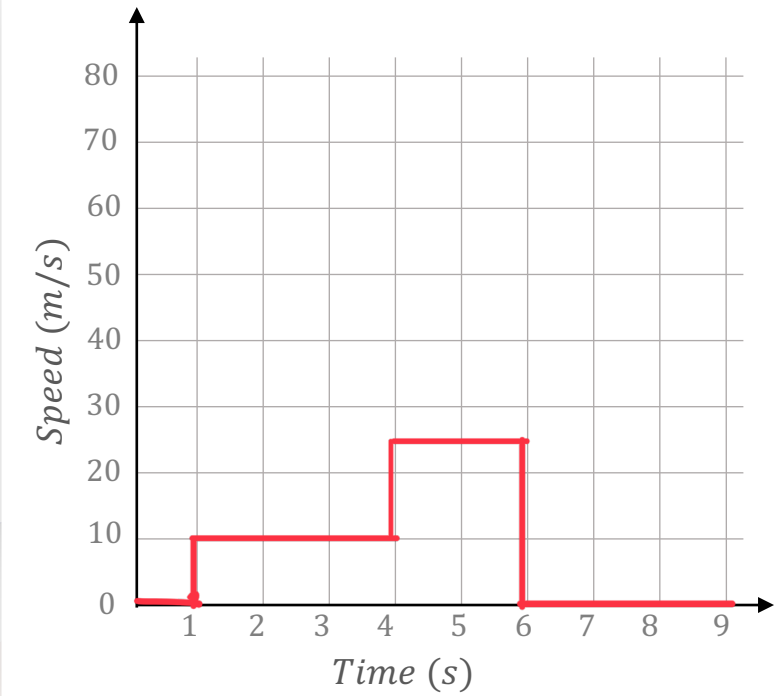
A car accelerates from 0-50 km/h in 20 minutes. For the next half an hour, it travels 25km. The car then decelerates and stops in the next 10 minutes. After staying in rest for 10 minutes, the car accelerates to 20km/s in the next 10 minutes and maintains that speed for another 10 minutes.

Tip: Draw graphs with a ruler and a sharp pencil. Don't draw lines too dark or light, and if you draw a curve, do it in one smooth gentle motion.

Motion graphs worksheet

Construct a SPEED-TIME graph based on the DISTANCE-TIME graph.





Evaluation!

I understand the definitions of the terms: *velocity, speed, distance, displacement, acceleration, deceleration, rest, constant.*

I can evaluate distance-time and speed-time graphs and answer exam-style questions on these.

I can confidently identify what different types of lines indicate on speed-time and distance-time graphs.

I can successfully construct distance-time and speed-time graphs based on written descriptions.

I can compare speed-time and distance-time graphs and use one to construct the other.