EXAM PAPERS PRACTICE

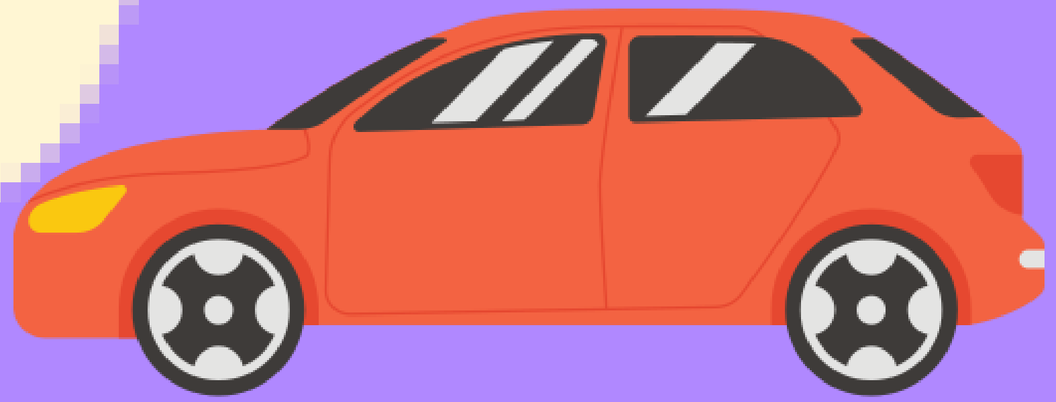
CHAPTER 2:

DESCRIBING MOTION

CIE IGCSE Physics

for board 0625 and 0972

(For exam 2025+)



SPEED

EXAM PAPERS PRACTICE

MEASURING SPEED

DISTANCE-TIME GRAPH

ACCELERATION

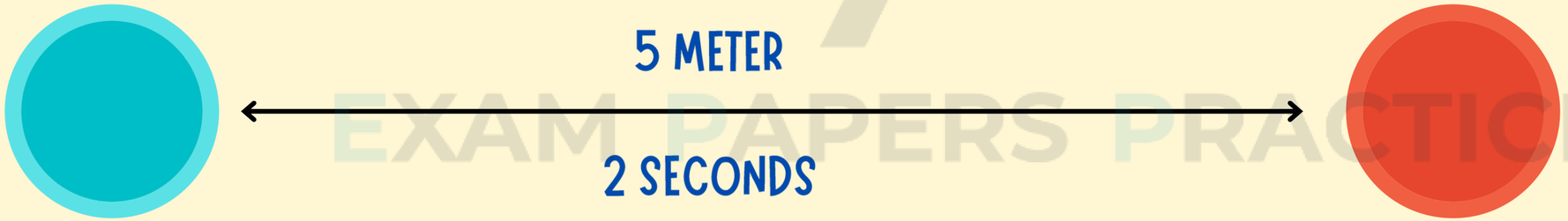
MEASURING ACCELERATION

SPEED-TIME GRAPH

MEASURING SPEED

EXAM PAPERS PRACTICE

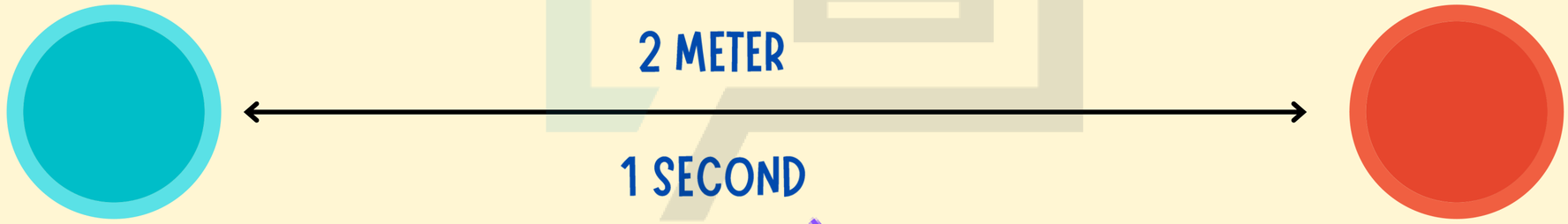
A. DISTANCE TRAVELLED BETWEEN 2 POINTS



B. TIME TAKEN TO TRAVEL BETWEEN THESE 2 POINTS

MEASURING SPEED

Definition: THE DISTANCE TRAVELLED BY AN OBJECT PER UNIT TIME



SPEED = 2 M/S

MEASURING SPEED

EXAM PAPERS PRACTICE

Formula for speed:

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

MEASURING SPEED

Quantity	SI Unit	Other units
Distance	Metre, m	Kilometre, km
Time	Second, s	Hour, h
Speed	Metre per second, m/s	Kilometre per hour, km/h

WORKED EXAMPLE 1

A RUNNER FINISHED A 1200-METER SEGMENT OF A RACE IN 30 SECONDS. WHAT WAS HIS AVERAGE SPEED?

SPEED = ?

WORKED EXAMPLE 1

A RUNNER FINISHED A 1200-METER SEGMENT OF A RACE IN 30 SECONDS. WHAT WAS HIS AVERAGE SPEED?

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$= \frac{1200\ \text{M}}{30\ \text{S}}$$

$$= 40\ \text{M/S}$$

WORKED EXAMPLE 2

A SUBMARINE IS TRAVELING AT A CONSTANT SPEED OF 20 KM/H. HOW LONG WILL IT TAKE TO COVER A DISTANCE OF 300 KM?

SPEED = ?

WORKED EXAMPLE 2

A SUBMARINE IS TRAVELING AT A CONSTANT SPEED OF 20 KM/H. HOW LONG WILL IT TAKE TO COVER A DISTANCE OF 300 KM?

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$20\ \text{KM/H} = \frac{300\text{KM}}{\text{TIME}}$$

$$\text{TIME} = 15\ \text{HOURS}$$

WORKED EXAMPLE 3

*conversion of unit is required

9000s = 2.5 hours

600km = 600000m

A TRAIN COVERS A DISTANCE OF 600 KM IN 9000 SECONDS. WHAT IS THE SPEED OF THE TRAIN IN KM/H AND M/S?

WORKED EXAMPLE 3

*conversion of unit is required

9000s = 2.5 hours

600km = 600000m

EXAM PAPERS PRACTICE

A TRAIN COVERS A DISTANCE OF 600 KM IN 9000 SECONDS. WHAT IS THE SPEED OF THE TRAIN IN KM/H AND M/S?

$$\text{SPEED (KM/H)} = \frac{\text{DISTANCE (KM)}}{\text{TIME (H)}}$$

$$= \frac{600\text{KM}}{2.5\text{H}}$$

$$= 240\ \text{KM/H}$$

$$\text{SPEED (M/S)} = \frac{\text{DISTANCE (M)}}{\text{TIME (S)}}$$

$$= \frac{600000\text{M}}{9000\text{S}}$$

$$= 66.67\ \text{M/S}$$

SPEED

EXAM PAPERS PRACTICE

MEASURING SPEED

DISTANCE-TIME GRAPH

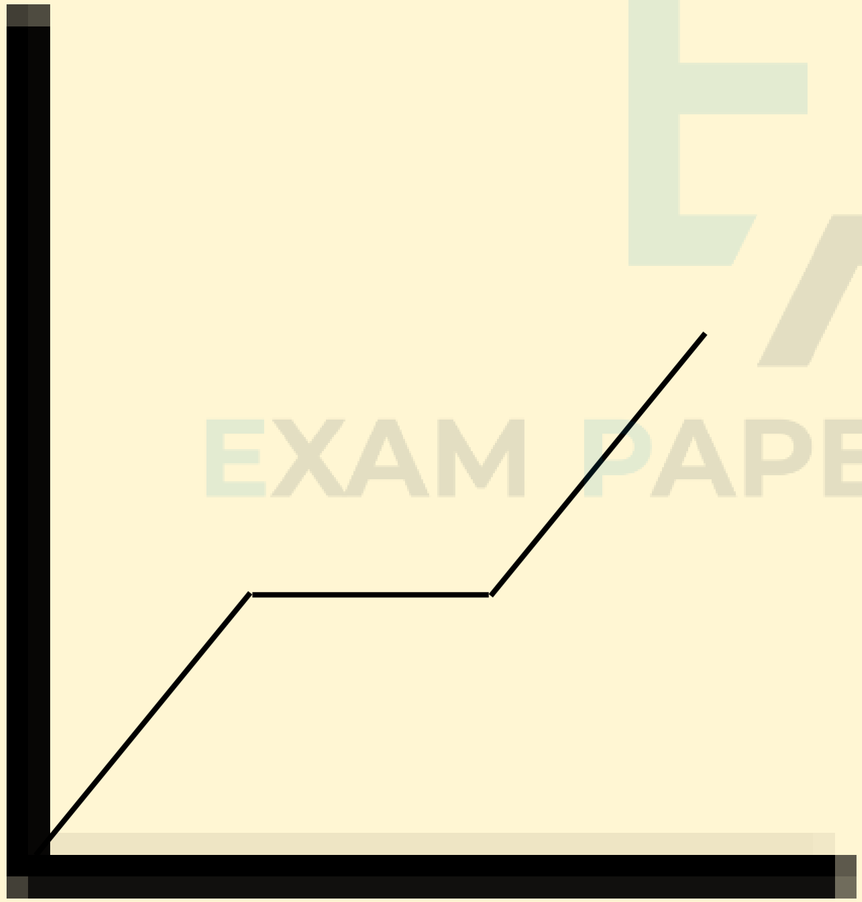
ACCELERATION

MEASURING ACCELERATION

SPEED-TIME GRAPH

DISTANCE TIME GRAPH

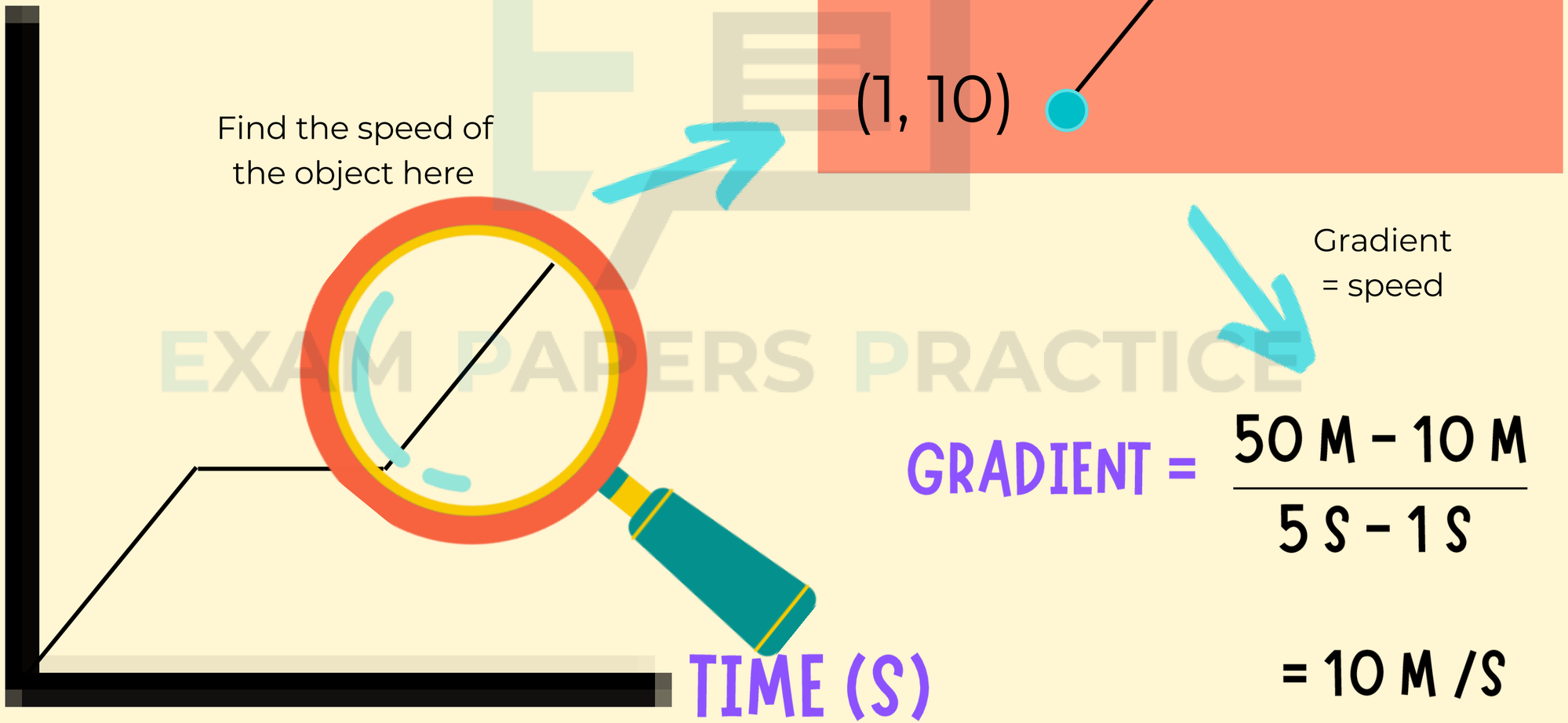
DISTANCE



TIME

SHOW HOW FAR AN OBJECT HAS TRAVELLED AT A PARTICULAR TIME

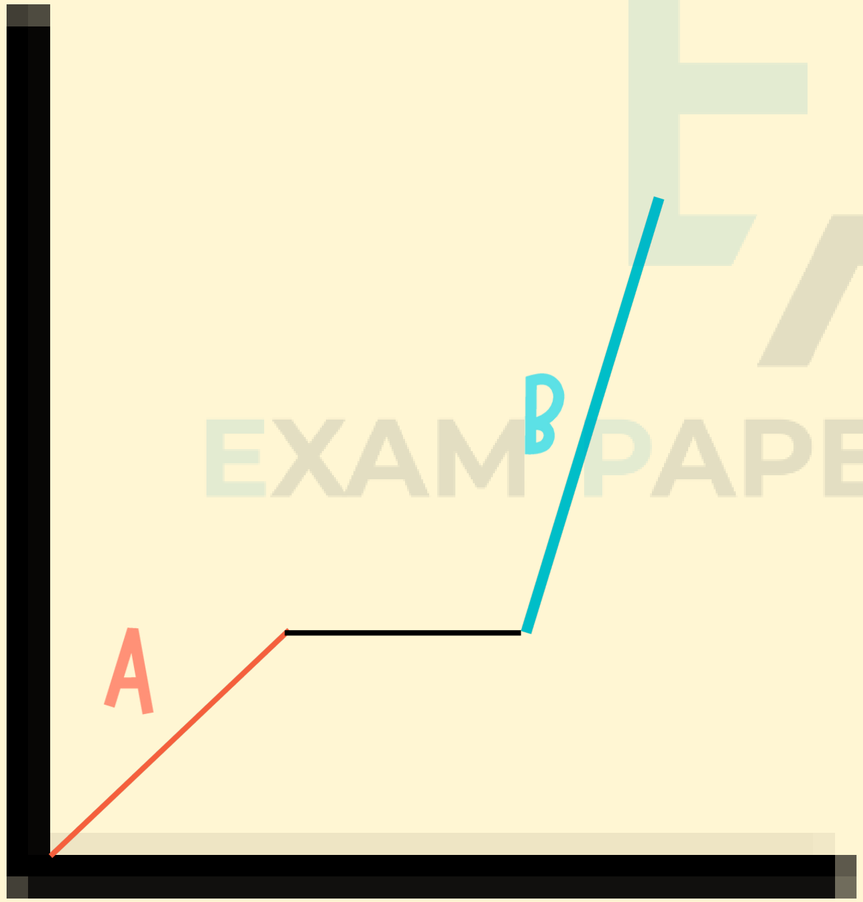
FIND THE SPEED FROM A DISTANCE-TIME GRAPH = GRADIENT



$$\text{GRADIENT} = \frac{50\ \text{M} - 10\ \text{M}}{5\ \text{S} - 1\ \text{S}}$$

$$= 10\ \text{M/S}$$

FIND THE SPEED FROM A DISTANCE-TIME GRAPH = GRADIENT



Tips

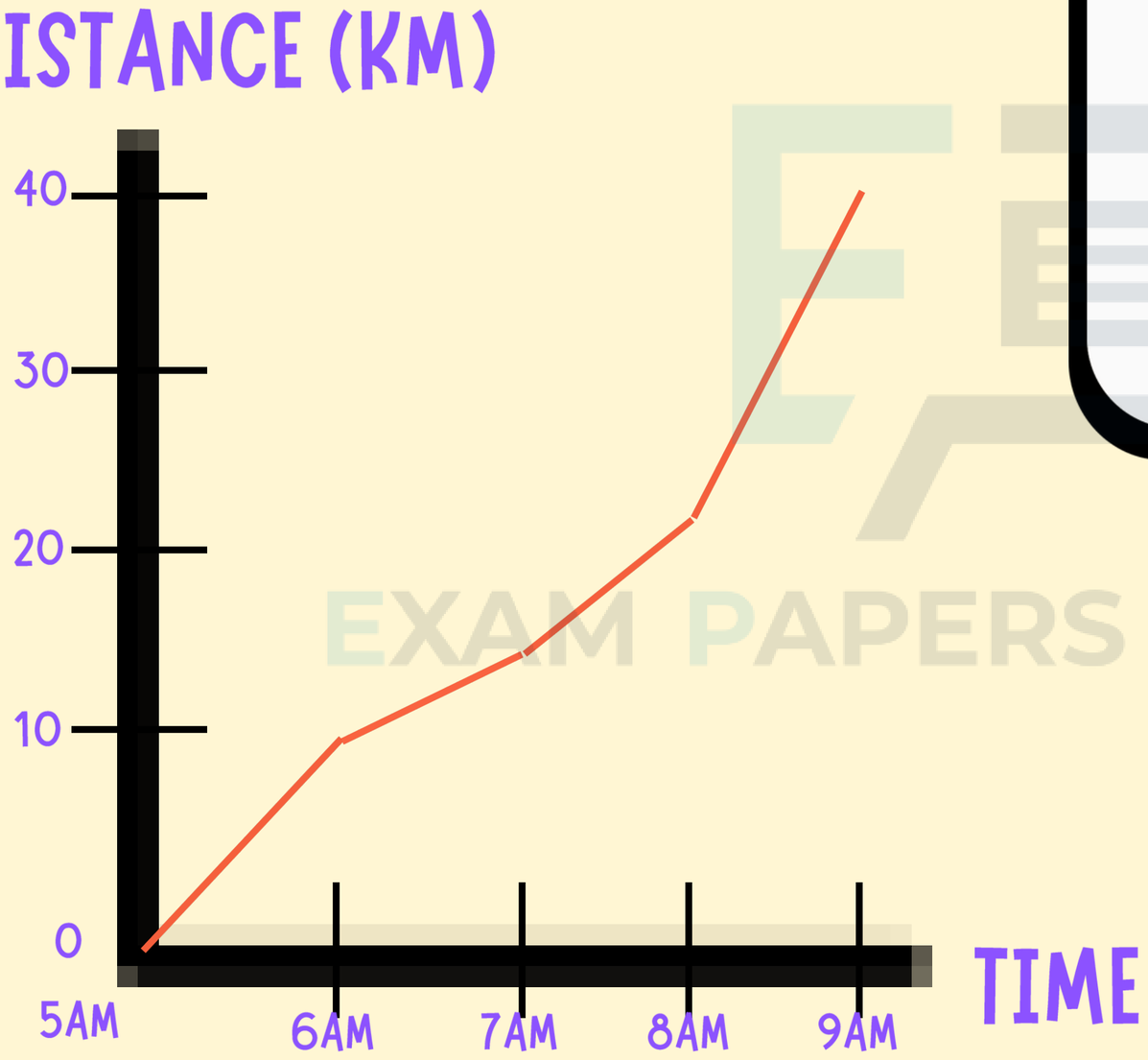
1. The gradient of the graph indicates the object's speed.
2. The steeper the gradient, the faster the movement.
3. When the slope is horizontal, it means the slope is zero.

*B is faster than A as it is steeper

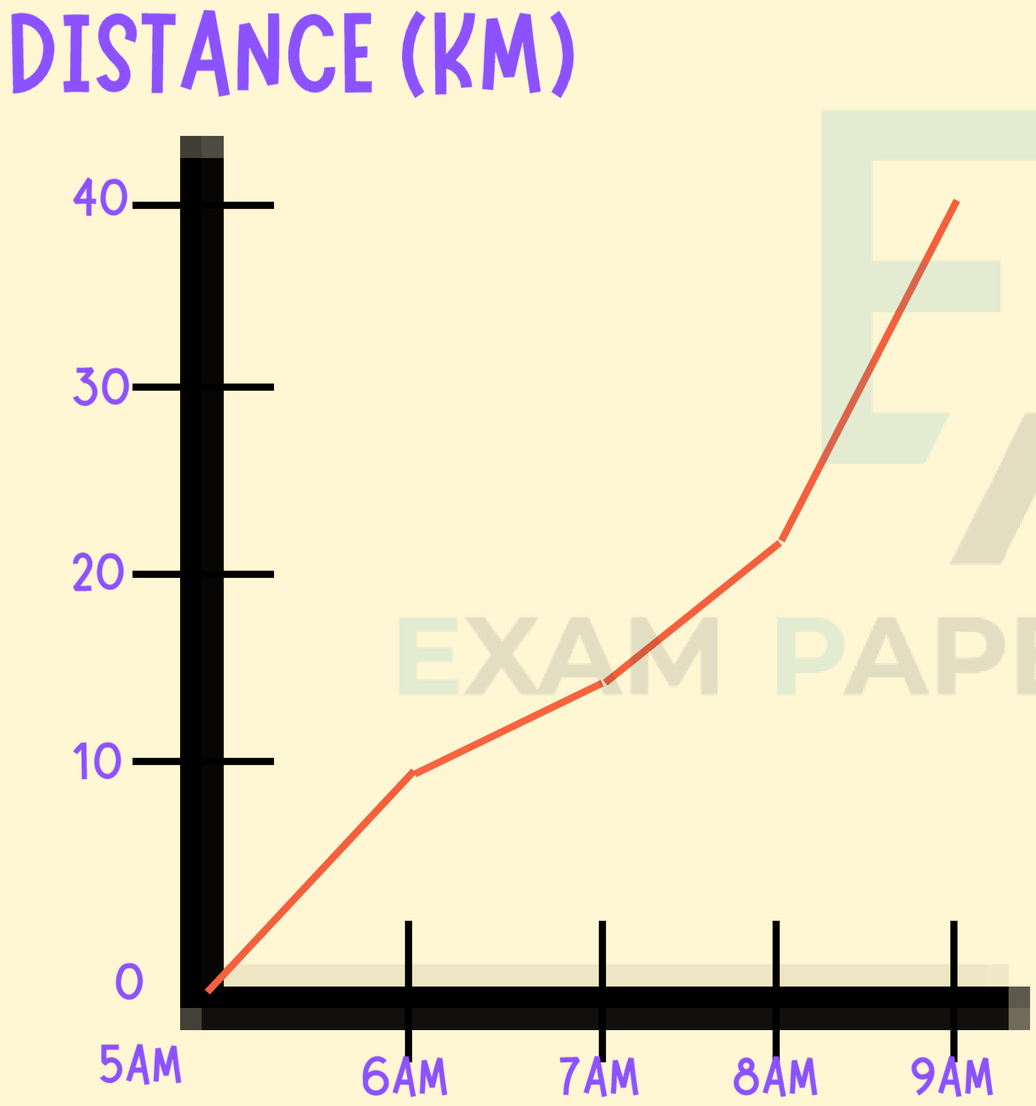
WORKED EXAMPLE 4

EXAM PAPERS PRACTICE

THE FIGURE ABOVE SHOWS THE DISTANCE-TIME GRAPH FOR A MARATHONER.



WORKED EXAMPLE 4

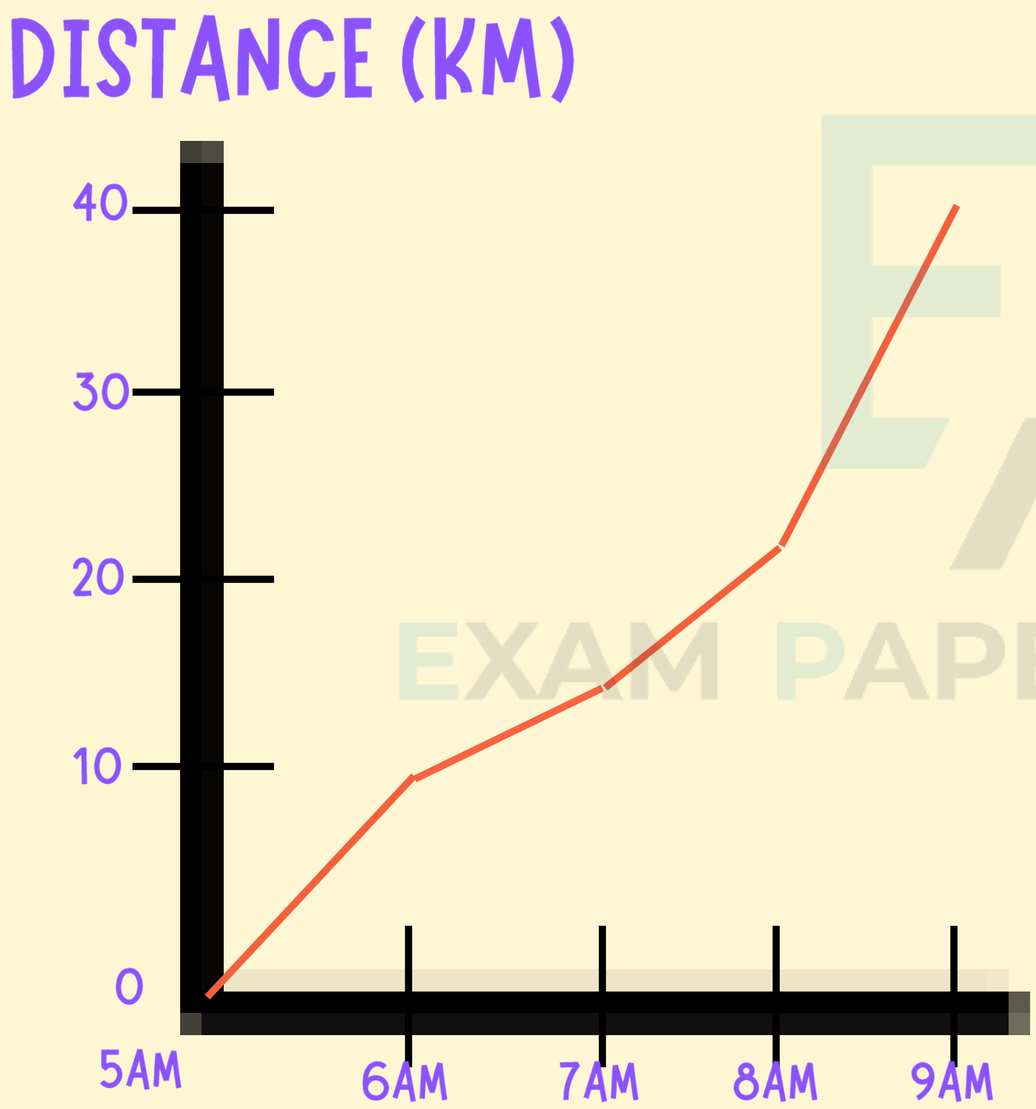


Q1:

1. HOW FAR DID THE MARATHONER RUN?

ANSWER: 40KM

WORKED EXAMPLE 4

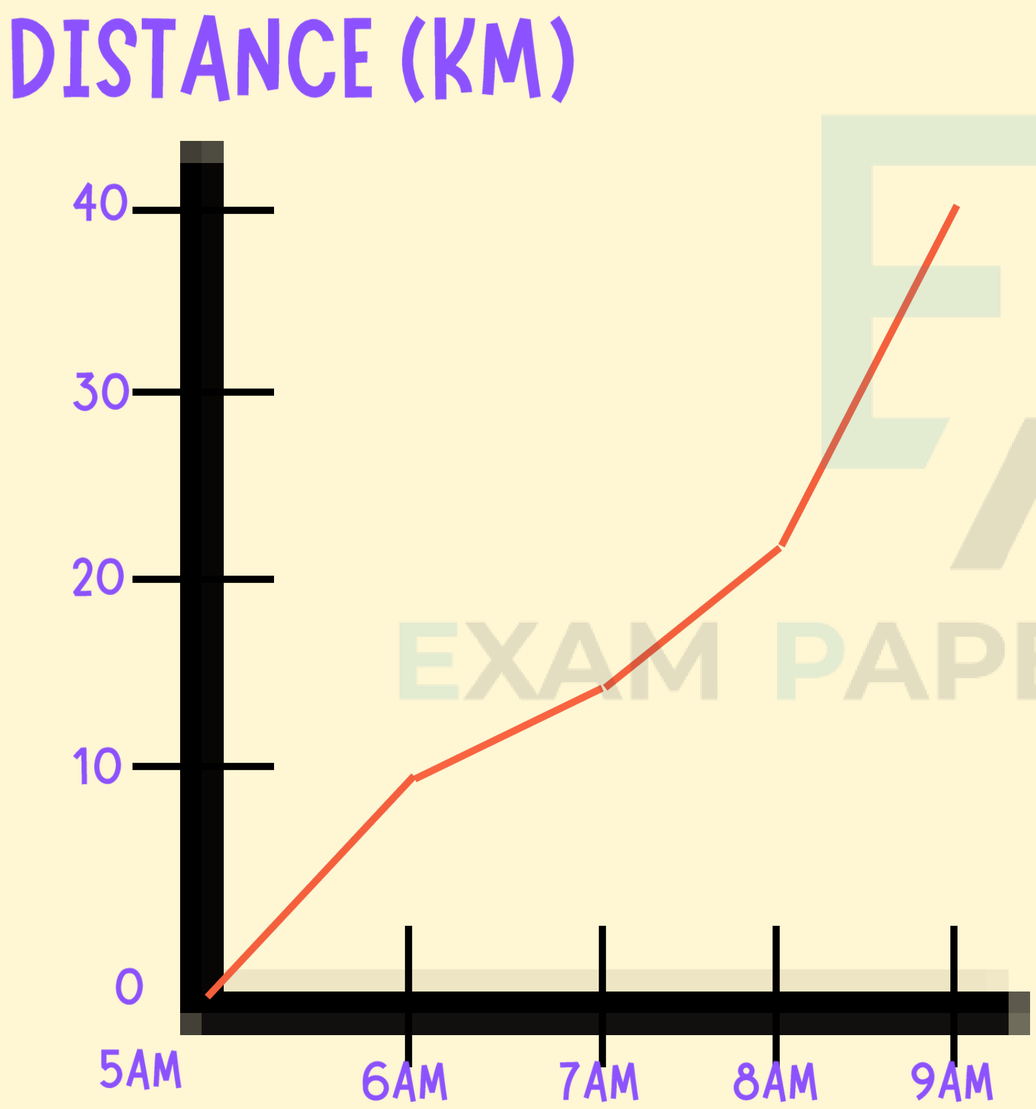


Q2:

WHAT WAS THE MARATHONER'S AVERAGE SPEED IN KM/H?

ANSWER: 40KM / 4HOURS= 10KM/H

WORKED EXAMPLE 4

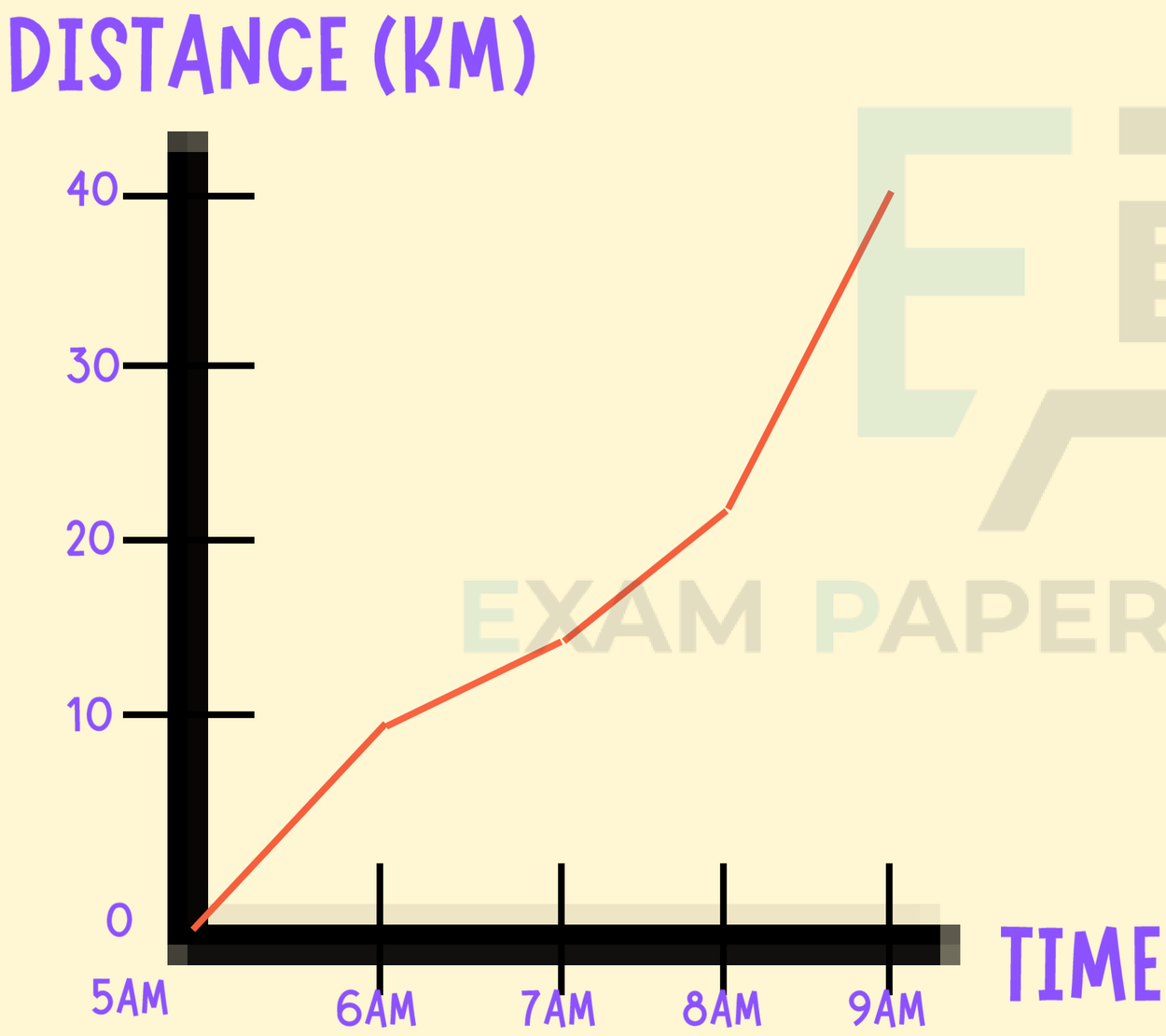


Q3:

HAVE THE MARATHONER EVER STOPPED?

ANSWER: NO, THERE IS NO HORIZONTAL LINE (HE IS A GREAT RUNNER!

WORKED EXAMPLE 4



Q4:

WHEN WAS THE MARATHONER HIGHEST SPEED?

ANSWER: 8AM – 9AM, WHERE THE SLOPE IS STEEPEST

EXAM PAPERS PRACTICE

SPEED

MEASURING SPEED

DISTANCE-TIME GRAPH

ACCELERATION

MEASURING ACCELERATION

SPEED-TIME GRAPH

ACCELERATION

EXAM PAPERS PRACTICE

Definition: ACCELERATION IS THE RATE OF CHANGE OF AN OBJECT'S VELOCITY.

DIFFERENCE BETWEEN SPEED AND VELOCITY

- BOTH VELOCITY AND SPEED QUANTIFY HOW FAST AN OBJECT IS MOVING, BUT VELOCITY ALSO REQUIRES SPECIFYING THE DIRECTION.
- FOR EXAMPLE, an aircraft may have a speed of 300 m/s and a velocity of 300m/s headingnorth.
- Speed is a scalarquantity, whereas velocity is a vector quantity.

ACCELERATION

EXAM PAPERS PRACTICE

A. CHANGE IN VELOCITY

B. TIME TAKEN

ACCELERATION

EXAM PAPERS PRACTICE

Important symbols:

V = FINAL SPEED

U = INITIAL SPEED

Formula for acceleration:

$$\text{ACCELERATION} = \frac{V - U}{\text{TIME}}$$

Unit for acceleration:

M / S^2

ACCELERATION

A CAR ACCELERATES FROM 20 M/S TO 80 M/S IN 10 SECONDS. WHAT IS ITS ACCELERATION?

$$\text{ACCELERATION} = \frac{V - U}{TIM}$$

$$\text{ACCELERATION} = \frac{80 - 20}{10}$$

$$= 6 M / S^2$$

EXAM PAPERS PRACTICE

SPEED

MEASURING SPEED

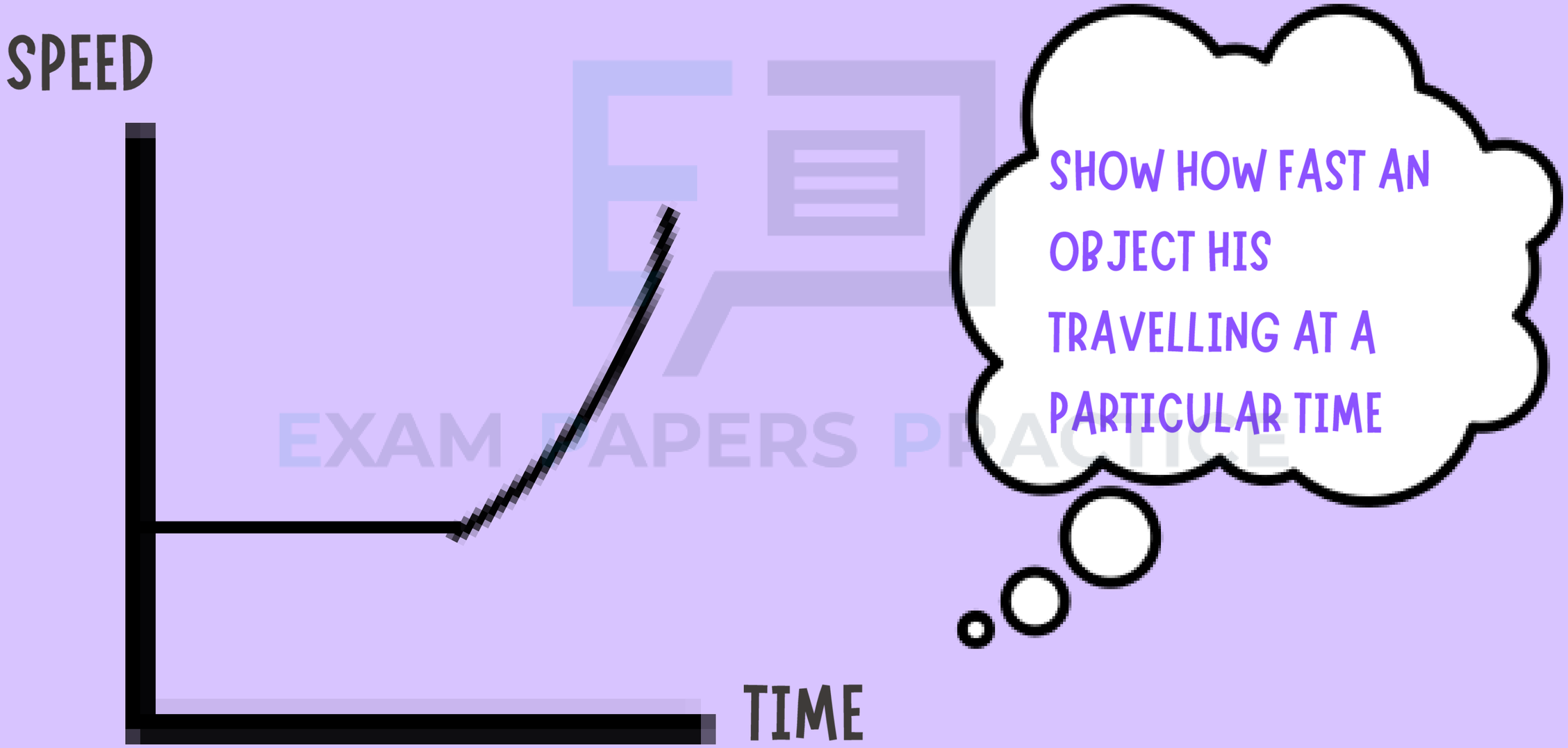
DISTANCE-TIME GRAPH

ACCELERATION

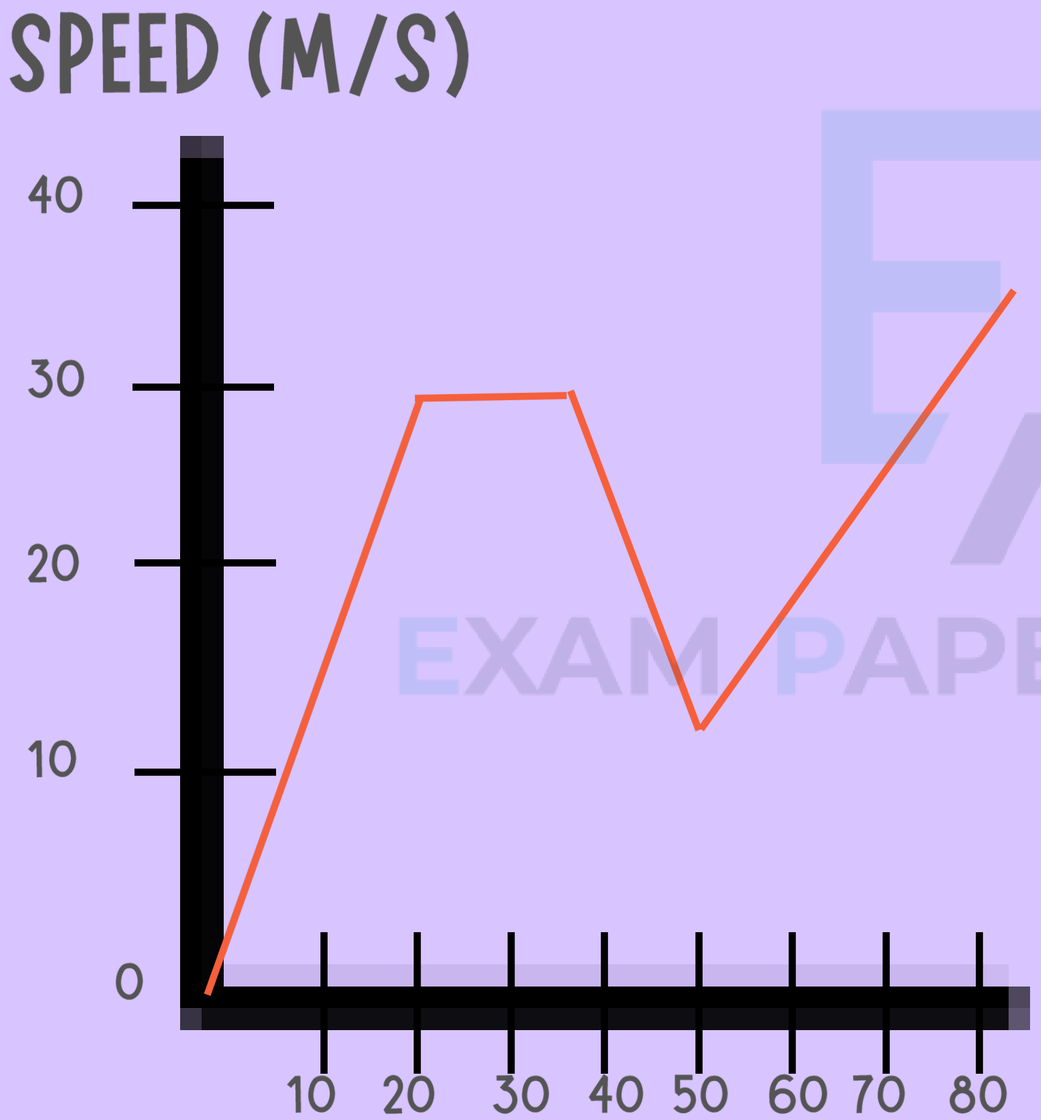
MEASURING ACCELERATION

SPEED-TIME GRAPH

SPEED-TIME GRAPH



WORKED EXAMPLE



NAME THE SECTIONS THAT REPRESENT:

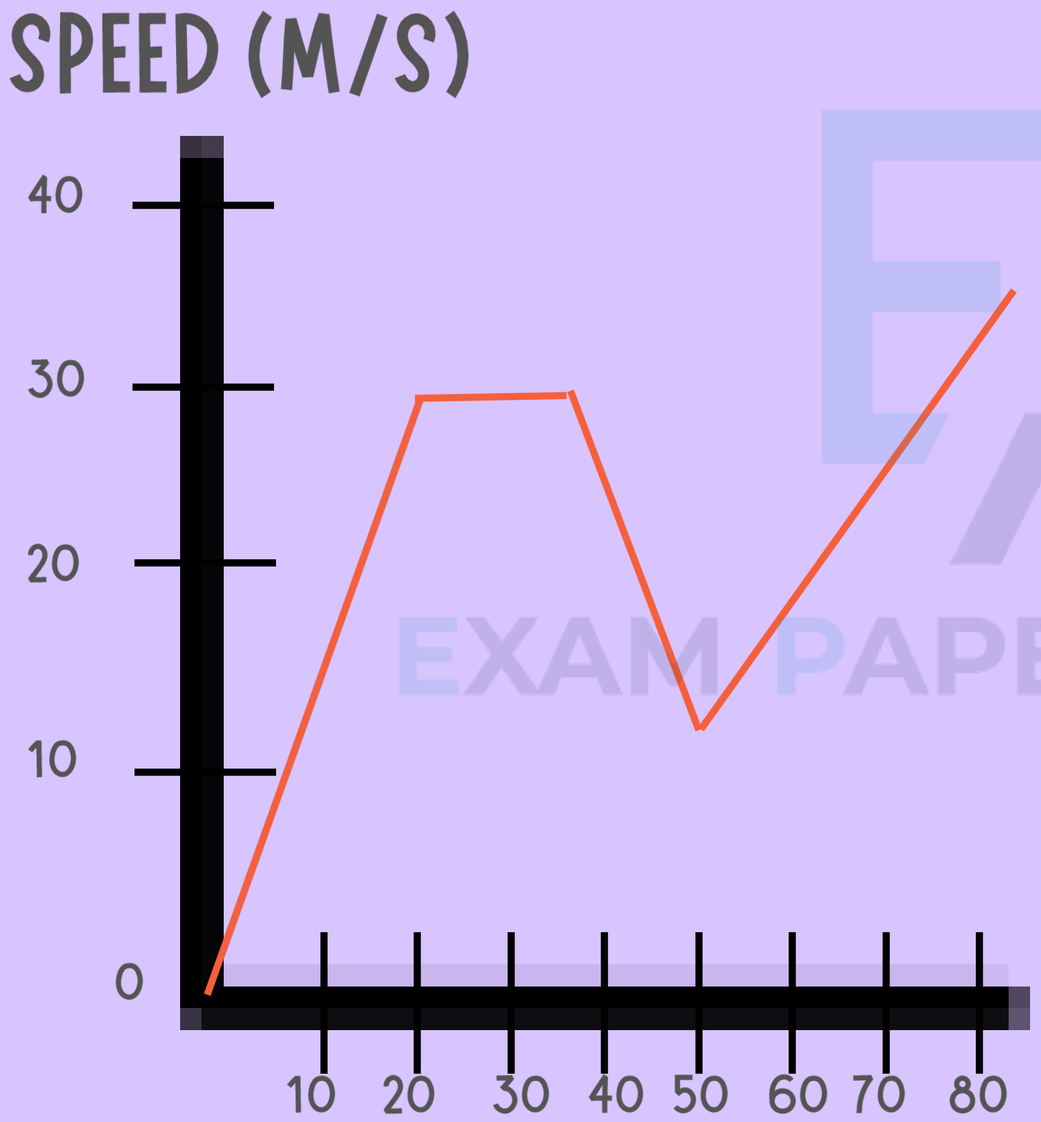
A. STEADY SPEED

B. SPEEDING UP

C. BEING STATIONARY

D. SLOWING DOWN

WORKED EXAMPLE



NAME THE SECTIONS THAT REPRESENT:

A. STEADY SPEED

(20S - 40S)

B. SPEEDING UP

(0S - 20S, 50S - 80S)

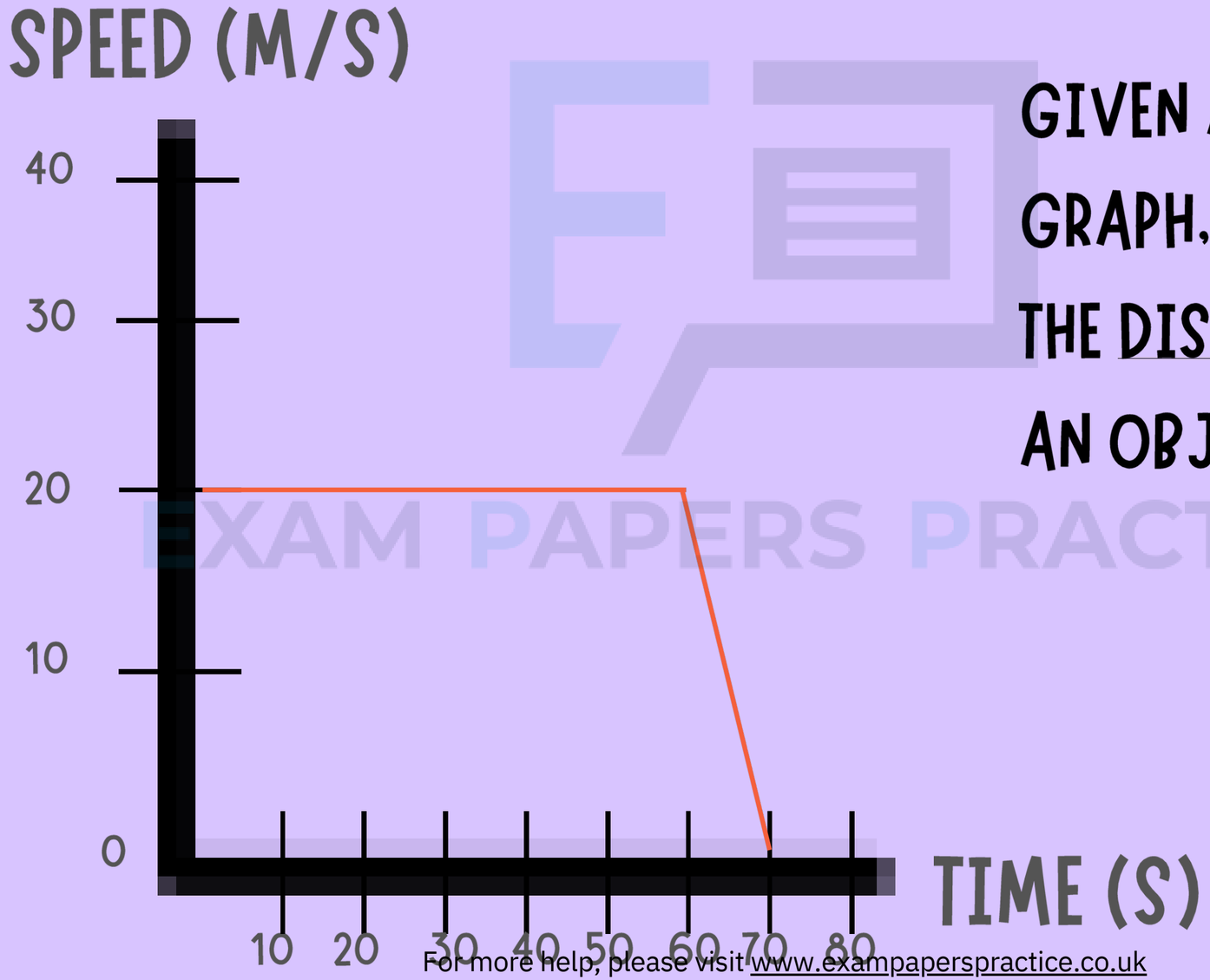
C. BEING STATIONARY

NONE!

D. SLOWING DOWN

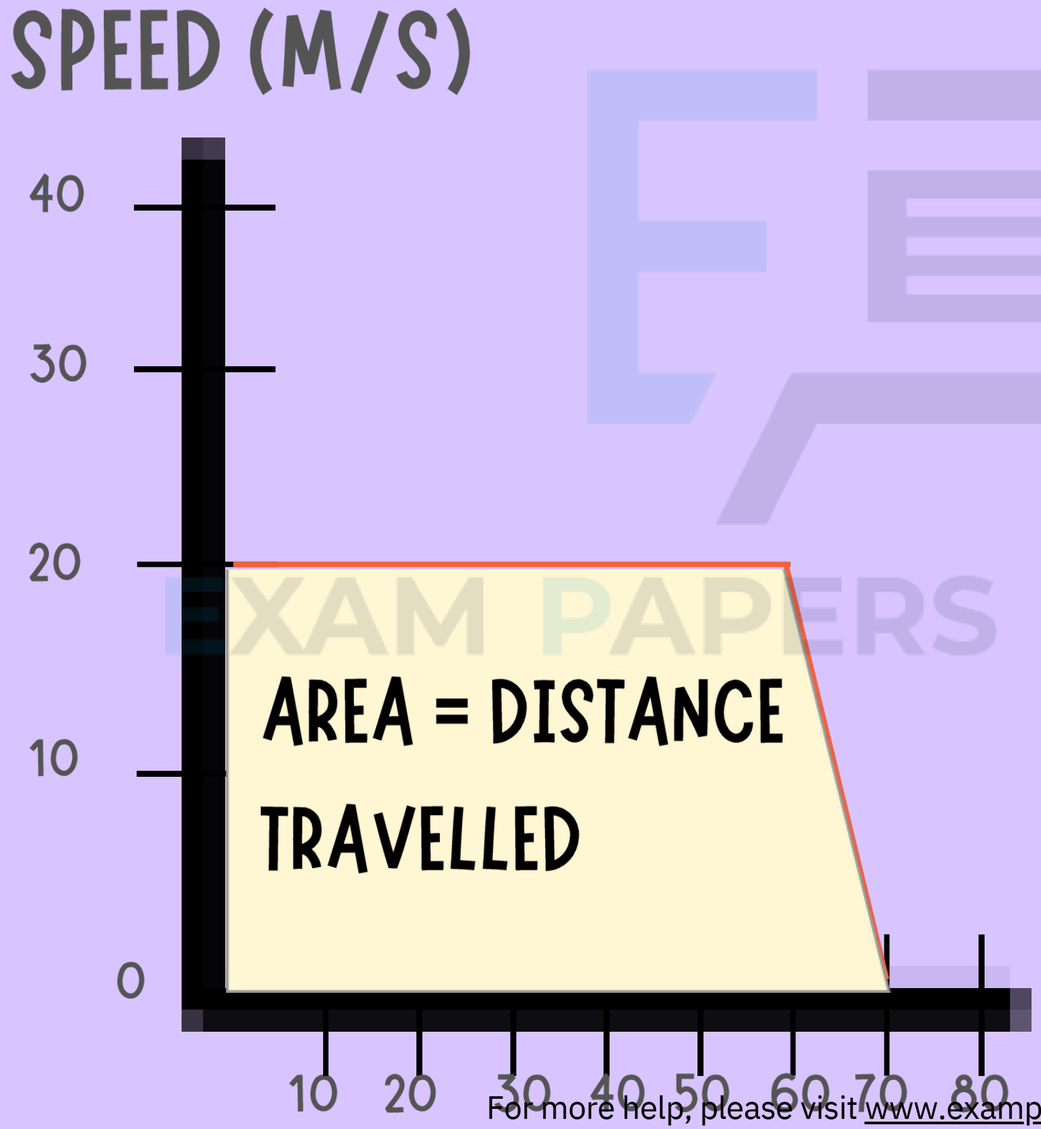
(40S - 50S)

DISTANCE FROM A SPEED TIME GRAPH - AREA



GIVEN A SPEED-TIME GRAPH, WE CAN CALCULATE THE DISTANCE TRAVELLED BY AN OBJECT.

DISTANCE FROM A SPEED TIME GRAPH - AREA

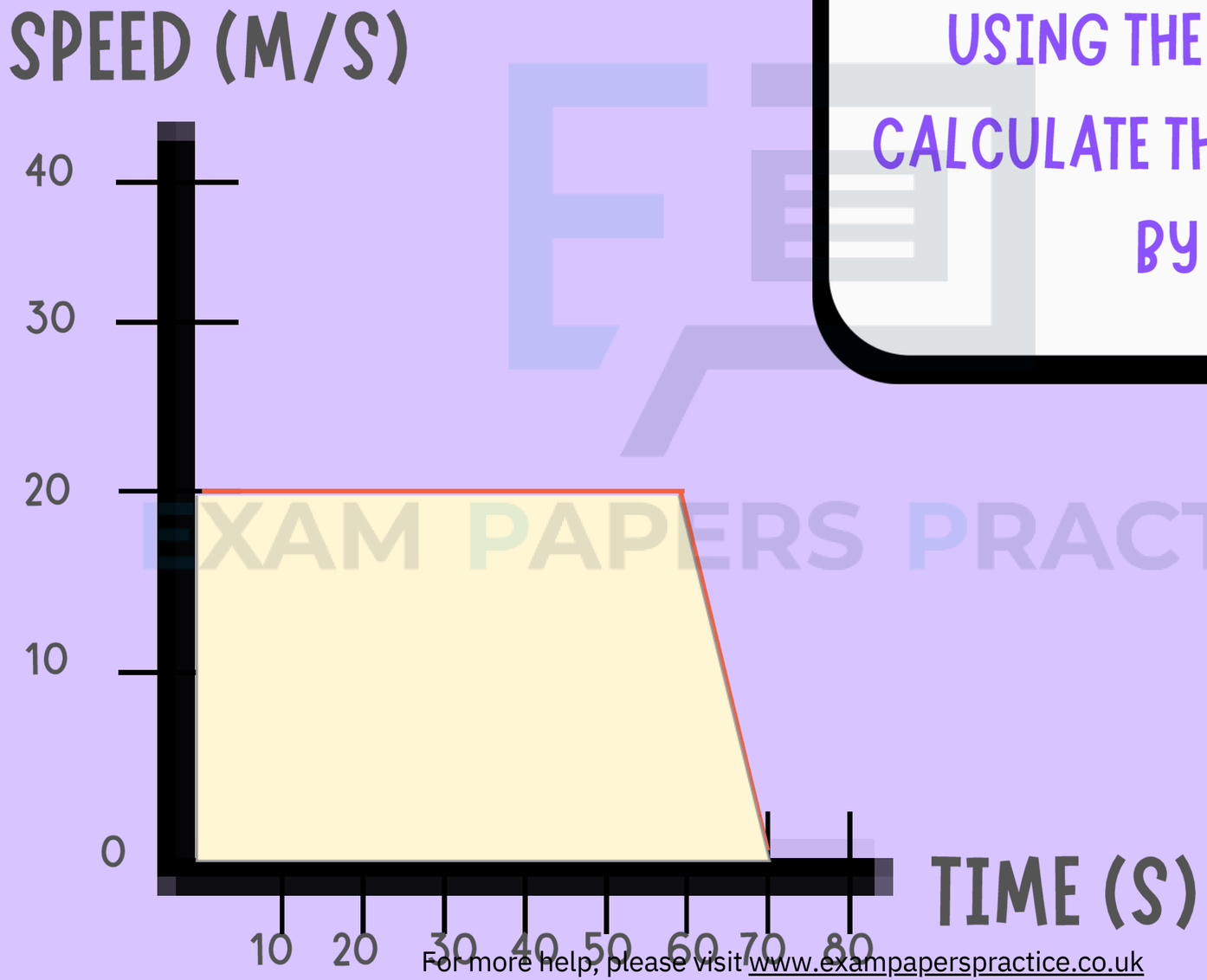


GIVEN A SPEED-TIME GRAPH, WE CAN CALCULATE THE DISTANCE TRAVELLED BY AN OBJECT.

WORKED EXAMPLE

EXAM PAPERS PRACTICE

USING THE SPEED-TIME GRAPH, CALCULATE THE DISTANCE TRAVELLED BY THE OBJECT.

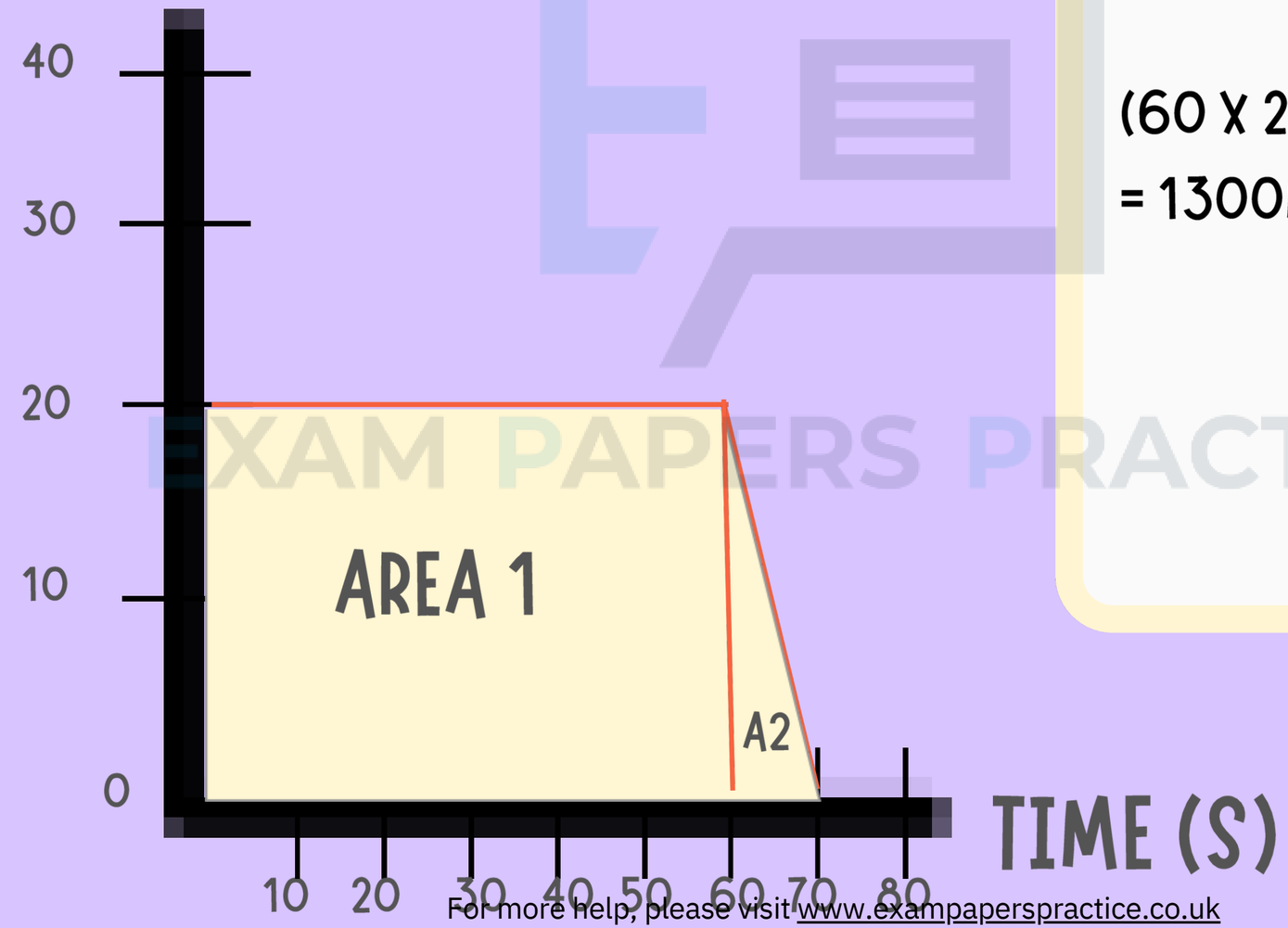


WORKED EXAMPLE

METHOD 1

AREA OF RECTANGLE +
AREA OF TRIANGLE:

(60 X 20) + (10 X 20 / 2)
= 1300M



WORKED EXAMPLE

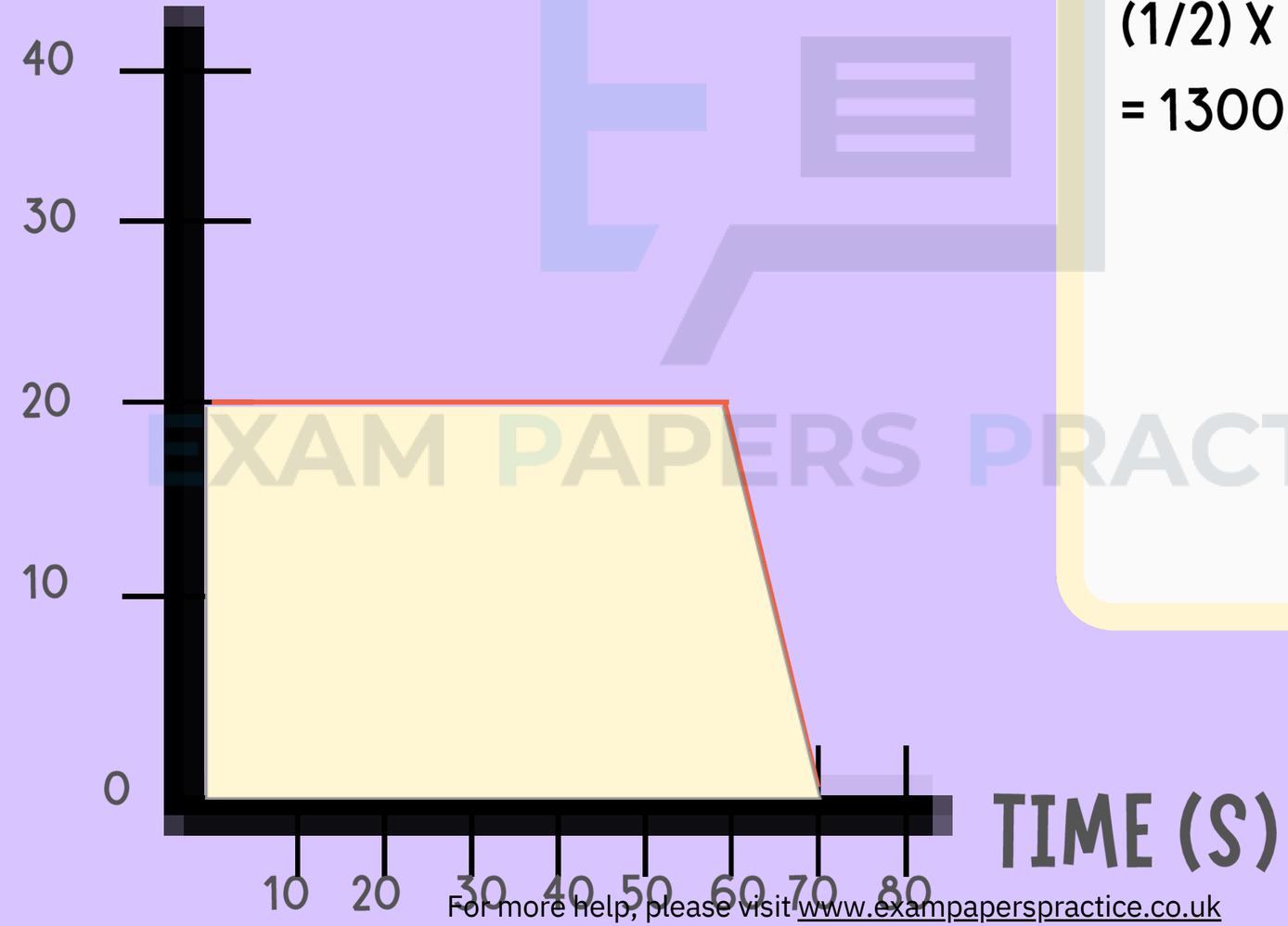
EXAM PAPERS PRACTICE

METHOD2

AREA OF TRAPEZIUM

(1/2) X (60 + 70) X 20

= 1300M

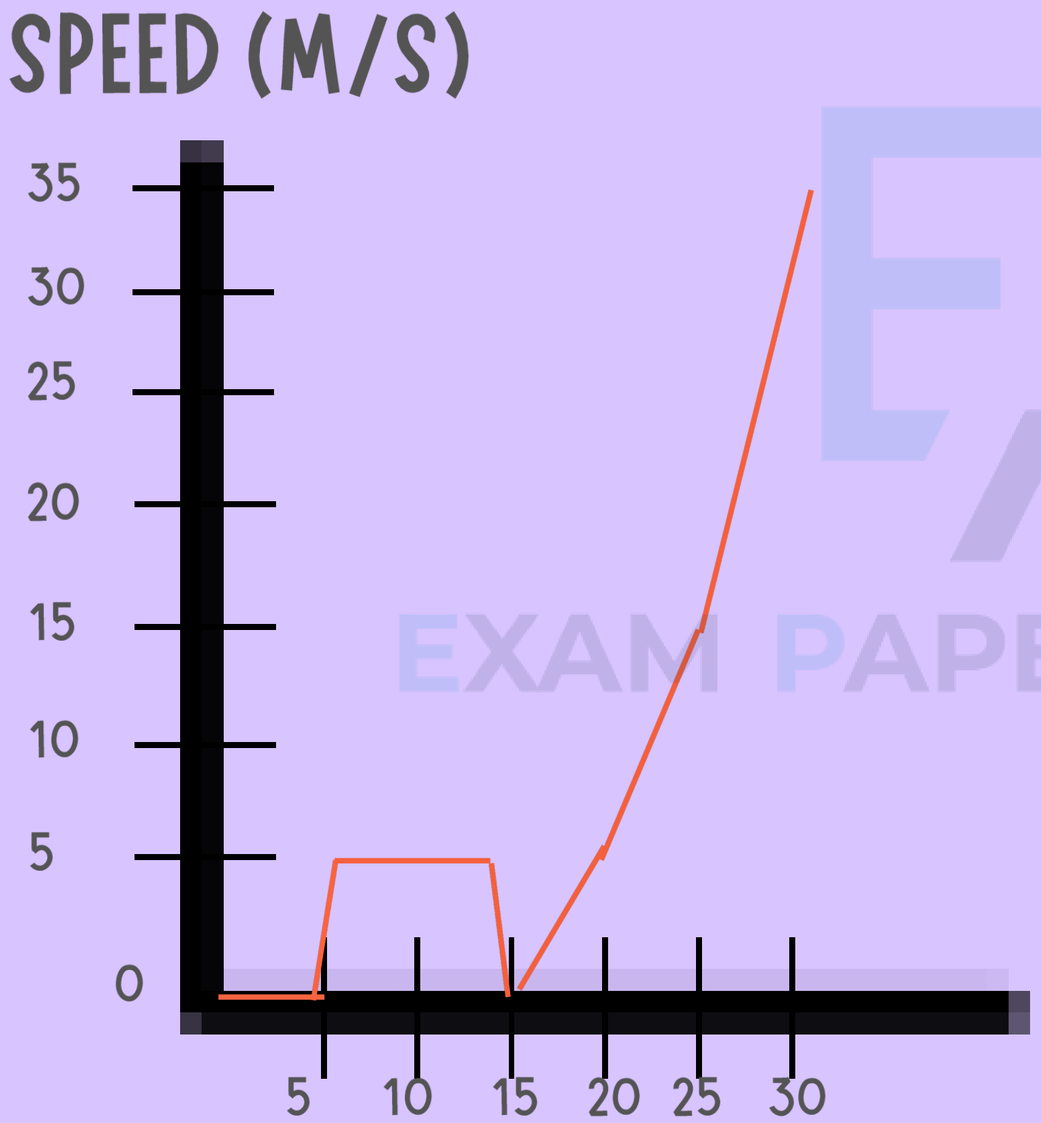


WORKED EXAMPLE: CALCULATING ACCELERATION FROM A SPEED-TIME GRAPH

A ROLLER COASTER STARTS AT REST AND GRADUALLY ACCELERATES UP A STEEP INCLINE. IT THEN REACHES ITS MAXIMUM SPEED AT THE PEAK BEFORE DESCENDING RAPIDLY. THE TABLE BELOW SHOWS ITS SPEED CHANGES. DRAW A SPEED-TIME GRAPH TO REPRESENT THIS DATA.

Time / s	Speed / m/s
0	0.0
5	5.0
10	5.0
15	0.0
20	5.0
25	15.0
30	35.0

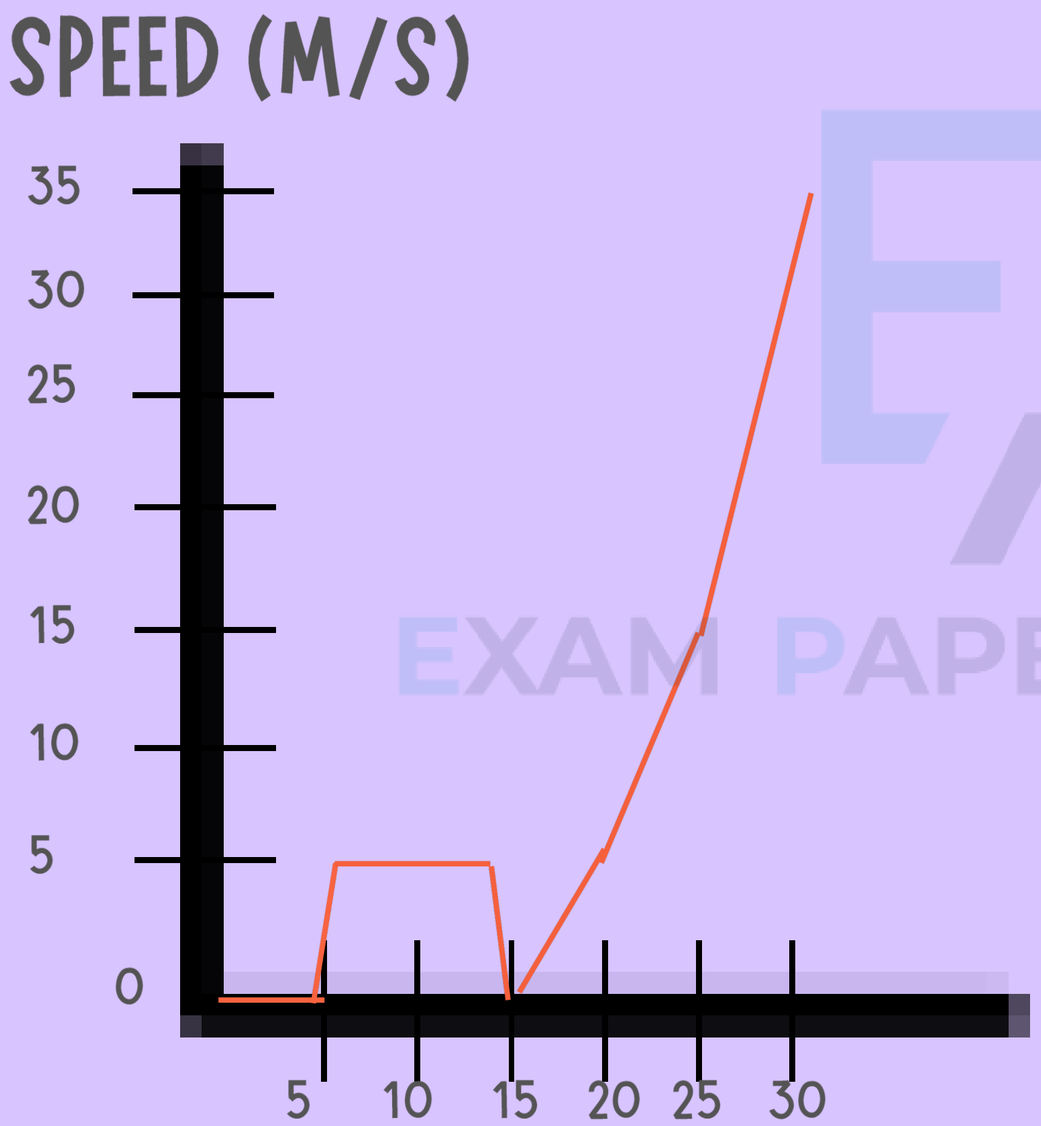
WORKED EXAMPLE: CALCULATING ACCELERATION FROM A SPEED-TIME GRAPH



FOLLOW UP QUESTION:

USE THE GRAPH TO CALCULATE THE TRAIN'S ACCELERATION FROM 25S TO 30S

WORKED EXAMPLE: CALCULATING ACCELERATION FROM A SPEED-TIME GRAPH



ACCELERATION = GRADIENT

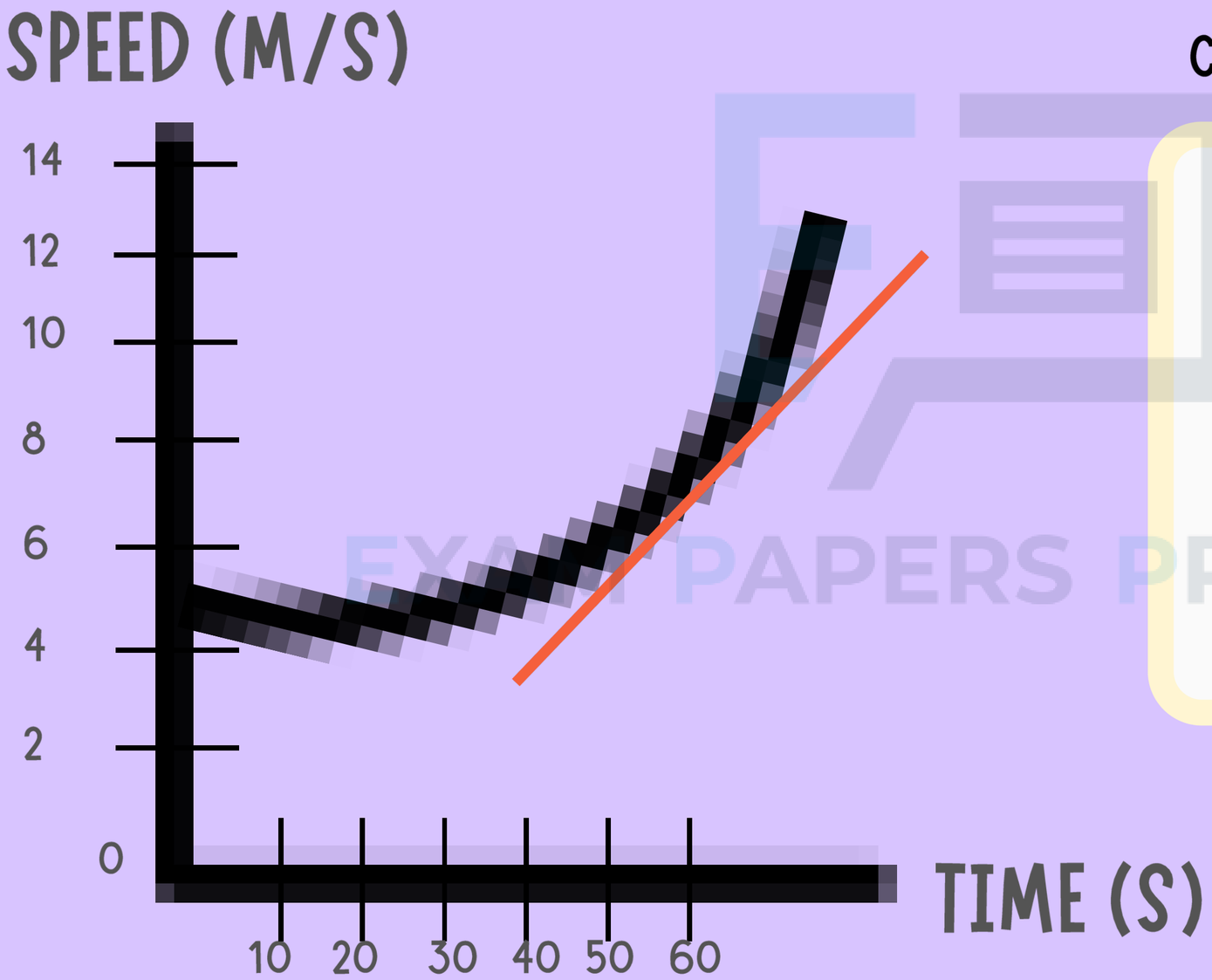
$$\text{ACCELERATION} = \frac{35-15}{5}$$

$$= 4 \text{ M/S}^2$$

CALCULATING ACCELERATION FROM A CURVED SPEED-TIME GRAPH

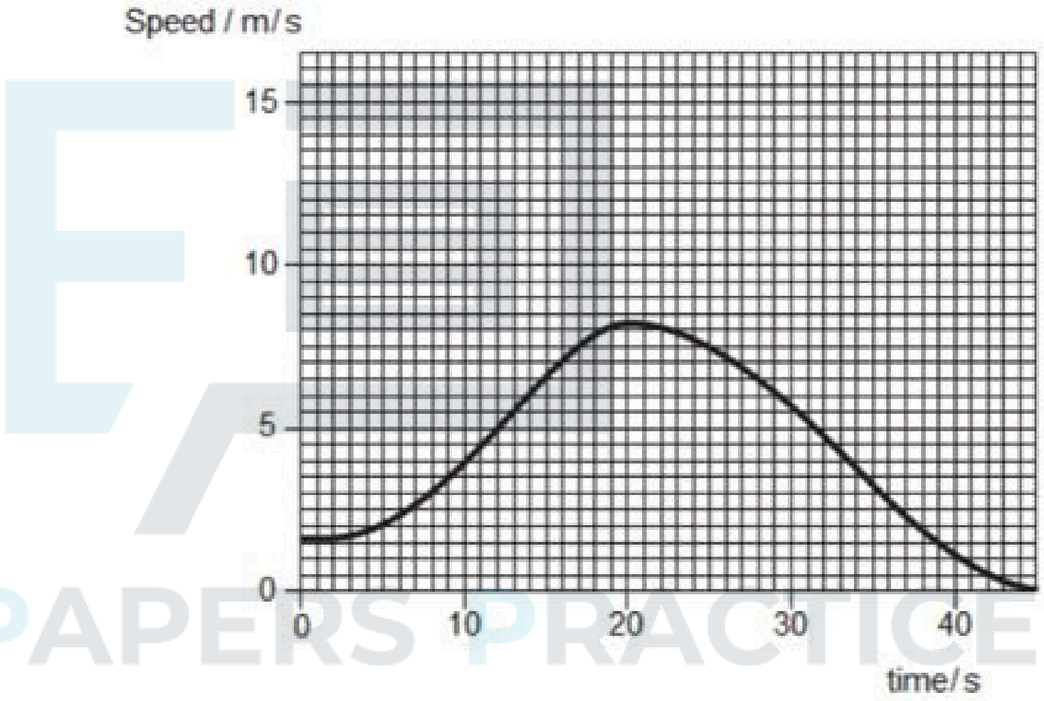
EXAM PAPERS PRACTICE

EG. CALCULATING ACCELERATION FROM A CURVE SPEED-TIME GRAPH AT TIME = 60



1. DRAW A TANGENT AT THE TIME WHICH ACCELERATION NEEDS TO BE FOUND
2. CALCULATE THE GRADIENT OF THE TANGENT

The graph shows the speed-time graph of a cyclist who is moving in a straight line.



What is the acceleration of the cyclist at a time of 20 seconds?

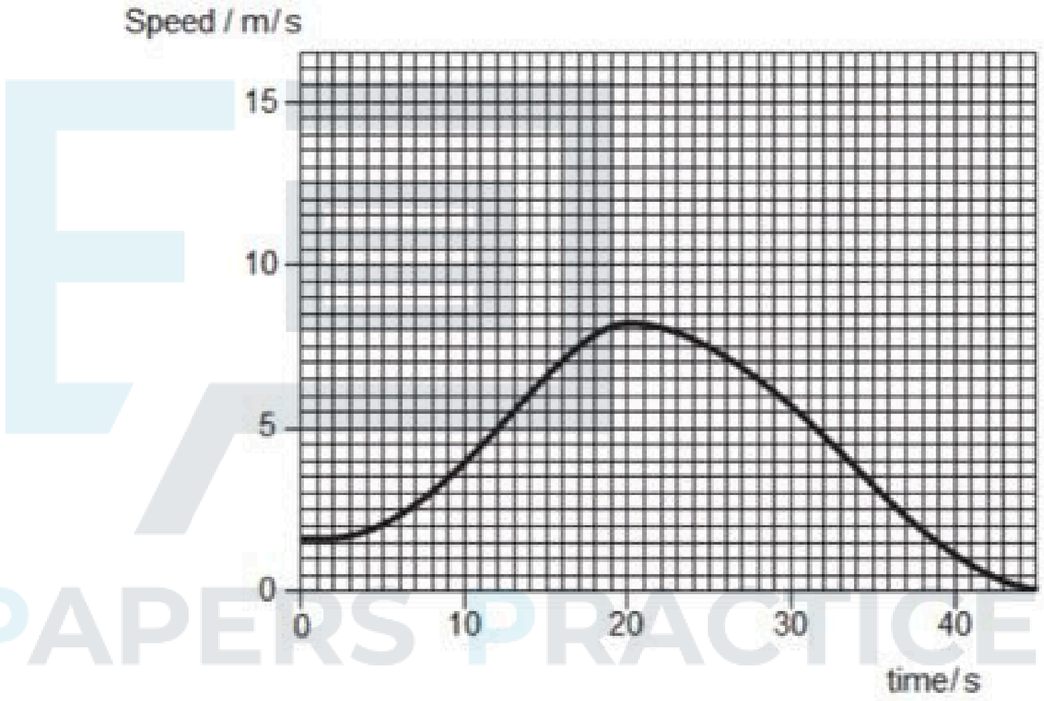
A 0.5 m/s^2

B -0.5 m/s^2

C 0 m/s^2

D 11.5 m/s^2

The graph shows the speed-time graph of a cyclist who is moving in a straight line.



What is the acceleration of the cyclist at a time of 20 seconds?

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D 11.5 m/s^2

A car travels along a clear 10.0 km section of motorway in 6.0 minutes. It then drives through 3.0 km of roadworks in 3.0 minutes.

Which calculation will give the correct average speed for the journey?

A $\frac{3.0}{3.0}$ = 1.00 km/min

B $\frac{10.0}{6.0}$ = 1.67 km/min

C 1.67 + 1.00 = 2.67 km/min

D $\frac{13.0}{9.0}$ = 1.44 km/min

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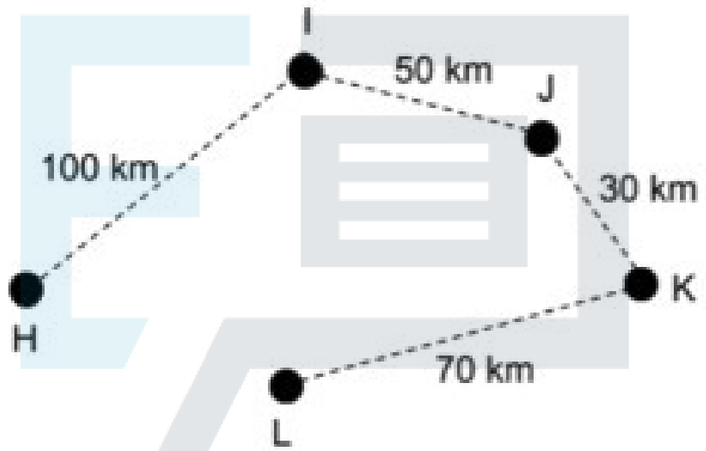
A helicopter flies the route shown below.

It stops at point I for 30 minutes to pick up some cargo.



The total time the helicopter takes between taking off from **H** and landing at **L** is 4.0 hours.

Calculate the average speed of the helicopter **when it is flying.**

A 55.6 km/h

B 250 km/h

C 62.5 km/h

D 71.4 km/h

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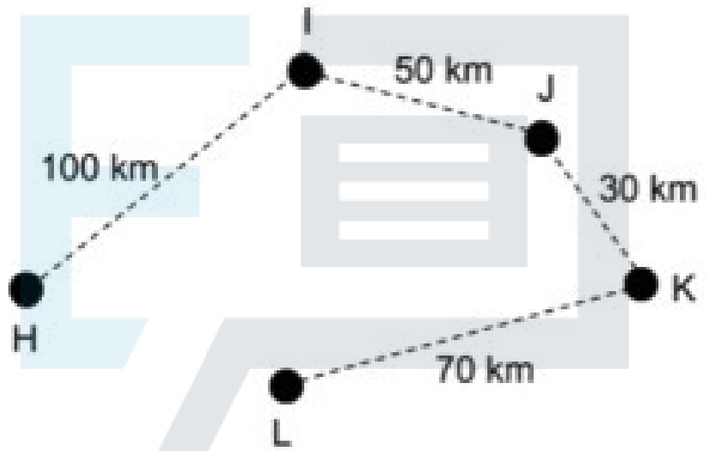

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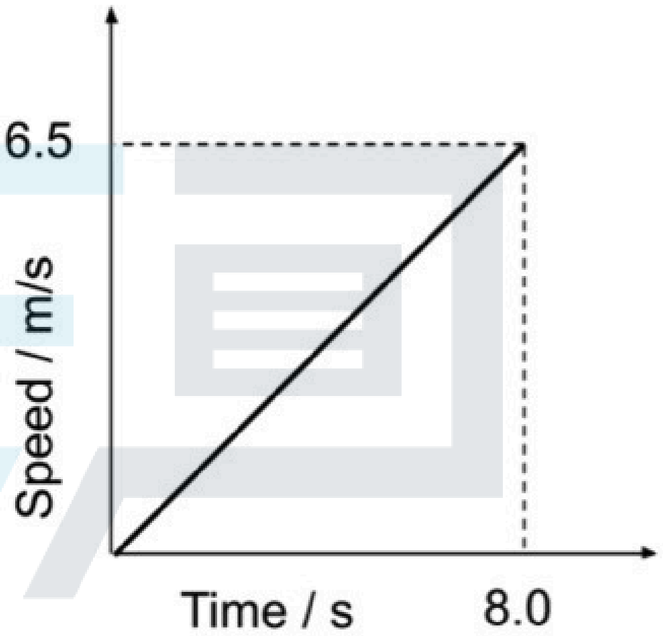
The graph shows the journey undertaken by a car.



Which equation correctly gives the distance travelled by the car?

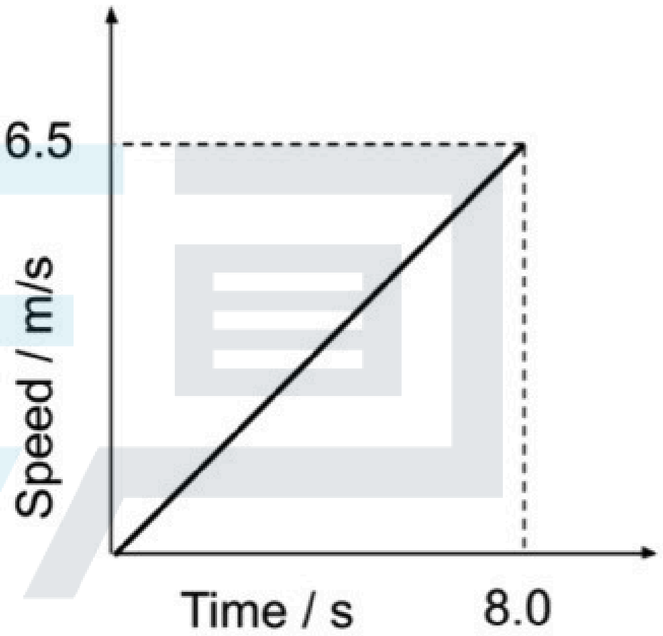
A $\frac{6.5 \times 8.0}{2} = 26$ m

B 6.5 x 8.0 = 52 m

C $\frac{6.5}{8.0} = 0.81$ m

D $\frac{8.0}{6.5} = 1.2$ m

The graph shows the journey undertaken by a car.



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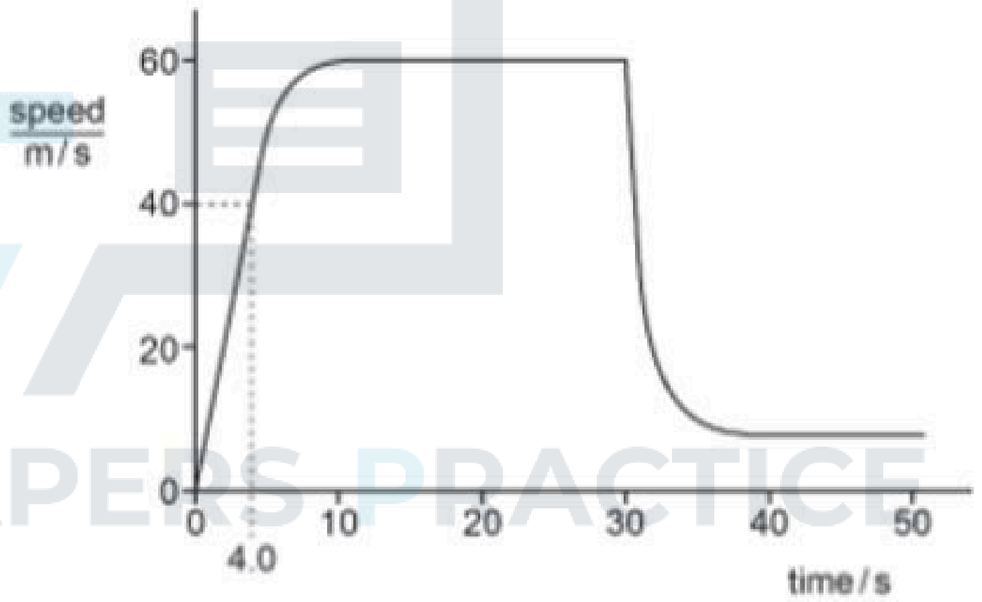
A sky-diver jumps out of a hot-air balloon, which is 4000 m above the ground. At time = 30 s, she opens her parachute.

The graph is the speed-time graph of her fall.



(a) Label with the letter X the point on the graph where the sky-diver opens her parachute. [1]

(b) Label with the letters Y and Z the **two** parts of the graph where the sky-diver falls at terminal velocity. [1]

[Total: 2]

Question	Answer	Marks
1(a)	X near (30,60)	1
1(b)	Y **AND** Z near any horizontal section of graph	1

An aeroplane lands with a speed of 62 m/s, on a horizontal runway at time $t = 0$. The aeroplane decelerates uniformly as it travels along the runway in a straight line until it reaches a speed of 6.0 m/s at $t = 35$ s.

At $t = 35$ s, the aeroplane stops decelerating and moves along the runway at a constant speed of 6.0 m/s for a further 15 s.

On the diagram, sketch the shape of the graph for the distance travelled by the aeroplane along the runway between $t = 0$ and $t = 50$ s. You are **not** required to calculate distance values.

1	curve of decreasing gradient from (0,0) to a point along dashed line (1) straight line of positive gradient after $t = 35$ s (1) gradient not zero at $t = 35$ s **OR** no change of gradient (at $t = 35$ s) (1)	3