

# Drawing and interpreting real-life graphs

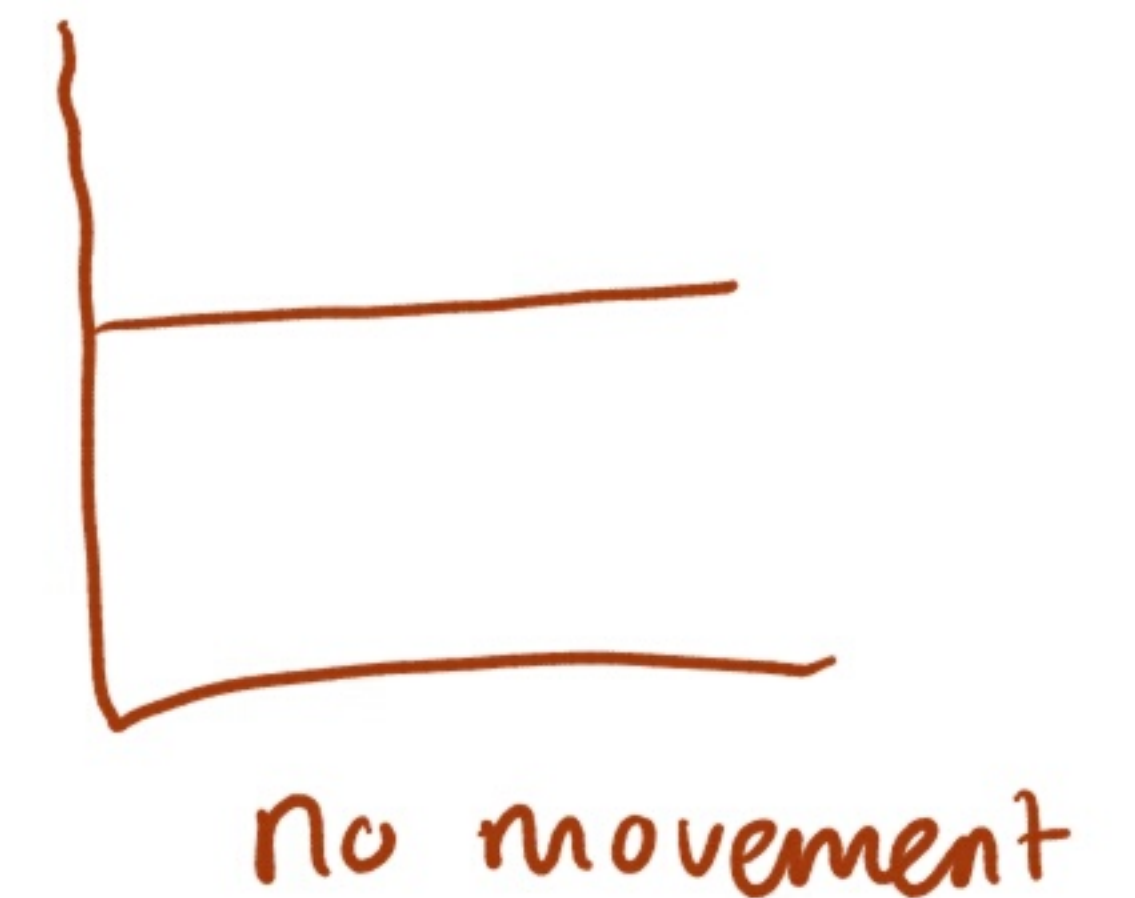
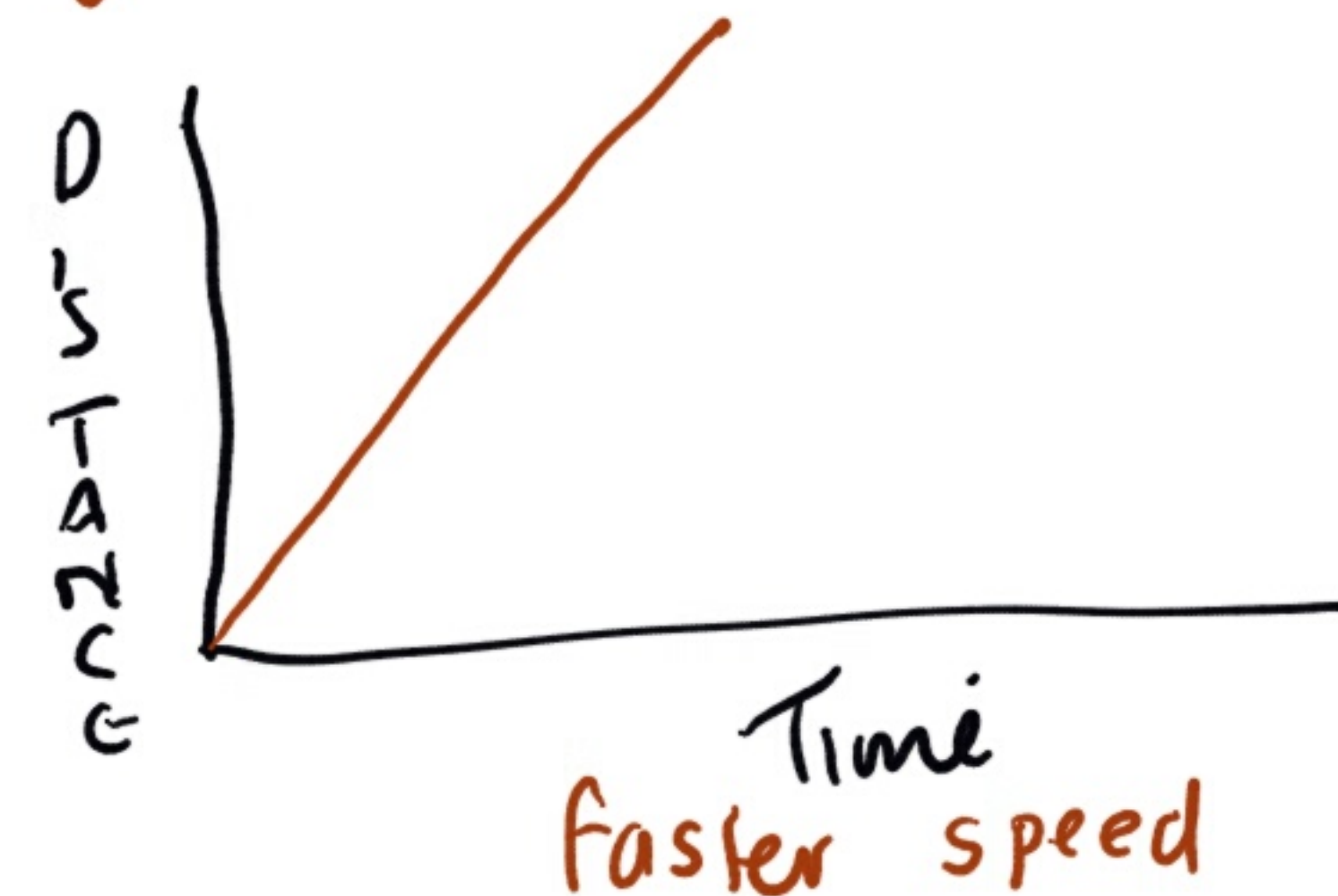
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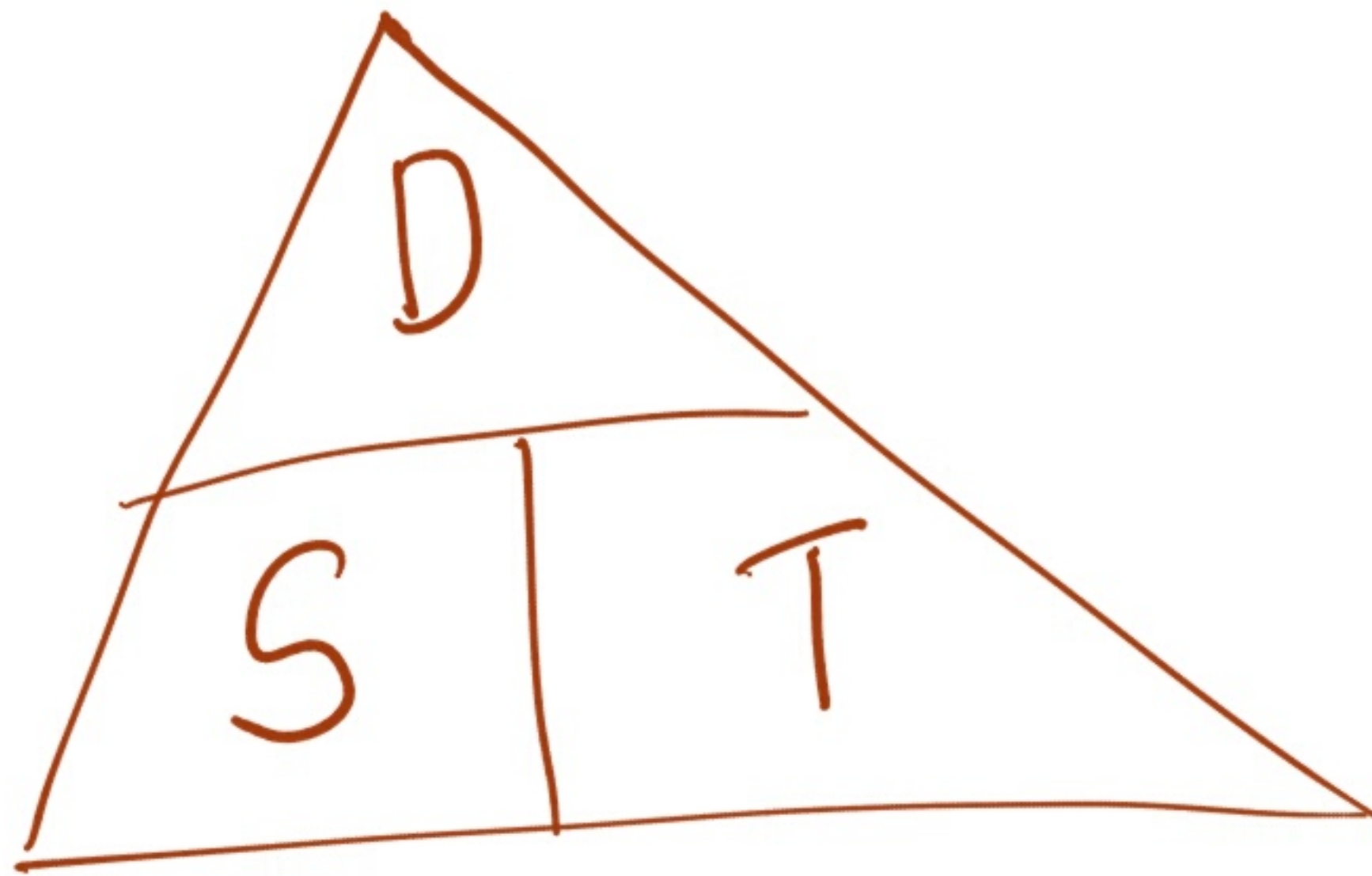
20

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## Section 20.1 Distance–time graphs

- a change in speed represents a change in steepness





$$S = \frac{D}{T}$$

$$T = \frac{D}{S}$$

$$D = S \times T$$

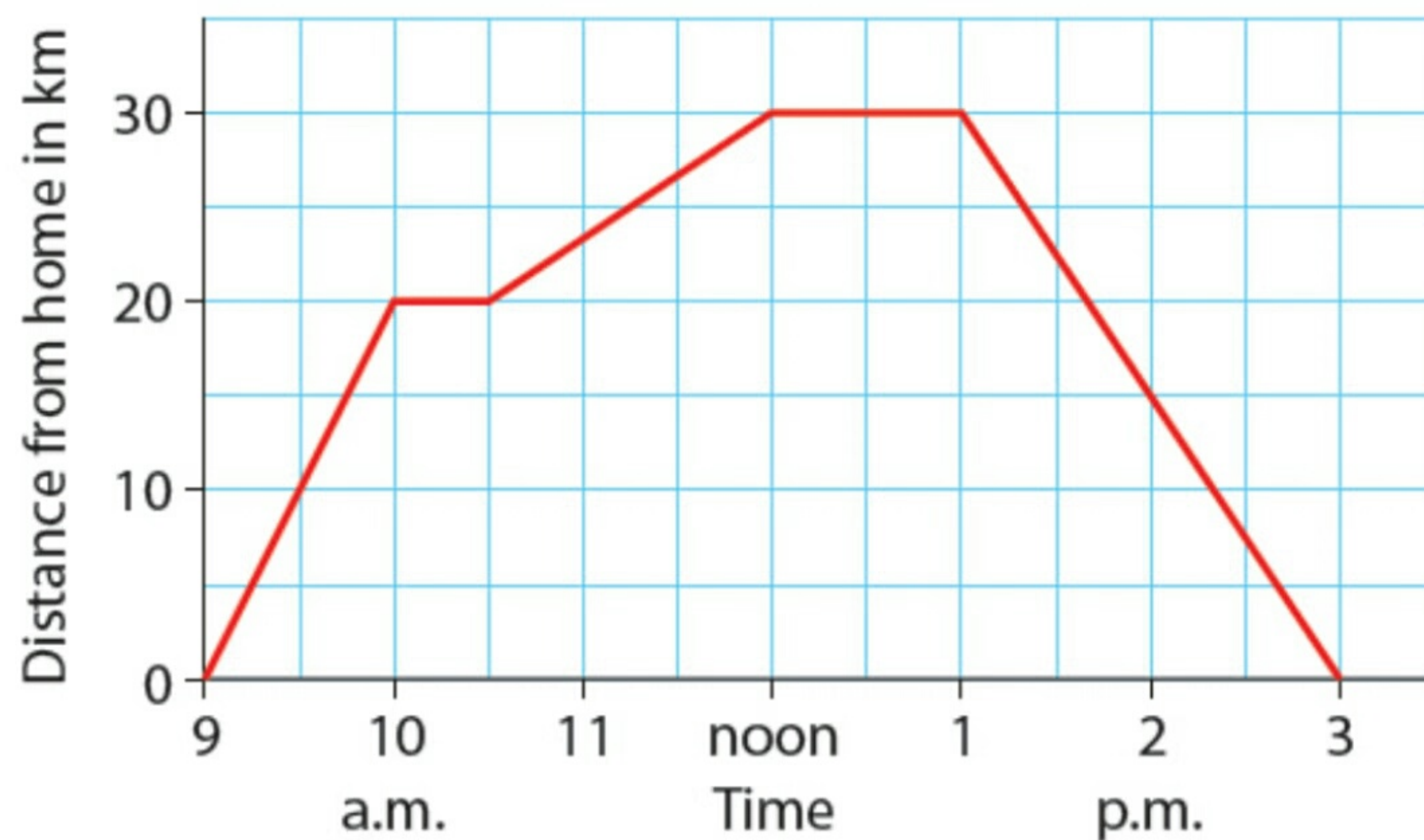
T = hours + minutes

S = km/hr  
m/sec

D = m or km

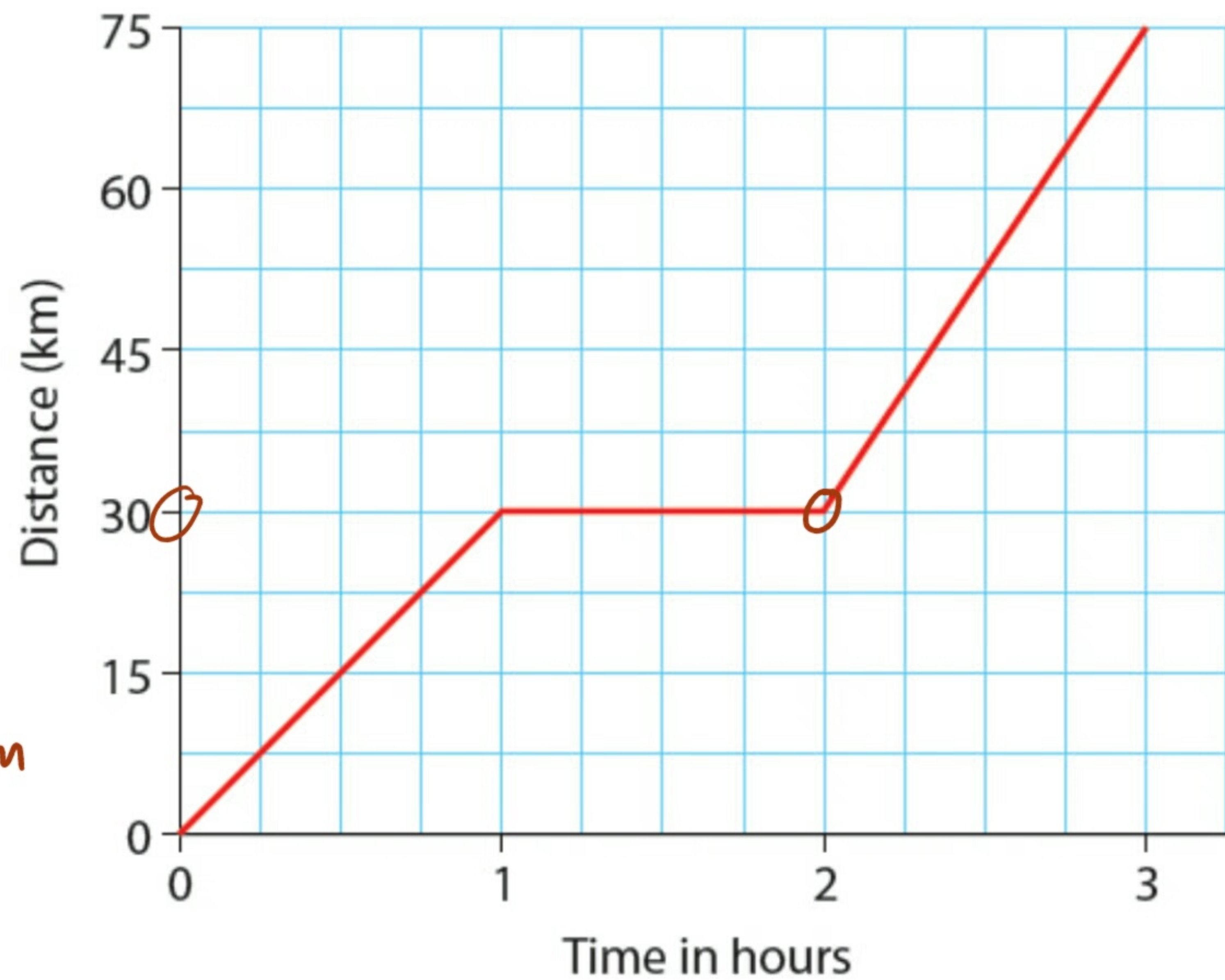
## Exercise 20.1

- 1.** This travel graph gives the distance of a boy from home.
- (i) When did the boy leave home?  
When did he return?
  - (ii) How far was he from home at 1.00 p.m.?
  - (iii) At what times was he 15 km from home?
  - (iv) At what times did he rest?
  - (v) When was he travelling most quickly?



2. The distance–time graph given shows Olivia's 3-hour journey.

- (i) How far did she travel in the first hour?  $30\text{ km}$
- (ii) For how long was she stopped?  $1\text{ hour}$
- (iii) How far did she travel in the third hour?  $75 - 30 = 45\text{ km}$
- (iv) What was the total length of the journey?  $30 + 45 = 75\text{ km}$



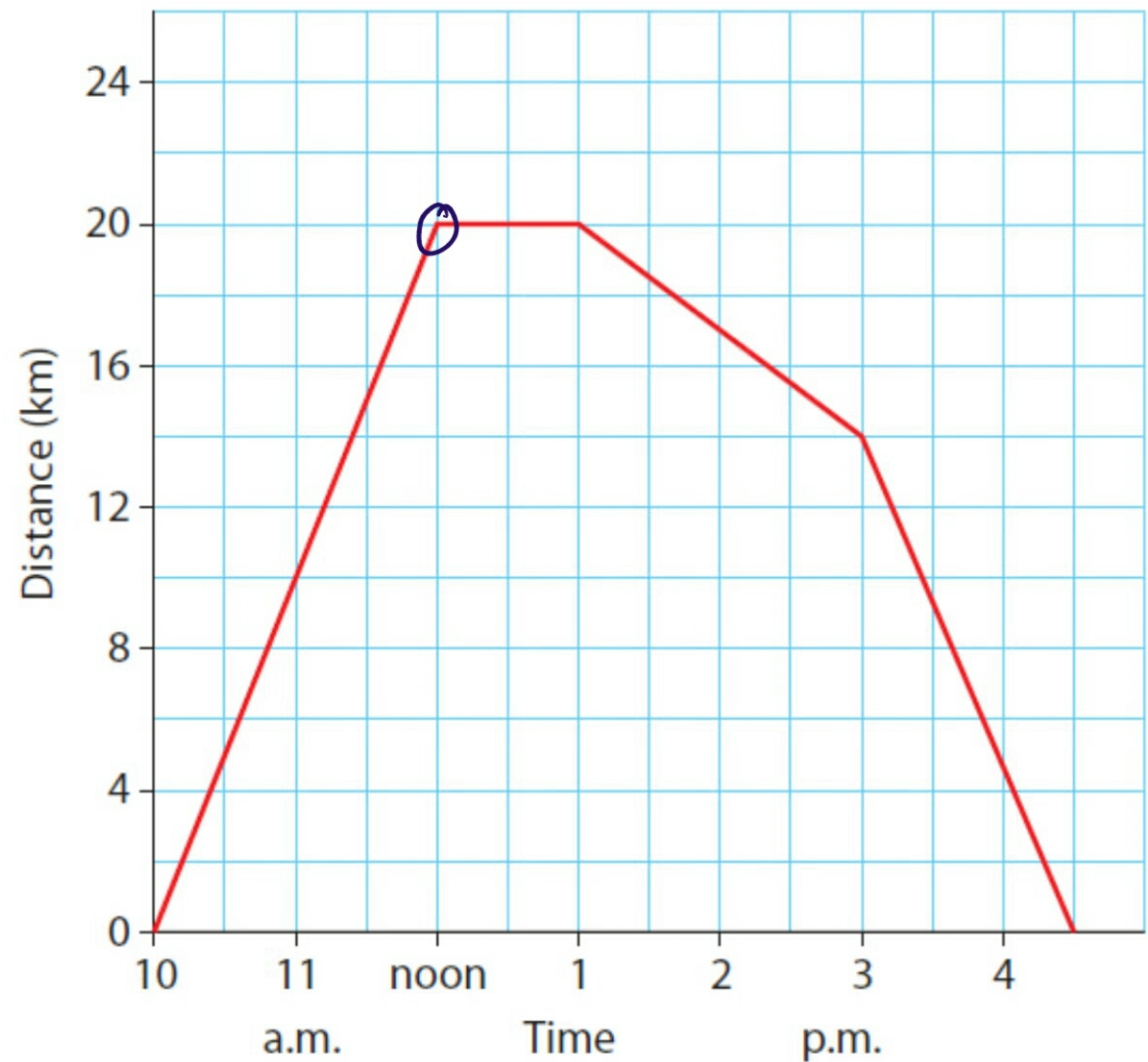
3. The travel graph shows the distance of a cyclist from his home between the times of 10. a.m. and 4.30 p.m.

- (i) How far does the cyclist travel in the first 2 hours? *20km*
- (ii) How far from home is he when he stops to rest? *20km*
- (iii) At what time does he commence the return journey? *1pm*
- (iv) At 3.00 p.m. his speed changes. Does it increase or decrease?

How can you tell without calculating the actual speeds?

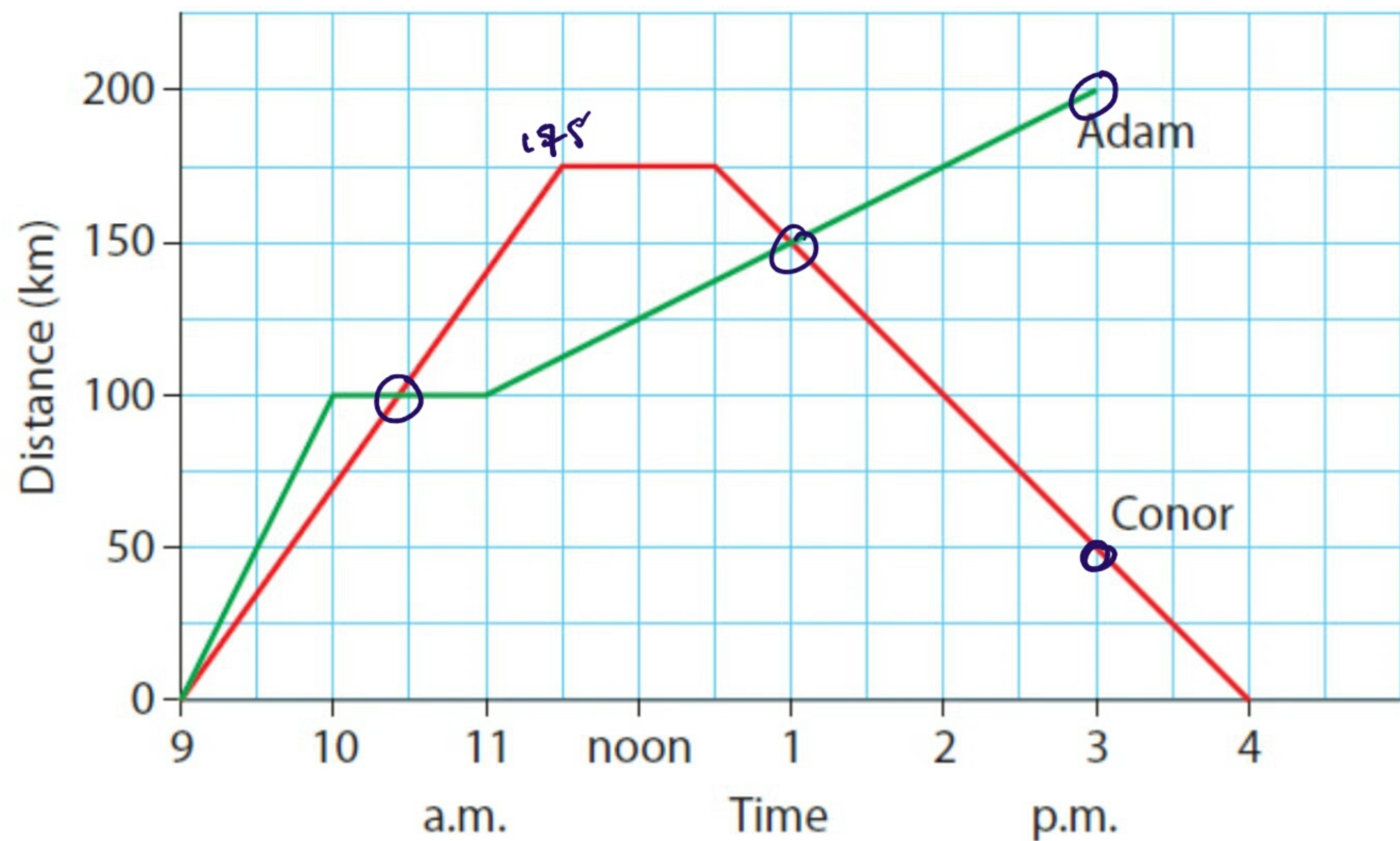
- (v) How far does he travel?

$$20 \text{ km} + 20 \text{ km} = 40 \text{ km}$$



*The line is steeper*

4. The graph shows the journeys of two motorists, Conor and Adam. They are travelling on the same road and in the same direction, leaving town A at 9.00 a.m.



- (i) Who travels the fastest in the first hour? Adam
- (ii) How many times do they pass each other?

(iii) At what time do they pass the second time? first 10:30 and 1pm

(iv) How far apart are they at 3.00 p.m.?  $200 - 50 = 150 \text{ km}$

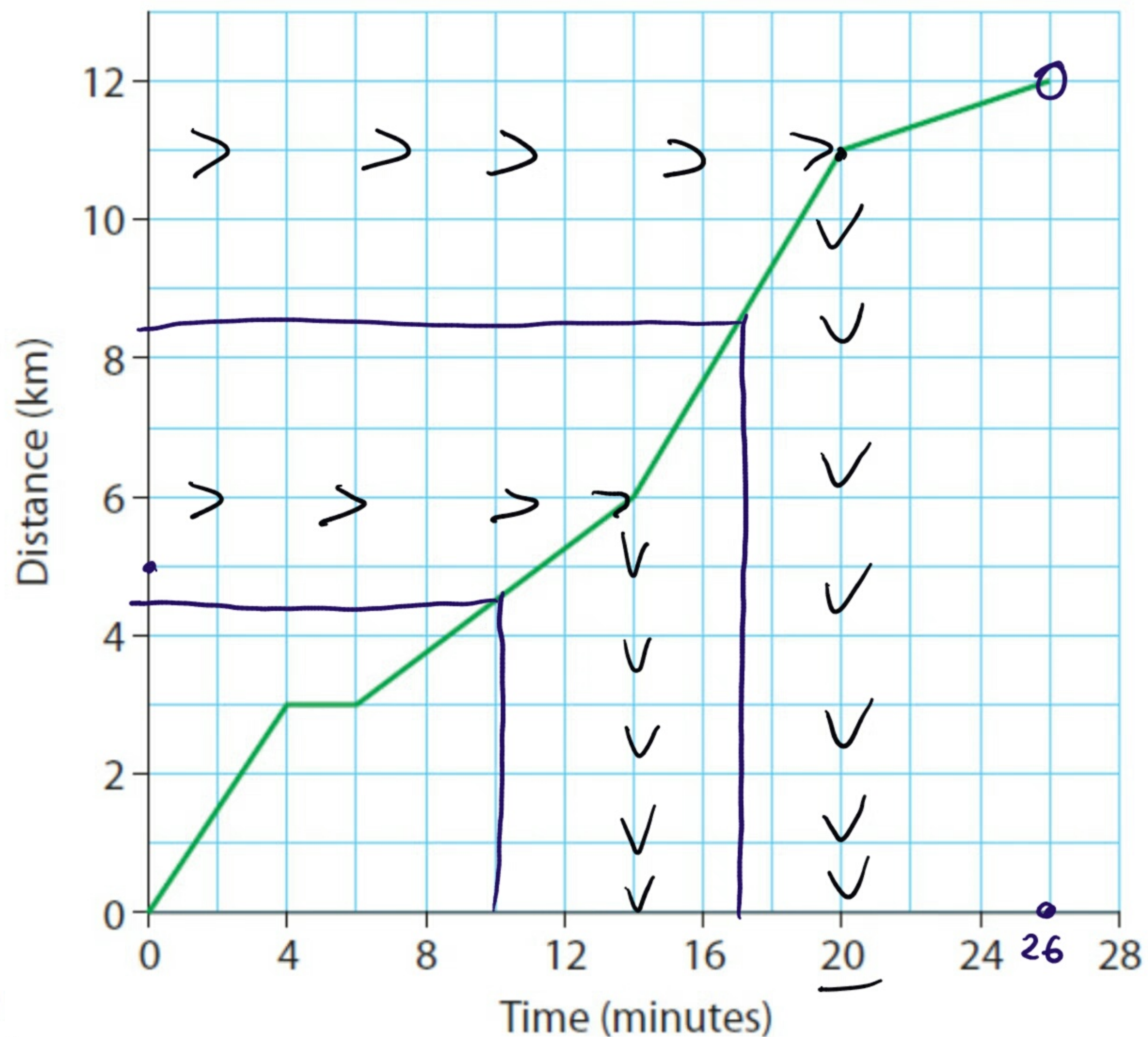
(v) How far does each man travel altogether?

Adam  $200 \text{ km}$  + Conor  $350 \text{ km} \Rightarrow 175 + 175$   
 $550 \text{ km}$  Total

5. The given graph indicates the distance a cyclist must travel to work.

Use the graph to determine:

- (i) the distance to work  $12\text{ km}$
- (ii) the time taken to get to work  $26\text{ mins}$
- (iii) the distance travelled after
  - (a) 10 minutes  $\approx 4.5\text{ km}$
  - (b) 17 minutes  $\approx 8.5\text{ km}$
- (iv) the time taken to travel
  - (a) 6 km  $14\text{ mins}$
  - (b) 11 km  $20\text{ mins}$
- (v) the average speed for the whole distance. (Exclude the two minute stop.)



$$\text{Time } 26 - 2 = 24$$

$$S = \frac{D}{T} = \frac{12}{\frac{24}{60}} = 30\text{ km/hr}$$

6. The graph shows the journeys of two motorists and gives their distances from their home town.

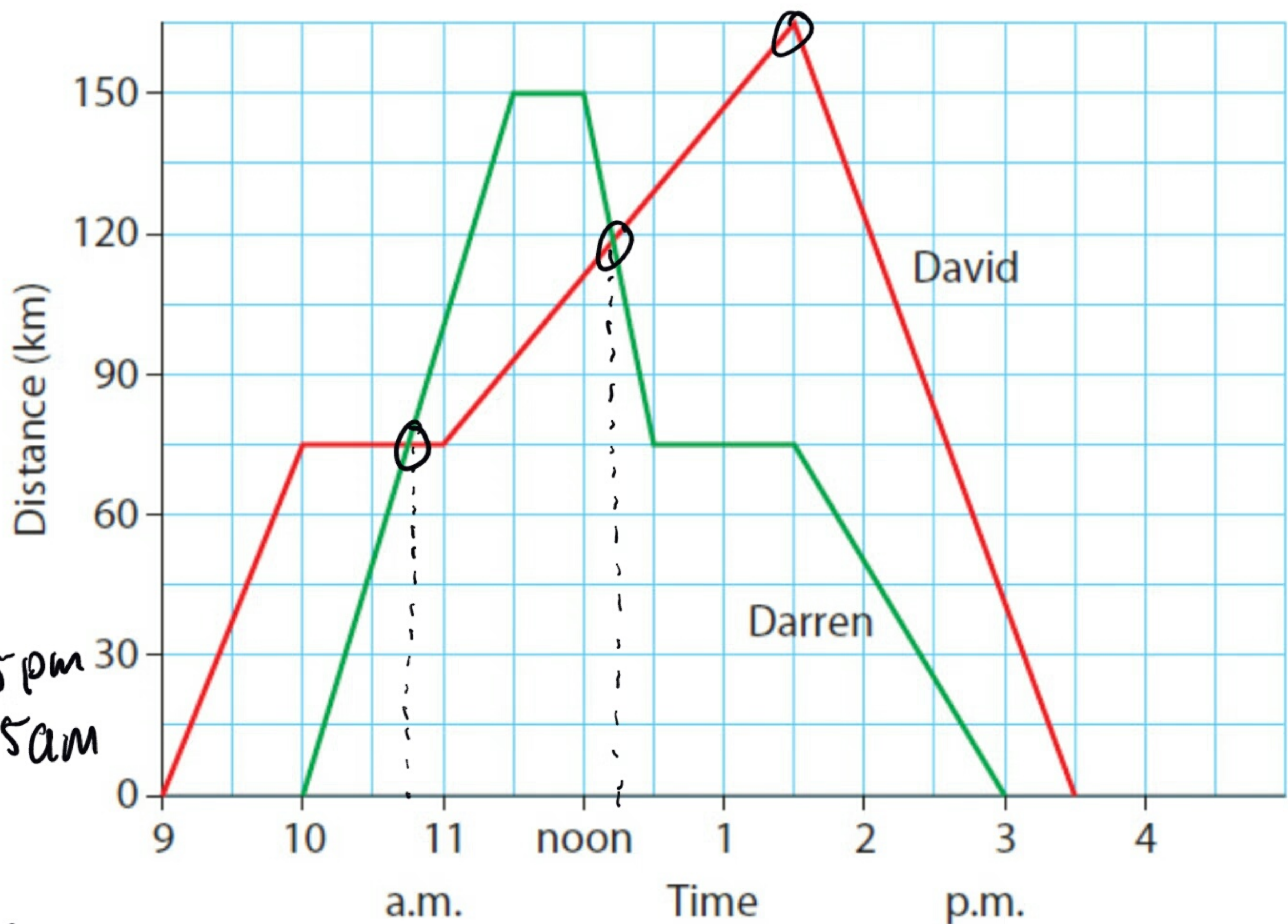
(i) How far is David from the town when Darren starts his journey? *75 km*

(ii) At approximately what times do their paths cross? *10:45 a.m.*

(iii) At what time does David begin his return journey? *1:30 p.m.*

(iv) How far is Darren from town when David begins his return journey? *75 km*

(v) Who returns to town first? *Darren*  
 What time elapses before the other motorist arrives? *30 mins.*





HW

7. The travel graph shows Mr McLoone's journey by car from home to work.

At A, he stops to buy a newspaper.

At B, he stops to buy petrol.

At D, he arrives at work.

(i) How long does the journey take?  $55 \text{ mins}$ .

(ii) For how long does Mr McLoone stop to buy petrol?  $10 \text{ mins}$ .

(iii) What is the car's average speed from C to D?  $10 / 20 / 60 = 30 \text{ km/hr}$

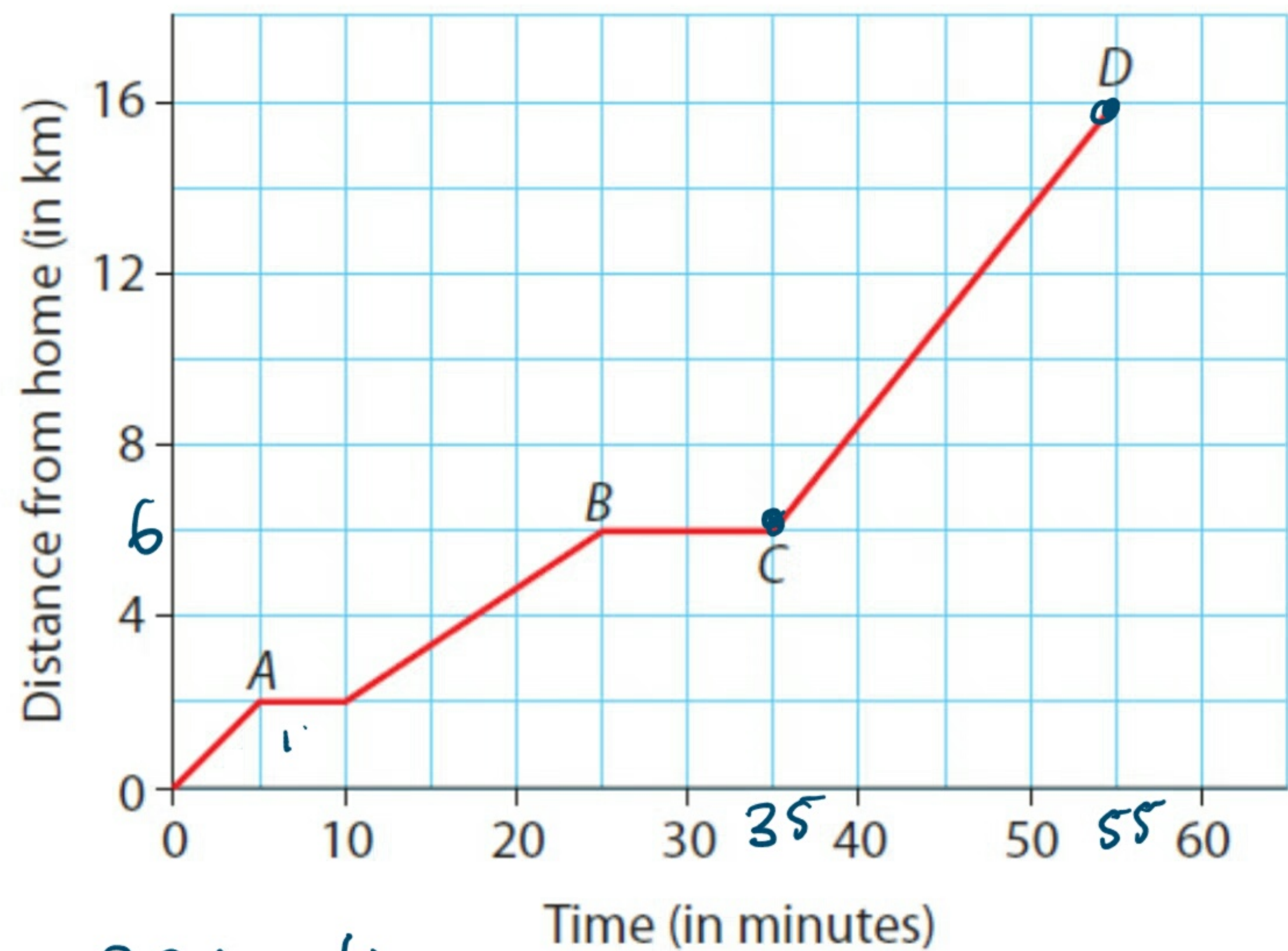
(iv) Excluding the two stops, what was the car's average speed for the whole journey?

$$55 - 15 = 40 \text{ mins.}$$

$$D = 16$$

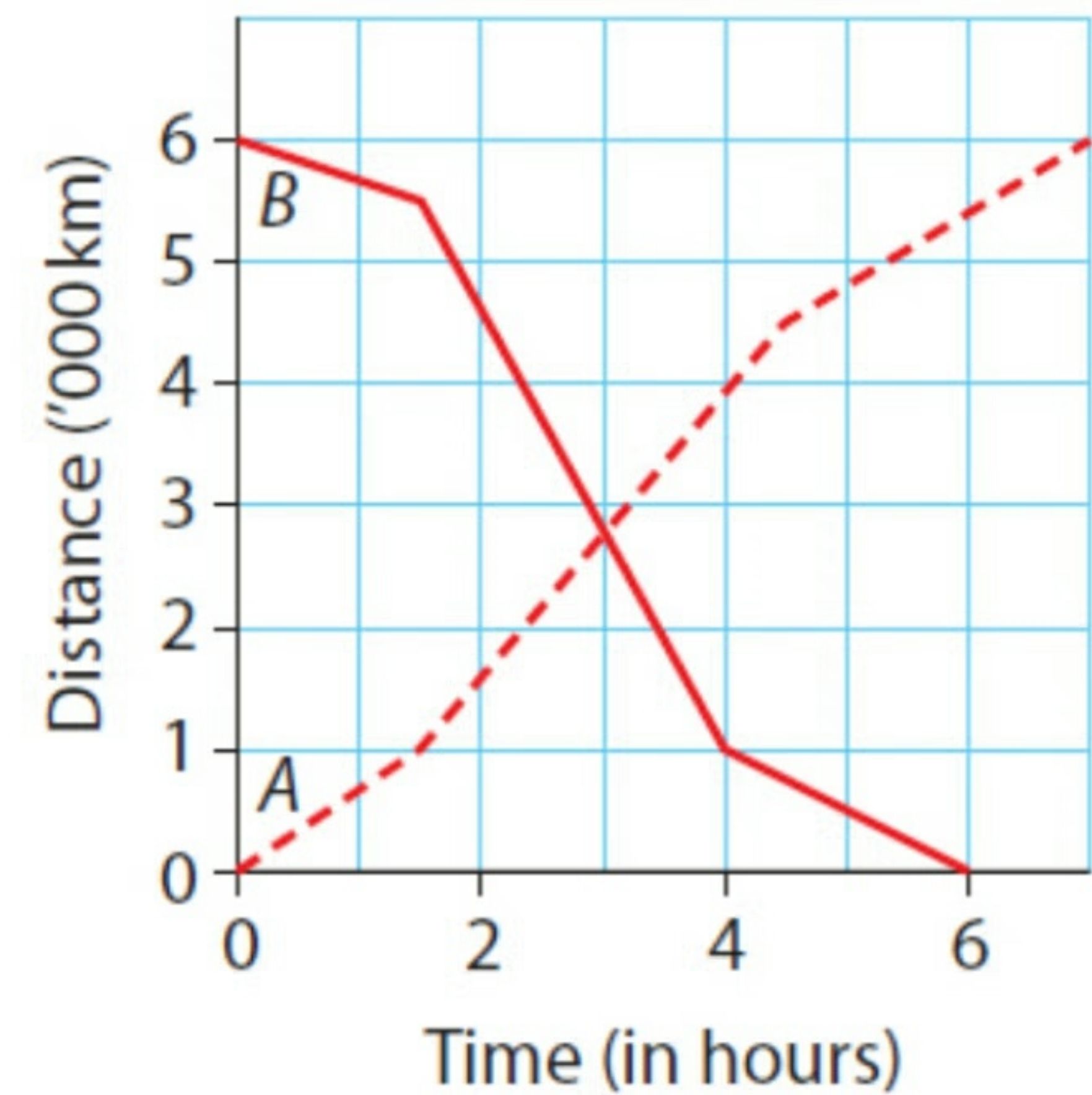
$$T = 40 / 60$$

$$S = 16 / 40 / 60 = 24 \text{ km/hr.}$$



HW

8. Two aircraft were flying the air route from  $A$  to  $B$  but in opposite directions. The distance from  $A$  is shown on the graph alongside. Use the graph to determine:
- the distance from  $A$  to  $B$
  - in which direction the flight was completed more rapidly, and by how much
  - how long into the flight the planes were when they crossed
  - the average speed of the flight in each direction.

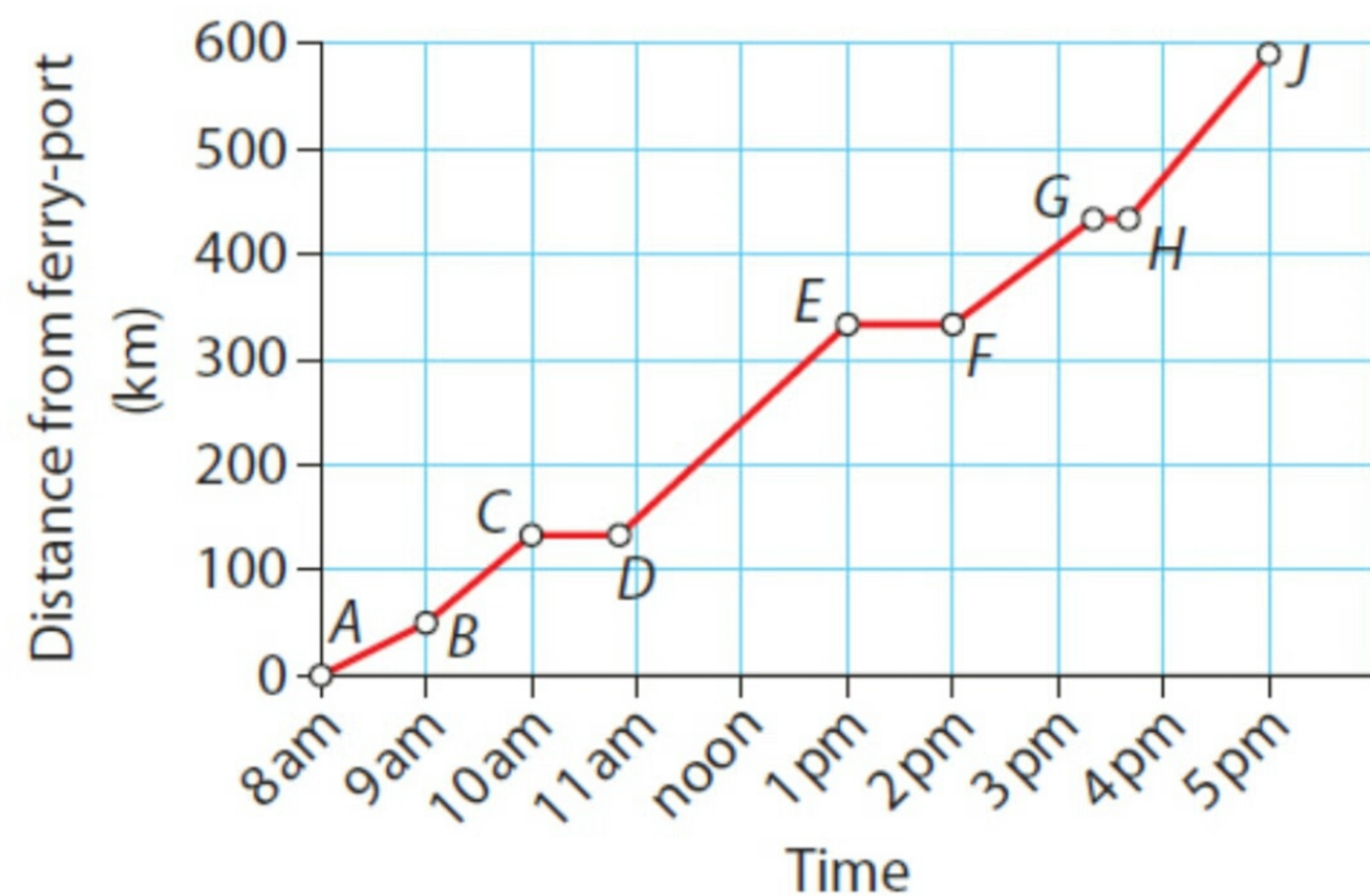


9. The given distance–time graph describes the journey of a family travelling from a French ferry-port to their campside for a holiday. The distance is 590 km.

Describe which line segment or point is appropriate for these statements:

- (i) "We will have lunch now."
- (ii) "This is the fastest section."
- (iii) "At last we have arrived."
- (iv) "We are only stopping for petrol."
- (v) "This is the slowest section."
- (vi) "This is the longest section."

Estimate the average speed for the whole journey, excluding stops.

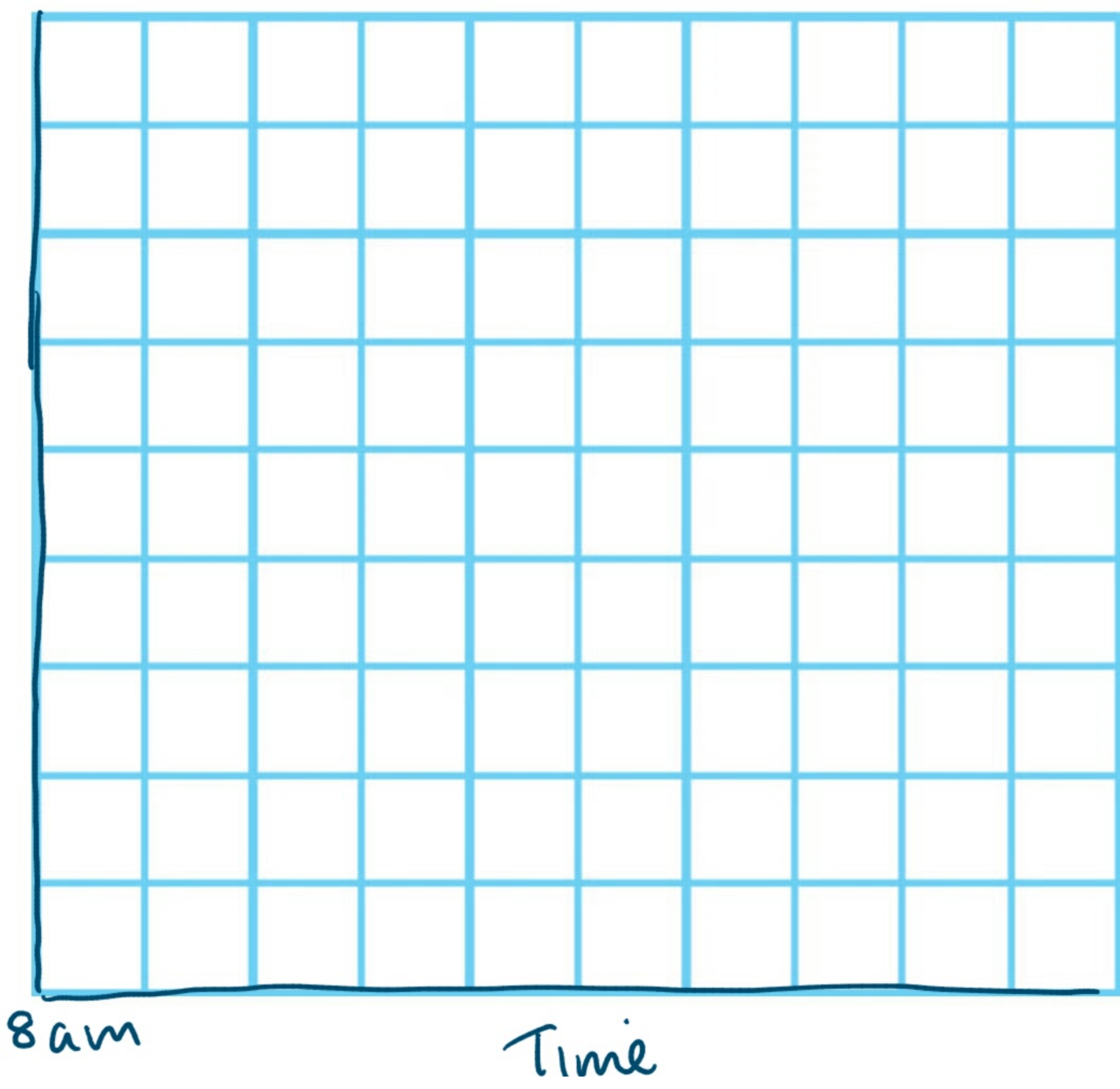


HW

**10.** Noel cycled to his friend's place. He started at 8.00 a.m. and covered 15 km in the first hour. After resting for half an hour, he then covered the next 20 km to his friend's place in two hours.

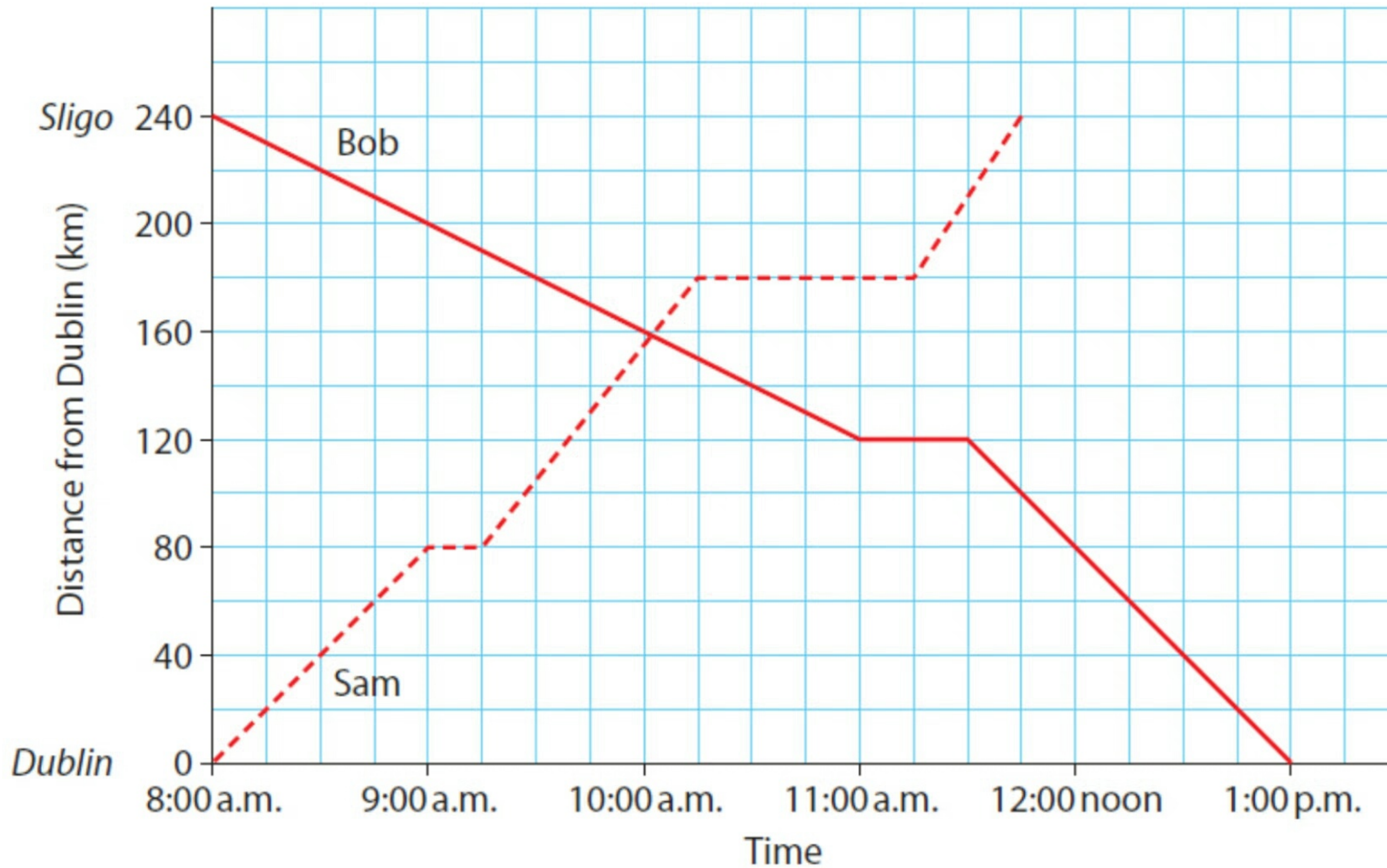
- (i) At what time did he reach his friend's place?
- (ii) How far was it from his home to his friend's place?
- (iii) Using a scale 1 cm : 5 km on the distance axis and 1 cm :  $\frac{1}{2}$  hr on the time axis, make a travel graph for Noel's trip.

D  
I  
S  
T  
A  
N  
C  
E



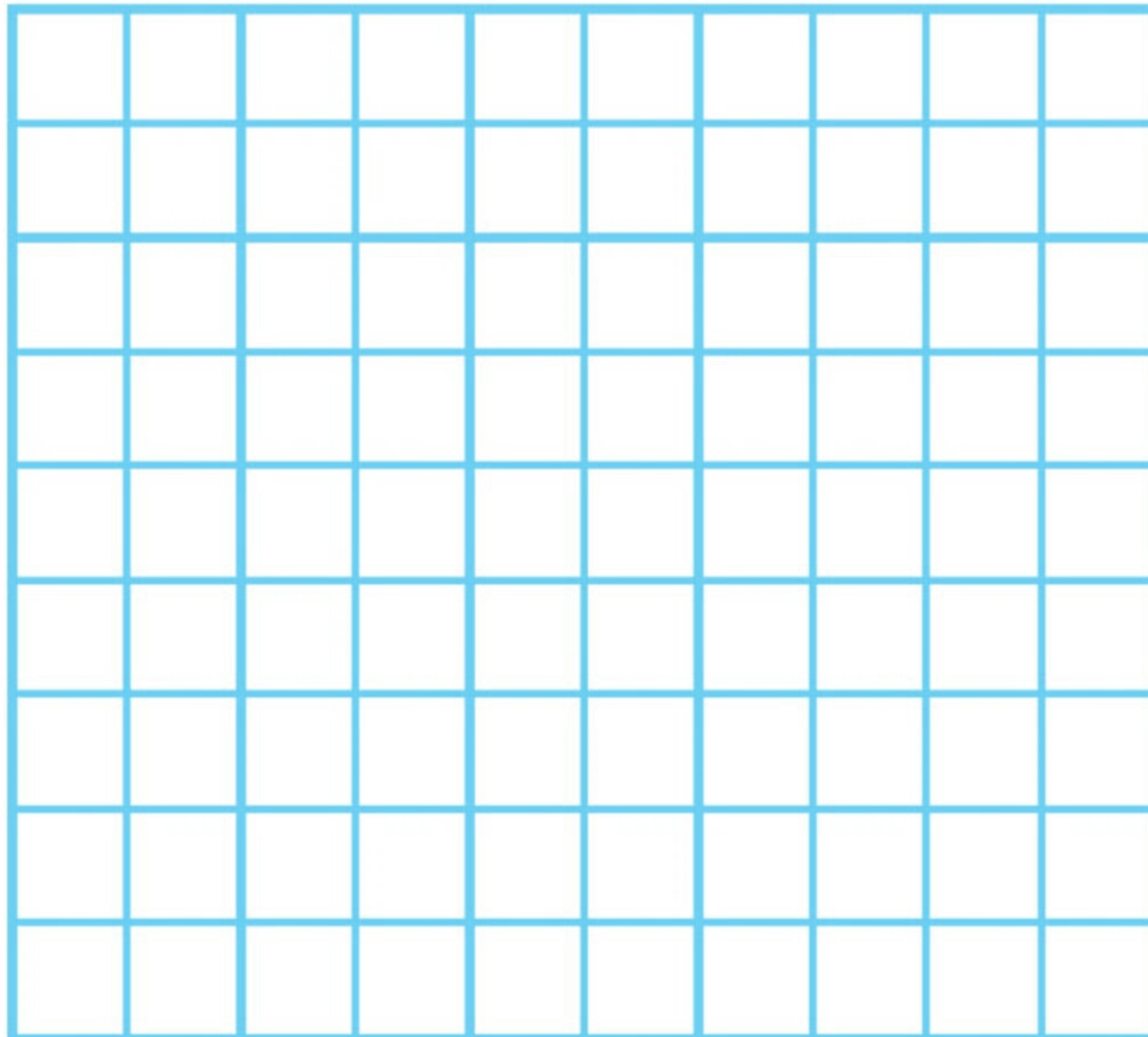
HW

11. Sam and Bob travel between Dublin and Sligo.



- How far is it between the two towns?
- At what time do Brian and Sam pass each other?  
How far are they from Dublin when they pass?
- Who has the faster means of transport, Bob or Sam?
- At what times is Sam stationary (not moving)?
- Find the average speed of each person excluding stops.

- 12.** Abdul is going to college, 1.25 km from his home.  
He walks 250 metres to the bus stop. This takes him 4 minutes.  
A bus arrives after 5 minutes and the journey takes 6 minutes.
- (i) Draw a distance–time graph for his journey.
  - (ii) Work out the speed of the bus in
    - (a) metres/minute
    - (b) km/hour.



# Answers

## Exercise 20.1

- 9 am; 3 pm
  - 30 km
  - 9.45 am, 2 pm
  - 10 am–10.30 am, Noon–1 pm
  - From 9 am to 10 am (20 km/hr)
- 30 km
  - 1 hour
  - 45 km
  - 75 km
- 20 km
  - 20 km
  - 1 pm
  - Increase; The steepness of the line
  - 40 km
- Adam
  - twice
  - 1 pm
  - 150 km
  - Adam – 200 km    Conor – 350 km
- 12 km
  - 26 min
  - $4\frac{1}{2}$  km
    - $8\frac{1}{2}$  km
  - 3 min
    - 20 min
  - 30 km/hr

# Answers

- 6.** (i) 75 km  
(ii) 10.45 am and 12.12 pm  
(iii) 1.30 pm  
(iv) 75 km  
(v) Darren; 30 min
- 7.** (i) 55 min (ii) 10 min  
(iii) 30 km/hr (iv) 24 km/hr
- 8.** (i) 6000 km (ii) B  $\rightarrow$  A; 1 hour  
(iii) 3 hr  
(iv) A  $\rightarrow$  B: 857 km/hr B  $\rightarrow$  A: 1000 km/hr
- 9.** (i) [EF] (ii) [HJ] (iii) J (iv) [EH]  
(v) [AB] (vi) [DE]; 87 km/hr
- 10.** (i) 11.30 am (ii) 35 km
- 11.** (i) 240 km (ii) 10.02 am; 158 km  
(iii) Sam  
(iv) 9.00 am to 9.15 am, 10.15 am to 11.15 am  
(v) Sam – 96 km/hr Bob –  $53\frac{1}{3}$  km/hr
- 12.** (ii) (a)  $166\frac{2}{3}$  m/min (b) 10 km/hr