Chapter 11 Exercise 11.1

Q. 1.

Departure Time	Arrival Time	Time taken for journey
09:23	13:26	4 hrs 03 mins
09:05	15:57	6 hrs 52 mins
14:47	21:35	6 hrs 48 mins
03:37	16:16	12 hrs 39 mins
12:36	23:11	10 hrs 35 mins
00:29	18:14	17 hrs 45 mins
14:16	18:03	3 hrs 47 mins
07:25	22:18	14 hrs 53 mins

Q. 2.

Distance (km)	Speed (km/hr)	Time (hrs and minutes)
100	50	2 hrs
75	150	$\frac{1}{2}$ hr
201.5	62	3 hrs 15 mins
550	60	9 hrs 10 mins
10	30	20 minutes
350	80	4 hrs 22.5 mins
80	75	1 hr 4 mins
1,200	375	3 hrs 12 mins
90	5.4	16 hrs 40 minutes
12	15	48 mins
650	60	10 hrs 50 mins
12.5	18	$41\frac{2}{3}$ mins

Q. 3. (i) $12 \text{ km/h} \times 1{,}000 = 12{,}000 \text{ m/h} \div 3{,}600$
$= 3\frac{1}{3} \text{ m/s}$

(ii) $800 \text{ m/s} \times 3{,}600 = 2{,}880{,}000 \text{ m/hr} \div 1{,}000$
$= 2{,}880 \text{ km/hr}$

(iii) $63 \text{ km/h} \times 1{,}000 = 63{,}000 \text{ m/h} \div 3{,}600$
$= 17.5 \text{ m/s}$

(iv) $5 \text{ cm/s} \div 100 = 0.05 \text{ m/s}$.

(v) $18 \text{ cm/s} \times 3{,}600 = 64{,}800 \text{ cm/hr} \div 100{,}000$
$= 0.648 \text{ km/hr}$

Q. 4. $D = S \times T$
$= 11 \times 2$
$= 22 \text{ km}$

Q. 5. $S = \frac{D}{T} = \frac{300 \text{ km}}{5 \text{ hrs}} = 60 \text{ km/hr}$

Q. 6. (i) 10:5, 12:35, 20:10

(ii) The 08:00 trains gets to Dublin in 2 hrs.

(iii) William should leave home by 6:46 at the latest. He will catch the 07:01 train to Portadown. In Portadown he will catch the 07:21 which arrives in Drogheda at 08:23. The next train to arrive in Drogheda at 12:10 which is too late.

(iv) 18:13 − 16:21 = 1 hr 52 mins

9 mins + 13 mins = 22 mins

$\frac{22}{112} \times 100 = 19.64 \approx 20\%$

Q. 7. $T = \frac{D}{S} = \frac{130}{75} = 1$ hr 44 mins

19:12 + 1 hr 44 mins = 20:56

Q. 8. (i) 340 m/s × 3,600 = 1,224,000 m/hr ÷ 1,000

= 1,224 km/hr

(ii) 300,000 m/s × 3,600 = 1,080,000,000 m/hr ÷ 1,000

= 1,080,000 km/hr

Q. 9. $T = \frac{D}{S} = \frac{6}{18} = \frac{1}{3}$ hr = 20 mins

8:43 am + 20 mins = 9:03 a.m.

Q. 10. (i) 17:15 bus from Athlone

(ii) 064

(iii) 19:30 − 15:05 = 4 hrs 25 mins

(iv) The 14:00 and 16:15 buses on Sunday are the fastest, taking $2\frac{1}{2}$ hours.

Q. 11. $T = \frac{D}{S} = \frac{500}{75} = 6$ hrs 40 mins

$T = \frac{D}{S} = \frac{500}{80} = 6$ hrs 15 mins

It takes 25 mins more.

Q. 12. (i) $S = \frac{D}{T} = \frac{55}{1.1} = 50$ km/hr

(ii) $T = \frac{D}{S} = \frac{110}{80} = 1$ hr 22.5 mins

(iii) Total distance = 55 + 110 = 165 km

(iv) Total time = 1 hr 6 mins + 1 hr 22.5 mins

= 2 hrs 28.5 mins

(v) $S = \frac{D}{T} = \frac{165}{2.475} = 66\frac{2}{3}$ km/hr

(vi) $S = \frac{D}{T} = \frac{270}{5} = 54$ km/hr

54 ÷ 9 = 6

6 × 8 = 48 km/hr

Q. 13. (i) $D = S \times T = 60 \times 1\frac{35}{60} = 95$ km

(ii) $T = \frac{D}{S} = \frac{180}{80} = 2$ hrs 15 mins

(iii) $95 + 180 = 275$ km

(iv) 1 hr 35 mins + 2 hrs 15 mins = 3 hrs 50 mins

(v) 12:35 + 3 hrs 50 mins = 16:25

(vi) $S = \frac{D}{T} = \frac{275}{3\frac{5}{6}} = 71.7391 = 71$ km/hr

(vii) 70 mph × 2 = 140 miles

35 mph × 4 = 140 miles

Total distance = 280 miles $\times \frac{8}{5}$

= 448 km

$S = \frac{D}{T} = \frac{448}{6} = 75$ km/hr

Q. 14.

1.5 km @ 3 km/h	= 30 min	distance	1.5 km
40 km @ 30 km/h	= 1 hr 20 min		40.0 km
10 km in 42 m	= 42 min	+	10.0 km
total time	= 2 hr 32 min		51.5 km

$\Rightarrow$ Average $= \frac{51.5 \text{ km}}{2 \text{ hr } 32 \text{ min}} = 20.3289$ km/h $= 20.3$ km/h

Q. 15. (a) $S = \frac{45}{1.25} = 36$ km/hr

(b) Cycle: 10 m/s

Swim: 2 m/s

Run: 12 km/hr or $3\frac{1}{3}$ m/s

Trevor's fastest speed was in the cycling portion of the triathlon.

(c) Swim: Distance = $S \times T$

$= 7.2 \times \frac{1}{10} = 0.72$ km

Cycle: 45 km

Run: 10 km

Total = 45 + 10 + 0.72 = 55.72 km

= 55,720 m

(d) Total time = 6 mins + 1 hr 15 mins + 50 mins

= 131 mins × 60

= 7,860 seconds

Speed $= \frac{55{,}720}{7{,}860} = 7.09$ m/s

Q. 16. $T = \frac{175}{20} = 8$ hrs 45 mins

$175 \div 25 = 7 \Rightarrow 6$ rest stops

Total time = 8 hrs 45 mins + 12 mins

= 8 hrs 57 mins

Q. 17. (i) Daniel

(ii) Ellie

(iii) Daniel: $\frac{25}{20} = 1.25$ m/s

Ellie: $\frac{25}{25} = 1$ m/s

(iv) Daniel: $\frac{25}{30} = \frac{5}{6}$ m/s

Ellie: $\frac{25}{20} = 1.25$ m/s

(v) No, each length they swim is 25 m.

(vi) At 22.5 secs they passed for the first time. Daniel was winning as he had already completed a full length. They passed again after 35 secs. At this point Ellie was winning as she was passing Daniel.

Q. 18.

	Graph A	Graph B	Graph C	Graph D
(i)	40 m	4 km	4 m	50 m
(ii)	5 s	5 hrs	3 mins	5 s
(iii)	$\frac{40}{5} = 8$ m/s	$\frac{4}{5} = 0.8$ km/hr	$\frac{4}{3} = 1\frac{1}{3}$ m/min or $0.02\dot{2}$ m/s	$\frac{50}{5} = 10$ m/s

Q. 19. (i) 8:00

(ii) 8:50

(iii) 2.5 km

(iv) It occurs between C and D as the distance travelled remains the same between these two points.

(v) Speed $= \frac{0.5}{\frac{1}{3}} = 1.5$ km/hr

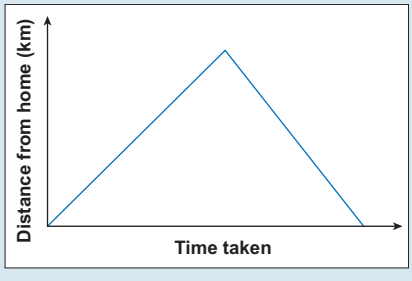
(vi) He moves fastest between points D and E because the slope of the graph between these two points is the greatest. He may be moving faster because he was late for school.

(vii) $\frac{2.5 \text{ km}}{\frac{5}{6}} = 3$ km/hr

Q. 20. (a) (i) Graph C (iii) Graph B

(ii) Graph A

(b)



Q. 21. (a) A to B – Upward-sloping straight line ⇒ constant speed.

B to C – A slower constant speed than A to B.

C to D – A faster constant speed than A to B and B to C.

D to E – The object is stationary – slope = 0.

E to F – The object has started travelling at a constant speed – slower than previously.

F to G – The object is travelling at its fastest constant speed.

(b) Between A and B: Travelling at a constant speed of 18 km/hr.

B and C: Travelling at a constant speed of 12 km/hr.

C and D: Constant speed of 20 km/hr.

D and E: Object is not moving.

E and F: Consant speed of 6 km/hr.

F and G: Constant speed of 36 km/hr.

Slope between F and G is highest indicating the part of the graph where the object is travelling the fastest.

Q. 22. $D = 80 \times \frac{1}{3} = \frac{80}{3}$ km.

$S = \frac{D}{T} = \frac{\frac{80}{3}}{\frac{32}{60}} = 50$ km/hr.

Q. 23. $T = \frac{150}{30} = 5$ hrs

30 km/h × 2.5 = 75 km/h

$T = \frac{150}{75} = 2$ hrs

They would have saved 3 hours.

Q. 24.

Note: Student answers will vary.

(i) A → B

The object remains 20 km away from its starting point for one hour. It may be stationary.

B → C

The object moves closer to the fixed point travelling 10 km in 1 hour at a constant speed.

C → D

The object travels away from the fixed point again. It moves 10 km at constant speed away from the fixed point until it is 20 km away in total.

D → E

The object travels 30 km in 1 hour at a constant speed. It is now 50 km away.

E → F

The object travels a further 10 km at a constant speed. It is now 60 km away from its starting point.

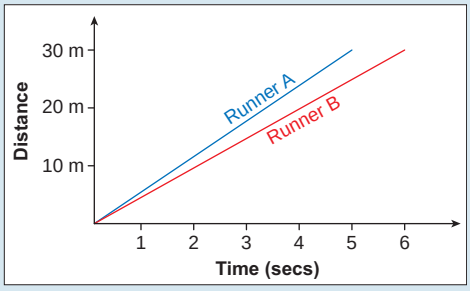
(ii) Between points P and Q the graph is curved, which means the object is accelerating (average acceleration from P to Q is 2 m/s^2). After point Q the graph curves more steeply, suggesting that the speed of the object is increasing more rapidly as the graph approaches point R (average acceleration from Q to R is 13 m/s^2).

(iii) At point X the object is 200 km away from the fixed point. It starts to travel towards the fixed point. The graph is curved which suggests the object is not travelling at a constant speed. The slope at any point is negative which means the object is decelerating as the graph approaches point Y. At point Y. The object begins to move away from the starting point. The graph is curved between point Y and point Z which suggests it is not travelling at constant speed. The slope at any point is positive which means the object is accelerating as the graph approaches point Z.

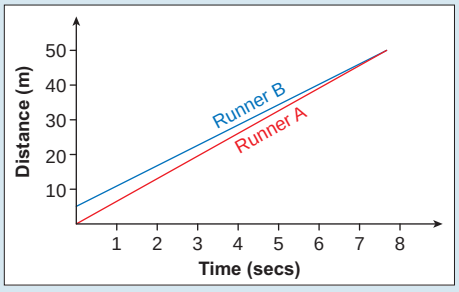
Q. 25. (i) Graph B (iii) Graph D

(ii) Graph A (iv) Graph C

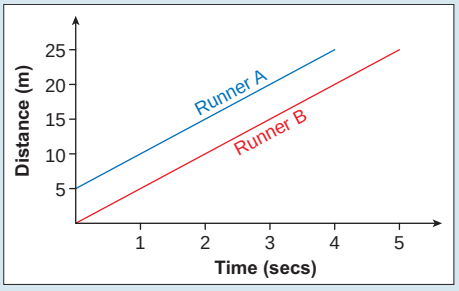
Q. 26. **Race 1:**



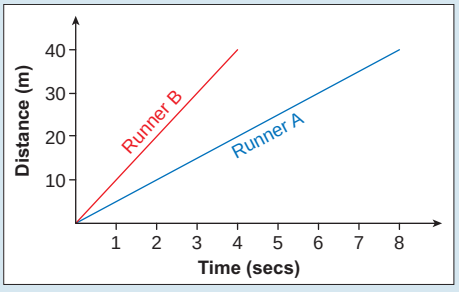
Race 2:



Race 3:



Race 4:



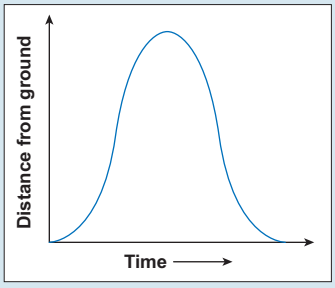
Runner A: $T = \frac{40}{5} = 8$ secs

Runner B: $T = \frac{40}{8} = 5$ secs

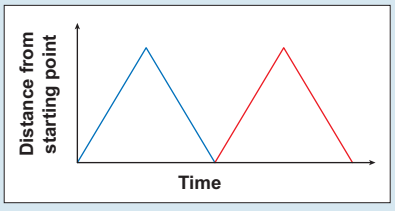
Q. 27. Student report should include the following information:

- Adam won the race (Barry was 2nd and Carl was 3rd).
- Carl was given a head start (1 km).
- Barry stopped for a rest.
- At the start of the race Carl was ahead. Adam overtook Carl (at approx. 7 minutes), then Barry overtook Carl (at approx. 19 minutes).
- The runners' overall average speeds (approx.) were:
  - Adam 11 km/hr
  - Barry 10 km/hr
  - Carl 9 km/hr

Q. 28. (i) Child on a Ferris wheel.

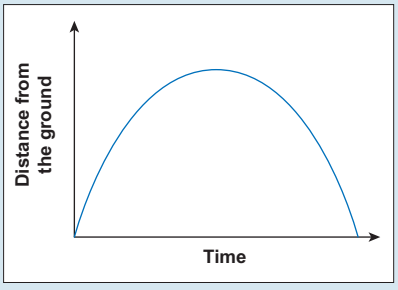


(ii) Swimming four lengths of a pool.

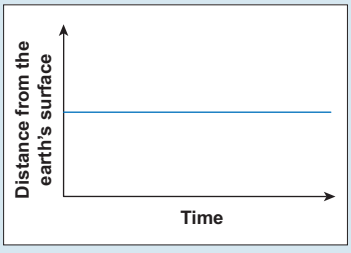


(Constant speed was assumed.)

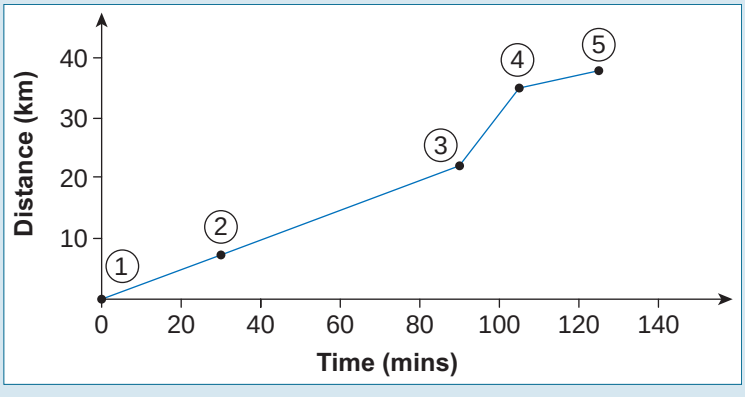
(iii) Ball thrown vertically in the air.



(iv) Satellite orbiting the Earth.



Q. 29.



(i) Total distance: 40 km

(ii) Total time: 2 hrs 5 mins

(iii) $\frac{40}{2\frac{1}{12}} = 19.2$ km/hr

Q. 30. (i) $60 \times \frac{15}{3{,}600} = \frac{1}{4}$ km
$= 250$ m

(ii) Distance travelled $= 330$ m

$\frac{330 \text{ m}}{10} = 33$ m/s $= 118.8$ km/hr

(iii) Distance travelled $= 200$ m

72 km/hr $= 20$ m/s

$T = \frac{200}{20} = 10$ s

(iv) 60 km/hr $= 16\frac{2}{3}$ m/s.

$D = 16\frac{2}{3} \times 25 = 416\frac{2}{3}$ m

$D = 16\frac{2}{3} \times 20 = 333\frac{1}{3}$ m

Assuming the height of the man (while standing) is negligible then height of apartment is $83\frac{1}{3}$ m.

Q. 31. (i) After 7 secs Chang has travelled 140 m. Henry can cover 10 m more than Chang every second.

$\frac{140}{10} = 14$ secs

Henry will overtake Chang after 14 seconds.

(ii) Chang covers 100 m more than Henry. His speed is 20% greater than Henry's.

$\frac{100}{0.20} = 500$ m

$\therefore$ Length of race $= 600$ m