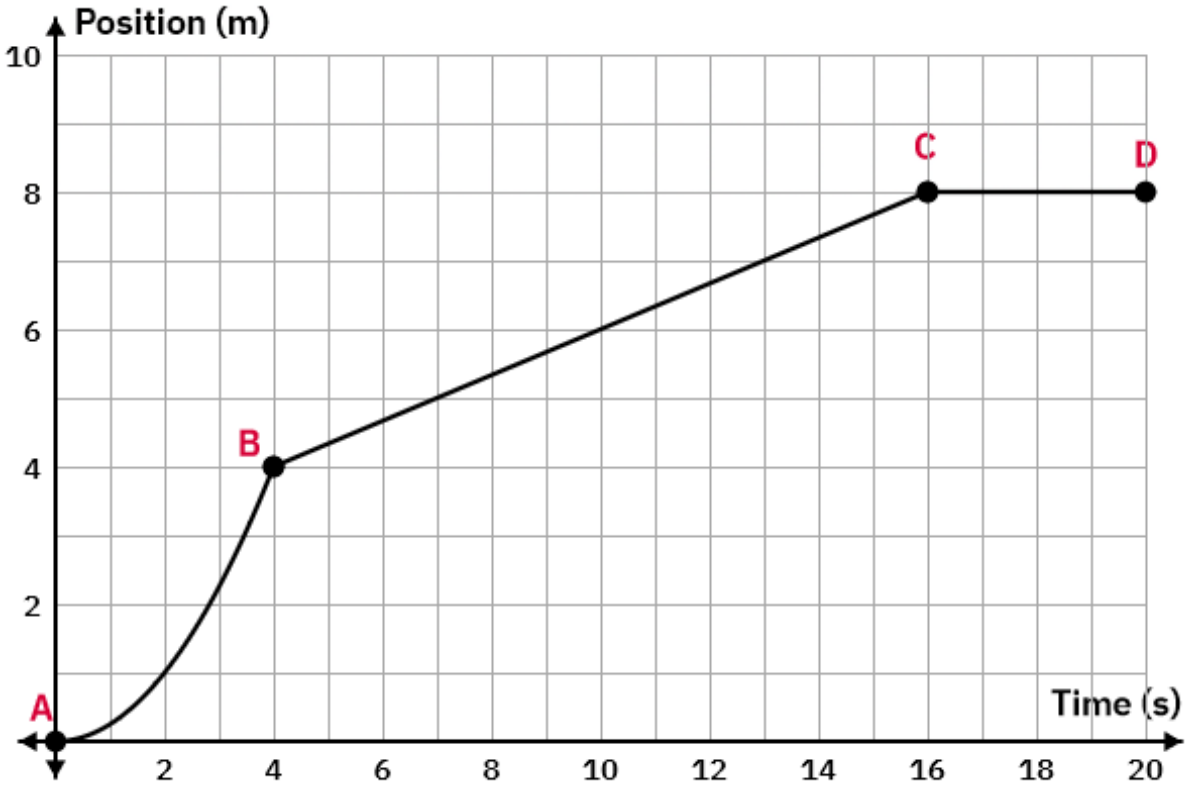
Kinematics Review

(Definitions, Graphing, Kinematic Equations)

1. A car travels 200 km in 90 minutes. What is the car's average speed in m/s?

2. A ball rolls up an incline, stops, and rolls back down. Sketch a velocity-time graph and a position-time graph representing the motion of the ball.

3. The following graph represents the position of a girl walking in a straight line with respect to time. The positive direction is North.



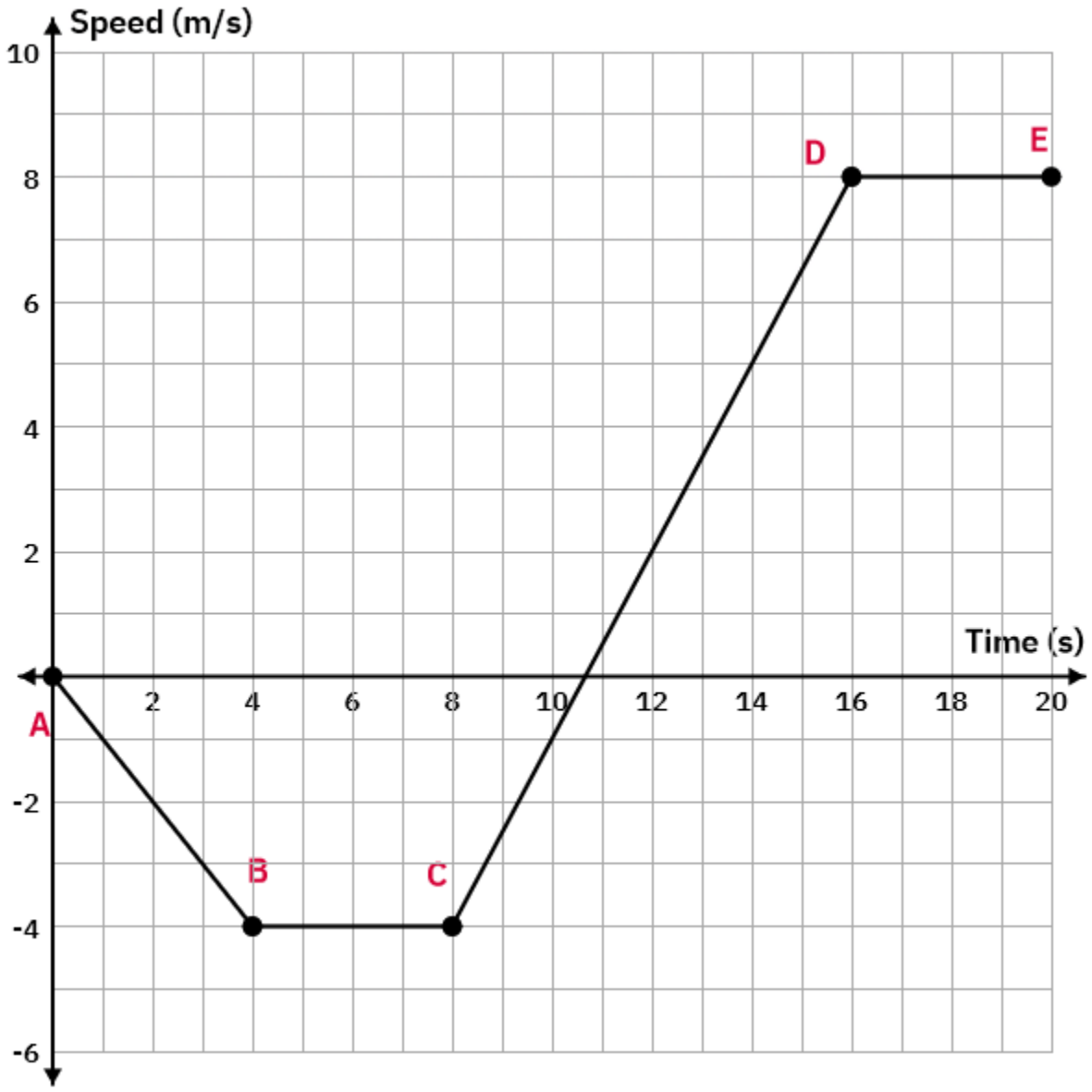
(a) Describe the girl's motion from

(i) A to B.
(ii) B to C.
(iii) C to D.

(b) Calculate the average velocity for the time interval

(i) B to C.
(ii) A to D.

4. The following graph represents the velocity of a car with respect to time. The positive direction is East.



(a) Describe the car's motion from

(i) A to B
(ii) B to C
(iii) C to D

(b) Calculate the acceleration of the car during the time interval A to B.

(c) Calculate the displacement for the entire trip.

5. An electric train initially moving at 7 m/s accelerates to 10 m/s in 20 s. Calculate the train's acceleration.

6. An airplane taking off from an airfield has a runway 370 m long. The airplane starts from rest, accelerates for 30 s and then takes off. What is the takeoff velocity?

7. A car accelerates from 30 m/s to 40 m/s in 30 s. How far did it travel in that time?

8. A train traveling at 30 m/s slows down with a uniform acceleration of -0.6 m/s^2. How long does it take to stop?

9. A boy in a wagon starts down a hill 90 m long with an initial velocity of 1.2 m/s, reaching the bottom in 50 seconds. Calculate his acceleration and velocity at the bottom of the hill.

10. A penny dropped into a wishing well reaches the bottom in 1.50 s. Calculate the velocity at the bottom.

11. A boy threw a small bundle toward his girlfriend on a balcony 10.0 m above him. The bundle stopped rising in 1.5 s. Was the bundle thrown high enough for her to catch it? Provide numerical proof.

12. A juggler performs in a room whose ceiling is 3.0 m above the level of her hands. She throws a ball vertically upward so that it just reaches the ceiling. Calculate
    (a) the initial velocity of the ball?
    (b) the time is required for the ball to reach the ceiling.

13. A stone is thrown vertically upwards with an initial speed of 10.0 m/s from a cliff that is 50.0 m high.
    (a) When does the stone reach the bottom of the cliff?
    (b) What speed does the stone have just before hitting the ground?

14. A ball is dropped from rest from the top of a 40.0 m building. A second ball is thrown downward 1.0 s later. They hit the ground at the same time. Calculate the speed with which the second ball was thrown.

15. A baseball is seen to pass upward by a window 28 m above street level with a vertical speed of 13 m/s. The ball was thrown from the street. Calculate
    (a) the initial velocity of the ball.
    (b) the maximum height of the ball.
    (c) how long it takes to reach the street again after the ball is thrown.