Take g = 9.81 ms^{-2} if necessary.

1. Yau walks at 5 m s^{-1} towards the south for 10 s. Then he walks towards the east at 5 m s^{-1} for 30 s. Find his average speed and the magnitude of his average velocity.

	Average speed / m s^{-1}	Average velocity / m s^{-1}
A.	2.5	4.0
B.	2.5	5.0
C.	5.0	4.0
D.	5.0	5.0

2. A stone is thrown vertical upward with a speed of 5 m s^{-1} from the top of a building. The stone takes 2 s to reach the ground. What is the height of the building?

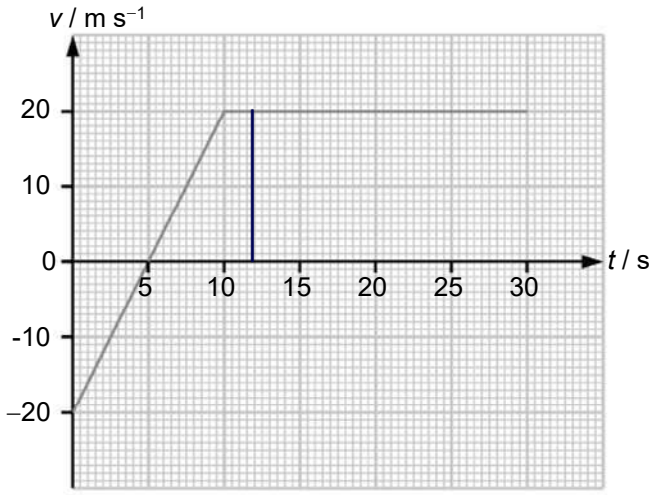
A. 9.6 m

B. 14.6 m

C. 25.6 m

D. 29.6 m

3. The velocity–time (v–t) graph of a car travelling on a straight road is shown below.



What is the average velocity of the car from t = 0 to t = 12 s?

A. 10.0 m s^{-1}

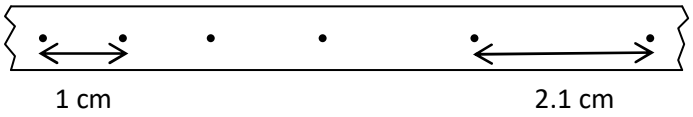
B. 13.3 m s^{-1}

C. 16.7 m s^{-1}

D. 18.8 m s^{-1}

0.025

4. A ticker-tape timer operating at 50 Hz is used to record the motion of an object. The figure below shows part of the tape. What is the average acceleration of the object?



$\frac{1.05 - 0.5}{0.08}$

A. 5.5 m s^{-2}

B. 6.9 m s^{-2}

C. 8.0 m s^{-2}

D. 13.8 m s^{-2}

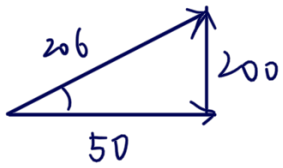
5. Terry takes 10 s to walk 50 m eastwards. He then takes 40 s to run 200 m northwards. Find his average velocity.

A. 4.1 m s^{-1} N14°E

B. 4.1 m s^{-1} N76°E

C. 5 m s^{-1} N14°E

D. 5 m s^{-1} N76°E



$\sin\theta = \frac{200}{206}$

6. Which of the following statements is/are correct?

(1) The resultant of two non-zero displacement is always non-zero.

(2) The velocity must be smaller or equal to its instantaneous velocity.

(3) The direction of velocity can be different from the direction of acceleration.

A. (1) only

B. (3 only

C. (1) and (2) only

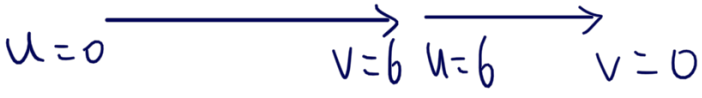
D. (2) and (3) only

7. A car speeds up from rest at a uniform acceleration of 2 m s^{-2} for 3 seconds. Then, it slows down at a uniform deceleration of 3 m s^{-2} for 2 seconds. Which of the following statements are correct?

(1) The total displacement of the car is zero at 6 s.

(2) The velocity of the car is zero at 6 s.

(3) The average velocity of the car is +3 m s^{-1}.



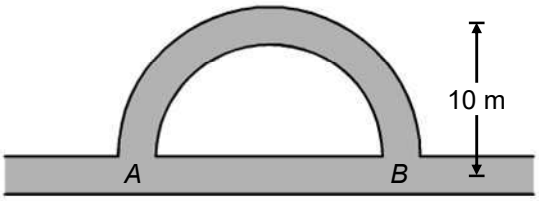
A. (1) only

B. (1) and (2) only

C. (2) and (3) only

D. (1), (2) and (3) only

8. The figure below shows two paths connecting points *A* and *B*. Mary and Jane travel from *A* to *B* along the semicircular path and the straight path respectively. The radius of the semicircular path is 10 m.



If Mary and Jane use the same time of 15 s for their journeys, find **the difference** in the average speeds of the girls.

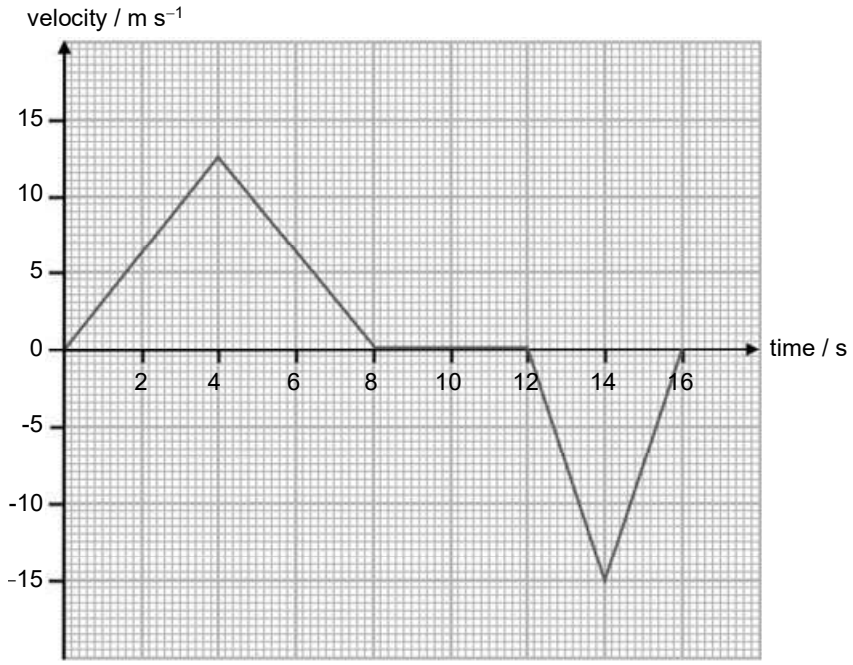
A. 0.38 m s^{-1}

B. 0.76 m s^{-1}

C. 1.43 m s^{-1}

D. 1.52 m s^{-1}

9. The velocity–time graph of a dog moving along a straight line is shown below.



The displacement of the dog from 0 to 16 s is

A. 10 m.

B. 20 m.

C. 40 m.

D. 80 m.

10. A student standing on a stage throws a small ball upwards at an initial speed of 5 m s^{-1} from a height of 10 m above the ground. What is the speed of the ball just before it hits the ground?

A. 13.1 m s^{-1}

B. 14.0 m s^{-1}

C. 14.2 m s^{-1}

D. 14.9 m s^{-1}

11. Which of the following statements is/are correct?

(1) An object moving at a constant velocity must have constant speed.

(2) An object with zero velocity can be accelerating.

(3) An object moving with a constant speed must have zero acceleration.

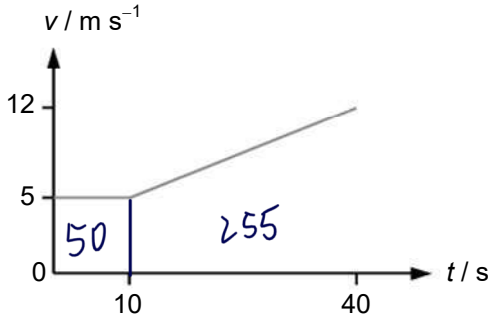
A. (1) only

B. (2) only

C. (1) and (2) only

D. (2) and (3) only

12. John is driving along a straight road at a uniform velocity. At time t = 10 s, he steps on the accelerator pedal and his car travels with a uniform acceleration along the same road. The graph below shows how the velocity of the car v varies with time t.



Find the average velocity of the car from time t = 0 to 40 s.

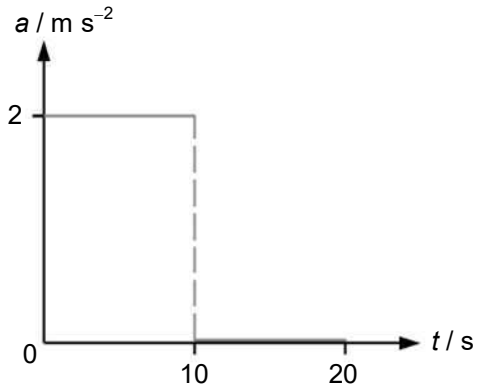
A. 6.1 ms^{-1}

B. 7.6 ms^{-1}

C. 9.8 ms^{-1}

D. 12 ms^{-1}

13. The graph below shows the acceleration–time (a–t) graph of a car travelling on a straight road. The car accelerates from rest for 10 s and then travels at a uniform speed afterwards.



Which of the following statements about the car is/are correct?

(1) From time t = 0 to 10 s, its displacement is 100 m.

(2) From time t = 10 to 20 s, the distance travelled is zero.

(3) From time t = 0 to 20 s, the average velocity of 10 ms^{-1}.

A. (1) only

B. (3) only

C. (1) and (3) only

D. (1), (2) and (3)

14. An object accelerates from rest uniformly. It travels a distance of 45 m after 3 seconds. Find the distance travelled by the object in the next second.

A. 35 m

B. 45 m

C. 65 m

D. 80 m

15. In a 100 m race, a runner first accelerates uniformly from rest to a speed of 10 ms^{-1}. He then maintains this speed and finishes the race in 11 s. How long does the runner take to reach the speed of 10 ms^{-1}?

A. 2 s

B. 4 s

C. 6 s

D. The answer cannot be found from the given data.

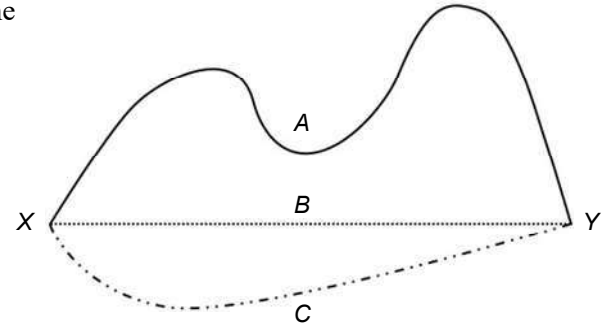
$100 = \frac{10t}{2} + 110 - 10t$

$200 = 10t + 220 - 20t$

$-10t + 20t = 220 - 200$

$t = 2$

16. Three girls *A*, *B* and *C* run at steady speeds from point *X* to point *Y* along different paths as shown. They take the same amount of time to complete the journey.



Which of the following statements are correct?

(1) The girls have the same average velocity.

(2) Girl *A* has the highest speed.

(3) Girl *B* has constant velocity.

A. (2) only

B. (1) and (2) only

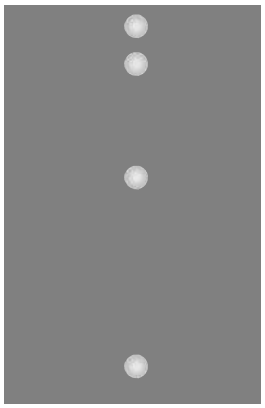
C. (2) and (3) only

D. (1), (2) and (3)

17. Using a stop-watch, Tom measured the time for a car to pass 2 streetlights. The reading was 1.2 s. If Tom's reaction time is 0.2 s, what is the percentage error of his measurement?

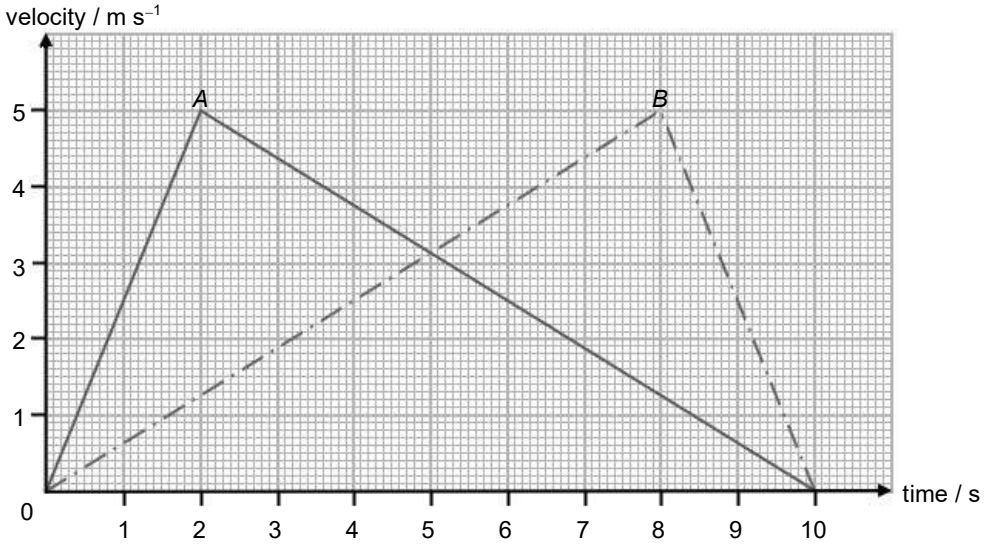
A. 8.33%
B. 16.7%
C. 33.3%
D. 66.7%

18. The following is a multiple-exposure photograph showing a ball falling from a height. If the camera takes images at a rate of 75 times per second, what is the time interval between the first and the fourth image? 0.013335



A. 0.02 s
B. 0.027 s
C. 0.04 s
D. 0.053 s

19. The figure below shows the velocity–time graphs of two objects, *A* and *B*, moving along a straight line. The initial positions of the objects are the same.



Which of the following statements are correct?

(1) The two objects meet at $t = 5$ s.

(2) The two objects have the average velocity

(3) Object *A* has a greater acceleration than object *B* at $t = 1$ s.

A. (1) only

B. (1) and (2) only

C. (2) and (3) only

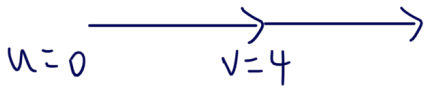
D. (1), (2) and (3)

20. An object is moving with a negative acceleration. Which of the following statements must be correct?
(1) It is slowing down.
(2) It is moving towards the negative direction.
(3) The direction of its acceleration is opposite to that of its velocity.
A. (1) only
B. (1) and (3) only
C. (2) and (3) only
D. None of the above

21. Which of the following statements is correct about scalars and vectors?
A. Scalar quantities must have a unit.
B. Vector quantities are specified by magnitude and direction.
C. The vector sum of two vectors in different directions must be larger than either one of the vector.
D. Two vectors are identical if they have the same direction.

22. A minibus starts from rest and speeds up at 2 m s^{-2} for 2 s along a straight road. Then it slows down at 0.3 m s^{-2} for 1 s. What is the final speed of the minibus?

A. 1.7 m s^{-1}
B. 2.3 m s^{-1}
C. 3.7 m s^{-1}
D. 4.3 m s^{-1}



$v = 4 + (-0.3)(1)$
$= 3.7 \text{ m s}^{-1}$

23. Mike slides down a straight water slide from rest with uniform acceleration. The slide is 22.5 m long and it takes her 3 s to finish the whole journey. What is her speed when she reaches the end of the slide?

A. 5 m s^{-1}
B 7.5 m s^{-1}
C. 8.2 m s^{-1}
D. 15 m s^{-1}

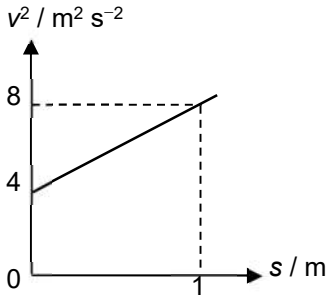
$22.5 = \frac{(0+v)3}{2}$
$45 = 3v$
$v = 15$

24. A ball is thrown vertically upwards and then returns to its starting position. Which of the following statements is/are correct when the ball reaches the highest position?

(1) Its acceleration becomes zero.
(2) Its velocity becomes zero.
(3) Its distance travelled is the maximum.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

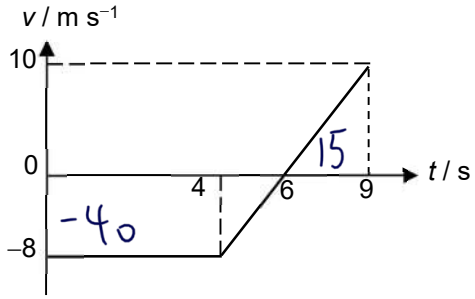
25. An object moves with uniform acceleration along a straight line. The figure below shows the variation of the square of its velocity v^2 with its displacement s. Find the acceleration.



$v^2 = u^2 + 2as$
$8 = 4 + 2a(1)$
$a = 2$

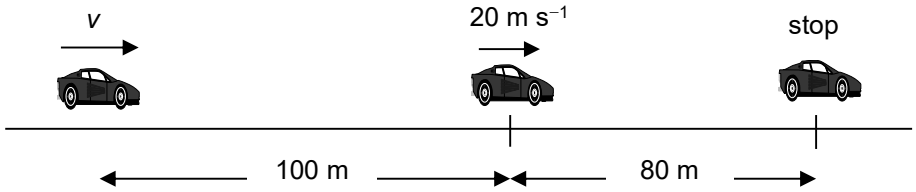
A. 2 m s^{-2}
B. 2.8 m s^{-2}
C. 4 m s^{-2}
D. 8 m s^{-2}

26. The figure below shows the v–t graph of an object moving along a straight line. Find the object's average velocity from 0–9 s.



A. -2.8 m s^{-1}
B. -2 m s^{-1}
C. 6.1 m s^{-1}
D. 8.6 m s^{-1}

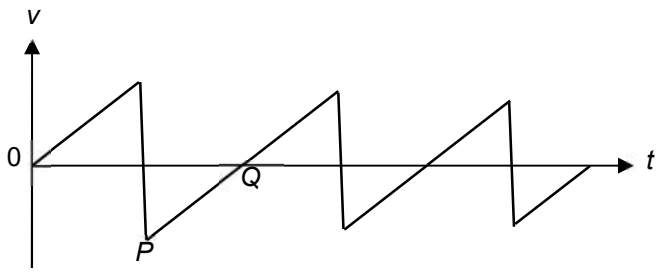
27. A car is slowing down uniformly along a straight road. It slows down to 20 m s^{-1} after travelling a distance of 100 m, and runs 80 m further before it comes to a stop. What is its initial speed?



A. 30 m s^{-1}
B. 40 m s^{-1}
C. 45 m s^{-1}
D. 60 m s^{-1}

$0^2 - 20^2 = 2a(80)$
$a = -2.5$
$20^2 = u^2 + 2(-2.5)(100)$
$900 = u^2$
$u = 30$

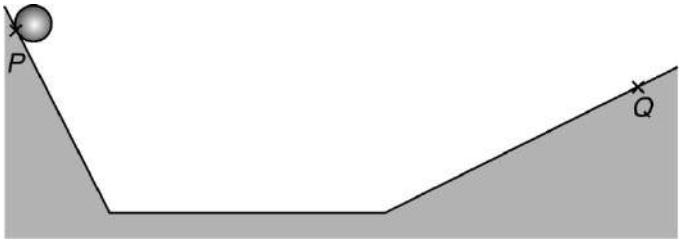
28. A ball is released from rest from a certain height at time $t = 0$. It hits the ground and bounces several times before coming to rest. Air resistance is negligible. The figure below shows its v–t graph.



Which of the following statements about the v–t graph is/are correct?
(1) Downwards is taken as positive.
(2) P represents the instant that the ball reaches the highest point after the first rebound.
(3) Q represents the instant that the ball hits the ground.

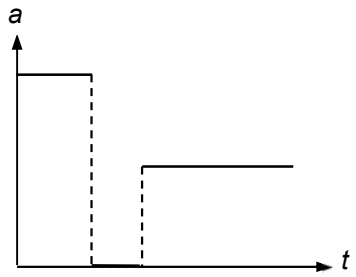
A. (1) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

29. In the following figure, a ball runs on a smooth rail from P to Q.

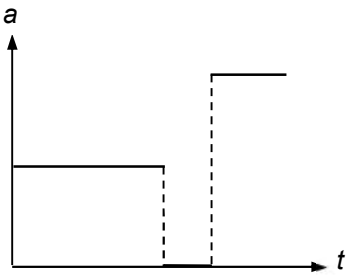


Which of the following graphs best represents the variation of the magnitude of the acceleration a of the ball with time t?

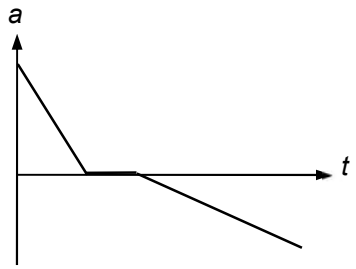
A.



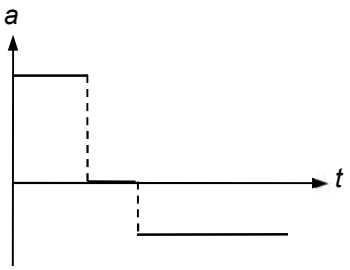
B.



C.



D.



30. Ball X is thrown vertically upwards with an initial speed of 15 m s^{-1} at time $t = 0$. At $t = 1$ s, ball Y is thrown vertically upwards from the same position with the same initial speed. When will the balls collide? Take $g = 9.81$ m s^{-2} and neglect air resistance.

A. $t = 1.45$ s
B. $t = 1.53$ s
C. $t = 2.03$ s
D. $t = 2.53$ s

End

$$15t + \frac{1}{2}(-9.81)(t)^2 = 15(t-1) + \frac{1}{2}(-9.81)(t-1)^2$$

$$t = 2.03$$