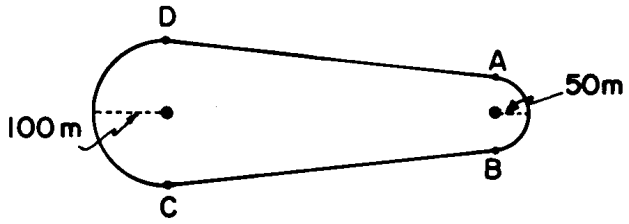
1. Base your answer to the following question on the diagram below which represents a flat racetrack as viewed from above, with the radii of its two curves indicated. A car with a mass of 1,000 kilograms moves counterclockwise around the track at a constant speed of 20 meters per second.



The net force acting on the car while it is moving from *A* to *D* is

A) 0 N B) 400 N C) 8,000 N D) 20,000 N

2. Two cars, *A* and *B*, are 400. meters apart. Car A travels due east at 30. meters per second on a collision course with car B, which travels due west at 20. meters per second. How much time elapses before the two cars collide?

A) 8.0 s B) 13 s C) 20. s D) 40. s

3. What is the average velocity of a car that travels 30. kilometers due west in 0.50 hour?

A) 15 km/hr B) 60. km/hr
C) 15 km/hr west D) 60. km/hr west

4. A high-speed train in Japan travels a distance of 300. kilometers in 3.60×10^3 seconds. What is the average speed of this train?

A) 1.20×10^{-2} m/s B) 8.33×10^{-2} m/s
C) 12.0 m/s D) 83.3 m/s

5. A blinking light of constant period is situated on a lab cart. Which diagram best represents a photograph of the light as the cart moves with constant velocity?

A)
B)
C)
D)

6. What is the average speed of an object that travels 6.00 meters north in 2.00 seconds and then travels 3.00 meters east in 1.00 second?

A) 9.00 m/s B) 0.333 m/s
C) 3.00 m/s D) 4.24 m/s

7. A group of bike riders took a 4.0-hour trip. During the first 3.0 hours, they traveled a total of 50. kilometers, but during the last hour they traveled only 10. kilometers. What was the group's average speed for the entire trip?

A) 15 km/hr B) 30. km/hr
C) 40. km/hr D) 60. km/hr

8. Car *A*, moving in a straight line at a constant speed of 20. meters per second, is initially 200 meters behind car *B,* moving in the same straight line at a constant speed of 15 meters per second. How far must car *A* travel from this initial position before it catches up with car *B*?

A) 200 m B) 400 m
C) 800 m D) 1000 m

9. As a cart travels around a horizontal circular track, the cart *must* undergo a change in

A) velocity B) inertia
C) speed D) weight

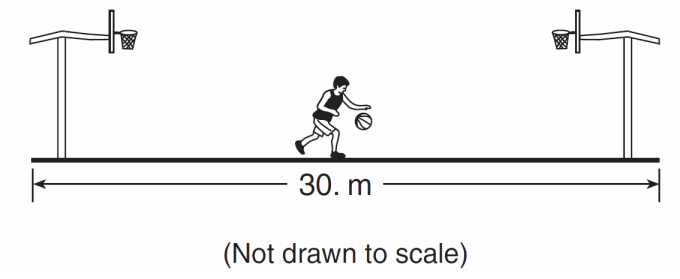
10. Which measurement of an average classroom door is closest to 1 meter?

A) thickness B) width
C) height D) surface area

11. What is the approximate mass of an automobile?

A) 10^1 kg B) 10^2 kg
C) 10^3 kg D) 10^6 kg

12. In a drill during basketball practice, a player runs the length of the 30.-meter court and back. The player does this three times in 60. seconds.

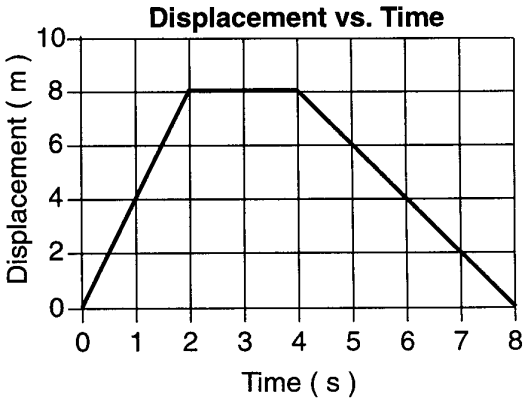


(Not drawn to scale)

The average speed of the player during the drill is

A) 0.0 m/s B) 0.50 m/s C) 3.0 m/s D) 30. m/s

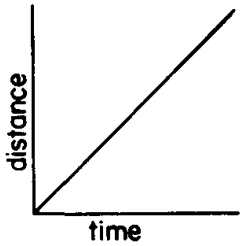
13. Base your answer to the following question on the graph below, which represents the relationship between the displacement of an object and its time of travel along a straight line.



What is the average speed of the object during the first 4.0 seconds?

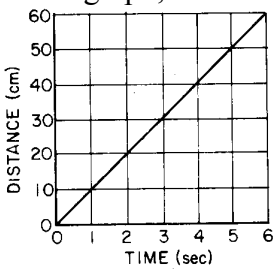
A) 0 m/s B) 2 m/s C) 8 m/s D) 4 m/s

14. The graph below represents the motion of a body that is moving with



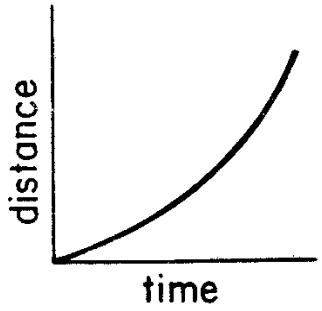
A) increasing acceleration
B) decreasing acceleration
C) increasing speed
D) constant speed

15. The graph represents the motion of a cart. According to the graph, as time increases, the speed of the cart



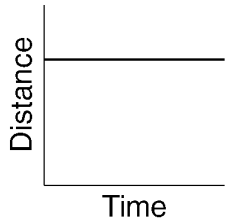
A) decreases B) increases
C) remains the same

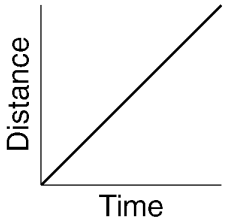
16. The graph below represents the relationship between distance and time for an object moving in a straight line. According to the graph, the object is

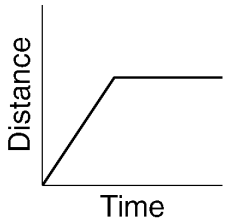


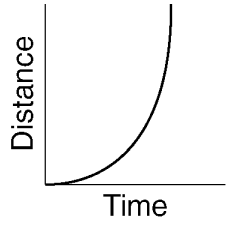
A) motionless
B) moving at a constant speed
C) decelerating
D) accelerating

17. Which graph best represents the motion of a block accelerating uniformly down an inclined plane?

A)


B)


C)


D)


18. A golf ball is propelled with and initial velocity of 60. meter per second at 37º above the horizontal. The horizontal component of the golf ball's initial velocity is

A) 30. m/s B) 36 m/s
C) 40. m/s D) 48 m/s

19. A projectile is fired with an initial velocity of 120 meters per second at an angle, θ, above the horizontal. If the projectile's initial horizontal speed is 55 meters per second, then angle θ measures approximately

A) 13° B) 27° C) 63° D) 75°

20. A golf ball is hit with an initial velocity of 15 meters per second at an angle of 35 degrees above the horizontal. What is the vertical component of the golf ball's initial velocity?

A) 8.6 m/s B) 9.8 m/s
C) 12 m/s D) 15 m/s

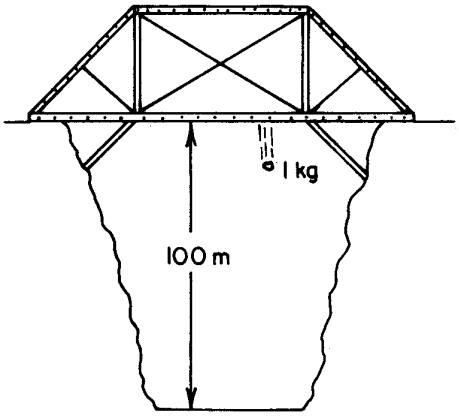
21. Two 20.-newton forces act concurrently on an object. What angle between these forces will produce a resultant force with the greatest magnitude?

A) 0º B) 45º C) 90.º D) 180.º

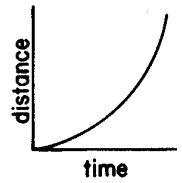
22. A child walks 5.0 meters north, then 4.0 meters east, and finally 2.0 meters south. What is the magnitude of the resultant displacement of the child after the entire walk?

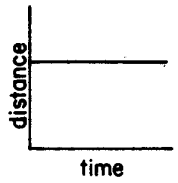
A) 1.0 m B) 5.0 m
C) 3.0 m D) 11.0 m

Base your answers to questions **23** and **24** on the diagram below which shows a 1-kilogram stone being dropped from rest from a bridge 100 meters above a gorge.



23. Which graph of distance traveled versus time represents the motion of the freely falling stone?

A)


B)


C)


D)


24. What will be the kinetic energy of the stone after it has fallen 50 meters?

A) 98 J B) 490 J C) 50 J D) 100 J

25. Base your answer to the following question on the information below.

A stream is 30. meters wide and its current flows southward at 1.5 meters per second. A toy boat is launched with a velocity of 2.0 meters per second eastward from the west bank of the stream.

What is the magnitude of the boat's resultant velocity as it crosses the stream?

A) 0.5 m/s B) 2.5 m/s C) 3.0 m/s D) 3.5 m/s