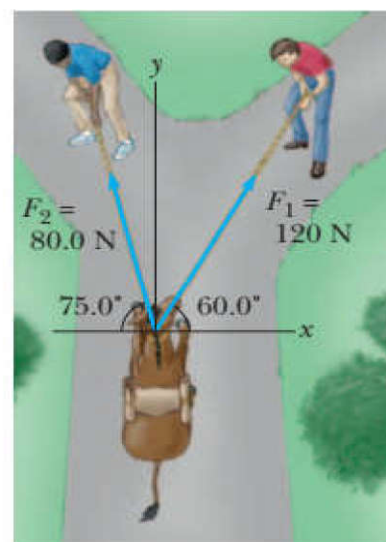


School of Excellence Secondary School
Physics Work sheet Two for grade 11, 2016 E.C

ATTEMPT THE FOLLOWING QUESTIONS ACCORDINGLY

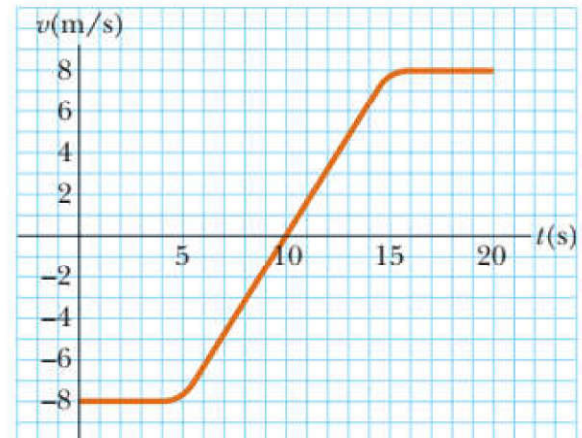
1. Discuss the following basics.
 - A. Uniform motion
 - a. Its graphical representation
 - B. Uniformly accelerated motion
 - a. Its graphical representation
 - C. Vertical motion
 - D. Define the average and instantaneous velocity, are they the same in a certain situation? Explain.
2. A man can row 5 km/h in still water. If the speed of the current is 1 km/hr, it takes 3 h more in upstream than in the downstream for the same distance. The distance is
3. An athlete in his training section undergoes successive displacement of 200m, east, 100m northeast and finally 280m, west in 1 hr.
 - A. What is the total displacement he covered?
 - B. What is his average velocity?
4. The magnitude of two vectors A and B are 12 units and 5 units. What are the possible values of the magnitude of the resultant vector A+B?
5. Let you drop a rock from a cliff. If air resistance is neglected, what will happen to the acceleration and velocity of the rock. If
 - A. It moves upward
 - B. If it moves downward
6. The helicopter view in the Figure to the right shows two people pulling on a stubborn mule. Find
 - A. the single force that is equivalent to the two forces shown and
 - B. the force that a third person would have to exert on the mule to make the net force equal to zero. The forces are measured in units of newtons (N)
7. The position of a particle moving along the x -axis is given by $x = (11 + 14t - 2.0t^2)$, where t is in seconds and x is in meters. Calculate;
 - A. Its position at $t = 1.0$ s to $t = 4.0$ s.
 - B. the average velocity during the time interval from $t = 1.0$ s to $t = 4.0$ s.
 - C. The velocity at $t = 6$ s.
 - D. Its acceleration at $t = 2$ sec.
8. An object moving with a constant acceleration covers 100m in 5sec. It covers 25m during the 5th se. Determine a) the acceleration b) the initial velocity and the c) the distance traveled during the 8th sec.
9. The x and y components of vector A are 4 units and -6 units, respectively. If B is added to A, then the resultant vector has a magnitude of 4 units along the negative x -axis. Determine,
 - A. The x and y components of vector B.
 - B. The magnitude and direction of B.
10. A runner hopes to complete the 10,000-m run in less than 30.0 min. After running at constant speed for exactly 27.0 min, there are still 1200 m to go. The runner must then accelerate at for how many seconds in order to achieve the desired time?
11. A car accelerates uniformly from rest to a speed of 72 km/h in 8.0 s. (a) Find the acceleration of the car. (b) Find the distance the car travels. (c) If the car brakes to



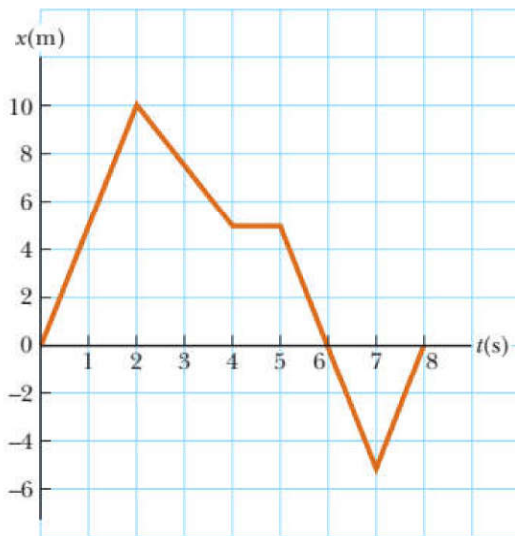
School of Excellence Secondary School
Physics Work sheet Two for grade 11, 2016 E.C

a stop over a distance of 50 m, then find its uniform deceleration.

12. The velocity vs. time graph for an object moving along a straight path is shown in the Figure to the right



- A. Find the average acceleration of the object during the time intervals 0 to 5.0 s, 5.0 s to 15 s, and 0 to 20 s.
- B. Find the instantaneous acceleration at 2.0 s, 10 s, and 18 s.
- C. Plot a graph of the acceleration versus time.

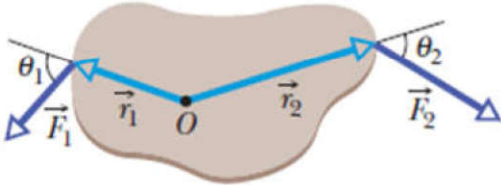


13. A graph of position versus time for a certain particle moving along the x -axis is shown in Figure to the left. Find the average velocity in the time intervals from

- A. 0 to 2.00 s,
- B. 0 to 4.00 s,
- C. 2.00 s to 4.00 s,
- D. 4.00 s to 7.00 s, and
- E. 0 to 8.00 s.

14. A car, initially at rest, is given a uniform acceleration of a 0.5 m/s^2 for 20 s. The car then moves with uniform velocity for 20 s. Brakes are then applied and the car is brought to rest in 10 s. Find the total distance covered by the car
15. A car is travelling from 20 m/s accelerates uniformly with 2 m/s^2 . If the car moves for 8 sec. What is the distance covered in the last two seconds?
16. A car travels along a straight line at a constant speed of 20 m/s for a distance d and takes another distance d in the same direction at a constant speed of 36 km/hr . What is the average speed for the entire trip?
17. A race car is moving at a constant speed of 35 m/s . A security car was moving at a speed of 5 m/s as the race car passes by it and was accelerating at a constant rate of 5 m/s^2 . What was the speed of the security car when it took over the race car?
18. A car starting from rest is accelerated at constant rate until it attains a constant speed, v . It is then retarded at a constant rate until it comes to rest. Considering that the car moves with constant speed for half of the time of total journey, the average speed of the car for the journey is
19. A racing car is moving on a circular track at a constant speed of 25 m/s . It takes $20\pi \text{ s}$ to complete one loop. The magnitude of centripetal acceleration of the car will be approximately
20. An object is thrown vertically upward and has a speed of 20.0 m/s when it reaches two thirds of its maximum height above the launch point. Determine its maximum height.

School of Excellence Secondary School
Physics Work sheet Two for grade 11, 2016 E.C

21. Two train cars are on a straight, horizontal track. One car starts at rest and is put in motion with a constant acceleration of 2.00 m/s^2 . This car moves toward a second car that is 30.0 m away and moving at a constant speed of 4.00 m/s.
- Where will the cars collide?
 - How long will it take for the cars to collide?
22. A particle is moving on a circular path of 10 m radius. At any instant of time, its speed is 5 m/s and the speed is increasing at a rate of 2m/s^2 . The magnitude of net acceleration at this instant is
23. Calculate the maximum speed with which a car can be driven safely along a curved road of a radius of 30m and banked at an angle of 30° with the horizontal. (take $g = 9.8\text{m/s}^2$).
24. Find the banking angle of the railway track with a radius of curvature of 1500m. If the train's maximum speed is 15m/s. If the distance between the two tracks is 1.8m, calculate the elevation of the outer track over the inner track.
25. A stone strikes the ground with a speed of 25 m/s. (a) From what height was it released? (b) How long was it falling? (c) If the stone is thrown down with a speed of 10 m/s from the same height, then what will be its speed just before hitting the ground?
26. A 0.525 kg ball is attached to a 1.25 m string and swings in a circular path. The angle of the string away from vertical is 30° . Find the centripetal force acting on the ball and the speed of the ball.
27. The body in the Fig below is pivoted at O, and two forces act on it as shown. If $r_1 = 1.30 \text{ m}$, $r_2 = 2\text{m}$, $F_1 = 4 \text{ N}$, $F_2 = 5\text{N}$, $\theta_1 = 75^\circ$ and $\theta_2 = 60^\circ$. What is the net torque about the pivot.
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28. Three-point masses, each of mass m , are placed at the corners of an equilateral triangle of side L . Find the moment of inertia of the system about an axis passing through one of the corners perpendicular to the plane of the triangle.
29. A disc with moment of inertia 2 kgm^2 changes its angular speed from 3 rad/s to 8rad/s by a net torque of 50 Nm . How long will the disc take to change its angular speed?
30. Two objects are attracted to each other by a gravitational force F . If the distance between the objects is doubled, what is the new gravitational force between the objects in terms of F .
31. A planet has twice the density of earth but the acceleration due to gravity on its surface is exactly the same as on the surface of earth. Its radius in terms of earth's radius R will be;
32. An automobile traveling at 80.0 km/h has tires of 75.0 cm diameter. If the car is brought to a stop uniformly in 300.0 complete turns of the tires (without skidding), what is the magnitude of the angular acceleration of the wheels?
33. A wheel has a constant angular acceleration of 3 rad/s^2 . During a 4 s interval, it turns through an angle of 60 rad . If the wheel started from rest, how long has it been in motion before the start of this 4 s interval?
34. The mass of planet Jupiter is $1.9 \times 10^{27} \text{ kg}$ and that of the Sun is $1.99 \times 10^{30} \text{ kg}$. The mean distance of Jupiter from the Sun is $7.8 \times 10^{11} \text{ m}$. Calculate the gravitational force which Sun exerts on Jupiter. Assuming that Jupiter moves in circular orbit around the Sun, also calculate the speed of Jupiter. $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$.