Average velocity-1

Friday, 29 January, 2021 21:33

A motorist drives south at $20\,m/s$ for $3min.$, then turns west and travels at $25\,m/s$ for $2min.$, and finally travels northwest at $30\,m/s$ for $1min.$. For this $6min.$ trip, find:

- the total vector displacement,
- the average speed
- the average velocity.

Average velocity-2

Saturday, 30 January, 2021 12:22

A man walks (30 m) east for (20 s) and then (40 m) north for (30 s). Determine the magnitude of the average velocity during this trip.

Average acceleration

Saturday, 30 January, 2021 12:22

A car is traveling east at (60 km/h), it rounds a curve and after (5 s), it is traveling north at the same speed. Find the average acceleration of the car.

Position, velocity and acceleration-1

Saturday, 30 January, 2021 12:23

A particle moves over a path such that the components of its position with respect to the origin are given as a function of time by:

$x = -t^2 + 12t + 5$

$y = -2t^2 + 16\,t + 10$

where t is in seconds and x and y are in meters.

- Find the particle's position vector as a function of time, and find its magnitude and direction at $t = 6s$.
- Find the particle's velocity vector as a function of time, and find its magnitude and direction at $t = 6s$.
- Find the particle's acceleration vector a as a function of time, and find its magnitude and direction at $t = 6s$.
- The velocity during the time interval $(t = 0s)$ to $(t = 6s)$
- The acceleration during the time interval $(t = 0s)$ to $(t = 1s)$

Position, velocity and acceleration-2

Saturday, 30 January, 2021 12:23

The position of a particle moving in the x-y plane is given by:
$\vec{r}(t) = (2t + 5t^2)\hat{\imath} + (t - 2t^2)\hat{\jmath}$, where (t) is in (s) and (r) is in (m).
Find:

- The velocity during the time interval $(t = 0s)$ to $(t = 1s)$
- The velocity at $(t = 1s)$
- The acceleration during the time interval $(t = 0s)$ to $(t = 1s)$
- The acceleration at $(t = 1s)$

Motion in a Plane

Saturday, 30 January, 2021 12:24

A particle moves in the xy plane, starting from the origin at $t = 0$ with an initial velocity having an x component of $20\ m/s$ and a y component of $-15\ m/s$. The particle experiences an acceleration in the x direction, given by $a_x = 4\ m/s^2$.

- Determine the total velocity vector at any time.
- Calculate the velocity and speed of the particle at $t = 5\ s$, and the angle the velocity vector makes with the x axis.
- Determine the position vector of the particle at any time (t) and its position vector at $t = 5\ s$.

Saturday, 30 January, 2021 12:24

A particle initially located at the origin has an acceleration $\vec{a} = 3\hat{j}\ m/s^2$ and an initial velocity of $\vec{v} = 5\hat{\imath}\ m/s$. Find:

- the vector position of the particle at any time t
- the velocity of the particle at any time t
- the coordinates of the particle at $t = 2s$,
- the speed of the particle at $t = 2s$.

Projectile Motion

Saturday, 30 January, 2021 12:25

A long jumper leaves the ground at an angle of (20°) above the horizontal and at a speed of (11 m/s).

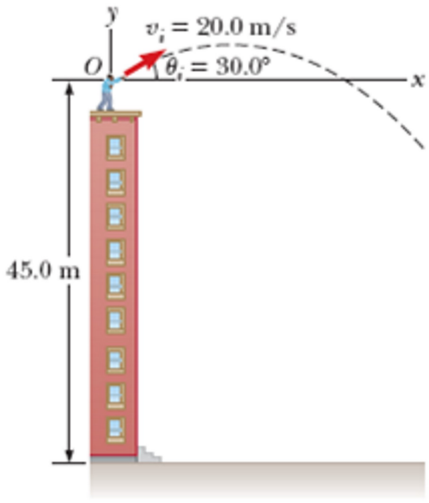
- How far does he jump in the horizontal direction?
- What is the maximum height reached?

That's Quite an Arm!

Saturday, 30 January, 2021 12:25

A stone is thrown from the top of a building upward at an angle of 30° to the horizontal with an initial speed of $20\ m/s$ as shown. The height from which the stone is thrown is $45\,m$ above the ground.

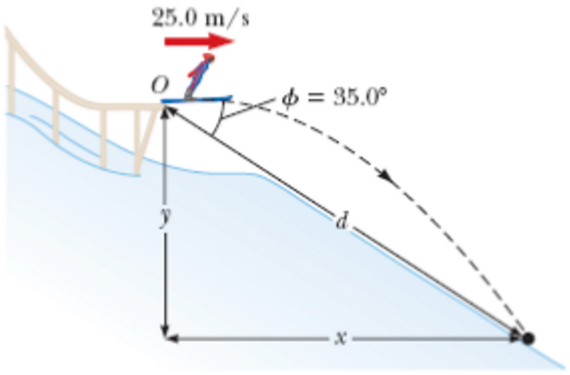
- How long does it take the stone to reach the ground?
- What is the speed of the stone just before it strikes the ground?



The End of the Ski Jump

Saturday, 30 January, 2021 12:26

A ski jumper leaves the ski track moving in the horizontal direction with a speed of $25\ m/s$ as shown. The landing incline below her falls off with a slope of 35°. Where does she land on the incline?



The Centripetal Acceleration of the Earth

Saturday, 30 January, 2021 12:28

What is the centripetal acceleration of the Earth as it moves in its orbit around the Sun?

The Centripetal Acceleration

Saturday, 30 January, 2021 12:28

An object moves at constant speed along a circular path in a horizontal xy plane, with the center at the origin .When the object is at $x = -2\,m$, its velocity is $(-4\ m/s)\,\hat{j}$. Give the object's velocity and acceleration at $y = 2\,m$.

Over the Rise

Saturday, 30 January, 2021 12:29

A car leaves a stop sign and exhibits a constant acceleration of $0.3\ m/s^2$ parallel to the roadway. The car passes over a rise in the roadway such that the top of the rise is shaped like a circle of radius $500\,m$. At the moment the car is at the top of the rise, its velocity vector is horizontal and has a magnitude of $6\ m/s$. What are the magnitude and direction of the total acceleration vector for the car at this instant?