

Use the formula $\text{Work} = \|F\| \|d\| \cos\theta$ to find the work done by the force F , with given magnitude and direction, in moving an object the given distance at the given angle.

(F is the force vector, d is the direction/distance vector, θ is the angle between F and d)

1. a wagon is being pulled with a force of 20 lbs. on a flat surface at a 15° angle for 60 feet.
2. a box weighing 40 lbs is being pushed up a 10° ramp 100 feet long.

Draw a figure to solve each of the following problems on a inclined plane.

3. What is the weight of a car sitting on a 14° slope if the force required to push the car up the hill is 750 pounds?
4. What is the force required to push a 40 pound lawn mower up a hill inclined at 8° ?
5. A 3000 pound car is sitting on a 12° slope. Find the magnitude of the force required to push the car up the slope (parallel) and the magnitude of the force holding the car on the slope (perpendicular)?

Solve each of the following using vectors.

6. Two forces of 692 N and 423 N acts at a point. The resultant force is 786 N. Find the angle between the forces.
7. A crate is supported by two ropes. One rope makes an angle of 46° with horizontal and has a tension of 89.6 lbs on it. The other rope is horizontal. Find the weight of the crate and the tension (force) on the horizontal rope.
8. Two tugboats are pulling a disabled speed boat into port with forces of 1240 lbs. and 1480 lbs. The angle between these forces is 28.2° . Find the direction and magnitude of the resultant.
9. Dusty Crophopper is travelling at a bearing of $N40^\circ E$ at 175 mph. A headwind is blowing at a bearing of $S10^\circ E$ at 20 mph. What is Dusty's actual speed?



10. On another leg of the Wings Across the Globe race, Dusty red-lines it back up to 190 mph. Traveling at a bearing of $S30^\circ E$ he catches a tailwind blowing at $S15^\circ E$ with a strength of 30 mph.

- (a) How fast is Dusty actually going?
- (b) What are his actual bearings?

