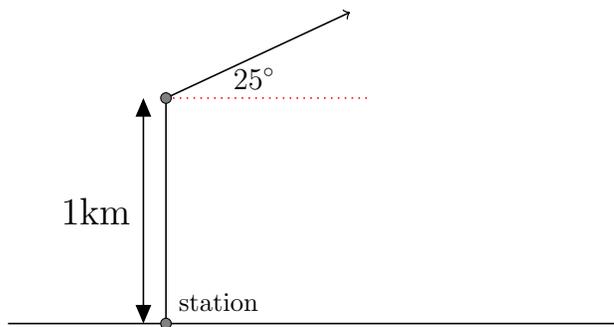
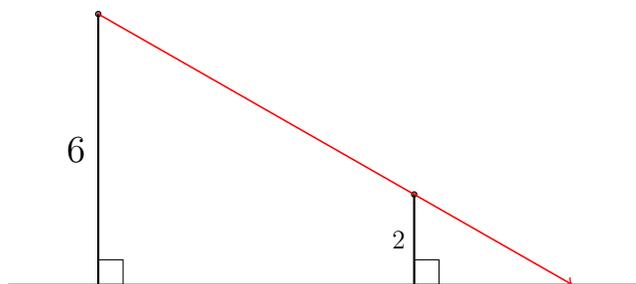


Related Rates Problems:

1. Tom and Jerry start at the same location. Tom is travelling due east at a velocity of 5 m/hr. Jerry is travelling due northwest at a velocity of 6 m/hr. After 1 hour, how fast is the distance between them changing?
2. The hour hand of a clock is 10 meters long and the minute hand of a clock is 12 meters long. At 4 o'clock, how fast is the distance between the two hands changing?
3. Air is being pumped into a spherical balloon at a rate of $4 \text{ m}^3/\text{hour}$. How fast is the radius of the balloon changing after 10 m^3 of air has been pumped into the balloon?
4. A plane flying with a constant speed of 100 m/s passes over a station directly below it at an altitude of 1 km and the plane is climbing at a 25° angle. How fast is the distance between the station and the plane changing one minute after?

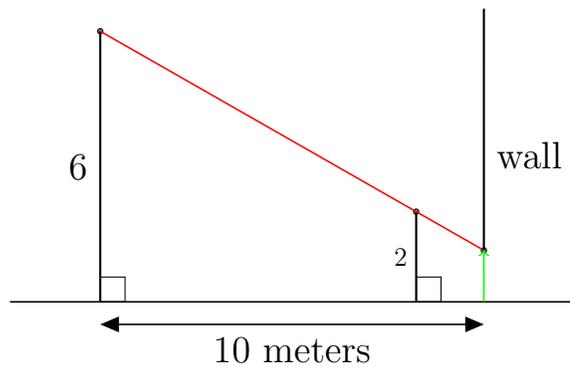


5. The radius of a circle is increasing at a rate of 10 m/s . How fast is the area of the circle increasing at the moment when the radius is 150 meters?
6. A light pole 6 meters tall has a light on the top of the pole. A person 2 meters tall is walking away from this pole at a rate of 0.6 meter per second, and the light casts a shadow of the person on the ground (in front of the the person). At the moment when the person is 10 meters from the light pole,



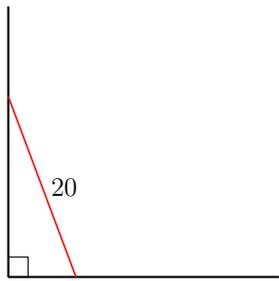
- a. how fast is the tip of the shadow moving away from the light pole?
 - b. how fast is the length of the shadow changing?
7. Same condition as previous problem, but this time there's a wall 10 meters away from the light pole, and the person is walking toward the wall at a rate of 0.6 m/s . At the point when the person is 2 meters from the wall, the light also casts a shadow of the person on the wall. How fast is the tip of the shadow

moving up the wall at this point?



8. Two people are 100 meters apart horizontally. The first person walks toward north at a rate of 0.8 m/s. 1 minute after the first person started, the second person walks toward south at a rate of 0.6 m/s. How fast is the distance between the two people changing 2 minutes after the first person started?

9. A ladder 20 meters tall is placed against a wall and the bottom starts slipping away from the wall at a rate of 0.2m/s. At the moment when the bottom is 6 meters from the wall,



- how fast is the top of the ladder dropping from the wall?
 - how fast is the area of the triangle (formed by the ladder, the ground, and the wall) changing?
 - how fast is the slope of the ladder (viewing the ground as the x -axis and the wall as the y -axis) changing?
10. A particle is moving around the unit circle centered at the origin with an angular velocity of 2π per second. How fast is the distance between the particle and the point $(2, 0)$ changing when the particle is at $(0, 1)$?