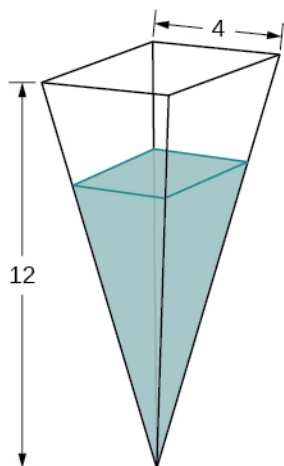


31. A tank is shaped like an upside-down square pyramid, with base of 4 m by 4 m and a height of 12 m (see the following figure). How fast does the height increase when the water is 2 m deep if water is being pumped in at a rate of $\frac{2}{3}$ m/sec?



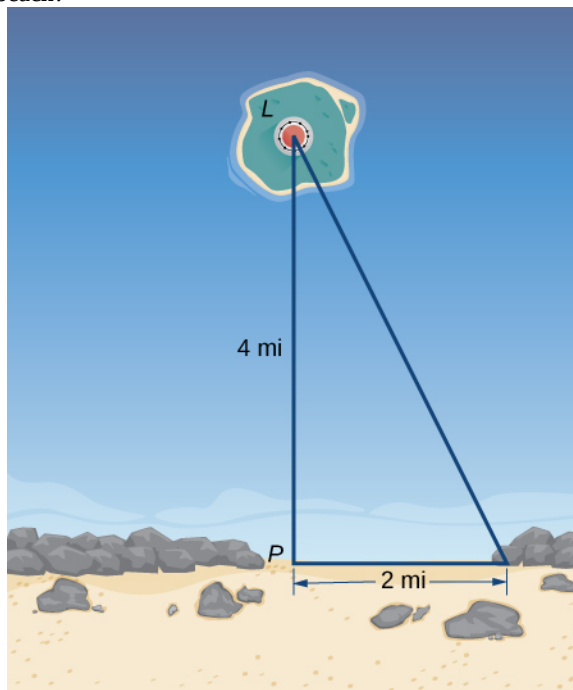
For the following problems, consider a pool shaped like the bottom half of a sphere, that is being filled at a rate of 25 ft³/min. The radius of the pool is 10 ft.

32. Find the rate at which the depth of the water is changing when the water has a depth of 5 ft.
33. Find the rate at which the depth of the water is changing when the water has a depth of 1 ft.
34. If the height is increasing at a rate of 1 in./sec when the depth of the water is 2 ft, find the rate at which water is being pumped in.
35. Gravel is being unloaded from a truck and falls into a pile shaped like a cone at a rate of 10 ft³/min. The radius of the cone base is three times the height of the cone. Find the rate at which the height of the gravel changes when the pile has a height of 5 ft.
36. Using a similar setup from the preceding problem, find the rate at which the gravel is being unloaded if the pile is 5 ft high and the height is increasing at a rate of 4 in./min.

For the following exercises, draw the situations and solve the related-rate problems.

37. You are stationary on the ground and are watching a bird fly horizontally at a rate of 10 m/sec. The bird is located 40 m above your head. How fast does the angle of elevation change when the horizontal distance between you and the bird is 9 m?
38. You stand 40 ft from a bottle rocket on the ground and watch as it takes off vertically into the air at a rate of 20 ft/sec. Find the rate at which the angle of elevation changes when the rocket is 30 ft in the air.

39. A lighthouse, L , is on an island 4 mi away from the closest point, P , on the beach (see the following image). If the lighthouse light rotates clockwise at a constant rate of 10 revolutions/min, how fast does the beam of light move across the beach 2 mi away from the closest point on the beach?



40. Using the same setup as the previous problem, determine at what rate the beam of light moves across the beach 1 mi away from the closest point on the beach.
41. You are walking to a bus stop at a right-angle corner. You move north at a rate of 2 m/sec and are 20 m south of the intersection. The bus travels west at a rate of 10 m/sec away from the intersection – you have missed the bus! What is the rate at which the angle between you and the bus is changing when you are 20 m south of the intersection and the bus is 10 m west of the intersection?

For the following exercises, refer to the figure of baseball diamond, which has sides of 90 ft.

