The base of an 8 foot tall upright cone has a radius of 4 feet. If water is entering the cone at 6 ft^3 per minute, how quickly is the water level rising when the water is at a height of 4 feet ?

STEP [1] Draw a diagram.

STEP [2] What quantity/quantities do you know the rate of change information for ?

_____ = _____ AND $\frac{d}{dt}$ = _____ _____

variable name of quantity | description of quantity | rate of change | units of rate of change

STEP [3] What quantity do you want the rate of change information for ? Under what circumstances ?

_____ = _____

variable name of quantity | description of quantity

WANT $\frac{d}{dt}$ WHEN _____ = _____ _____

variable name | amount | units

STEP [4] What equation connects the variables/quantities in [2] and [3] above ?

STEP [5] Differentiate the equation in [4] implicitly with respect to time (ie. $\frac{d}{dt}$).

Remember that the variables in the equation in [4] are actually functions of time.

STEP [6] Substitute all known values and units into the derivative equation in [5].

STEP [7] Solve for the desired rate of change.

A lighthouse is located 1/2 mile offshore from a beach. The beacon in the lighthouse makes 1 full rotation every 15 seconds. How fast is the spot of light on the beach moving when it is 1 mile from the lighthouse ?

STEP [1] Draw a diagram.

STEP [2] What quantity/quantities do you know the rate of change information for ?

_____ = _____ AND _d___ = _____ _____
variable name of quantity | description of quantity | dt | rate of change | units of rate of change

STEP [3] What quantity do you want the rate of change information for ? Under what circumstances ?

_____ = _____
variable name of quantity | description of quantity

WANT _d___ WHEN _____ = _____ _____
dt | variable name | amount | units

STEP [4] What equation connects the variables/quantities in [2] and [3] above ?

STEP [5] Differentiate the equation in [4] implicitly with respect to time (ie. $\frac{d}{dt}$).

Remember that the variables in the equation in [4] are actually functions of time.

STEP [6] Substitute all known values and units into the derivative equation in [5].

STEP [7] Solve for the desired rate of change.

A spotlight sits on the floor, facing a wall 12 feet away. You are 6 feet tall, and you move from the wall towards the light at 2 feet per second. How quickly is your shadow on the wall growing when you are 4 feet from the wall ?

STEP [1] Draw a diagram.

STEP [2] What quantity/quantities do you know the rate of change information for ?

_____ = _____ AND $\frac{\_d\_}{dt}$ = _____ _____
variable name of quantity | description of quantity | rate of change | units of rate of change

STEP [3] What quantity do you want the rate of change information for ? Under what circumstances ?

_____ = _____
variable name of quantity | description of quantity

WANT $\frac{\_d\_}{dt}$ WHEN _____ = _____ _____
variable name | amount | units

STEP [4] What equation connects the variables/quantities in [2] and [3] above ?

STEP [5] Differentiate the equation in [4] implicitly with respect to time (ie. $\frac{d}{dt}$).

Remember that the variables in the equation in [4] are actually functions of time.

STEP [6] Substitute all known values and units into the derivative equation in [5].

STEP [7] Solve for the desired rate of change.

A 6 foot statue stands on a 4 foot pedestal. A snake is slithering along the ground towards the statue at 2 feet per second. How quickly is the snake's viewing angle (the angle from the top of the statue to the snake to the bottom of the statue) changing when it is 8 feet from the statue ?

STEP [1] Draw a diagram.

STEP [2] What quantity/quantities do you know the rate of change information for ?

_____ = _____ AND $\frac{d}{dt}$ = _____ _____
variable name of quantity | description of quantity | rate of change | units of rate of change

STEP [3] What quantity do you want the rate of change information for ? Under what circumstances ?

_____ = _____
variable name of quantity | description of quantity

WANT $\frac{d}{dt}$ WHEN _____ = _____ _____
variable name | amount | units

STEP [4] What equation connects the variables/quantities in [2] and [3] above ?

STEP [5] Differentiate the equation in [4] implicitly with respect to time (ie. $\frac{d}{dt}$).

Remember that the variables in the equation in [4] are actually functions of time.

STEP [6] Substitute all known values and units into the derivative equation in [5].

STEP [7] Solve for the desired rate of change.