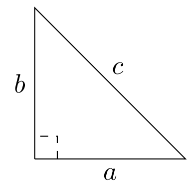
MATH 1210
RELATED RATES WORKSHEET

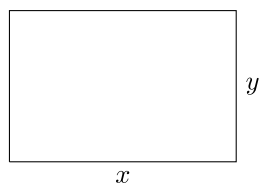
Some Useful Geometric Facts for Common Related Rates Problems

Pythagorean Theorem.



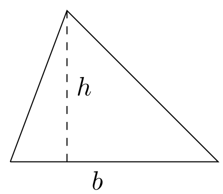
Pythagorean Theorem: $a^2 + b^2 = c^2$

Area, Perimeter, Circumference Formulas.

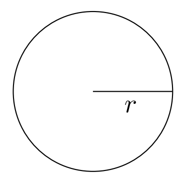


$Area = xy$

$Perimeter = 2x + 2y$



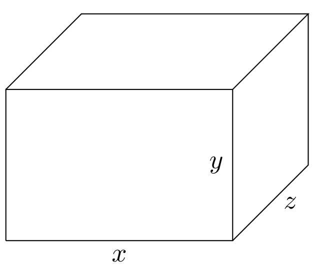
$Area = \frac{1}{2}bh$



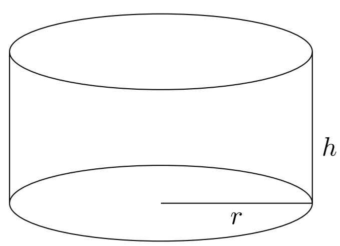
$Area = \pi r^2$

$Circumference = 2\pi r$

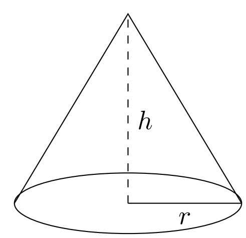
Volume Formulas.



$Volume = xyz$



$Volume = \pi r^2 h$



$Volume = \frac{1}{3}\pi r^2 h$

General Guidelines for Solving Related Rates Problems

(1) Assign a variable to each quantity. Draw a diagram if applicable.

(2) Write down what we are trying to find as well as the given values of the variables and the given rates of change.

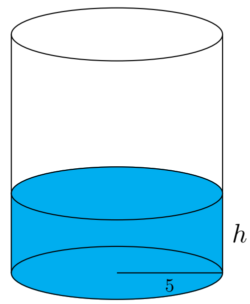
(3) Write down any equation(s) that relate the variables.

(4) Implicitly differentiate equation(s).

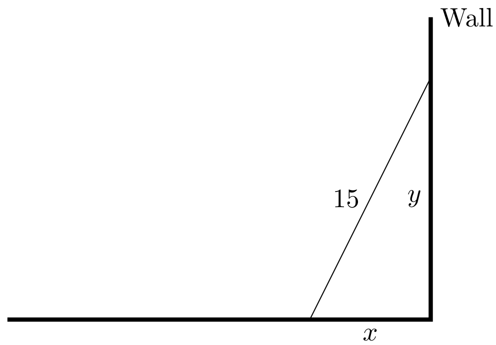
(5) Solve for desired rate of change. Then state the final answer and remember to include units.

Related Rates Examples.

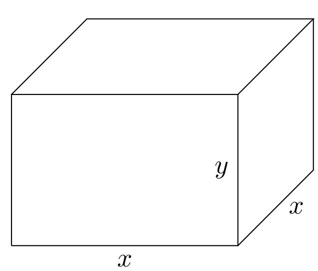
(1) Webassign 3.6 # 11. A coffee pot in the form of a circular cylinder of radius 5 in. is being filled with water flowing at a constant rate. If the water level is rising at the rate of 0.7 in./sec, what is the rate at which water is flowing into the coffee pot? (Round your answer to one decimal place.)



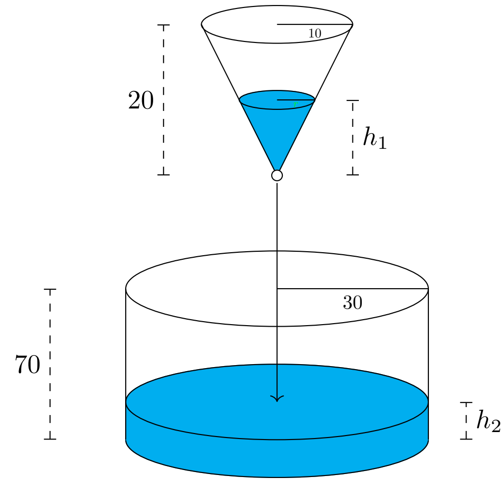
(2) Webassign 3.6 # 12. A 15-ft ladder leaning against a wall begins to slide. How fast is the top of the ladder sliding down the wall at the instant of time when the bottom of the ladder is 9 ft from the wall and sliding away from the wall at the rate of 6 ft/sec?



(3) Suppose we have a constantly changing rectangular box with fixed volume of 100 in^3 and a square base where the sides of the base are increasing by 5 inches every second. If this necessarily flexible material costs $\$10, \$20$, and $\$30$ per square inch, for the top, bottom, and sides, respectively, then find the rate of change of the cost when the sides of the base are 10 inches.



(4) Suppose that water is flowing out of a hole at the bottom of a cone into a cylinder located below the bottom of the cone. Suppose that the height of the water in the cone is decreasing at a constant rate of 2 cm/sec. The cone has radius 10 cm and height 20 cm. The cylinder has radius 30 cm and height 70 cm. For simplicity, assume that as soon as water leaves the hole of the cone it instantaneously goes into the cylinder. In other words, it takes 0 time for the water to fall from the hole into the cylinder. What is the rate of change of the height of the water in the cylinder when the height of the water in the cone is 4 cm? See the next page for a picture. **(Hint: Use Similar Triangles)**



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