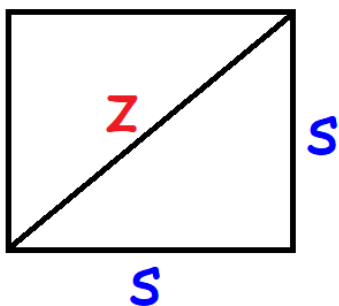


Related Rates – Formula Sheet:

The Square:



Area:

$$A = s^2$$

$$\frac{dA}{dt} = 2s \frac{ds}{dt}$$

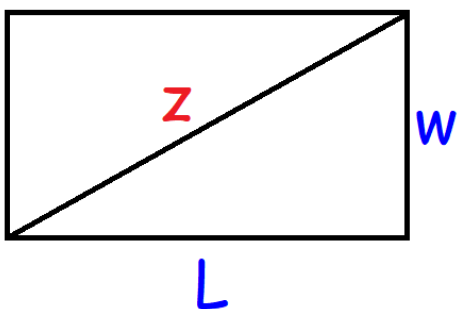
Perimeter:

$$P = 4s$$

Diagonal Length:

$$z^2 = 2s^2$$

The Rectangle:



Area:

$$A = lw$$

Perimeter:

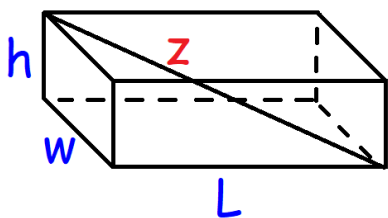
$$P = 2l + 2w$$

Diagonal Length:

$$z^2 = l^2 + w^2$$

$$2z \frac{dz}{dt} = 2l \frac{dl}{dt} + 2w \frac{dw}{dt}$$

The Rectangular Prism:



Volume:

$$V = lwh$$

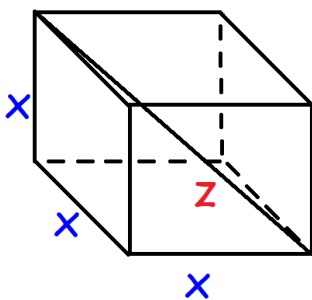
Surface Area:

$$SA = 2lw + 2lh + 2wh$$

Diagonal Length:

$$z^2 = l^2 + w^2 + h^2$$

The Cube:



Volume:

$$V = x^3$$

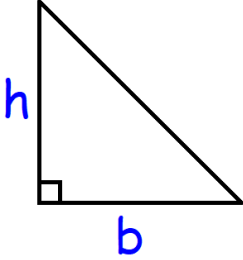
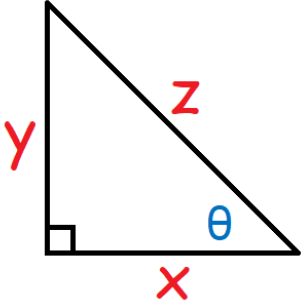
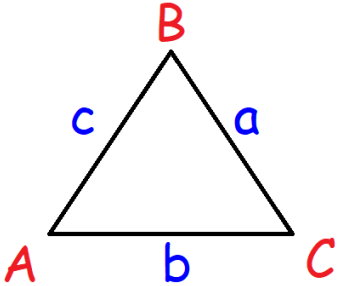
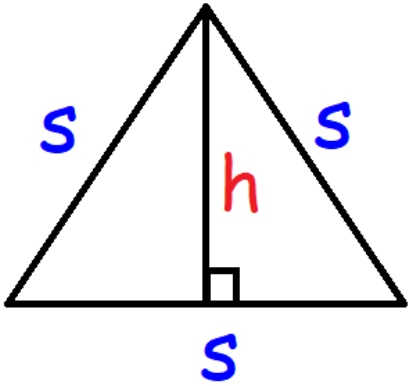
$$\frac{dV}{dt} = 3x^2 \frac{dx}{dt}$$

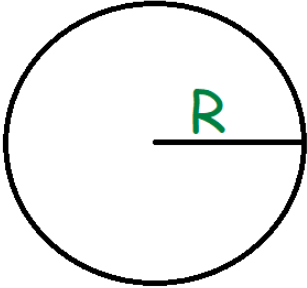
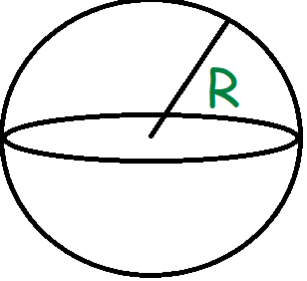
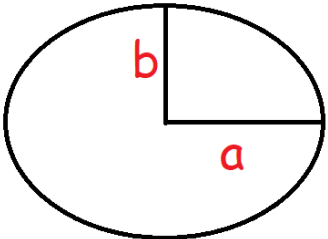
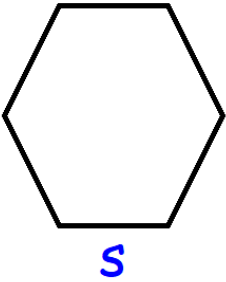
Surface Area:

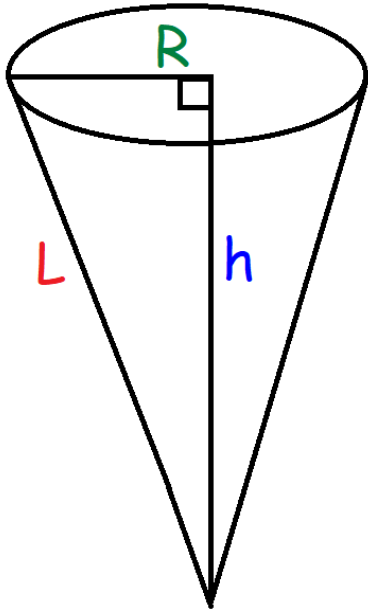
$$SA = 6x^2$$

Diagonal Length:

$$z^2 = 3x^2$$

The Right Triangle: 	Area: $Area = \frac{1}{2}bh$ $\frac{dA}{dt} = \frac{1}{2} \left(b \frac{dh}{dt} + h \frac{db}{dt} \right)$
The Pythagorean Theorem: 	Side Lengths: $z^2 = x^2 + y^2$ $2z \frac{dz}{dt} = 2x \frac{dx}{dt} + 2y \frac{dy}{dt}$ The Angle of Elevation: $\sin \theta = \frac{y}{z} \quad \cos \theta = \frac{x}{z} \quad \tan \theta = \frac{y}{x}$
The Scalene Triangle: 	Area: $A = \frac{1}{2} ab \sin C$ If 'a' and 'b' are constant: $\frac{dA}{dt} = \frac{1}{2} ab \cos C \frac{dC}{dt}$
The Equilateral Triangle: 	Area: $A = \frac{\sqrt{3}}{4} s^2 \quad A = \frac{1}{2} sh$ $\frac{dA}{dt} = \frac{\sqrt{3}}{4} (2s) \frac{ds}{dt}$ $\frac{dA}{dt} = \frac{1}{2} \left(s \frac{dh}{dt} + h \frac{ds}{dt} \right)$ The Height: $h = \frac{\sqrt{3}}{2} s$

The Circle:  A diagram of a circle with a horizontal radius line extending from the center to the right edge. The radius is labeled with a green 'R'.	Circumference: $C = 2\pi R$ Diameter: $d = 2R$ The Area: $A = \pi R^2$ $\frac{dA}{dt} = \pi(2R) \frac{dR}{dt}$
The Sphere:  A diagram of a sphere with a radius line extending from the center to the top edge. The radius is labeled with a green 'R'.	The Volume: $V = \frac{4}{3}\pi R^3$ $\frac{dV}{dt} = \frac{4}{3}\pi(3R^2) \frac{dR}{dt}$ Surface Area: $SA = 4\pi R^2$
The Ellipse:  A diagram of an ellipse with a horizontal semi-major axis labeled 'a' and a vertical semi-minor axis labeled 'b'.	The Area: $A = \pi ab$ $\frac{dA}{dt} = \pi \left(a \frac{db}{dt} + b \frac{da}{dt} \right)$
The Hexagon:  A diagram of a regular hexagon with a side length labeled with a blue 's'.	The Area: $A = \frac{3\sqrt{3}}{2}s^2$ $\frac{dA}{dt} = \frac{3\sqrt{3}}{2}(2s) \frac{ds}{dt}$ The Perimeter: $P = 6s$ $\frac{dP}{dt} = 6 \frac{ds}{dt}$

The Cone:**Volume:**

$$V = \frac{1}{3}\pi R^2 h$$

$$\frac{dV}{dt} = \frac{1}{3}\pi \left(2R \frac{dR}{dt} h + R^2 \frac{dh}{dt} \right)$$

Lateral Surface Area:

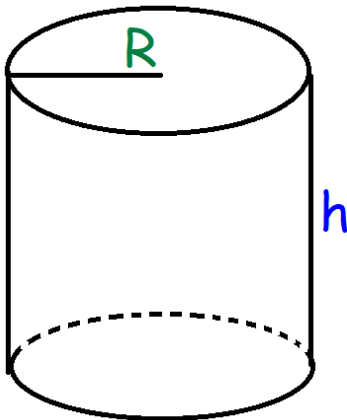
$$LA = \pi R l$$

Surface Area:

$$SA = \pi R l + \pi R^2$$

The Slant Height:

$$l^2 = R^2 + h^2$$

The Cylinder:**Volume:**

$$V = \pi R^2 h$$

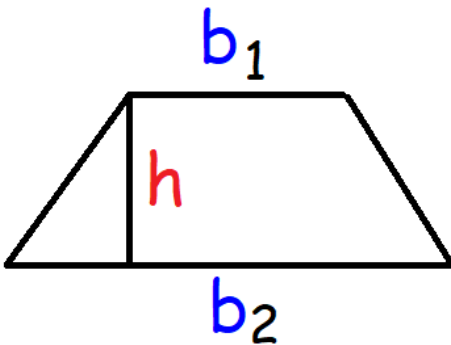
$$\frac{dV}{dt} = \pi \left(2R \frac{dR}{dt} h + R^2 \frac{dh}{dt} \right)$$

Lateral Surface Area:

$$LA = 2\pi R h$$

Surface Area:

$$SA = 2\pi R h + 2\pi R^2$$

The Trapezoid:**Area:**

$$A = \frac{1}{2}(b_1 + b_2)h$$