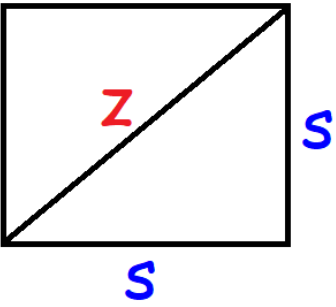
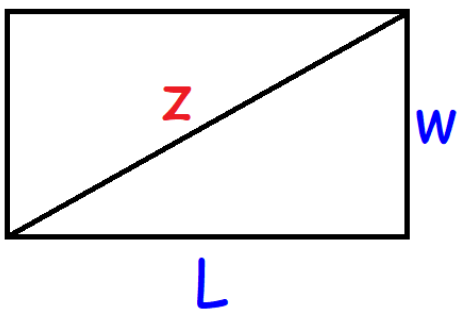
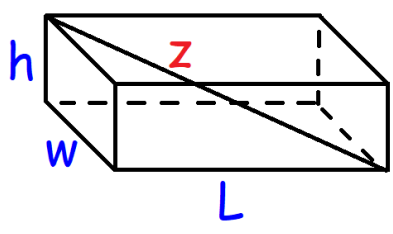
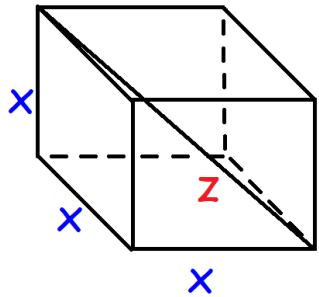
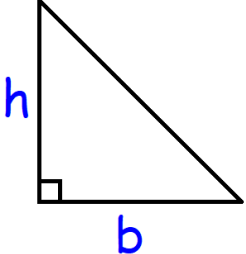
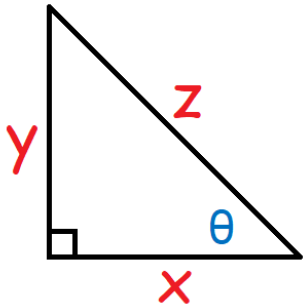
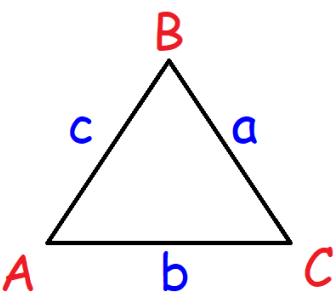
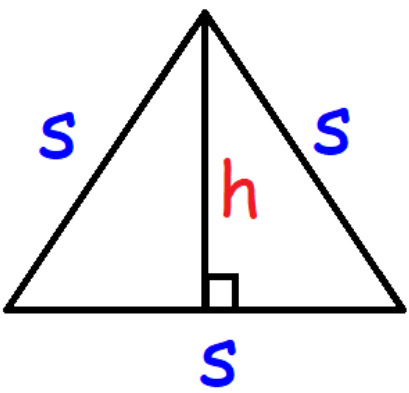
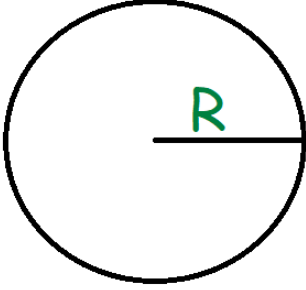
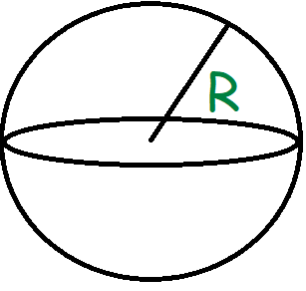
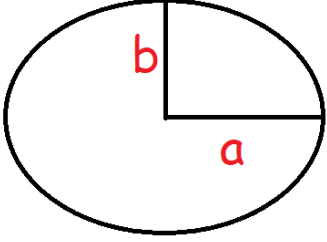
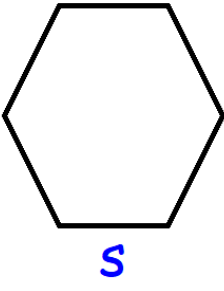


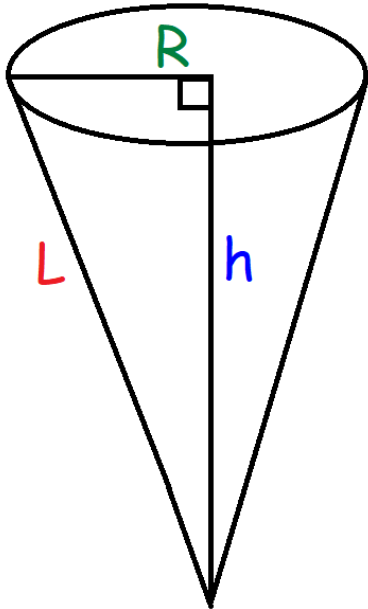
Related Rates – Formula Sheet:

<p style="text-align: center;">The Square:</p>  <p style="text-align: center;">A square with side length s and diagonal length z.</p>	<p>Area:</p> $A = s^2$ $\frac{dA}{dt} = 2s \frac{ds}{dt}$ <p>Perimeter:</p> $P = 4s$ <p>Diagonal Length:</p> $z^2 = 2s^2$
<p style="text-align: center;">The Rectangle:</p>  <p style="text-align: center;">A rectangle with length l, width w, and diagonal length z.</p>	<p>Area:</p> $A = lw$ <p>Perimeter:</p> $P = 2l + 2w$ <p>Diagonal Length:</p> $z^2 = l^2 + w^2$ $2z \frac{dz}{dt} = 2l \frac{dl}{dt} + 2w \frac{dw}{dt}$
<p style="text-align: center;">The Rectangular Prism:</p>  <p style="text-align: center;">A rectangular prism with length l, width w, height h, and diagonal length z.</p>	<p>Volume:</p> $V = lwh$ <p>Surface Area:</p> $SA = 2lw + 2lh + 2wh$ <p>Diagonal Length:</p> $z^2 = l^2 + w^2 + h^2$
<p style="text-align: center;">The Cube:</p>  <p style="text-align: center;">A cube with side length x and diagonal length z.</p>	<p>Volume:</p> $V = x^3$ $\frac{dV}{dt} = 3x^2 \frac{dx}{dt}$ <p>Surface Area:</p> $SA = 6x^2$ <p>Diagonal Length:</p> $z^2 = 3x^2$

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

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

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:

$$LA = \pi R L$$

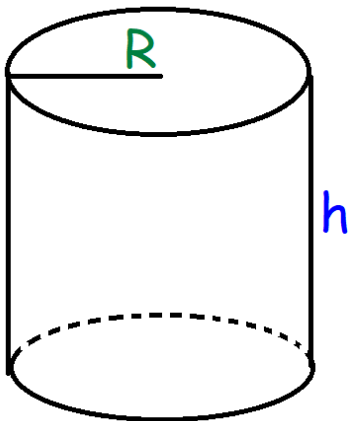
Surface Area:

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

The Slant Height:

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

The Cylinder:



Volume:

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

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

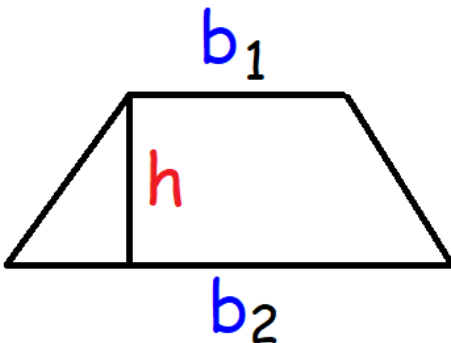
Lateral Surface Area:

$$LA = 2\pi R h$$

Surface Area:

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

The Trapezoid:



Area:

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