**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:**$$\sin(θ)=\frac{y}{z} \cos(θ)=\frac{x}{z} \tan(θ)=\frac{y}{x}$$ |
| **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:**$$A=\frac{\sqrt{3}}{4}s^{2} A=\frac{1}{2}sh$$$$\frac{dA}{dt}=\frac{\sqrt{3}}{4}(2s)\frac{ds}{dt}$$$$\frac{dA}{dt}=\frac{1}{2}\left(s\frac{dh}{dt}+h\frac{ds}{dt}\right)$$**The Height:**$$h=\frac{\sqrt{3}}{2}s$$ |

|  |  |
| --- | --- |
| **The Circle:** | **Circumference:**$$C=2πR$$**Diameter:**$$d=2R$$**The Area:**$$A=πR^{2}$$$$\frac{dA}{dt}=π(2R)\frac{dR}{dt}$$ |
| **The Sphere:** | **The Volume:**$$V=\frac{4}{3}πR^{3}$$$$\frac{dV}{dt}=\frac{4}{3}π(3R^{2})\frac{dR}{dt}$$**Surface Area:**$$SA=4πR^{2}$$ |
| **The Ellipse:** | **The Area:**$$A=πab$$$$\frac{dA}{dt}=π\left(a\frac{db}{dt}+b\frac{da}{dt}\right)$$ |
| **The Hexagon:** | **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:**$$V=\frac{1}{3}πR^{2}h$$$$\frac{dV}{dt}=\frac{1}{3}π\left(2R\frac{dR}{dt}h+R^{2}\frac{dh}{dt}\right)$$**Lateral Surface Area:**$$LA=πRl$$**Surface Area:**$$SA=πRl+πR^{2}$$**The Slant Height:**$$l^{2}=R^{2}+h^{2}$$ |
| **The Cylinder:** | **Volume:**$$V=πR^{2}h$$$$\frac{dV}{dt}=π\left(2R\frac{dR}{dt}h+R^{2}\frac{dh}{dt}\right)$$**Lateral Surface Area:**$$LA=2πRh$$**Surface Area:**$$SA=2πRh+2πR^{2}$$ |
| **The Trapezoid:** | **Area:**$$A=\frac{1}{2}\left(b\_{1}+b\_{2}\right)h$$ |