Coordinates Geometry

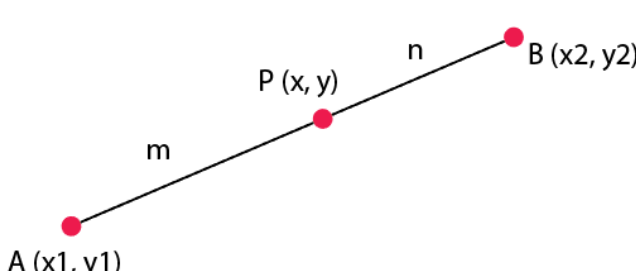|	
1 Distance/length formulae - Distance between 2 2D points - Distance between 2 3D points	$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ $$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$
2 Midpoint between 2 points	$$\frac{(x_1 + x_2)}{2}, \frac{(y_1 + y_2)}{2}, \frac{(z_1 + z_2)}{2}$$
3 Slope between 2 points	$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$
4 Line equation - Need Slope value - Need y-intercept	$$(Equation)\ y = mx + c$$ $$y - y_1 = m(x - x_1)$$
5 Parallel Lines - Are the points collinear?	$$m_1 = m_2$$ Check if collinear: If both slope is same $$if\ mAB = mBC = mAC$$ $$if\ AB = BC, \qquad B\ is\ a\ common\ point$$ $$ABC\ is\ collinear, meaning\ all\ 3\ points\ lines\ on\ the\ same\ line$$
6 Perpendicular Lines	$$m_2 * m_1 = -1$$ $$m_2 = -\frac{1}{m_1}$$
7 Perpendicular Bisector of AB - Get the perpendicular line of line AB	1. Get midpoint of AB $(x_2, y_2$ 2. Get slope of line AB : m 3. Get perpendicular slope of AB = $-\frac{1}{m}$ 4. Bisector of line AB → $y - y_2 = -\frac{1}{m}(x - x_2)$
8 Ratio Theorem	$$x = \frac{m(x_2) + n(x_1)}{m + n}, \qquad y = \frac{m(y_2) + n(y_1)}{m + n}$$
9 Area of polygon	$$\frac{1}{2}(x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1 - x_2y_1 - x_3y_2 - x_4y_3 - x_1y_4)$$ 1/2 $\begin{vmatrix} x1 & x2 & x3 & x4 & x1 \\ y1 & y2 & y3 & y4 & y1 \end{vmatrix}$

1. Exercise

1	$P(4,-4),\quad Q(9,6),\quad R(-2,4),\quad S$ are the vertices of a parallelogram Find the midpoint of PR, $$midpoint\ x = \frac{4+(-2)}{2},\qquad midpoint\ y = \frac{-4+4}{2}$$ $$midpoint\ x = 1,\qquad midpoint\ y = 0$$ The coordinates of point S $$Let\ coodinates\ of\ S\ be\ x,y$$ $$1 = \frac{9+x}{2},\qquad 0 = \frac{6+y}{2}$$ $$x = -7,\qquad y = -6$$ Show that PQRS is a rhombus $$show\ that\ length\ of\ PQ = RQ$$ $$|PQ| = \sqrt{(9-4)^2-(6+4)^2} = \sqrt{125}$$ $$|RQ| = \sqrt{(9+2)^2-(6-4)^2} = \sqrt{125}$$