

# Generalized Midpoint Formula (C)

Suppose that  $0 \leq t \leq 1$  and we would like to find the point which is  $t$  of the way from the point P with coordinates  $(a,b,c)$  to the point Q with coordinates  $(x,y,z)$ . The coordinates of this point are given by

$$((1-t)a+tx, (1-t)b+ty, (1-t)c+tz)$$

When  $t = 1/2$  this reduces to the ordinary midpoint formula. Again, one can reason by similar triangles. In the case of points in the plane, one just omits the third coordinates. Thus the coordinates of the point which is  $1/3$  of the way from  $(6,12)$  to  $(-3, 15)$  are

$$\left( \frac{2}{3}6 + \frac{1}{3}(-3), \frac{2}{3}12 + \frac{1}{3}(15) \right) = (3, 13).$$

If we vary  $t$  from 0 to 1 the points given by this formula trace out the line segment from P to Q. This is very helpful in describing straightline motion in space, where we might interpret  $t$  as time.