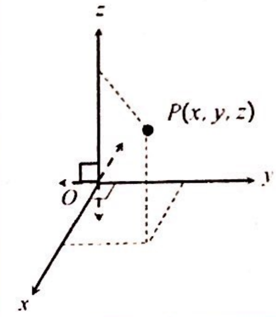
Name:	**Date:**
Topic:	**Class:**

Main Ideas/Questions	Notes/Examples
Three-Dimensional **COORDINATE SYSTEM**	In the Cartesian coordinate system, a plane is divided into four quadrants by the x- and y-axis. To represent a point in space, the **three-dimensional coordinate system** is used. In this system, a third axis, called the z-axis, is added to give the appearance of depth. The additional axis divides the space into eight regions, called **octants.** A point in space is represented by an **organized triple** and written as (x, y, z).
DISTANCE & MIDPOINT Formulas	Given $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$, you can find the the distance between the points and the midpoint of $\overline{AB}$ using the following formulas:



DISTANCE FORMULA	$AB=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$
MIDPOINT FORMULA	$M=\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}, \frac{z_1+z_2}{2}\right)$

Find the length and midpoint of the segment with the given endpoints.

1. $R(-1, 2, -5)$ and $S(4, 0, 9)$

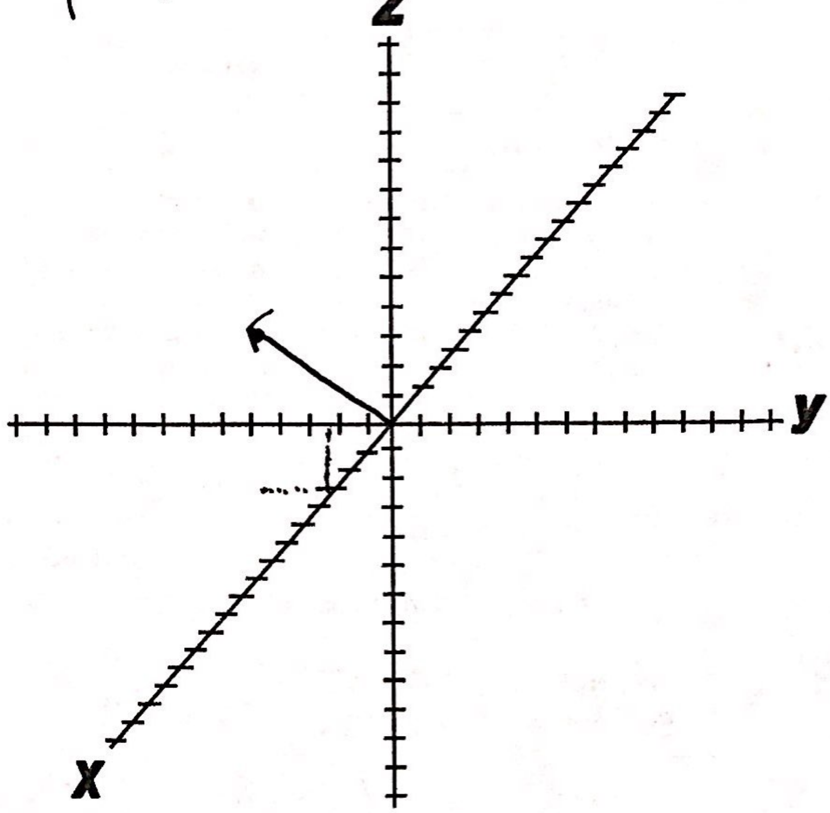
$$RS=\sqrt{(4--1)^2+(0-2)^2+(9--5)^2}=\sqrt{225}=\boxed{15}$$

$$M=\left(\frac{-1+4}{2}, \frac{2+0}{2}, \frac{-5+9}{2}\right)=\boxed{\left(\frac{3}{2}, 1, 2\right)}$$

2. $J(-7, -3, 2)$ and $K(10, -1, 8)$

3. With respect to an air traffic control tower, two helictopers are flying with coordinates (400, 200, 3000) and (150, -300, 5500). Find the direct distance between the helicopters.

$\langle 3, -2, 6 \rangle$



$\langle -4, 5, -3 \rangle$