

**Learning Goal:** I will be able draw vectors in  $\mathbb{R}^2$  and  $\mathbb{R}^3$  and interpret their characteristics.

**Minds On:** Can you draw it?

**Action:** 1. Class Examples  
2. Practice on page 317

**Consolidation:** Exit Question

**Minds On**

# RAVT

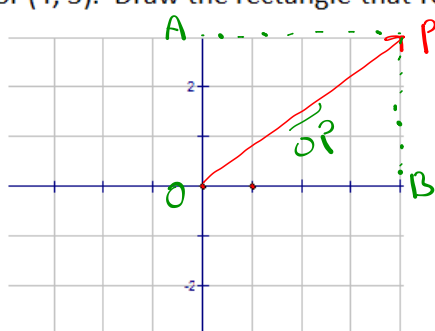
Read About Vectors For Ten

Please read pages 310 - 313

You can stop when you reach Example 1

## Minds On

Draw the vector  $(4, 3)$ . Draw the rectangle that relates to it. List the co-ordinates of the vertices of the rectangle.



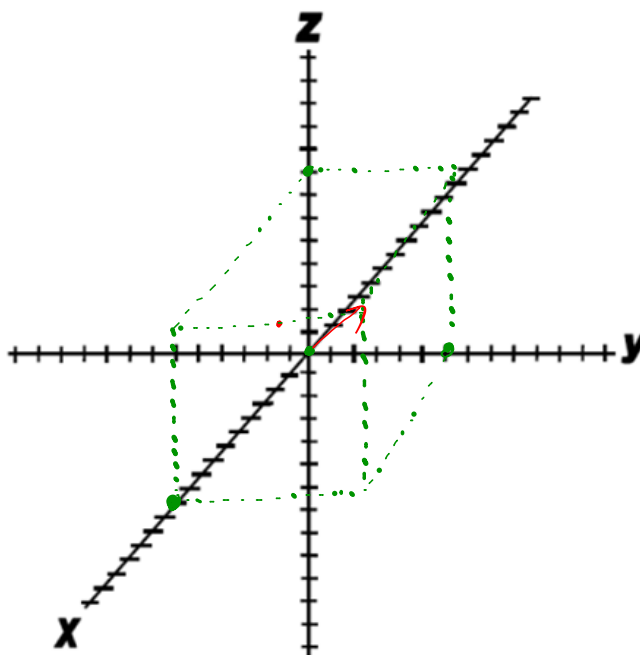
$$A = (0, 3)$$

$$O = (0, 0)$$

$$B = (4, 0)$$

$$P = (4, 3)$$

Draw the 3 dimensional vector  $(5, 3, 4)$ . We relate this vector to a rectangular prism – draw it.



**Action****6.5 Vectors in  $\mathbb{R}^2$  and  $\mathbb{R}^3$** **Vectors in  $\mathbb{R}^1$** 

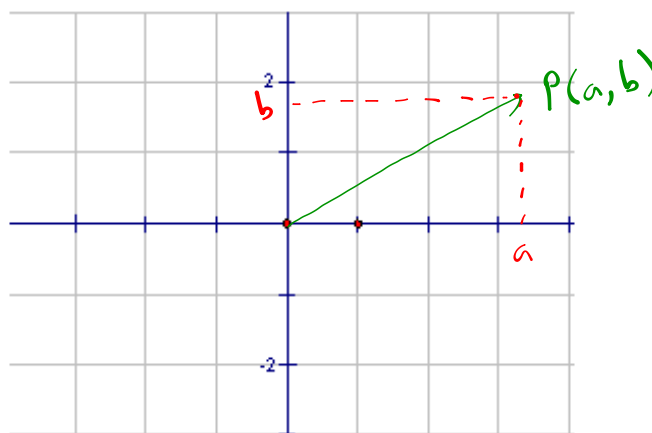
- We use a regular number line
- The vectors' tail is at the origin and its head is at  $P(a, 0)$
- Since each point  $P$  has a unique position on this axis, it means the vector  $\vec{OP}$  is also unique.



## Action

### Vectors in $R^2$

- Represented by the vector  $(a, b)$
- Tail at origin and head at  $P(a, b)$ .
- Draw perpendicular lines to the axes
- $a$  is the x-component,  $b$  is the y-component

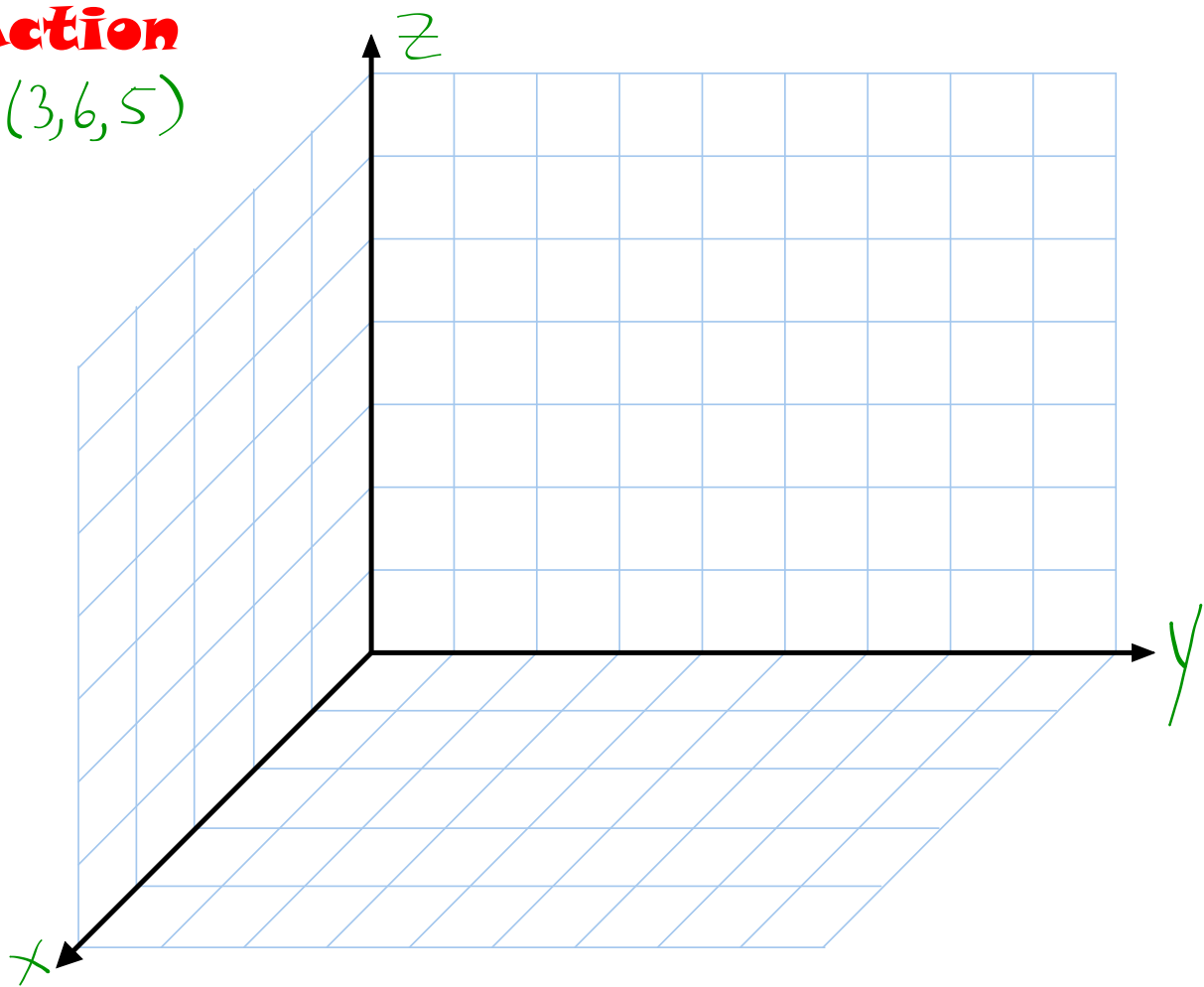


## Action

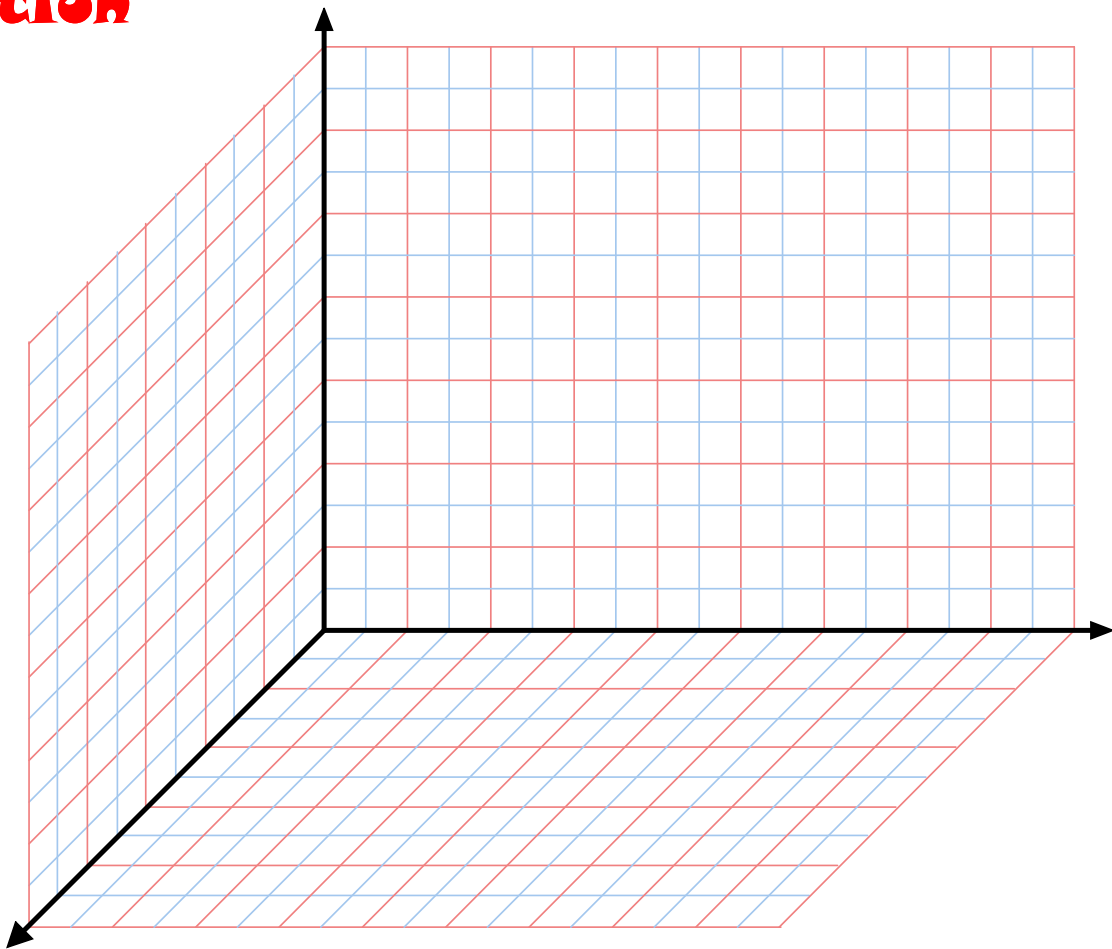
### Vectors in $R^3$

- use the x-, y-, and z-axes
- the vector's head is at the point  $P(a, b, c)$  and the associated vector is  $\vec{OP} = (a, b, c)$
- imagine that you're looking down the positive z-axis onto the xy-plane so that when the positive x-axis is rotated  $90^\circ$  counterclockwise it becomes coincident with the positive y-axis (right-handed system of coordinates)
- Coordinates are given in the form of  $P(a, b, c)$  and are located in the order of  $(x, y, z)$

**Action**  
 $P(3, 6, 5)$



**Action**





## Action

**Example 1:** a) In the following diagram, the point  $P(6, 2, 4)$  is located in  $\mathbb{R}^3$ . What are the coordinates of A, B, C, D, E, and F?

b) Draw the vector  $\vec{OP}$ .

$$A = (6, 0, 0)$$

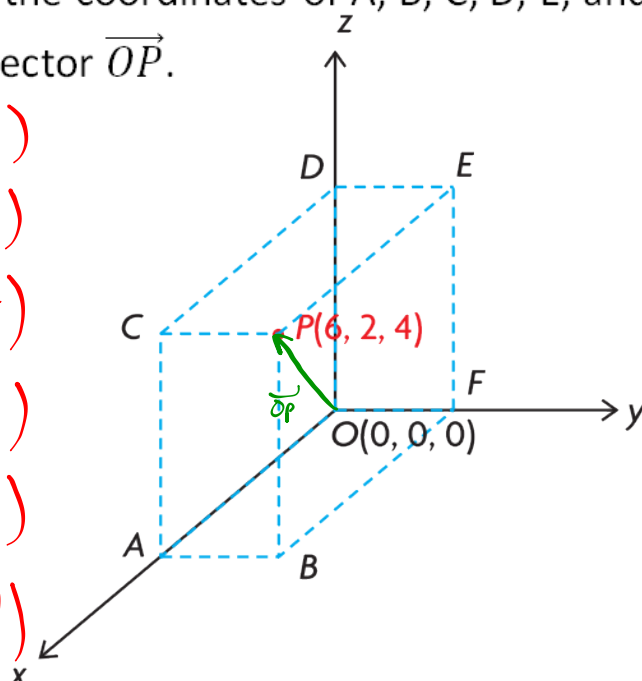
$$B = (6, 2, 0)$$

$$C = (6, 0, 4)$$

$$D = (0, 0, 4)$$

$$E = (0, 2, 4)$$

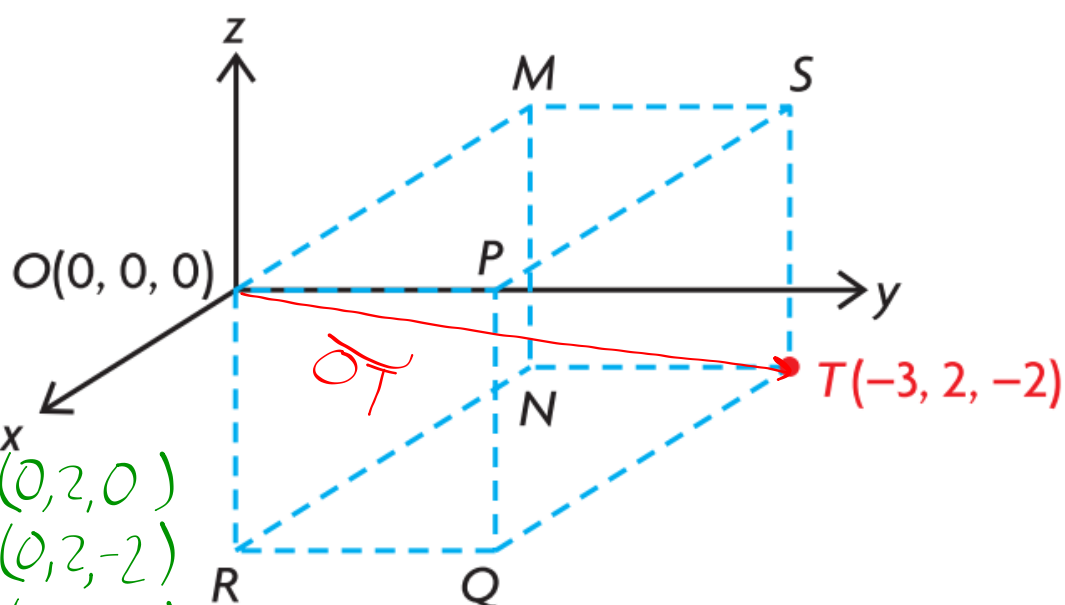
$$F = (0, 2, 0)$$



## Action

**Example 2:** a) In the following diagram, the point  $T(-3, 2, -2)$  is located in  $\mathbb{R}^3$ . What are the coordinates of  $P$ ,  $Q$ ,  $R$ ,  $M$ ,  $N$ , and  $S$ ?

b) Draw the vector  $\overrightarrow{OT}$ .



$P = (0, 2, 0)$   
 $Q = (0, 2, -2)$   
 $R = (0, 0, -2)$   
 $M = (-3, 0, 0)$   
 $N = (-3, 0, -2)$   
 $S = (-3, 2, 0)$

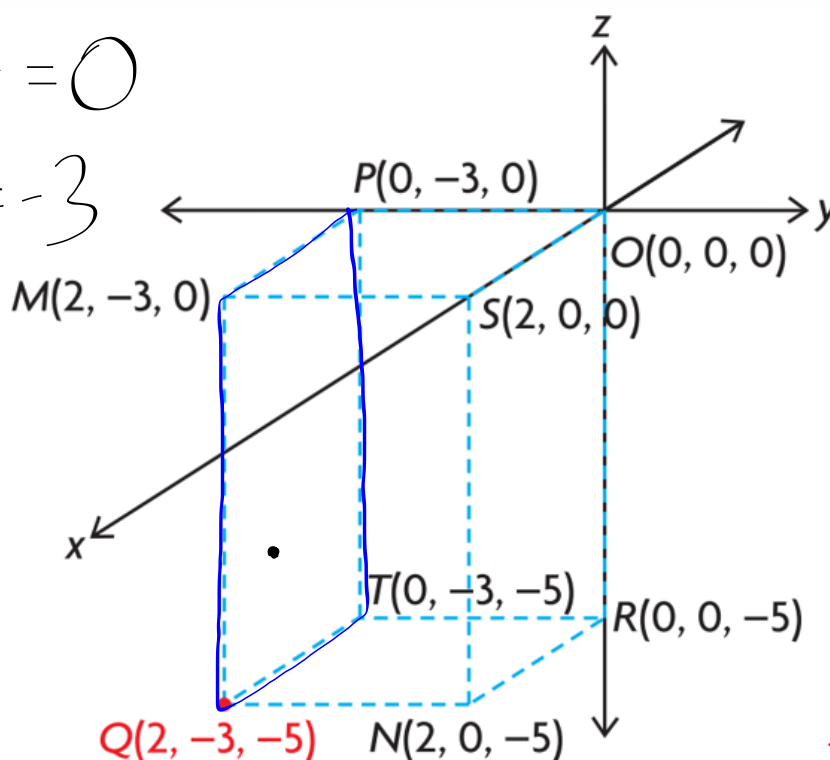
## Action

**Example 3:** The point  $Q(2, -3, -5)$  is shown in  $\mathbb{R}^3$ .

- Write an equation for the  $xy$ -plane.
- Write an equation for the plane containing the points  $P$ ,  $M$ ,  $Q$ , and  $T$ .
- Write a mathematical description of the set of points in rectangle  $PMQT$ .
- What is the equation of the plane parallel to the  $xy$ -plane passing through  $R(0, 0, -5)$ ?

a)  $z = 0$

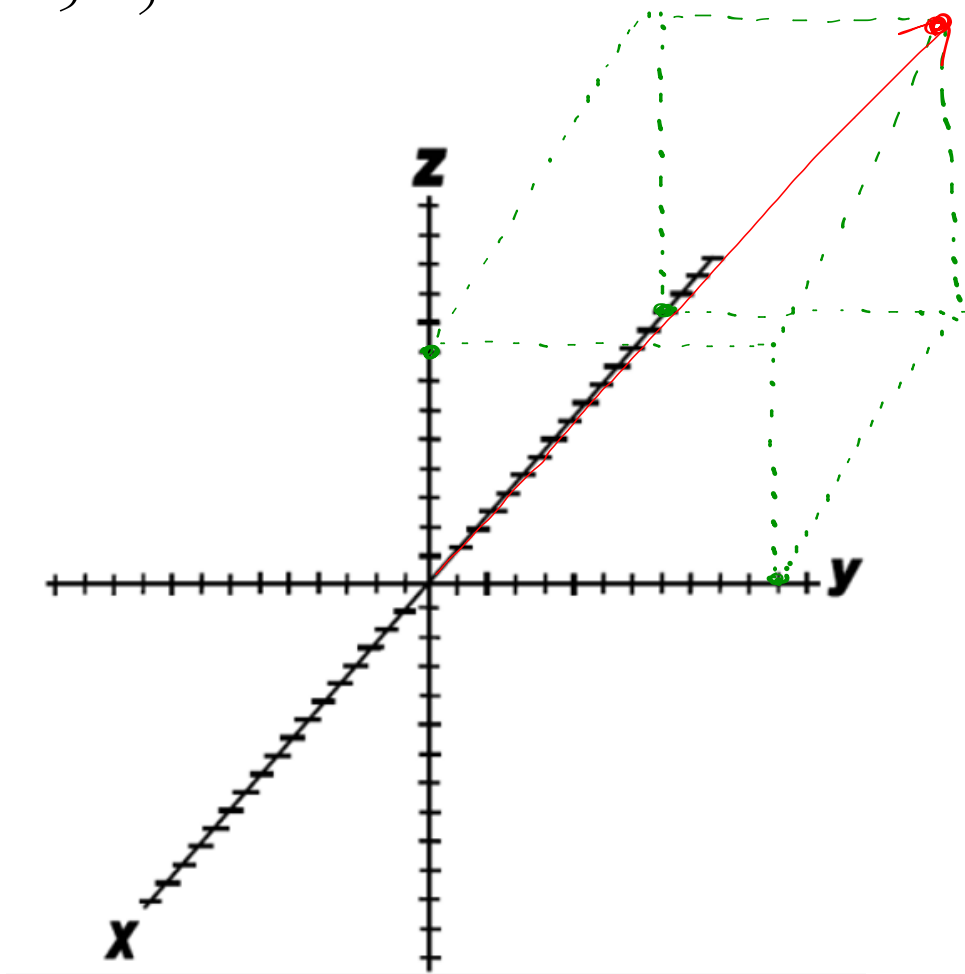
b)  $y = -3$



c) Points have the form  $(x, -3, z)$  where  $0 \leq x \leq 2$ , and  $-5 \leq z \leq 0$ .

d)  $z = -5$

$$P(-7, 6, 4)$$



## **Consolidation**

# Exit Question

# Page 318 #15

Be sure to look at other questions as well!