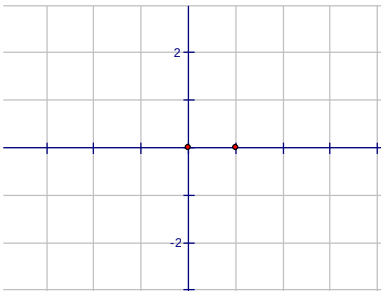
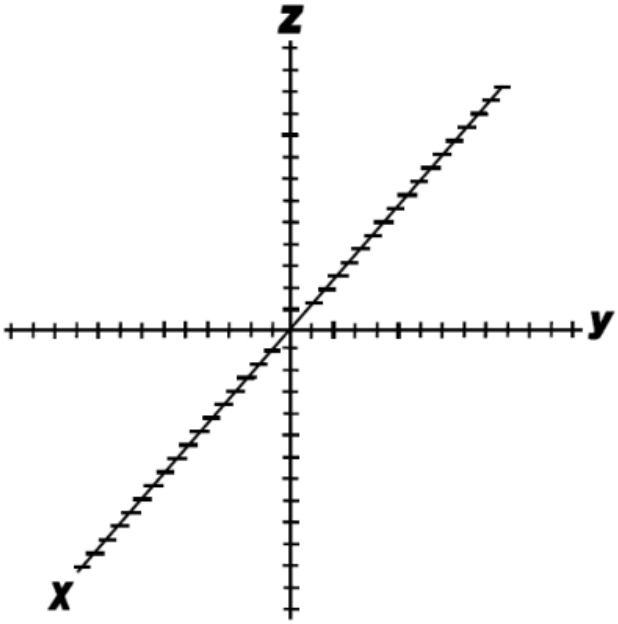
6.5 Vectors in R^2 and R^3

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



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

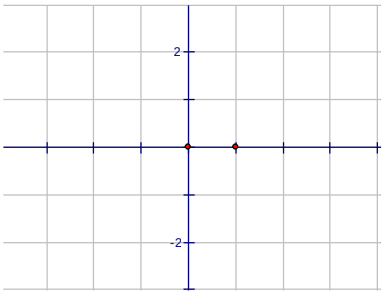


Vectors in R

- 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 is also unique.

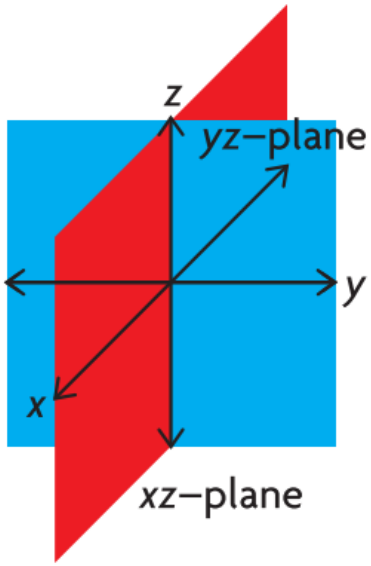
Vectors in R^2

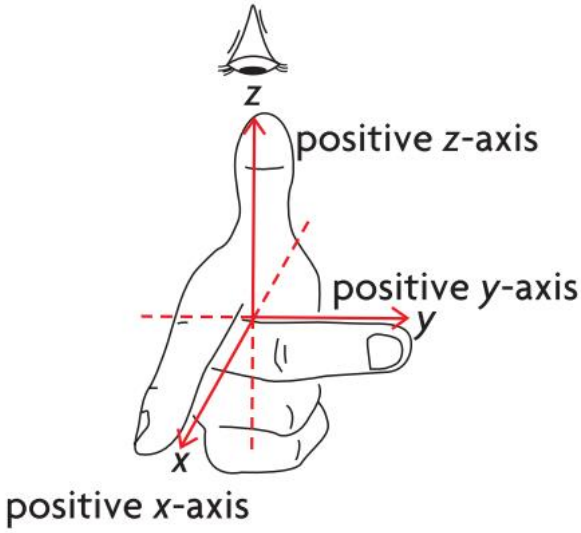
- Represented by the vector (a, b)
- Tail at origin and head at P(a, b).
- Draw perpendicular lines to the axes
- a is the x-component, b is the y-component



Vectors in R^3

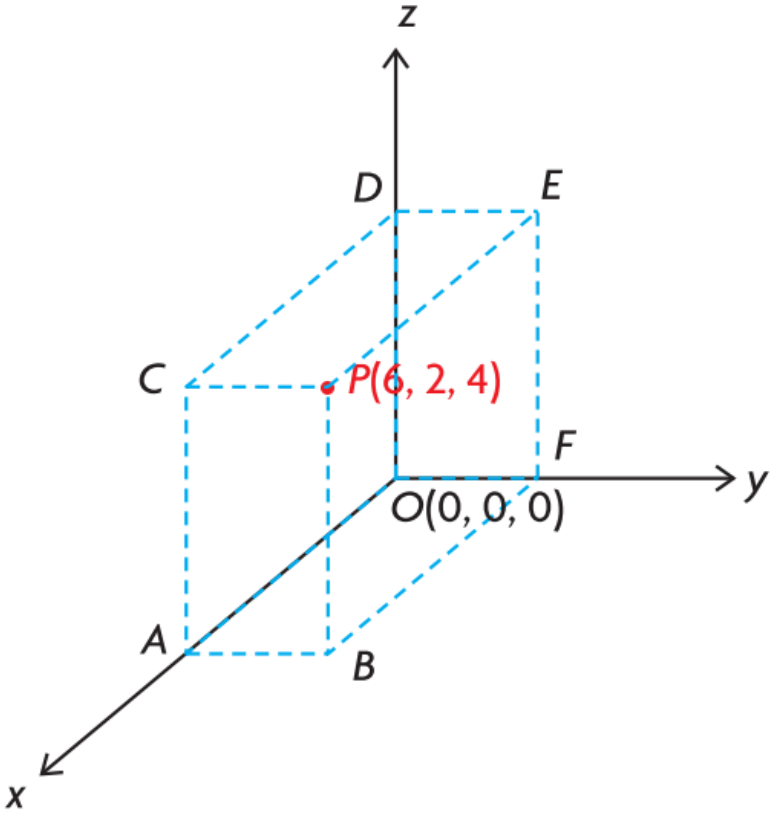
- use the x-,y-, and z-axes
- the vector's head is at the point P(a, b, c) and the associated vector is
- imagine that you're looking down the positive z-axis onto the xy-plane so that when the positive x-axis is rotated 90° counterclockwise it becomes coincident with the positive y-axis (right-handed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





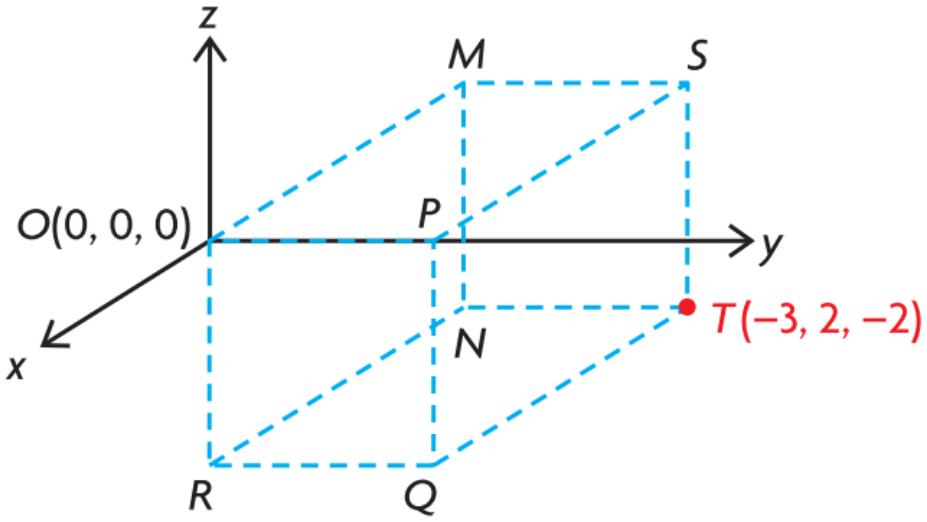
Example 1: a) In the following diagram, the point P(6, 2, 4) is located in R^3. What are the coordinates of A, B, C, D, E, and F?

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



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

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



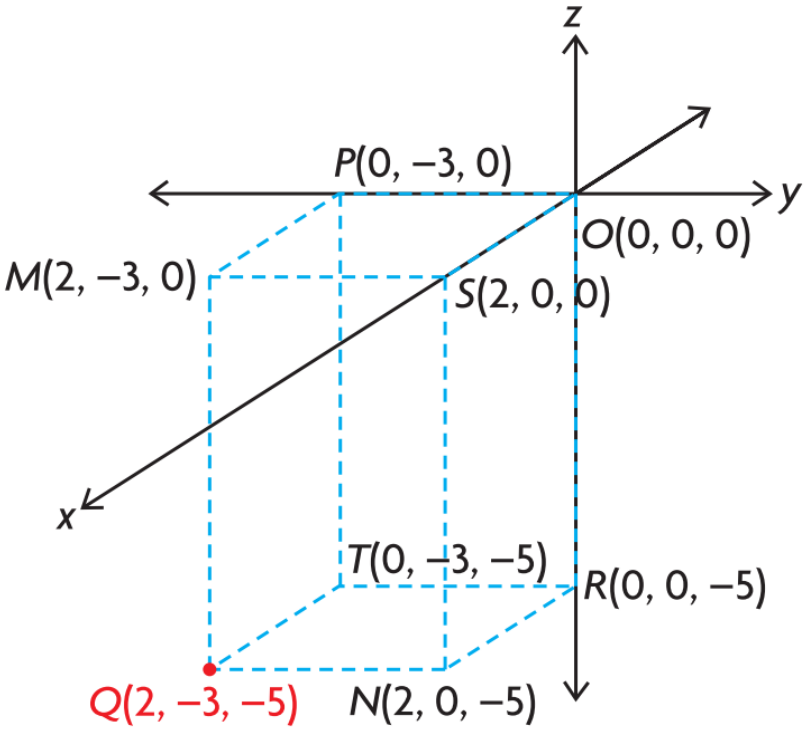
Example 3: The point Q(2, -3, -5) is shown in R^3.

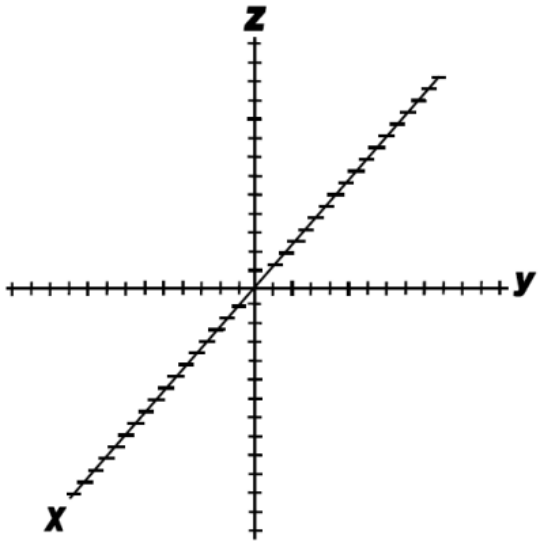
a) Write an equation for the xy-plane.

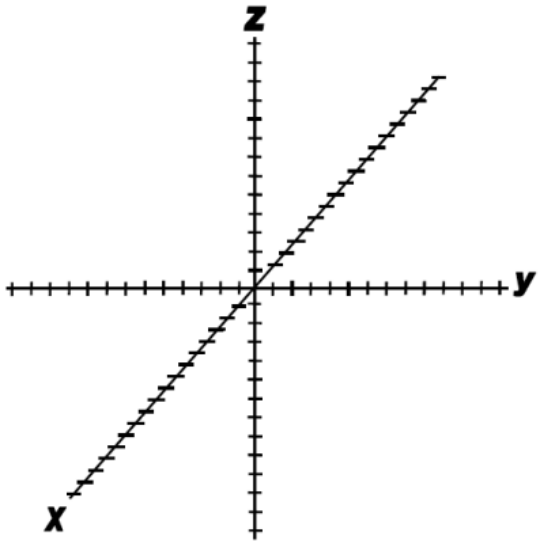
b) Write and equation for the plane containing the points P, M, Q, and T.

c) Write a mathematical description of the set of points in rectangle PMQT.

d) What is the equation of the plane parallel to the xy-plane passing through R(0, 0, -5)




z
y
x


z
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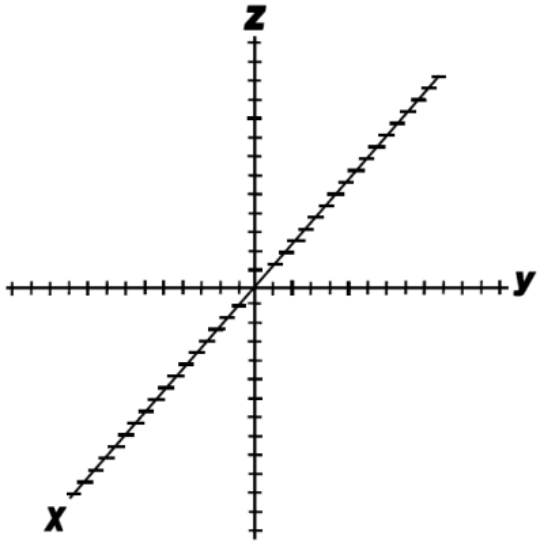
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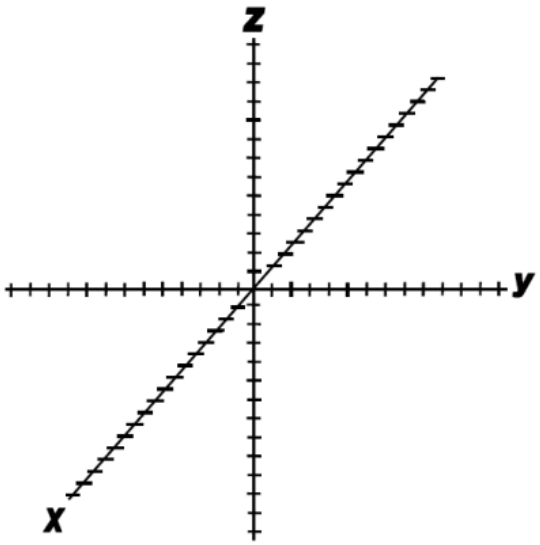
z
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