



## 4.1 Vectors on a Map

### READ



You have learned that velocity is a vector quantity—this means that when you talk about velocity, you must mention both speed and direction. You can use velocity vectors on a coordinate plane to help you figure out the position of a moving object at a certain point in time.

### EXAMPLE



Your home is at the origin. From there you ride your bicycle to the movie theater. You ride 30. km/hr north for 0.50 hour, and then 20. km/hr east for 0.25 hours.

Show your home and the movie theater on a coordinate plane, and give the coordinates for each.

#### Solution:

If your home is at the origin, it is given the coordinates (0, 0). To find the position of the movie theater, you need to find the change in position. Use the relationship:

change in position = velocity  $\times$  change in time

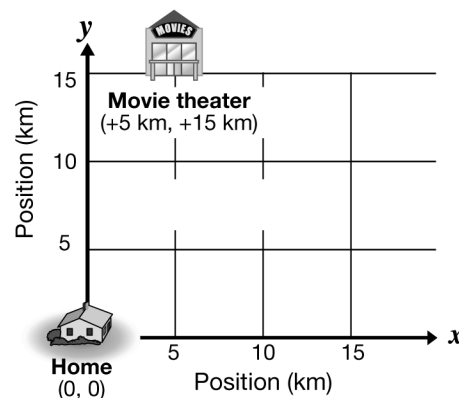
First change in position:  $+30. \text{ km/hr} \times 0.50 \text{ hr} = 15 \text{ km}$   
NORTH

Second change in position:  $+20. \text{ km/hr} \times 0.25 = 5 \text{ km}$   
EAST

From home, travel north 15 km. Then turn and go east 5 km.

The coordinates of the movie theater are (+5 km, +15 km).

**Note:** Be careful to report the  $x$ -coordinate first. It does not matter which direction you traveled first. When reporting position, you always give the  $x$ - (east-west) coordinate first, then the  $y$ - (north-south) coordinate.



### PRACTICE



1. Augustin and Edson are going to a baseball game. To get to the stadium, they travel east on the highway at 120. km/hr for 30. minutes. Then they turn onto the stadium parkway and travel south at 60. km/hr for 10. minutes. Assume their starting point is at the origin. What is the position of the stadium?
2. Destiny and Franijza are at the swimming pool. They decide to walk to the ice cream shop. They walk north at a pace of 6 km/hr for 20. minutes, and then east at the same pace for 10. minutes. If the swimming pool is at the origin (0,0) what is the position of the ice cream shop?
3. After finishing their ice cream, the girls decide to go to Destiny's house. From the ice cream shop, they walk south at a pace of 4.0 km/hr for 15 minutes. What is the position of Destiny's house?
4. Draw a map showing the swimming pool at the origin (0,0). Show the coordinates of the ice cream shop and Destiny's house.
5. **Challenge!** Make up your own velocity question. Your object (or traveler) should make at least one turn. Use at least two different speeds in your problem. Trade questions with a partner. Use a coordinate plane to help you solve the new question.