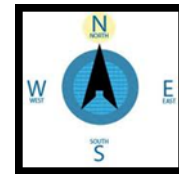


Finding Things In Space

Activity 1: Precise directions

Have you ever had to stop and ask for directions and received an answer like, “Take a left, then 2 rights, then another left. It’s going to be on your right?” It can be really confusing – especially if you miss that first right! One wrong turn and the directions are no longer what you need. How about if the person giving directions assumes you’re coming from a different direction? Then everything is *really* out of whack! You need something more specific.

Sometimes people say “Go East on the Interstate, then go north on Main Street. The office is on the east side of the road.” These directions are more specific and can be more helpful than the left, right, left, right form because they are unchanging. If you take a wrong turn, as long as you get to Main Street, you know that the office will be on the *east* side of the road. We call these unchanging directions the *cardinal directions*: North, South, East, West. In fact, cardinal directions are so much more helpful it’s the standard format of directions when looking at a map.



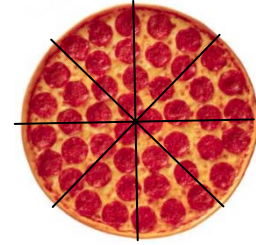
What happens if you need to go diagonally – somewhere in between North and East? We mix the two and say that direction is Northeast. The same is said for the other “diagonals”: Northwest, Southeast and Southwest.

How about if you need to be more exact than “in between” the diagonals? West Southwest. North Northeast. Those are even more precise than just Southwest or Northeast alone. Can you make a list of all the combinations of the “in between” diagonals?

Sometimes though, especially when dealing with things over long distances, these too just are not accurate enough. (see side note) There needs to be something more precise still. This is how sailors, soldiers, scientists and map makers give directions. On the ocean, if the captain said “sail over there” it may not be precise enough and the crew might become lost. On a battlefield, things need to be even more precise if we need to shoot a canon at a specific target.

It may be an interesting side lesson to think about how longer distances traveled will increase any error in direction of travel. Going a few steps? 1 °off is a tiny fraction of an inch off target. Going 1000miles? 1° off is 17 miles off.

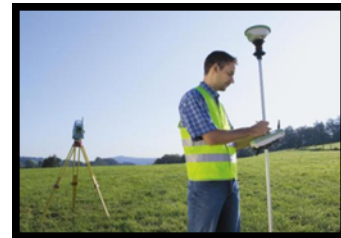
In order to be even more precise, someone long ago divided up all the points on a compass into 360 equal slices – similar to cutting a pizza into 360 slices. Starting at the top and going around clockwise, we begin counting at 0. Slice #0 is known as “North”, Slice #90 is “East”, Slice #180 is “South” and Slice #270 is “West”.



Of course, if we said “Go ____ slices”, people might get hungry so we refer to each of the 360 slices as *degrees*. When writing degrees, we use the symbol °. (Yep, just like temperature is measured!)

Using degrees for direction of travel is *much* more accurate. In fact, each slice can then be divided further into smaller and smaller slices if we need to be more and more precise. We call this form of directions “azimuth”. Just as “West” is a *cardinal* direction, 270° is an *azimuth*. They both mean the same direction of travel, just different forms. Sometimes you may also see the word *heading*, when reading about azimuth. In this use, the word heading means the same as *direction*.

If you’ve ever seen a survey team on the side of the road using their equipment, you may notice them taking notes. Their job is based on precision measurements. They use azimuth headings daily to determine where measurements were taken.



Pilots, sailors, engineers, soldiers, map-makers, weather forecasters and astronomers all use azimuths to indicate a precise heading for their type of work. What would happen if one of these people used an incorrect heading? Could they still do their job correctly? Why or why not?

Activity

As an activity, you might try to navigate to a specific point around your school or an open field using a compass and azimuth directions. This sort of activity is known as orienteering. Many communities have an active orienteering group that can provide further information and/or assistance.

For this activity you will need a compass for each student or group of students. The compass needs to have degrees marked on the outer rim. New, quality compasses are sold at sporting goods stores for backpackers and hikers and are relatively inexpensive.

Quick Review Questions

1. What are the four cardinal headings?
2. How many degrees (or slices) are there in an azimuth?
3. What is the benefit of using an azimuth over cardinal directions?
4. What is the symbol for degrees?
5. Name at least 3 jobs that use azimuth.