

# SIMPLE SHIPMENTS ADVENTURE JOURNAL

TAKING ON THE  
WORLD, ONE  
ENGINEERING  
CHALLENGE AT A TIME

PROPERTY OF THE FUTURE ENGINEER,

## Going the distance!



Hi everyone! I am getting ready to leave the Qinling Mountains where I have been studying panda bears so that I can visit the Great Wall. I know a scientist who has a lab there, and she wants to see what I've learned about the pandas. It's a long trip from here to the Great Wall, though, and I have to make sure I get there before I run out of supplies. I have a map that shows different paths I can take on my bike, but the map is pretty complicated, and I'm not sure which way will get me there in time. I only have enough supplies to travel for 12 days, so my journey can't be any longer than that. I hope you all can study the map and help me figure out which way will get me to the Great Wall fastest! Check online for the videos I posted to get more details about my trip. I can't wait to see your solutions!

Good luck,

Flynn



# BRING SIMPLE SHIPMENTS TO LIFE



## CREATE OBSTACLE COURSE TO REPLICATE MAP

Recreate traditional buildings on the map

Use boxes, dollhouses, or any solid object to represent the buildings on the map. If you use boxes, color them to represent the buildings

Replicate each city on the map with a different object and label it with the name of the city

Use things that reflect Chinese culture such as a fan, a teapot, a dragon, a bowl of rice, Chinese candy, a Chinese hat, etc. Get creative!

Create the path from city to city

Use rulers or strips of paper to represent the paths in between each city. Don't forget to label or color the red paths as red!

Replicate the mountains on the map which are in black

Use crumpled up paper or paper shredding to resemble the mountains. They are in black on the map.

# Instructions for GEERlings

## Segment 1— Simple Shipments



Guess what GEERlings? In 2003, China became the third country to successfully send a person to space. Isn't that exciting? I love space exploration!

Use the tools and materials provided to find the shortest route to the Great Wall of China from the Qinling Mountains.

**Map of China** — Use this to see all the possible paths Flynn can take and plan a route for her. Not every route will work, so make sure you try different ones!

**Ruler** — Use this to measure the length of each path on the map. Some of them may be a little off because it is an old map, but from your measurement, use how ever many inches it is closest to!

**Data Collection Worksheet** — Use this to write down the length that you measure for each path. It is very important to track your measurements as you work so you don't forget! Also, it will help you to calculate how long it will take Flynn to travel each path if you have it all written down on your sheet!

Good luck GEERlings!

# Let's Engineer It!

## Segment 2—Simple Shipments



Flynn needs to travel to the Great Wall of China on her bike in less than 12 days. She has a map, but she isn't sure which route will take her to her destination in the shortest amount of time. She also just found out that she has to make a stop in the city of Taiyuan to pick up some additional supplies. You will need to figure out which route is the fastest way to go. Today you need to answer the questions below to help you think about what you can do to find the fastest route.

You can use websites to learn more about Dijkstra's algorithm or other ways to get directions and find routes between two places.

Did you know that 47% of the population live in urban areas? That is a super high percentage! I have heard that Chinese cities have a lot to offer!



Try to only write down information you understand! Talk about it with your group, or look it up online using the research links we provide to learn more about the concepts!

1. What is Dijkstra's algorithm?

2. When you want to get somewhere, how do you find out which way to go?



3. What is GPS?

4. If we didn't have things like GPS and Google Maps, how would we find the fastest way to travel somewhere?



5. What is the relationship between Dijkstra's algorithm and GPS? Do they have anything in common?

6. How is Dijkstra's algorithm related to engineering?



7. How might you use Dijkstra's algorithm in your every day life?

8. What are the advantages of algorithms? Why do engineers and other professionals use them?



9. What connections can you make between software and GPS?

10. Are some paths easier to travel than others? Why?

11. When Flynn is traveling, is it more important for her to find the shortest path or the fastest path? What's the difference?



Use this space for any additional information you find and want to remember:

Okay GEERlings, now that you've done some research on Dijkstra's algorithm, it's time to BUILD! Your goal is to make find the shortest path for Flynn to travel. Have fun, and try and use some of new things you learned!



# Let's Put It All Together!

## Instructions and Data Collection Sheet

### Segment 3 - Simple Shipments

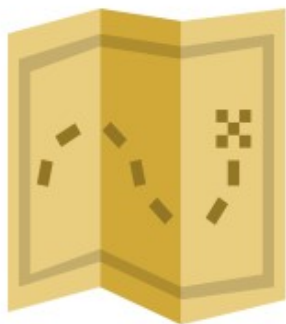


So, now that I need to stop in another city, Taiyuan, this whole trip is getting a little more complicated!

Here is a data collection sheet to make it easier to track and calculate the best path for me to travel. Try to remember what you learned the first day and during your research to help you as well!

Use the table on the following page to observe and record data from the map. Write down how many inches each path is, and then write down how many days it will take Flynn to travel that path. Each inch on a path represents one day of traveling for Flynn EXCEPT on the **red** bike paths. On those paths, each inch represents a half-day of travel.

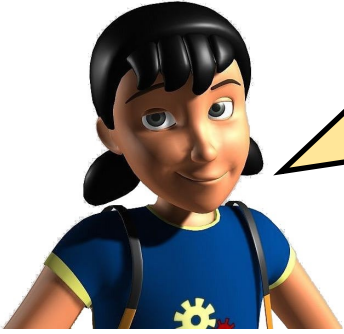
**Measuring note:** Round to the nearest inch when measuring each path. For example, if a path is a little longer than 2 inches or a little shorter than 2 inches, you can just write "2" on the chart.





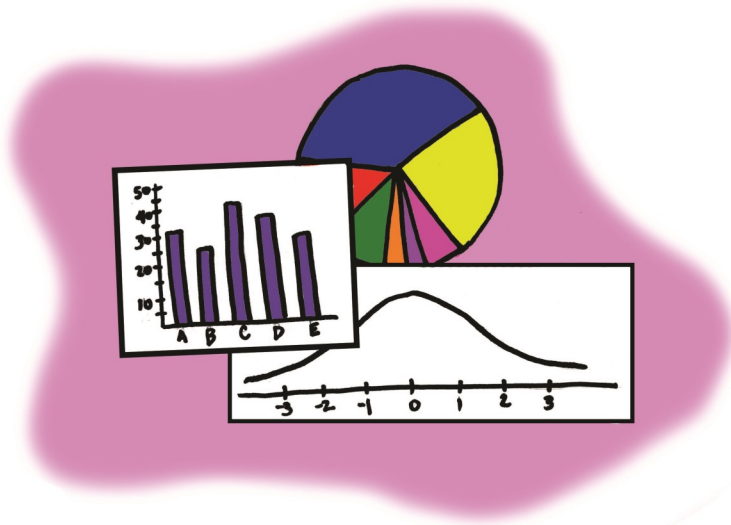
| Name of path                         | Length in inches | Days to travel |
|--------------------------------------|------------------|----------------|
| Qianhe River Way                     |                  |                |
| Eastern Qinling Bike Path            |                  |                |
| Guangzhong Plain Trail               |                  |                |
| Xuchang Road                         |                  |                |
| Northern Henan Provincial Bike Trail |                  |                |
| Mountain Foothills Path              |                  |                |
| Sanhuang Mountain Trail              |                  |                |
| Shaanxi Province Bike Path           |                  |                |
| Fuyin Bike Expressway                |                  |                |
| Tunlan River Path                    |                  |                |
| Lower Gobi Crossing                  |                  |                |
| Yellow River Crossing Path           |                  |                |
| Inner Mongolia Provincial Trail      |                  |                |
| Xinzhou Bypass                       |                  |                |
| Hutuo-Dasha River Path               |                  |                |
| Namong Lake Trail                    |                  |                |
| Liuwu New River Road                 |                  |                |
| Dezhou Bypass                        |                  |                |
| North China Plain Bike Path          |                  |                |
| River Crossing Bike Path             |                  |                |
| Taihang Mountains Pass               |                  |                |
| Haila Railroad Path                  |                  |                |
| Upper Gobi Desert Bike Expressway    |                  |                |
| Guangling Road                       |                  |                |
| Datong Path                          |                  |                |
| Guanting Reservoir Trail             |                  |                |
| Daihai Sea Trail                     |                  |                |
| Shouyang Trail                       |                  |                |

# GEERling Vocabulary List



Did you know that the Chinese are responsible for inventing a lot of the items that we use on a day to day basis? They invented paper, the compass, gunpowder, printing, and kites! The country is full of budding engineers just like you!

**Data:** facts and information. Engineers collect data to help them find solutions to problems.

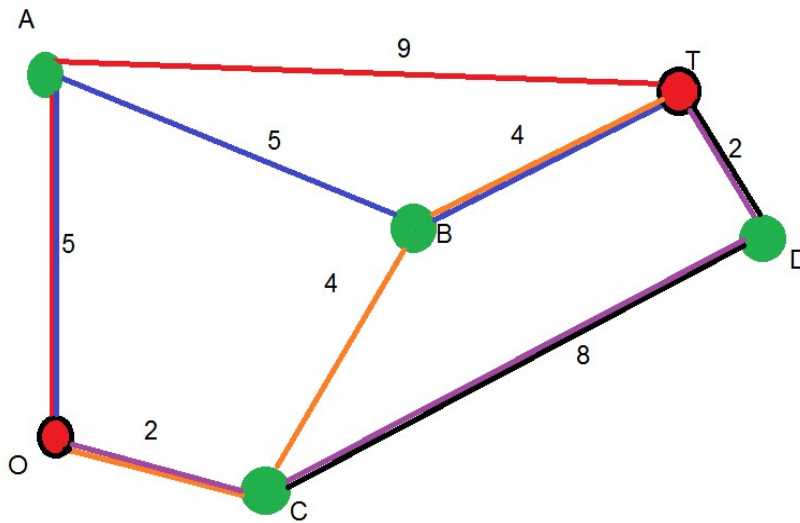


**Algorithm:** step-by-step instructions for solving a problem.

$$\begin{array}{r} 248 \\ -135 \\ \hline 113 \end{array}$$

$$y = mx + b$$

**Dijkstra's Algorithm:** a step-by-step way to find the shortest route between two places. It works by adding up the distance of each path in a route to find out the total distance of the route and then comparing that route to other possible routes.



Red:  $5 + 9 = 14$

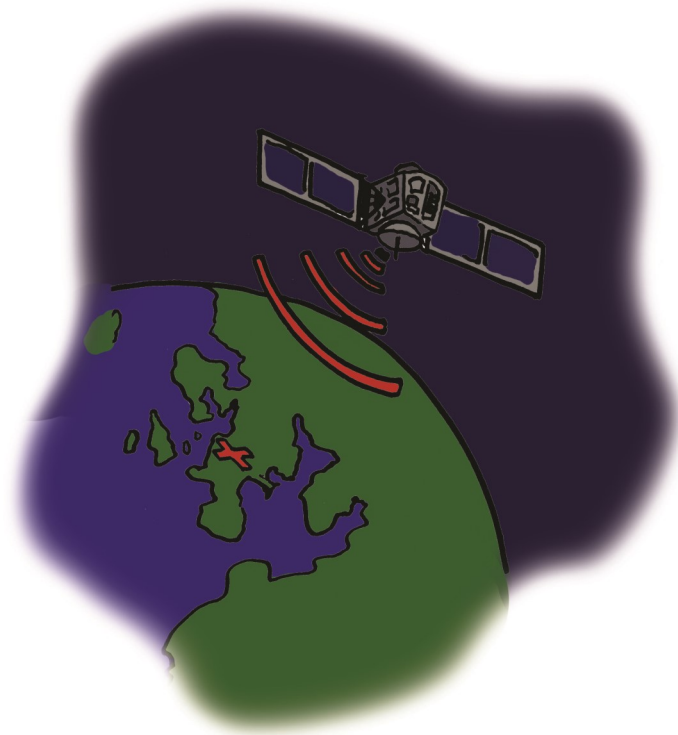
Blue:  $5 + 5 + 4 = 14$

Orange:  $2 + 4 + 4 = 10$

Purple:  $2 + 8 + 2 = 12$

Orange is the shortest route!

**GPS:** "global positioning satellite" — a device that communicates with satellites in space to locate where people and places are located. The GPS device shows you directions from where you are now to where you want to go.



**Software:** instructions that a machine can read that tell the computer's processors to do certain tasks. Some examples of software are Microsoft Word, Internet Explorer, or Google Maps



**Optimize:** to make something work as well as it possibly can; to find ways to make work fast and easy without making mistakes.

