

Math with Flight Paths

Students will practice math skills while learning about flight paths.

LESSON PLAN

Learning Objectives:

The students will:

- Interpret information from a chart
- Use basic math skills to answer questions regarding distances
- Compose a flight plan with the supplied information

Purpose:

Students will preview the supplied chart and answer questions. Students will understand different flight patterns and how that affects the time and distance an airplane can travel. Students will learn how to calculate the distances between varying locations and which paths are the best to take. They will infer how air traffic controllers and pilots handle the change in direction or the added mileage to their flight path.

Background:

Pilots and Air Traffic Controllers (ATC) learn numerous concepts as they apply to moving an aircraft from one airport to another. Important is the fact that an aircraft can only hold so much fuel. Making the fuel stretch is very important, as well as knowing how much fuel to put on the airplane to start. Mileage and elapsed time are also very important, since running out of fuel is not a very good way to end a flight! Pilots and ATC use Instrument Flight Rules (IFR) enroute charts to help out with this flying process and try to find the best route possible. The objective of IFR enroute flight is to navigate within the lateral limits of a designated airway at an altitude consistent with the ATC clearance. For these enroute charts, there are both high and low altitude ones that encompass different needs for both military and public domains. To effectively depart from one airport and navigate enroute under instrument conditions, a pilot needs the appropriate IFR enroute low-altitude charts.

Grade Level: 3 – 4

[Ohio Learning Standards/Mathematics \(2017\)](#)

Mathematical Practices:

- [MP.1:](#) Make sense of problems
- [MP.2:](#) Reason abstractly & quantitatively
- [MP.3:](#) Construct viable arguments
- [MP.6:](#) Attend to precision

Algebra

- [3.OA.3:](#) Use multiplication & division within 100
- [3.OA.8:](#) Solve two-step word problems

Numbers & Operations (-base ten & -fractions)

- [3.NBT.2:](#) Fluently add & subtract within 1,000
- [3.NF.3:](#) Explain reason for fractions in special cases
- [4.NBT.4:](#) Fluently add & subtract multi-digit whole numbers

Measurement & Data

- [4.MD.2:](#) Solve real world problems

Materials Required:

- Pencil
- Paper
- Worksheet (pages 3-4)

Procedure:**A. Warm-up**

1. Review the operations of math, especially the difference (subtraction) and division.
2. Explain how aircraft move from airport to airport based on high and low altitude enroute charts, comparing it to an interstate highway.
3. Explain that a pilot wants to go the most direct way he can to another airport and the consequences if he doesn't.

B. Activity

1. Have a student read the brief story at the beginning of the worksheet.
2. Demonstrate the way a pilot or air traffic controller would plan a short trip on an IFR Enroute Chart (See **Resources/References** tab).
3. Students will use the supplied chart and, by reading the questions, provide the correct information to answer the questions.

Assessment/Evaluation:

Check worksheet for correct answers. Have students share their flight plans and compare results.

Resources/References:

IFR enroute charts:

<https://www.cfnotebook.net/notebook/navigation-and-flight-planning/ifr-en-route-charts>

https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/ifr/

https://www.faa.gov/air_traffic/flight_info/aeronav/productcatalog/ifrcharts/lowaltitude/

Flight paths:

https://collection.eliterature.org/2/works/pullinger_flightpaths.html

<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/flight-path>

Name: _____

Leah's family owns a small airport named Berry County Airport (**BCA**). They all like to fly and they often make many trips to visit their friends at the neighboring airports. The airplane they fly goes **120 miles per hour** and they estimate the length of their trips with this speed (hint: used in question #2). There are five other airports that the family goes to visit, these are:

Lyon Airport (**LA**)

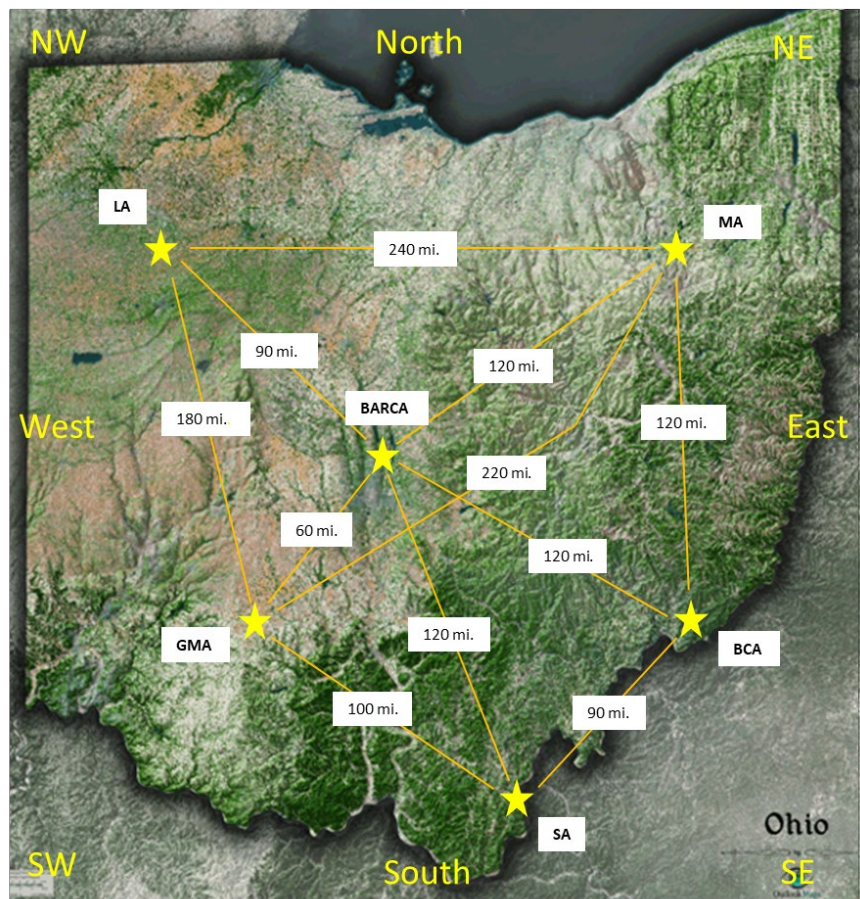
Manta Airpark (**MA**)

Barstow County Airport (**BARCA**)

Gonzo Municipal Airport (**GMA**)

Sentry Airpark (**SA**)

Berry County Airport (**BCA**)



Use the map above to answer the following questions. **NOTE:** these figures are not drawn to actual scale nor represent any real locations in Ohio.

1. Which airport(s) is/are 120 miles from Berry County Airport (BCA)?
 - a. Sentry Airpark only
 - b. Barstow County Airport only
 - c. Manta Airpark and Barstow County Airport
 - d. Sentry Airpark and Barstow County Airport

2. How long is the trip from Berry County Airport to Manta Airpark?
 - a. One hour
 - b. Two hours
 - c. Three hours
 - d. One half hour

3. What are the total number of miles between Berry County, Manta Airpark, and Lyon Airport?
 - a. 380 miles
 - b. 290 miles
 - c. 360 miles
 - d. 120 miles

4. What are the totla number of miles between Berry County, Sentry Airpark, Gonzo Municipal Airport, Manta Airpark, and back to Berry County?
 - a. 460 miles
 - b. 530 miles
 - c. 430 miles
 - d. 550 miles

5. Which airprot is located east of Berry County Airport?
 - a. Sentry Airpark
 - b. Manta Airpark
 - c. Gonzo Municipal Airport
 - d. No airport is east of Berry

6. Name the aiport located in the northeast corner of the map. _____

7. What is the difference in mileage between Sentry Airpark and Gonzo Municipal Airport, and Barstow County Airport and Manta Airpark?
 - a. 240 miles
 - b. 20 miles
 - c. 220 miles
 - d. No difference

8. Which airport is exacly 220 miles from Manta Airpark? _____

9. Design a flight plan that will take you from Berry County Airport and fly exactly 490 miles.



NATIONAL MUSEUM OF THE UNITED STATES AIR FORCE™

- Which airport(s) is/are 120 miles from Berry County Airport (BCA)?
 - Sentry Airpark only
 - Barstow County Airport only
 - Manta Airpark and Barstow County Airport
 - Sentry Airpark and Barstow County Airport
- How long is the trip from Berry County Airport to Manta Airpark?
 - One hour
 - Two hours
 - Three hours
 - One half hour
- What are the total number of miles between Berry County, Manta Airpark, and Lyon Airport?
 - 380 miles
 - 290 miles
 - 360 miles
 - 120 miles
- What are the total number of miles between Berry County, Sentry Airpark, Gonzo Municipal Airport, Manta Airpark, and back to Berry County?
 - 460 miles
 - 530 miles
 - 430 miles
 - 550 miles
- Which airport is located east of Berry County Airport?
 - Sentry Airpark
 - Manta Airpark
 - Gonzo Municipal Airport
 - No airport is east of Berry
- Name the airport located in the northeast corner of the map. Lyon Airport (LA)
- What is the difference in mileage between Sentry Airpark and Gonzo Municipal Airport, and Barstow County Airport and Manta Airpark?
 - 240 miles
 - 20 miles
 - 220 miles
 - No difference
- Which airport is exactly 220 miles from Manta Airpark? Gonzo Municipal Airport (GMA)
- Design a flight plan that will take you from Berry County Airport and fly exactly 490 miles.
BCA->BARCA->GMA->SA->BARCA->LA