NATIONAL MUSEUM
OF THE UNITED STATES AIR FORCE™

Aviation Rules: Direction, Degrees, and Altitude

Students will learn about instrument and aviation flight rules by observing the measurements of cardinal direction, degrees, and altitude.

LESSON PLAN

Learning Objectives:

The students will:
- Interpret data from a chart
- Choose the correct direction of flight
- Determine the correct direction of flight based on the assigned altitude

Purpose:

This class is designed to give students the opportunity to practice, observe, and analyze aviation rules for the skies. Students will understand that these aviation rules require degree and altitude measurements to effectively provide a safe airspace. They will learn that in each cardinal direction there is a set of degrees and altitude standards that are used for these aviation rules. Students will be quizzed on their ability to decipher the degrees on a compass and determine the specific altitude that accompanies it.

Introduction:

Thousands of aircraft fly across the United States each hour of the day. To keep the aircraft that are flying below 18,000 feet (Mean Sea Level) on Instrument Flight Rules (IFR) from running into each other, a formula was devised to ensure proper separation of aircraft is maintained. Aviation rules require aircraft flying on an IFR flight plan be separated by at least one thousand feet. This formula, as basic as it seems, provides a safer air space. Any aircraft flying a heading of East - including North, Northeast, East or Southeast (0 degrees through 179 degrees) - must be at an odd altitude (3000', 5000', 13000', etc.). Only the thousandth's place determines odd vs. even. So, yes, in mathematics, 3,000 is an even number. In flying, we are only interested in how many thousands. Thus, 3,000 is an odd number! Any aircraft flying a heading of west - whether South, Southwest, West, or Northwest (180 degrees through 359 degrees) - must be at an even altitude (4000', 8000', 16000, etc.). This procedure helps keep everyone stay safe in the air!

Grade Level: 4

Ohio Learning Standards/Mathematics (2017)
Ohio Standards for Mathematical Practices
MP.1: Make sense of problems
MP.2: Reason abstractly and quantitatively
MP.5: Use appropriate tools strategically
MP.6: Attend to precision
MP.8: Look for and express regularity

Algebra
4.OA.5: Generate a number or shape pattern

Measurement & Data
4.MD.5: Recognize angles as geometric shapes
4.MD.6: Measure angles in whole number degrees
4.MD.7: Recognize angle measure as additive

Materials Required:

- Worksheet
- 360 degree compass
- Pencil

Procedure:

A. Warm-up

1. Review the Introduction section above and explain to the students the method behind the measurements of cardinal direction, degrees, and altitude.

2. Explain the importance of the formula and its ramifications should these rules be violated.

3. Review concept of 360 degree circle and the applicable cardinal points of the compass. Give students compass for reference.

B. Activity

1. Write five or six altitudes on the board. Also draw compass on board.

2. Select a student for each altitude.

3. Have the students determine whether the altitudes are even or odd.

4. Pass out the worksheet and read directions to the students.

5. Allow the students to work on the sheet, completing each question.

Assessment/Evaluation:

Students will complete worksheet. Check **page 5** for correct answers.

Resources/References:

Aviation Regulations:

https://www.faa.gov/regulations_policies/faa_regulations/

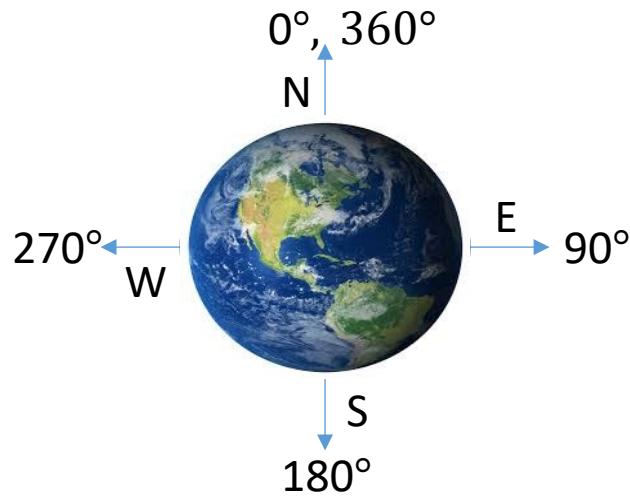https://www.faa.gov/regulations_policies/

Instrument Flight Rules:

https://www.skybrary.aero/index.php/Instrument_Flight_Rules_(IFR)

https://www.cfinotebook.net/notebook/rules-and-regulations/instrument-flight-rules

August 2020

Name: _____

Aviation Rules: Direction, Degrees, and Altitude

Altitude For Direction Of Flight:

Compass reading: From 0, 360 degrees to 179 degrees…..Odd Altitudes
(3,000', 5,000', 17,000')
From 180 degrees to 359 degrees….Even Altitudes
(4,000', 8,000', 16,000')

Circle the correct altitude, even or odd, for the direction of flight.

Freddy wants to go on a heading of:

    a.   090 degrees   His altitude should be: even/odd

    b.   270 degrees   His altitude should be: even/odd

    c.   350 degrees   His altitude should be: even/odd

    d.   010 degrees   His altitude should be: even/odd

    e.   175 degrees   His altitude should be: even/odd

    f.   290 degrees   His altitude should be: even/odd

August 2020

g. 360 degrees   His altitude should be: even/odd

h. 120 degrees   His altitude should be: even/odd

i. 001 degrees   His altitude should be: even/odd

j. 359 degrees   His altitude should be: even/odd

Determine whether the altitudes below are appropriate for the direction of flight.

a. 10,000 ft heading 330 degrees   correct / wrong

b. 7,000 ft heading 070 degrees   correct/wrong

c. 6,000 ft heading 010 degrees   correct/wrong

d. 15,000 ft heading 270 degrees   correct/wrong

e. 11,000 ft heading 190 degrees   correct/wrong

f. 23,000 ft heading 140 degrees   correct/wrong

g. 16,000 ft heading 220 degrees   correct/wrong

h. 3,000 ft heading 030 degrees   correct/wrong

i. 18,000 ft heading 300 degrees   correct/wrong

j. 19,000 ft heading 170 degrees   correct/wrong

August 2020

Answer Sheet

Circle the correct altitude, even or odd, for the direction of flight.

Freddy wants to go on a heading of:

    k. 090 degrees   His altitude should be: even/odd

    l. 270 degrees   His altitude should be: even/odd

    m. 350 degrees   His altitude should be: even/odd

    n. 010 degrees   His altitude should be: even/odd

    o. 175 degrees   His altitude should be: even/odd

    p. 290 degrees   His altitude should be: even/odd

    q. 360 degrees   His altitude should be: even/odd

    r. 120 degrees   His altitude should be: even/odd

    s. 001 degrees   His altitude should be: even/odd

    t. 359 degrees   His altitude should be: even/odd

Determine whether the altitudes below are appropriate for the direction of flight.

    a. 10,000 ft heading 330 degrees   correct/wrong

    b. 7,000 ft heading 070 degrees   correct/wrong

    c. 6,000 ft heading 010 degrees   correct/wrong

    d. 15,000 ft heading 270 degrees   correct/wrong

    e. 11,000 ft heading 190 degrees   correct/wrong

    f. 23,000 ft heading 140 degrees   correct/wrong

    g. 16,000 ft heading 220 degrees   correct/wrong

    h. 3,000 ft heading 030 degrees   correct/wrong

    i. 18,000 ft heading 300 degrees   correct/wrong

    j. 19,000 ft heading 170 degrees   correct/wrong

August 2020