"If I Could Fly"

Objective: Students will apply concept of aerodynamics and use the relationship between weight and wingspan to calculate what their wingspan must be to be able to fly. Students will report their data using two different graphical representations, a football field and a graph grid. Students will then use a spreadsheet to graph their results.

Strand: Geometry and Spatial Sense; Data Analysis and Discrete Mathematics; Measurement; Algebra

SLC: - Math: 6^{th} grade: #10, #17, #21 7^{th}-8^{th} grade: #3, #6, #7, #12

Assessment: Students will use the concept of ration and proportion to solve a problem involving building of airplanes.

Activity: Students should work in groups.
Activity #1: Students calculate their wingspan and graph it on a football field graph using worksheets #1 and #2. (Students will need to change their wingspan to yards to graph it on a football field but **no instructions for this should be given**)

Activity #2: Each group of students will graph the relationship between weight/wingspan on a piece of graph paper and describe their results using worksheets #3 and #4. **The only instructions the students will need are to name and label the graph and each space represents 10 units.**

Activity #3: Students will graph the results of their group on the computer usinga spreadsheet. They will graph both a line and pie chart.

Materials: all included
"If I Could Fly" worksheets for activity #1 and #2
Graph paper
Assessment
Football graph for overhead
Copy of answer key

Extended Activity:
Students can design a large football field and a large centimeter graph using the rolled art paper and put it on a wall in the classroom. Students can put their results on these graphs.

Beginner's Guide to Aerodynamics: NASA
https://www.grc.nasa.gov/www/k-12/airplane/bga.html

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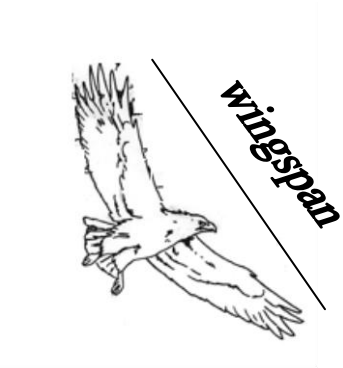

Activity #1
An eagle whose weight is 10 pounds needs a wingspan of 6 feet to be able to fly. Using your weight what wingspan would you need to fly? Use the information about the eagle to calculate your wingspan and then graph it on the football graph supplied.

Show your work and explain your answer in words and/or numbers below.

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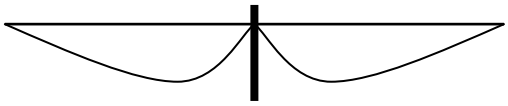
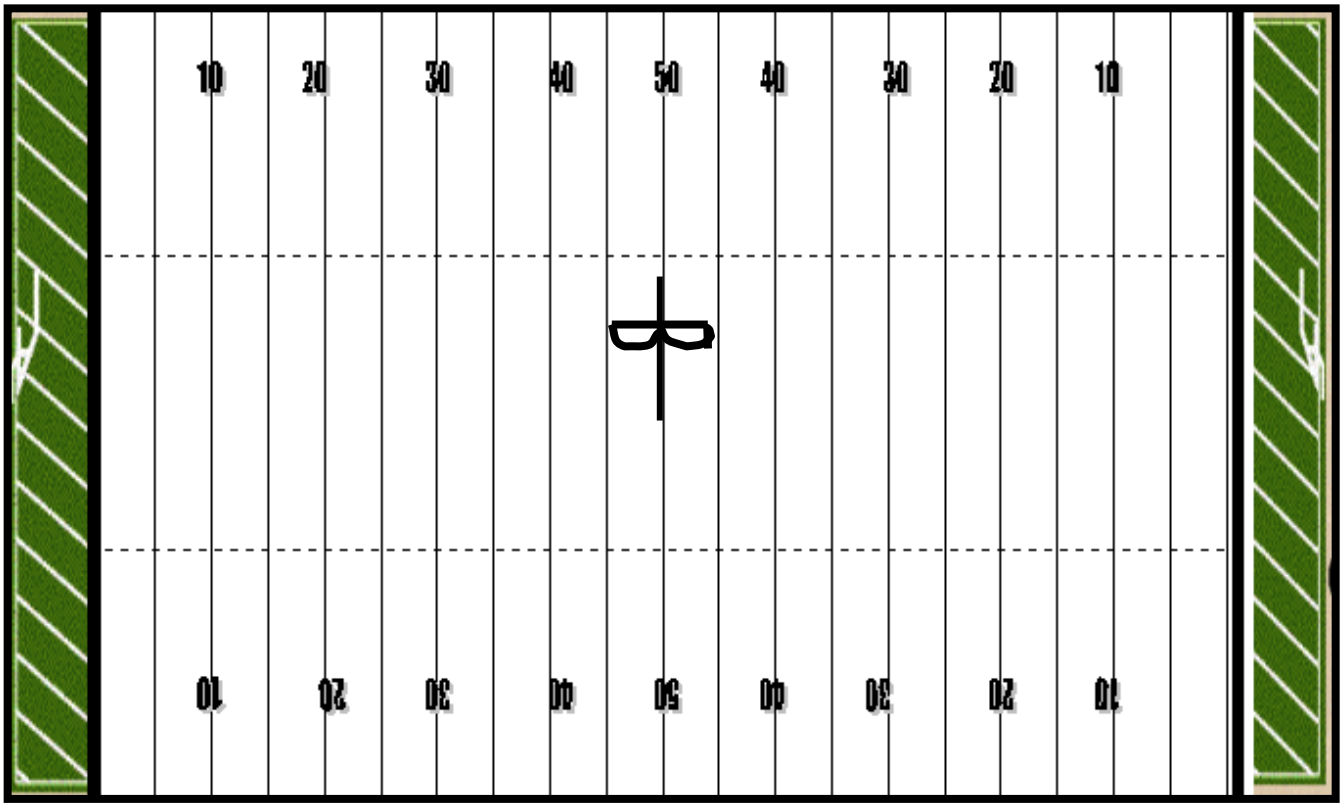
Activity #1
Using a dark colored marker, draw your wingspread, using the eagle figure below as the example, on the football field graph.





This is what the 50 pound eagle would look like if it spread its wings on a football field. Explain how you know that the above representation of the eagle on the football field is accurate?

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Activity #2

On the graph paper below, graph the results of the weight/wingspan of your group. **Title and label your graph and explain your results on the other sheet provided**.

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Activity #2
Explain the results of your graph.

_____

_____

_____

_____

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Assessment:

The students in Nichole and Michael's class are building toy airplanes out of thin pieces of wood. They discovered that some of their designs will fly and some will not. To find an explanation they decided to chart their findings.

Will Fly		**Will Not Fly**	
Length	**Wingspan**	**Length**	**Wingspan**
32	20	24	4
16	10	8	4
24	15	25	5
48	30	12	3

1. What is the relationship between the length of the airplane and its wingspan for it to fly.

Explain your answer using pictures, words, or graphs how you arrived at your solution.

_____

_____

_____

_____

_____

_____

2. List three other designs that will fly and three that will not.

_____

_____

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Answer Sheet:

Activity#1

The students are given the following information and will use it to solve the problem: A 10 pound eagle has a wing span of 6 feet. The following are examples of the way the problem can be solved but students can use any method they can justify and explain.

$$\frac{\text{weight of Eagle}}{\text{Eagle's wingspan}} = \frac{\text{student's weight}}{\mathbf{w}(\text{student's wingspan})}$$

$$\frac{10}{\text{weight of student}} = \frac{6}{\mathbf{w}(\text{student's wingspan})}$$

10**w** = 6 times (student's weight)
w= (student's wingspan) in feet

or the proportion can be set up as:

$$\frac{\text{weight of Eagle}}{\text{student's weight}} = \frac{\text{Eagle's wingspan}}{\mathbf{w}(\text{student's wingspan})}$$

The equation is the same:
10**w** = 6 times (student's weight)
w = (student's wingspan) in feet

The football field is in yards so the students must convert feet to yards by dividing their answer by 3.

The figure should be drawn on the football field graph with the 50-yard line as the center of the wing span as shown on their graph.

Activity#2:

If graphed correctly the x-axis represents the weight of the student and the y-axis is the wingspan. The independent variable is weight and dependent is wingspan because the wingspan depends on the weight of the student or bird. The students should explain that it is a straight line graph because each weight/wingspan is the same ratio/proportion so that is why the results is a straight line graph.

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Assessment

The students need to explain that there is a direct proportion between the length/wingspan of 8/5 for all the planes that “Will Fly” and 8/3, 2/1, 5/3, 3/2 for those that “Will Not Fly”.

Tow possibilities are:
The students set up a proportion for length/wingspan and reduce each fraction to lowest terms and show that for those planes that “Will Fly” they are all equal while those that “Will Not Fly” are not. They should show that all the fractions formed from the planes that “Will Fly” when reduced to lowest terms are 8/5 and those that “Will Not Fly” are different

The students could graph the two tables and explain that those planes that “Will Fly” forms a straight line graph which proves that they are in direct proportion while the plane that “Will Not Fly” do not form a straight line.

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Weight	Wingspan

"If I Could Fly"