

LessonTitle: Ratio and Proportion in KIDS		Pre 4.3
Utah State Core Standard and Indicators Pre-Algebra Standards 2-5 Process Standards 1-5		
Summary		
In this activity, students measure and then figure out proportions using height/head circumference, thumb/wrist, etc. They change the ratios to decimals, organize the data into tables and plots to find patterns and make predictions.		
Enduring Understanding	Essential Questions	
We can use proportion equations to make predictions about sizes and heights in kids.	How can we use ratio to help us make predictions and solve problems?	
Skill Focus	Vocabulary Focus	
<ul style="list-style-type: none"> • Measuring size • Ratios • Proportion equations • Statistics plots and central tendencies 		
Assessment ideas:		
<ul style="list-style-type: none"> • Use the Credit Card and Ratio and Proportion Assessments later in the module. • Have students respond in writing to the essential questions. • Have students write about their learning. What was interesting? What did they learn the most from? What connections did they make? What did they think while they were working? 		
Materials: Calculators, measurement tools, worksheets, DaVinci picture copies		
Launch		
Explore		
Summarize		
Apply		

Directions:

- Show the videotape Donald in Mathemagic Land. Discuss how we've already been using ratios in a lot of our statistics and probability activities.
- Students measure and record. Follow the worksheets below. You may wish not to do all the parts of the activities and focus instead on the last one only.
- You might consider using "Go for the Gold," golden ratio activity found in Explorations Discovering Math with the TI-73 (blue)

Pre 4.3

Ratio and Proportion in KIDS

Of all the concepts in mathematics, the idea of ratio is one of the most important and useful. In this activity we'll look for ratios in *us*. From our investigations we'll eventually draw the proportions for a typical student of your age.

What is a ratio? Give some examples from previous class discussions.

What is a proportion equation? Demonstrate the idea using information from previous class discussions.

I. If we know your head circumference, how can we predict your height? And vice-versa?

My Data: Head circumference _____ Height _____ Height/Head ratio _____

Class data:

Data		Comparison			Data		Comparison	
Head Circ. (cm)	Height	Ratio $\frac{\text{Height}}{\text{Head}}$	Dec. Equiv.		Head Circ. (cm)	Height	Ratio $\frac{\text{Height}}{\text{Head}}$	Dec. Equiv.
Totals				→				
Averages				→				

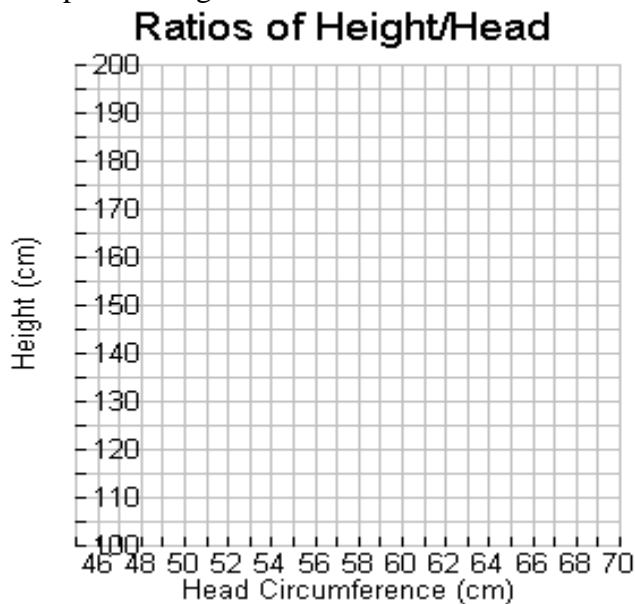
- 1) Write a proportion equation to show how to find the height of a giant with a 100 centimeter head circumference.

- 2) How could you use the decimal ratio to find that height?

- 3) Write a proportion equation to show how to find the head circumference of a computer generated 100 centimeters tall movie character.

- 4) How could you use the decimal ratio to find that head size?

Graph the Height/Circumference Ratio data below.



5) Use the graph to predict the height of a football player with a 70 cm head. _____

6) Predict the head size of a basketball player who is 185 cm tall. _____

7) What patterns do you see in the graph?

II. If we know the circumference of your thumb, what else might we estimate about you?

Group Circumferences				Ratios			
Name	Thumb	Wrist	Neck	Ankle	Wrist/thumb	Neck/Wrist	Ankle/neck
Totals →							

What conclusions can you draw from the information recorded in the table?

Record class data below.

Group	Number of Members	Total of Ratios		
		Wrist/thumb	Neck/wrist	Ankle/neck
1				
2				
3				
4				
5				
6				
7				
8				
9				
Totals →				
Averages →				

Using the information above, predict the wrist, neck and waist of a giant with the thumb size of a Pepsi can. Show your proportions and work. Wrist _____ Neck _____ Waist _____

III Where do you fit in the range of heights for students in your class?

My Height _____ Measure and record the class heights from smallest to largest below.

Class data Stem and Leaf Plot

Boys & Girls Stem and Leaf Plot

Class Data Box Plot

Label the median, quartiles, min, max.

Boys and Girls Box Plots

Label the median, quartiles, min, max.

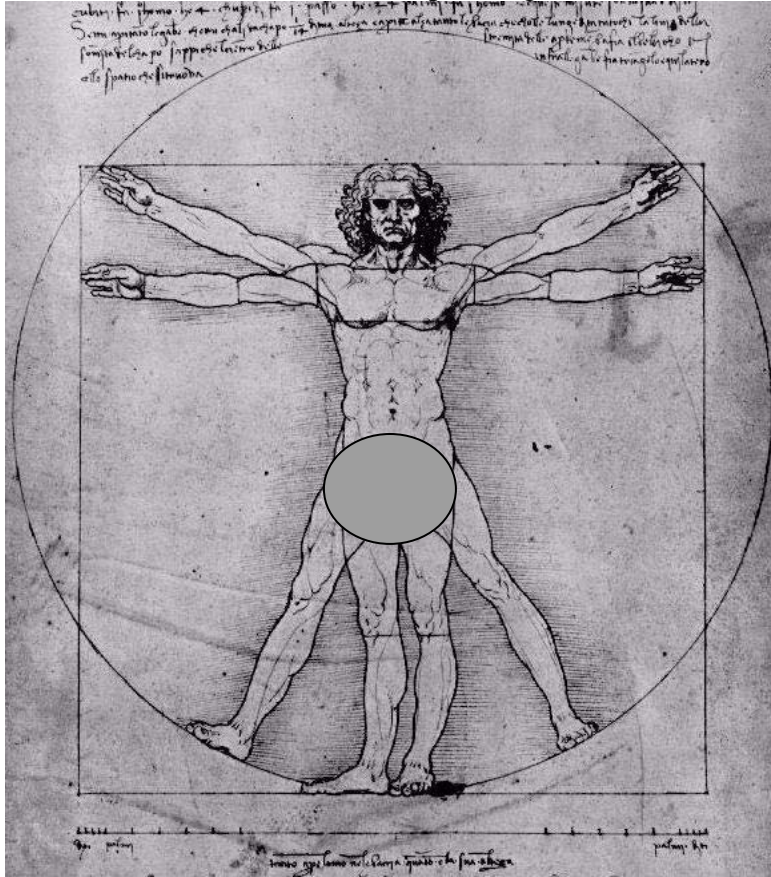
What is the mean? Class _____ Boys _____ Girls _____

Are there any modes? If so what are they? _____

Where do you fit in the range of heights of students for your class?

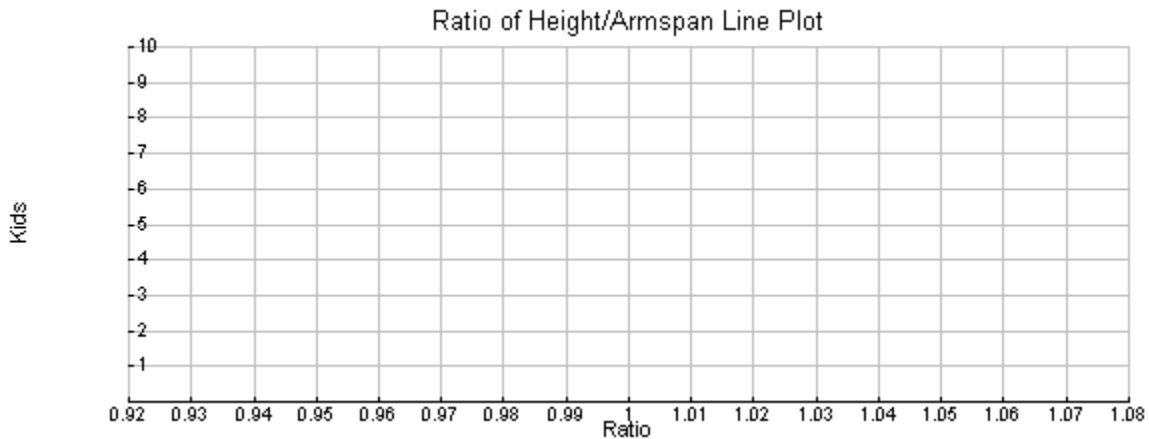
4) Leonardo DaVinci thought there was an ideal proportion for human beings. How close are you to what he thought? What do you think about “ideal”—is there such a thing?

Look at the DaVinci picture. What relationship between height and arm span does DaVinci think is ideal? Measure in centimeters and create an armspan/height ratio. _____

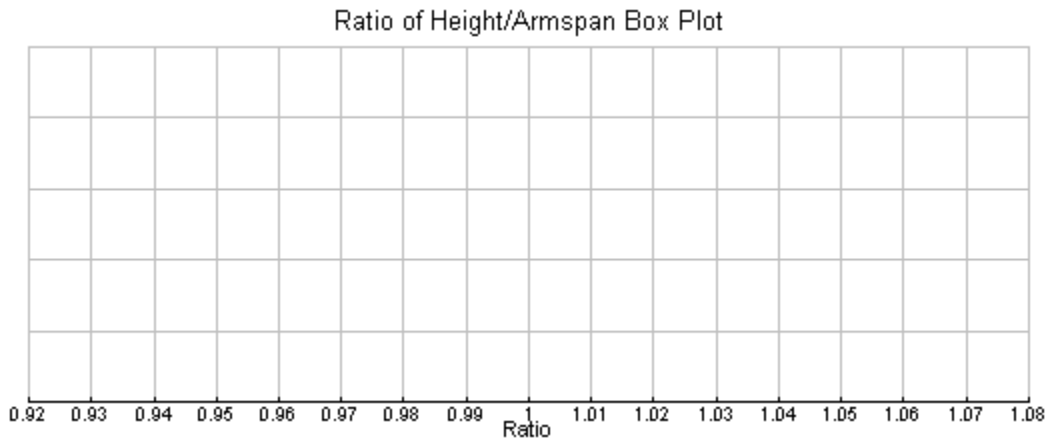


My height (cm) _____ My arm span (cm) _____ My Height/Span _____
Frac Dec.

Record the student ratios on the line plot below.



Using information from the line plot above, create a box plot which shows, the quartiles, median, min and max.



Median Ratio _____

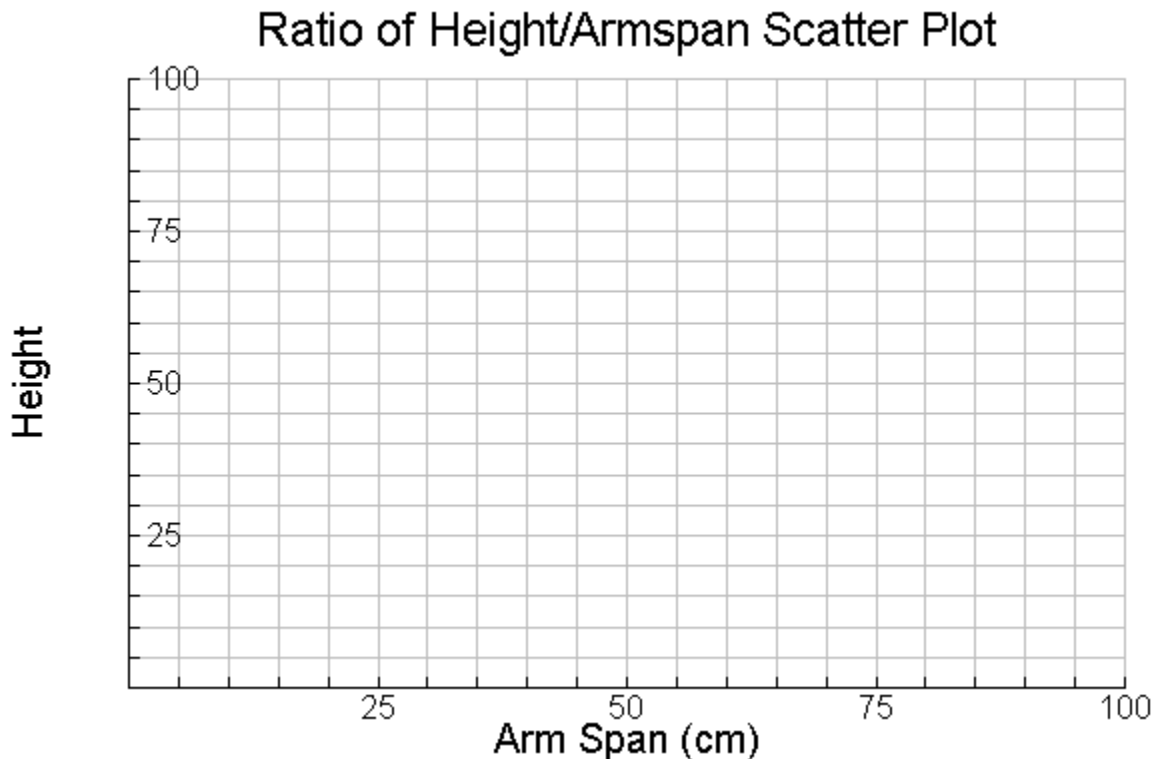
Find the mean ratio. _____ What do you think the mean and median tell you?
How are they alike and how are they different?

Predict heights for the following arm spans using mean and median ratios

Arm Spans	140 cm	150 cm	160 cm
Predicted Height using mean ratio			
Predicted Height using median ratio			

What conclusion might you draw from these plots?

Create a scatter plot to show the height and arm span ratios.



How is this scatter plot different than the line and box plot?

What does it show that the others don't?

Find and locate yourself on each of the graphs. Place a point and label it "ME."

Explain how you think you fit into the data and the graphs.

Do you think other classes would produce similar graphs? Why or why not.

Leonardo DaVinci thought there was an ideal proportion for human beings. How close are you to what he thought? What do you think about "ideal"—is there such a thing?

5) What proportions does the typical student your age have? How are you different and like the typical student? What makes you unique?

Your measurements:

Body Height _____ Arm Span _____ Head Height _____ Head Width _____

Chin-to Eye Height _____ Leg length _____ Shoulder Height _____ Foot Length _____

Your Ratios:

Body Ht/Arm Span _____ Head Ht/Body Ht _____ Head Width/Head Ht _____

Eye-to Chin/ Head Ht. _____ Leg Length/Body Ht. _____

Shoulder Ht/Body Ht _____ Foot Length/ Body Ht. _____

Class data:

Enter the Class data into lists in the graphing calculator. Decide which kind of graph (from section 5 above) tells you the most useful information and plot graphs for each of the ratios.

Record graphs below. Then make a point to show where you are in each of the graphs.

Body Ht/Arm Span

Head Ht/Body Ht

Head Width/Head Ht

Eye-to Chin/ Head Ht.

Length/Body Ht.

Shoulder Ht/Body Ht

Foot Length/ Body Ht.

Ratio averages:

Use the calculator to find the mean of all the categories of ratios below.

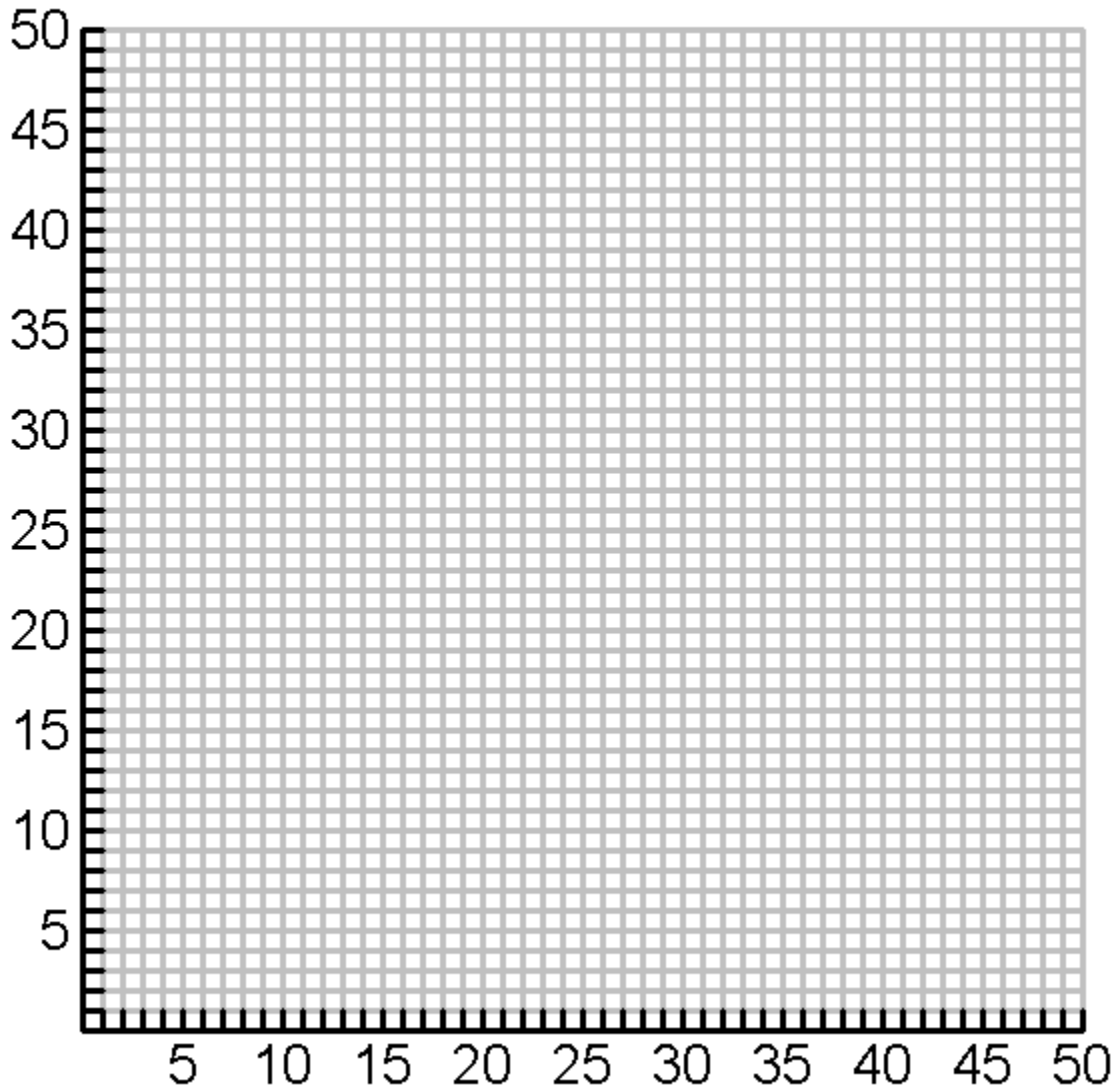
Body Ht/Arm Span _____ Head Ht/Body Ht _____ Head Width/Head Ht _____

Eye-to Chin/ Head Ht. _____ Leg Length/Body Ht. _____

Shoulder Ht/Body Ht _____ Foot Length/ Body Ht. _____

The Typical Student:

Use the data you have gathered above to block out a typical student that follows the proportions found in your conclusions. Start with Height.



How are you different and like the typical student? If you wish draw your self on the graph and shade in a different color.

What makes you unique?