MiSP Human Growth and Development Worksheet #1 L3

Name _____ Date _____

HUMAN GROWTH FROM AGES 2 TO 20 YEARS

Introduction:

People grow. They start before they are born, and growth continues until approximately age 20. We know that there is no normal height although most people fall in an average range. Genetics, nutrition, and general health affect how tall a person will be.

Do people, in general, grow at the same rate or are there growth spurts? You will look at data collected by the Centers for Disease Control and Prevention. They collected height measurements from many, many people and determined the average heights, by age, of children in the United States children from 2 to 20 years. You will be given a chart of the data with heights for boys and girls.

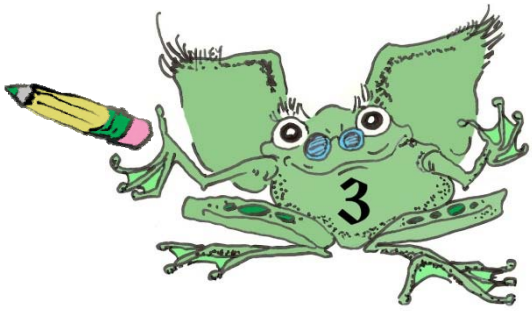
Procedures:

Review the data on the chart, "Median Heights of U.S. Boys and Girls." It lists the age, in years, from 2 to 20, and the median height at each of those ages for boys and girls. Median is also called the "50th percentile." That means that half of the children have a height less than the 50th percentile and half of the children have a height greater than the 50th percentile. Heights are given in centimeters (cm).

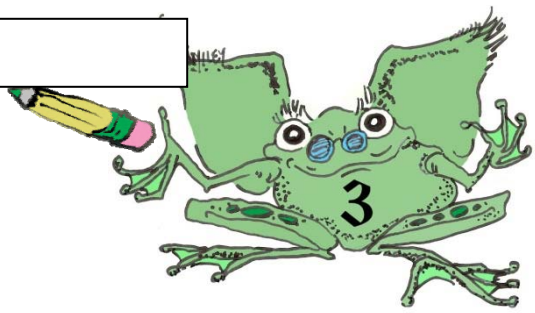
Graph the data:

Graph the boys' or girls' data on the next page to show the relationship between age (years) and height (cm). Plot both sets of data on the same graph. Use a different color pencil for boys and girls.

- Label the *x*-axis with age (years).
- Label the *y*-axis with height (cm).
- Connect the data points.
- Add a legend to your graph.
- Give the graph a title: "Median Height of U.S. Boys and Girls."



Discussion Questions:



1. It should be clear from your graph that as a child grows from age 2 to 20 years old, her or his height increases. You should also see that the increase does not occur at a constant rate (the height does not increase the same amount for each span of years). During which years is the growth rate the smallest?

_____

2. During which years is the growth rate the greatest?

_____

3. People often talk about young people having growth spurts (when they increase in stature quickly). That often occurs during some time period between the ages of 10 and 14. Does your answer to 2 agree with there being a growth spurt between the ages of 10 and 14? Explain.

_____

_____

_____

4. Compare the lines for girls and boys. List two ways the graphs are <u>similar</u>.

_____

_____

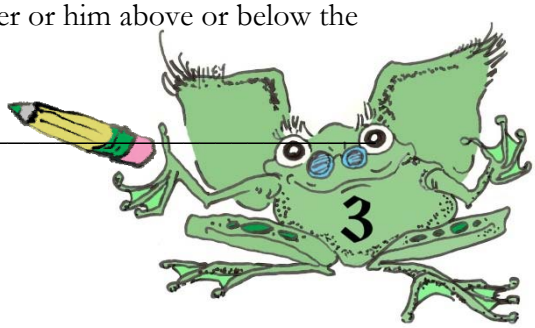
5. List two ways the graphs are <u>different</u>.

_____

_____

6. A 4-year-old child has a stature of 105.0 cm. Does that place her or him above or below the line for the median height (50th percentile) for age 4?

_____



7. Does your answer to 6 mean that this child will always be above or below the median height (50^{th} percentile) as he or she becomes 5 years old, 6, 7, etc.? Explain.

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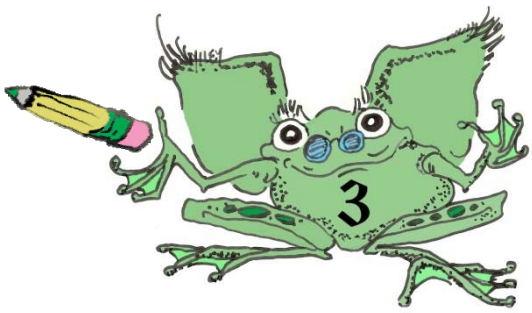
_____

8. Use your graph to predict the median height of a 3.5-year-old boy and girl.

Boy _____ Girl _____

9. Compare the changes in height in two regions of the graph (2 to 10 years old and 18 to 20 years old) by calculating the unit rate of change (slope). **Use either the boys' or the girls' data.** Your teacher will tell you which to use.

Unit Rate of Change = $\frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{\Delta \text{ Stature (cm)}}{\Delta \text{ Age (years)}}$



Section of Graph	Ordered pairs (x_1, y_1) (x_2, y_2)	Δ Stature (cm) Δy	Δ Age (years) Δx	**Unit Rate of Change** $\Delta y/\Delta x$
2–10 years				
18–20 years				

10. Compare the unit rates of change (slopes) of the two sections of the graph.

_____

_____

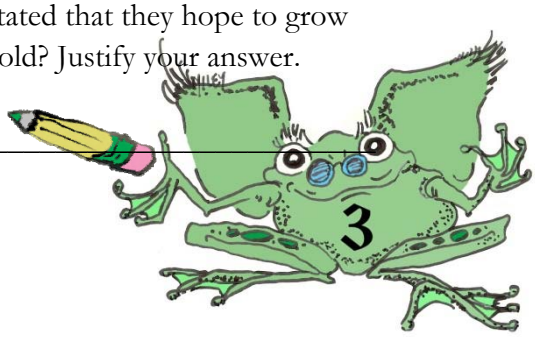
_____

11. Based on the unit rates of change, when do children grow at the greatest rate—between 2 and 10 years of age or between 18 and 20?

_____

12. Using mathematics and referring to your graph and the unit rate of change between ages 18 and 20 years, what would you say to a person who, at age 19, stated that they hope to grow another 6 cm (about 2 ¼ inches) by the time they are 23 years old? Justify your answer.

_____



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_____

13. If your connected data points do not make a straight line, draw a best-fit line segment from 2 to 10 years. If the original line or your best-fit line was extended, it would intersect the *y*-axis ($x = 0$ years).

    Use the equation for a line to calculate the *y*-intercept. The equation for a line is
    $y = mx + b$, where m is the unit rate of change (slope) and
    b is the *y*-intercept

Y-Intercept
$m =$ Ordered pair $(x, y) =$ (___ , ___) $y = mx + b$ Solve for b:

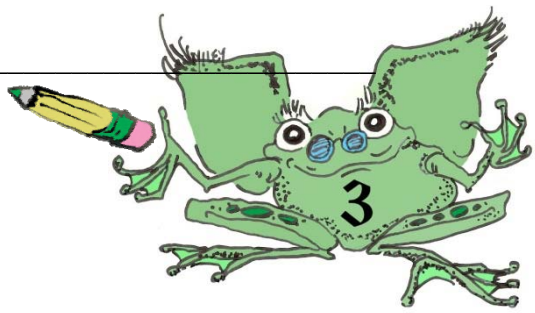
14. According to your calculation above, when a child is 0 years old, his/her height would be _____cm. Convert this value to inches.

    ____ cm x $\frac{0.39 \text{ inches}}{1 \text{ cm}}$ = _____ inches

15. Why does the use of the linear equation result in an invalid answer to question #14?

_____

_____



16. Based on the unit rate of change and the *y*-intercept that you calculated above, write an equation for the section of the graph from 2 to 10 years.

Equation

17. Use the formula you determined above to calculate the height for ages 3.75 and 30 years.

Age (*x*)	Calculated Stature (height) (*y*) cm
3.75 years	
50 years	

18. Convert the calculated height in cm for 50 years, above, to inches by multiplying the cm by .39 inches/cm. Find out how many feet tall that represents by dividing the inches by 12 in/ft.

    That height is, of course, impossible. Why does the formula for the line from 2 to 10 years NOT work for 50 years?

    _____

    _____