Name _____

Class _____

Problem 1 – Fibonacci Numbers

1. The first seven terms in the Fibonacci sequence are 1, 1, 2, 3, 5, 8, and 13. Write the next 13 terms. _____

2. Enter the first 20 terms in L1 and the 2nd through 21st terms in L2. Press $\boxed{\text{LIST}}$ and move to the top of L1. Press $\boxed{\text{CLEAR}}$ $\boxed{\text{ENTER}}$ if needed to empty the list. After entering L1, move to the very top of L2. Press $\boxed{\text{CLEAR}}$ $\boxed{\text{ENTER}}$ and then insert L1 ($\boxed{\text{2nd}}$ $\boxed{\text{LIST}}$ $\boxed{\text{ENTER}}$ $\boxed{\text{ENTER}}$). Then delete the first element by highlighting it and pressing $\boxed{\text{DEL}}$. Then enter the 21st element at the end of the list.

L1	L2	L3	2
1	1	------	
1	2		
2	3		
3	5		
5	8		
8	13		
13	21		

    L2(1)=1

    In L3, enter the ratio between L1 and L2. Go to the top of L3 and press $\boxed{\text{2nd}}$ $\boxed{\text{LIST}}$ $\boxed{\text{ENTER}}$ $\boxed{\div}$ $\boxed{\text{2nd}}$ $\boxed{\text{LIST}}$ $\boxed{2}$ $\boxed{\text{ENTER}}$ to enter **L1/L2** and execute the command. What are the first 6 ratios? _____

3. Describe the pattern you see in the ratios as you move down the list. _____
    _____

Problem 2 – Height Ratio – Gathering the Data

Next, you will explore the ratio between your height and the height of your navel.

4. Record your measurements in the table below.

 | | Height (cm) ∟HT | Navel Height (cm) ∟NHT | Height/Navel Height ∟HTNHT |
    |--|-----------------|------------------------|----------------------------|
    | Me | | | |
    | Partner | | | |

    Now collect all the data from the class and enter in the indicated lists. Press $\boxed{\text{LIST}}$ and insert lists ($\boxed{\text{2nd}}$ $\boxed{\text{DEL}}$) with the given names. Find **HTNHT** by dividing the first list, **HT**, by the second list, **NHT**.

5. Which student's ratio is the most "golden"? Justify your answer with a reason.
    _____

6. Which student's ratio is the least "golden"? Justify your answer with a reason.
    _____

7. Find the mean average of the Height / Navel Height list (∟HTNHT). Use **Mean(**, found in the **Stat > MATH** menu. Press $\boxed{\text{2nd}}$ $\boxed{\text{LIST}}$ $\boxed{\blacktriangleright}$ $\boxed{\blacktriangleright}$ $\boxed{3}$ and then $\boxed{\text{2nd}}$ $\boxed{\text{LIST}}$ to find **HTNHT**.
   _____

8. Sketch the navel height versus the student height. Make sure to label the axes and use numbers to show the values on the axes.

9. In general, as navel height increases, what happens to the student height? _____

_____

_____
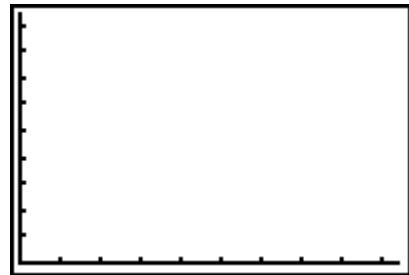
Problem 3 – The Best Fit Line

Now, we are going to graph the scatter plot of data and find a best fit line that models the data.

10. Set up and graph the scatter plot of navel height versus height. The screen at the right shows the settings for the scatter plot. Press [2nd] [Y=] [ENTER] to access **Plot1**. To access the list names, press [2nd] [LIST] and move down to the appropriate name.
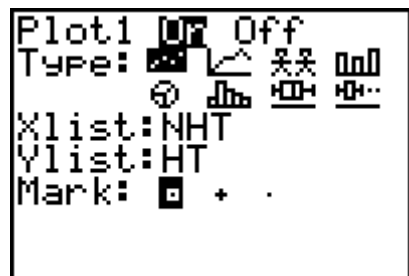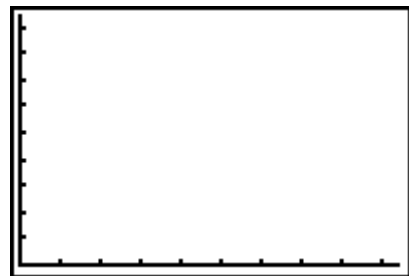
What would be an appropriate window for the data for your class?

Xmin? _____ Xmax? _____ Xscl? _____

Ymin? _____ Ymax? _____ Yscl? _____

Press [2nd] [WINDOW] to enter the values.

11. Press [GRAPH] and sketch the scatter plot of the class data to the right.

12. Next, find a line of fit for the data using the **Manual-Fit** command. From the Home screen, press [2nd] [LIST] [◄] [3] (to select Manual-Fit) and [2nd] [APPS] [2] [1] (to select Y1), then press [ENTER]. When the graph appears again, move the cursor to the first end point that you want for the line of fit. Press [ENTER]. Move to the other end point and press [ENTER] again. After the line is drawn, you can use the arrows to move the line about. (up and down or to adjust the slope) Press [ENTER] one last time when you are happy with where the line is located.

Sketch the line of fit on the scatter plot in Question 11.

13. What is the equation found? Press [Y=] to see the Y1 equation. _____

14. The number in front of the X in the equation is defined as the ratio of change in *y* over change in *x*. How does this number compare to the Golden ratio from Question 3?

_____

_____

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15. If Y = Height, X = Navel Height, and Y ÷ X = 1.618, then Y = _____.

16. Type the equation from Question 15 in Y2 and press GRAPH. Are there similarities between Y1 and Y2? If so, explain. _____

_____

_____

17. Next, use the mean average of the class to write an equation in Y3. In Y3, type in the number you found in Question 7 and press x. Then graph Y1, Y2, and Y3. Are there similarities between Y1, Y2, and Y3? If so, explain. _____

_____

_____

18. Based on the relationship of a person that fits a truly golden proportion, which equation would you use to find their height? _____

19. Find the height of a truly "golden" person whose navel height is 100 cm. _____

Golden Ratio

Table 1

Name	Height (cm) $_L$HT	Navel Height (cm) $_L$NHT	Height/Navel Height $_L$HT /$_L$NHT