

## Exploration of Rational Equations with Young's and Cowling's Rules.

Doctors commonly use dose formulas for prescribing medicines to children. These dose formulas describe an approximate relationship only. Young's Rule and Cowling's Rule (two dose formulas) both relate a child's age  $A$  in years and an adult dose  $D$  of medication to the proper child's dose  $C$ . The formulas are most accurate when used for children between the ages of 2 and 13.

$$\text{Young's Rule: } C = \frac{DA}{A+12}$$

$$\text{Cowling's Rule: } C = \frac{D(A+1)}{24}$$

### To input data into the TI-nspire:

Click on the Home key  $\square$ ,

Select number 6: New Documents, when prompted: Do you want to save 'Unsaved Document'?

Please say **NO!** Select number 3: Lists and Spreadsheets

Go to the top of column A and type in "Age"

In cell A1 enter an age for the child of 2

In cell A2, enter  $=A1+1$  and hit  $\cdot$  (a value of 3 should appear in that cell)

You are in cell A3, arrow back up to cell A2

Select your b key

Select number 3: Data

Select number 3: Fill Down

Now arrow down to cell A12 and hit  $\cdot$

Let the adult dose  $D = 1000$  mg.

Go to the top of column B and type in "Youngs"

In column B, in the grey area type in  $=1000(\text{Age})/(\text{Age}+12)$  and hit  $\cdot$

If your data in your columns comes up in fractional form.....

Select your c key

Select number 8: Systems Info

Select number 1: Document Settings

Tab down until the Auto or Approx choice, choose Approximate from your drop down menu

Tab down until at the OK button and hit  $\cdot$

Go to the top of column C and type in "Cowlings"

In column C, in the grey area type in  $=1000(\text{Age}+1)/24$  and hit  $\cdot$

1.) Fill in the table with the dosages for the children based on their ages and Young's versus Cowling's Rule.

Age of Child	Child's Dose by Young's Rule	Child's Dose by Cowling's Rule
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

2.) Use the graphing tool to graph the formula for each rule (with  $D = 1000$  mg) on the same graph. Record the graphs on the grid below. Label the axes and scales appropriately.

To use the graphing tool:

Select /c to access the Tools menu

Select number 5:Page Layout

Select number 2:Select Layout

Select number 2:Layout 2

Select the /e keys in order to highlight the right side of the screen

Select the b key

Select number 2:Add Graphs & Geometry

To create an appropriate window:

Select b key

Select number 4: Window

Select number 1: Window Settings

And set appropriate values for your x and y values, record what you decided to use below:

XMin: \_\_\_\_\_

XMax: \_\_\_\_\_

XScale: Auto

YMin: \_\_\_\_\_

YMax: \_\_\_\_\_

YScale: 100

Tab down until you can hit OK

Select b key

Select number 3: Graph Type

Select number 4: Scatter Plot

In the drop down boxes for x, select the xkey to open the drop down menu, and select "Age" by hitting the xkey again, now hit the e key and in order to access the drop down again use the xkey, and select "Youngs" by hitting the xkey again.

Now hit the e key several times until s2 appears in the lower left of the graphing window

We will repeat the above steps but they are copies here below for your reference:

In the drop down boxes for x, select the xkey to open the drop down menu, and select "Age" by hitting the xkey again, now hit the e key and in order to access the drop down again use the xkey, and select "Cowlings" by hitting the xkey again. Close the menu by selecting / and G.



3.) Use your table and/or graph to decide whether either formula will consistently predict a larger dose than the other. If one formula does, which one? If not, is there an age at which the doses predicted by one formula become greater than the doses predicted by the other formula? If this is true, estimate that age. Explain your decision.

If you need to trace the data on the graph you can:

Select b key

Select number 5:Trace

Select number 1: Graph Trace

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4.) Use the graphing tool and/or the spreadsheet tool to determine if your conclusion in question number three would be the same if the related adult dose  $D$  was 500 mg. Explain how you arrived at your conclusion.

You will need to change your grey formulas to include a 500 instead of 1000. To do this:

Select the /e keys in order to highlight the left side of the screen

Go to the grey lines and edit the formula to include a 500 instead of 100

The calculator will open a screen called "Data Loss", and will ask you "This operations will overwrite data in the current column. Do you wish to proceed?" Say OK!

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