DATA ANALYSIS   ALGEBRA I or ALGEBRA II: PICTURES

Clearly show ALL work on your paper.

 A photography studio offers the following packages to students posing for yearbook photos.

Number of pictures	15	24	31	44
Total Cost	$10.00	$13.00	$16.00	$19.00

a. Graph this data on your graphing calculator using an appropriate window.
Record the window that you used.
What type of relationship it this?
What type of equation could you use to "model" this behavior?

b. Using traditional means, find an equation to "best fit" this data. Show all work.
Also write your equation using function notation using appropriate variables and this time round your values to the nearest penny..

c. Graph this "non-rounded" equation to see how good a "fit" it is.

d. For which of the 4 points does your "non-rounded" equation work exactly? Why do those points match exactly?

e. Use the Stat Calc feature on your calculator to find an equation of "best fit." Graph it and compare this equation with yours. Write the equation. Then write the equation using function notation and rounding numbers to the nearest hundredth. Use this "rounded" equation to answer questions f - l.

NOTE: *for the remainder of the questions, use the "rounded" answer obtained in part e. Round answers to the nearest penny, nearest number of pictures.*

f) If the studio offers a 50-print package, what do you think they should charge?

g) If the studio offers a 20-print package, what do you think they should charge?

h) If you only have $17.00, how many prints do you think they should sell you? (?Clearly show ***how*** to solve this algebraically and support your answer graphically)

i) If you have $25.00, how many prints do you think they should sell you? (Clearly show ***how*** to solve this algebraically and support your answer graphically)

j) What is the y-intercept for the equation? Write a complete sentence to explain the real-world meaning of the y-intercept.

k) What is the slope for the equation? Write a complete sentence to explain the real-world meaning of the slope.

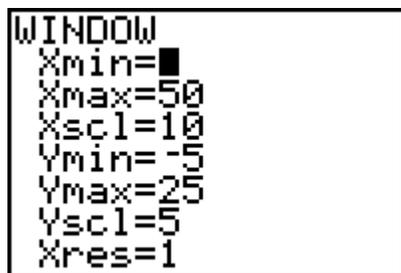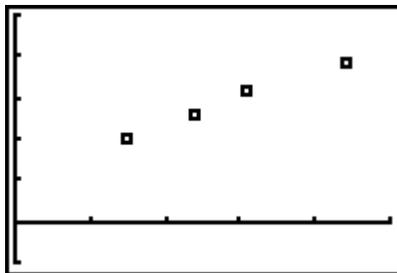l) Of parts f, g, h, i, which deal with interpolation?   with extrapolation?

a.

An appropriate window   The graph

```
WINDOW
 Xmin=█
 Xmax=50
 Xscl=10
 Ymin=-5
 Ymax=25
 Yscl=5
 Xres=1
```

The relationship appears
To be linear.

I would suggest y = mx + b
to model this data.

b.
Traditional means, that is, find the slope using any two points, then the y-intercept.
For this example we will use the 2nd and 4th points.

(24, 13)   (44, 19)

$$m = \frac{\Delta y}{\Delta x} = \frac{19-13}{44-24}$$

$$m = \frac{6}{20}$$

$$m = \frac{3}{10}$$

$$\therefore \quad y = \frac{3}{10}x+b$$

$$Use \quad (24,13)$$

$$13 = \frac{3}{10}\cdot 24 + b$$

$$13 = \frac{36}{5}+b$$

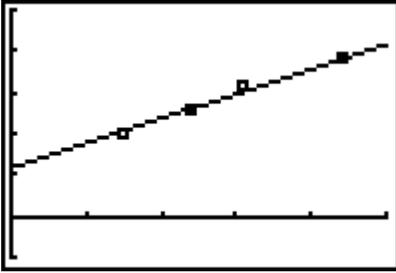$$\frac{65}{5}-\frac{36}{5} = b = \frac{29}{5}$$

$$\therefore \quad y = \frac{3}{10}x+\frac{29}{5}$$

It is important that our students realize that the cost is a function of the number of pictures, that is, cost depends upon the number of pictures.

Let C denote cost and n represent the number of pictures, then:

$$C(n) \quad = \quad \frac{3}{10}n + \frac{29}{5} \qquad or \qquad 0.3n + 5.8$$

c. the graph of the "non-rounded" equation

The graph appears to model this data decently.

It looks like a decent "fit."

d. By tracing on the equation (not the Plot 1 data), two of the points predict the cost of the pictures exactly: (24, 13) and (44, 19). The reason they do work exactly is those are the two points we used to generate the equation!
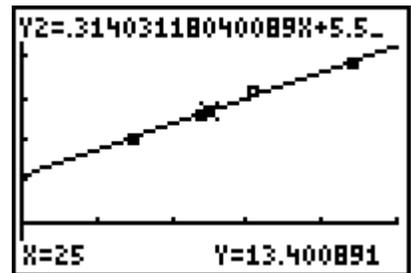
e.

To get the linear regression: And the equation is: The graph of this equation:


```
LinReg(ax+b) L₁,
L₂,Y₂■
```



```
LinReg
y=ax+b
a=.3140311804
b=5.550111359
r²=.9839643653
r=.9919497796
■
```



```
Y2=.3140311804008₃X+5.5_
X=25                Y=13.400891
```

y = 0.3140x + 5.5501 or using function notation: C(n) = 0.31 n + 5.55 rounded to the nearest hundredth. NOTE: Use this last (rounded) equation to answer the remaining questions.

f. This can be found several ways and students should be aware of these ways to make the connection between the equation, its graph, the table of values, and the notation.
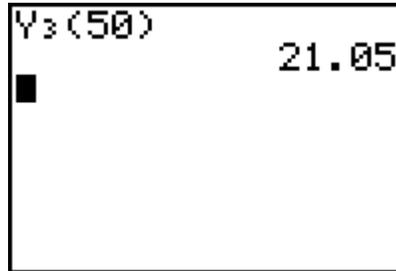
One way	Second way	Third way
Evaluating the function using the proper notation:	Type the equation into y3 y3 = .31 + 5.55 and evaluate:	Trace on the graph at x = 50

$C(50) = .31(50) + 5.55$

$C(50) = 21.05$

```
Y₃(50)
              21.05
■
```

```
Y3=.31X+5.55
```

```
X=50          Y=21.05
```
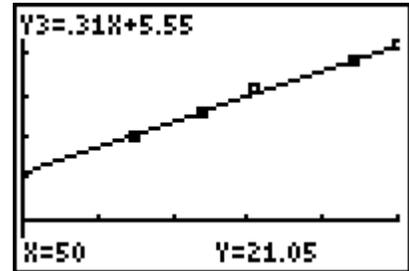
Fourth way
Set up the table   <2ⁿᵈ> <GRAPH> (TABLE)

```
TABLE SETUP
 TblStart=50
 ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

```
  X  │ Y₃ │
 50  │21.05│
 51  │21.36│
 52  │21.67│
 53  │21.98│
 54  │22.29│
 55  │22.6 │
 56  │22.91│
X=50
```

Answer: charge $21.05 for a 50-print package

g. Again there are several ways to find the answer and students should be aware of all of them.

$C(20) = 11.75$ or $11.75 for a 20-print package
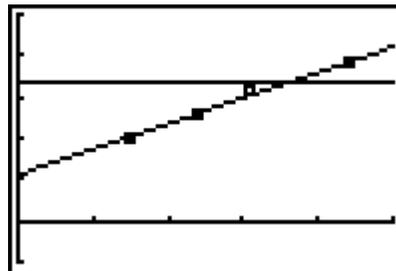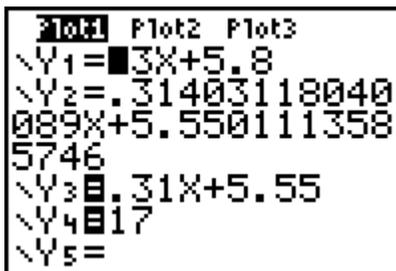
h. Algebraic solution:
$17.00 = .31 n + 5.55$
$11.45 = .31 n$
$11.45/.31 = 36.93548…$
or they should sell me 37 pictures for $17.00
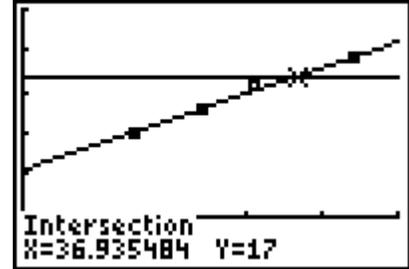
Graphical solution:
In y4, type y4 = 17   Graph:

```
Plot1 Plot2 Plot3
\Y₁=■3X+5.8
\Y₂=.31403118040
089X+5.550111358
5746
\Y₃■.31X+5.55
\Y₄■17
\Y₅=
```

Now use <2nd> <TRACE>
(CALC)   5: intersect

Press <ENTER> for the
first curve and the second
curve

And press <ENTER>
for the guess

```
CALCULATE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
```

```
Y4=17



Second curve?
X=25          Y=17
```

```



Intersection
X=36.935484  Y=17
```
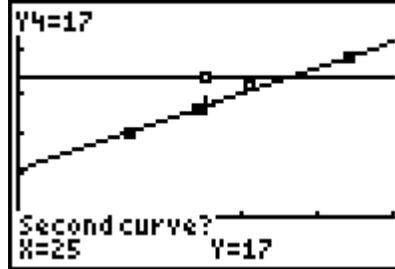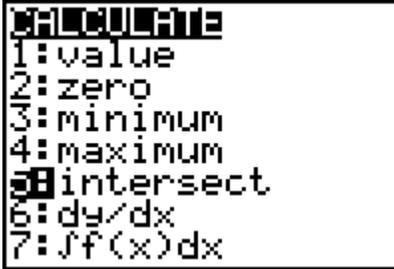
i. This would be done in a similar fashion as part h.

n = 62.74 or you would expect to get 63 pictures fo $25.00

j. Now this is a very important part of this activity – establishing a real-world meaning of the y-intercept. $5.55 is the cost for the sitting, or the cost of just taking the pictures.

k. Again this is important for the student to put actual English words to the meaning of the slope. 31 cents is the cost per print, once you have paid for the initial sitting ($5.55).

l. Parts g and h deal with interpolation, that is, interpreting "between" the given data.

Parts f and in deal with extrapolation, that is, interpreting the "beyond" the data.