2.1 Connecting the Dots: Piggies and Pools

A Develop Understanding Task

1. My little sister, Savannah, is three years old. She has a piggy bank that she wants to fill. She started with five pennies and each day when I come home from school, she is excited when I give her three pennies that are left over from my lunch money. Use a table, a graph, and an equation to create a mathematical model for the number of pennies in the piggy bank on day n.

2. Our family has a small pool for relaxing in the summer that holds 1500 gallons of water. I decided to fill the pool for the summer. When I had 5 gallons of water in the pool, I decided that I didn't want to stand outside and watch the pool fill, so I had to figure out how long it would take so that I could leave, but come back to turn off the water at the right time. I checked the flow on the hose and found that it was filling the pool at a rate of 2 gallons every minute. Use a table, a graph, and an equation to create a mathematical model for the number of gallons of water in the pool at t minutes.

3. I'm more sophisticated than my little sister so I save my money in a bank account that pays me 3% interest on the money in the account at the end of each month. (If I take my money out before the end of the month, I don't earn any interest for the month.) I started the account with $50 that I got for my birthday. Use a table, a graph, and an equation to create a mathematical model of the amount of money I will have in the account after m months.

4. At the end of the summer, I decide to drain the 1500 gallon swimming pool. I noticed that it drains faster when there is more water in the pool. That was interesting to me, so I decided to measure the rate at which it drains. I found that 3% was draining out of the pool every minute. Use a table, a graph, and an equation to create a mathematical model of the gallons of water in the pool at t minutes.

5. Compare problems 1 and 3. What similarities do you see? What differences do you notice?

6. Compare problems 1 and 2. What similarities do you see? What differences do you notice?

7. Compare problems 3 and 4. What similarities do you see? What differences do you notice?

2.4 Getting Down to Business

A *Solidify Understanding Task*

Calcu-rama had a net income of 5 million dollars in 2010, while a small competing company, Computafest, had a net income of 2 million dollars. The management of Calcu-rama develops a business plan for future growth that projects an increase in net income of 0.5 million per year, while the management of Computafest develops a plan aimed at increasing its net income by 15% each year.

a.   Create standard mathematical models (table, graph and equations) for the projected net income over time for both companies. (Attend to precision and be sure that each model is accurate and labeled properly so that it represents the situation.)

b.   Compare the two companies. How are the representations for the net income of the two companies similar? How do they differ? What relationships are highlighted in each representation?

c.   If both companies were able to meet their net income growth goals, which company would you choose to invest in? Why?

d.   When, if ever, would your projections suggest that the two companies have the same net income? How did you find this? Will they ever have the same net income again?

e.   Since we are creating the models for these companies we can choose to have a discrete model or a continuous model. What are the advantages or disadvantages for each type of model?
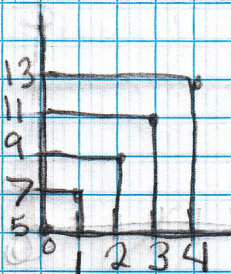
mathematics
vision project

4.1 Connecting the dots
P.t 2

Graph:

arithmetic

Words:

We Start out w/ 5 @ step Zero, hence we find that the pool fills up 2 Gals a minute.
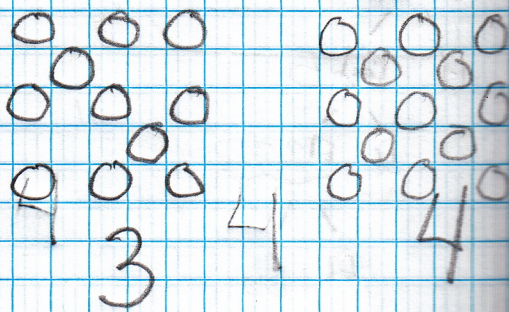
table

0	5
1	7
2	9
3	11
4	13

Picture:

0   1   2

3   4   4
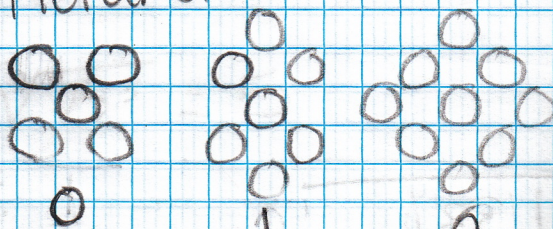
Equations:

E: $f(n) = 2n + 5$

R: $f(n) = f(n-1) + 2$

$f(1) = 7$

③

Table:

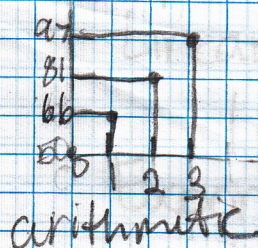| f(n)	n
0	50
1	66
2	81
3	97

×16
+16
+16

Equation:
f(n) = 50n+16
f(n) = f(n-1)+16

Continuous [Line] connect dots
&
Discrete [dots]

Graph

arithmetic

Words:

We're adding 16 to 50 & so on bc
16 is 3% of 50. They recieve
$16 a month anytime they don't
use $ that month

11/10/15

A = Calcurama ——> $5. million every year
    $5 million
B = Computafest ——> %.15 every year
    $ 2million

(A) Recursive:

t	y
0	5
1	5.5
2	6

5 →+.5
5.5 →+.5
6

$f_n = f(n-1)+.5$

$f(0) = 5 mil$

(B)

t	y
0	2m
1	2.3
2	2.645

2m →·1.15
2.3 →·1.15
2.645

$f(0) = 2 mil$

Explicit Equation

X, Y

Ⓐ
$$y = .5 + 5x$$
$$y = 5x + 5$$

Ⓑ
$$y = 2(1.15)^x$$

Ⓐ They're the same through how
they're both going up by the same #'s.
Both linear.
one requires step before

Ⓑ