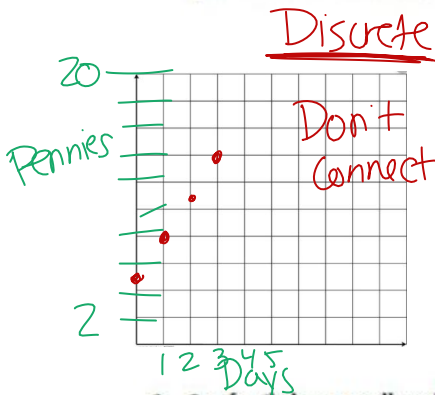# 2.1 Connecting the Dots: Piggies and Pools

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.

Discrete

Don't Connect

X	Y
0	5
1	8
2	11
3	14

Arithmetic

$$y = 3x + 5$$

Rec

$A_1 = 8$

$A_n = A_{n-1} + 3$

(graph: Pennies vs Days, y-axis labeled 2 to 20, x-axis labeled 1 2 3 4 5 Days)

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.

Continuous

have in between gallons

Flowing Water

X	Y
0	5
1	7
2	9
3	11
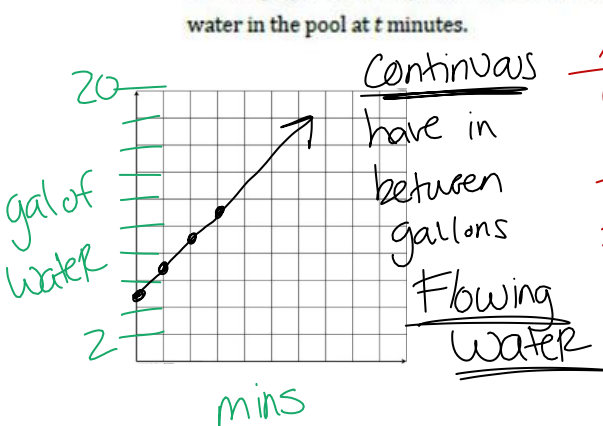
$$y = 5 + 2x$$

Rec $A_1 : 7$

$A_n = A_{n-1} + 2$

✳ no negative time
no negative gallons

(graph: gal of water vs mins, y-axis labeled 2 to 20)

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.

↑ $

$$100 + 3 = \frac{103\%}{100}$$

$$1.03$$
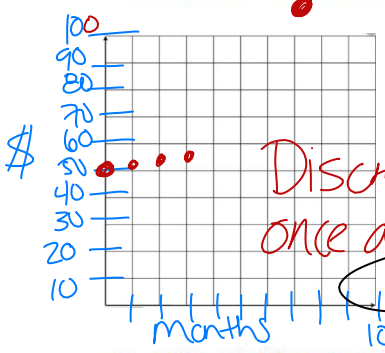
Geo

$$50(1.03)^n$$

X	Y
0	50
1	51.5
2	53.05
3	54.64
4	

→ ×1.03
→ ×1.03
→ ×1.03

Discrete once a month

exponential

*One time a month
Don't connect

$ (y-axis) 100 90 80 70 60 50 40 30 20 10

months (x-axis) 10

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.

Decrease

$$100 - 3 = 97 \rightarrow 0.97$$
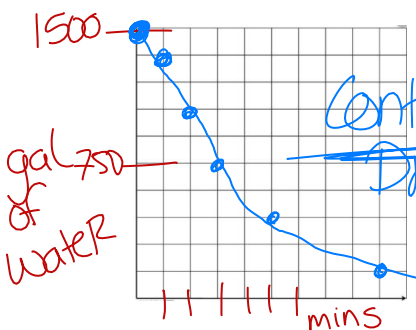
$$1500(0.97)^n$$

X	Y
0	1500
1	1455
2	1411.35
3	1369.01
4	1327.94

→ ×0.97
→ ×0.97
→ ×0.97

Continuous Draining

gal of water
1500
750

mins

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

Both Discrete   one expo
                       one linear

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

Both Linear   One discrete
                     one continuous

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

Both exponential   One Discrete
                     one continuous