3.4 The Water Park
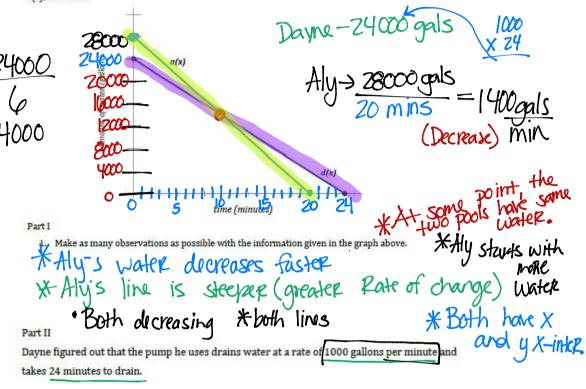
A Solidify Understanding Task

Aly and Dayne work at a water park and have to drain the water at the end of each month for the ride they supervise. Each uses a pump to remove the water from the small pool at the bottom of their ride. The graph below represents the amount of water in Aly's pool, $a(x)$, and Dayne's pool, $d(x)$, over time.

[handwritten annotations:]

Dayne – 24000 gals   1000 × 24

$$\text{Aly} \rightarrow \frac{28000 \text{ gals}}{20 \text{ mins}} = 1400 \text{ gals/min} \quad \text{(Decrease)}$$

$$\frac{24000}{6} = 4000$$

[graph with a(x) and d(x) lines, y-axis: 28000, 24000, 20000, 16000, 12000, 8000, 4000, 0; x-axis: time (minutes) 0, 5, 10, 15, 20, 24]

At some point, the two pools have same water.

Aly starts with more water

Part I

1. Make as many observations as possible with the information given in the graph above.

[handwritten:]
* Aly's water decreases faster
* Aly's line is steeper (greater Rate of change)
* Both decreasing   * both lines
* Both have X and y X-inter.

Part II

Dayne figured out that the pump he uses drains water at a rate of 1000 gallons per minute and takes 24 minutes to drain.

2. Write the equation to represent the draining of Dayne's pool, $d(x)$. What does each part of the equation mean?

[handwritten:]
Amount of water @ any time

draining Rate – how fast   Slope (Rate of change)

$$y = \boxed{24000} - \boxed{1000}\boxed{x} \rightarrow \text{time (mins)}$$

y-int → start amt water

3. Based on this new information, correctly label the graph above.

4. For what values of *x* make sense in this situation? (Use interval notation to write the domain of the amount of water in Dayne's pool).

time → mins

empty pool → 24 mins
Full pool → 0 mins

[0,24] Interval

Inequal $0 \le x \le 24$

5. Determine the range, or output values, that make sense in this situation. (Use interval notation to write the range of the amount of water in Dayne's pool).

Amount of water
Full pool - 24000 gal
empty pool - 0 gal

Interval
[small, big] = [0, 24,000]

Inequal
$0 \le y \le 24,000$

6. Write the equation used to represent the draining of Aly's pool, *a(x)*. Using interval notation, state the domain and range for the function, *a(x)* as well as the domain and range of the situation. Compare the two domains by describing the constraints made by the situation.

Alys → $y = 28000 - 1400x$ → time (mins)

Amt of Water @ Any time

y-int
water @ Full/beginning

Decrease Rate
Slope

*Aly has more water
*Aly drains faster

Dom [0,20] $0 \le x \le 20$
time
20 mins to empty

Range [0, 28000]
Water Full - 28,000 $0 \le y \le 28000$

Part III *Compare X & Y intercepts

Based on the graph and corresponding equations for each pool, answer the following questions.

7. When is *a(x) = d(x)*? What does this mean?

10 mins   At 10 mins, Aly and Dayne's pools have the same Amt of water.

8. Find *a(5)*. What does this mean?

at 5 mins, how much water is in Aly's pool?
$28000 - 1400(5) = 21000$ gallons

9. If *d(x) = 2000*, then *x* = ___. What does this mean?

When does Dayne's pool hit 2000 gals?

$24000 - 1000x = 2000$
$-24000 \qquad -24000$
$\dfrac{-1000x}{-1000} = \dfrac{-22000}{-1000}$
$x = 22$

22 mins

10. When is *a(x) > d(x)*? What does this mean?

When is aly's water level above Dayne's water level? From 0 to 10 mins