Graphs and Tables

Non-Calculator: Multiple Choice

Salinity vs. Days since Water Change
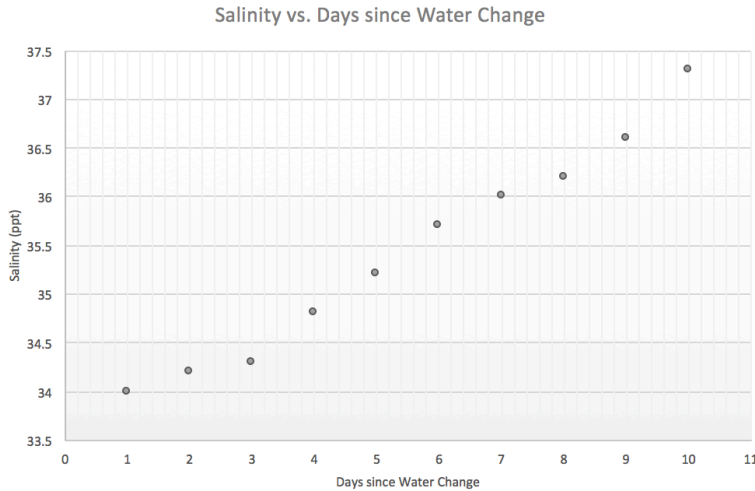
1. Chandler, a saltwater reef enthusiast, is measuring the salinity in his tank. He completes a water change on day 0 and measures the salinity in parts per thousand for the next ten days. The target range for salinity is 34ppt—36ppt, and any salinity reading below the range indicates that additional salt is needed. Any reading above the range requires a water change to bring the tank water back into range. On which day was a water change indicated?
    A) Day 4
    B) Day 7
    C) Day 8
    D) Day 9

2. Referring to the graph above, approximate the average daily rate of change in salinity from day 3 to day 7?
    A) +0.375 ppt/day
    B) +0.425 ppt/day
    C) +0.75 ppt/day
    D) +0.85 ppt/day

Realizing that he should have changed the water before the 10ᵗʰ day, Chandler refers back to prior salinity readings and is a bit confused. In the past, the salinity has remained in range for 11-12 days. He decides to complete another trial, this time measuring the depth of the water, from the base of the tank to the water line at the top. The tank is 24 inches from top to bottom, and he "tops off the tank" to 23 inches on day 0.

Days since Water Change	Water Depth in Inches
0	23
1	22.9
2	22.7
3	22.6
4	22.5
5	22.3
6	22
7	21.8
8	21.7
9	21.2
10	20.9

Salinity vs. Days since Water Change
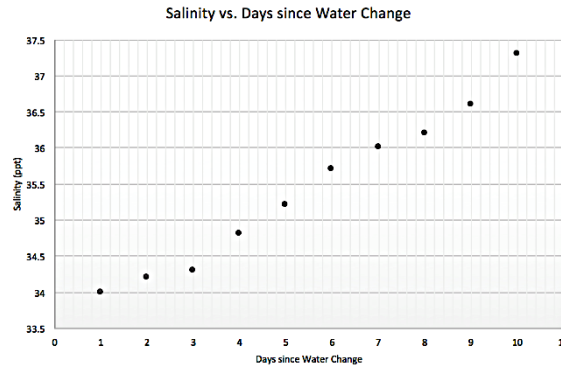
3. Chandler suspects that there is a relationship between the water depth and the salinity level in the tank and compares the table and graph from problem #1 side by side. Does there appear to be a relationship, and if so, what is the relationship?
   A) Yes; As the water depth decreases, the salinity decreases.
   B) Yes; As the water depth decreases, the salinity increases.
   C) Yes; As the water depth increases, the salinity increases.
   D) There is no apparent relationship between water depth and salinity.

Chandler decides to top of his tank every couple of days to see if it keeps the salinity in range for a longer period of time. To avoid adding extra salt to the tank, he adds distilled water to maintain a tank depth near 23 inches each day. The table below compares the water depth vs. the salinity measurement each day.

Days since last water change	Water depth	Salinity
1	23	34
2	23	34
3	22.9	34.2
4	23.1	34
5	22.8	34.3
6	23	34
7	23	34
8	22.9	34.2
9	23.1	34
10	23.1	34

4. Does it appear that Chandler's hypothesis was correct?
   A) Yes; with a tank depth near 23 inches, the salinity was within range of 34-36ppt for all 10 days
   B) Yes; keeping the tank at a depth between 34-36 inches kept the salt within the normal range of 23 ppt for all 10 days.
   C) No; the tank depth waivered, causing the salinity reading to waiver out of range on some days.
   D) It is impossible to determine whether or not a relationship between the water depth and the salinity reading exists.

5. In a 2017 survey, 150 marine biologists, 142 wildlife biologists, and 108 botanists completed a survey indicated their major professional activity. The results are summarized in the table below. Use the information in the table to solve for the missing value x and y.

| Type of Biologist	Major Professional Activity		Total
	Research	Teaching	
Marine	96	x	
Wildlife	51	91	142
Botanist	y	34	

   A) $x = 54, y = 147$
   B) $x = 57, y = 74$
   C) $x = 54, y = 74$
   D) $x = 57, y = 147$

6. Using the table in question 5, approximately what proportion of ALL biologists indicated 'Research' as their major professional activity?

   A) $\frac{150}{400}$

   B) $\frac{179}{400}$

   C) $\frac{199}{400}$

   D) $\frac{221}{400}$

7. An intern at a veterinary hospital is interested in studying how heart rates differ in small, medium, large, and extra-large dogs. The intern starts collecting weight and heart rate data on each canine client that visits the veterinary clinic for a non-emergency check-up and tracks the data over one week of November. He then finds the average heart rate for each size category and creates the table below.

Size Category	Average Heart Rate (beats per minute)
Small (0-25 pounds)	148
Medium (26-50 pounds)	126
Large (51-100 pounds)	92
Extra-Large (100+ pounds)	68

If a 5-pound dog visits the veterinary clinic for a non-emergency check-up, the dog's heart rate will most likely be:

A) Greater than 148 bpm
B) Exactly 148 bpm
C) Less than 148 bpm
D) Approximately 148 bpm
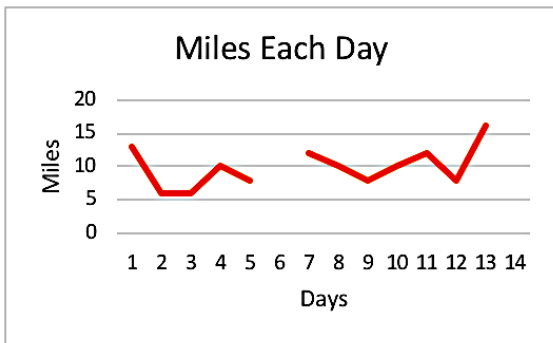
Miles Each Day

8. Dana plots the number of miles that she runs each day for the final 3 weeks of her Boston marathon prep. The data are shown in the line graph above. In which interval do Dana's miles strictly increase then strictly decrease?
A) Day 2 to Day 5
B) Day 7 to Day 11
C) Day 9 to Day 12
D) Day 8 to Day 11

Non-Calculator: Grid In

Results of the Harry Potter Knowledge Exam

|	Passed Knowledge Exam	Did Not Pass Knowledge Exam
Took review course	46	9
Did not take review course	5	70

9. The table above summarizes the results of 130 Harry Potter enthusiasts who took the Harry Potter Knowledge Exam. If one of the surveyed enthusiasts who passed the exam is chosen for an interview, what is the probability that the person chosen did not take the review course?

10. Millie throws a tennis ball to her dog. The ball bounces six times before her dog is able to catch it, shown in the figure below. After Millie threw the ball, how many times was the ball at a height of 3 feet?
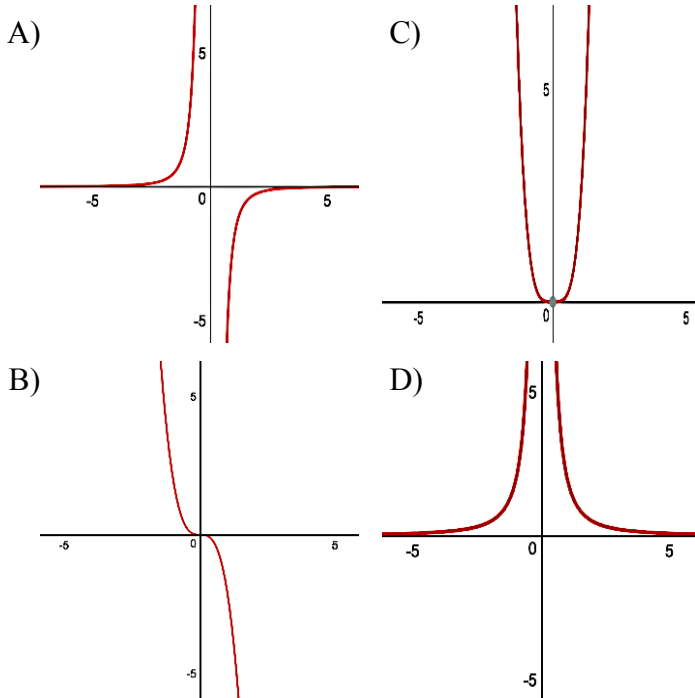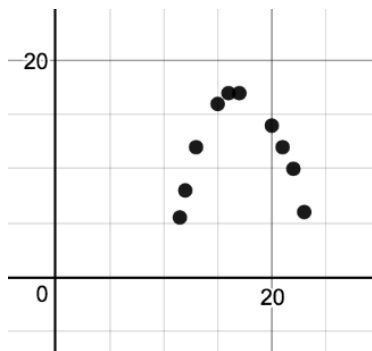
Height vs. Time for a Tennis Ball

Time
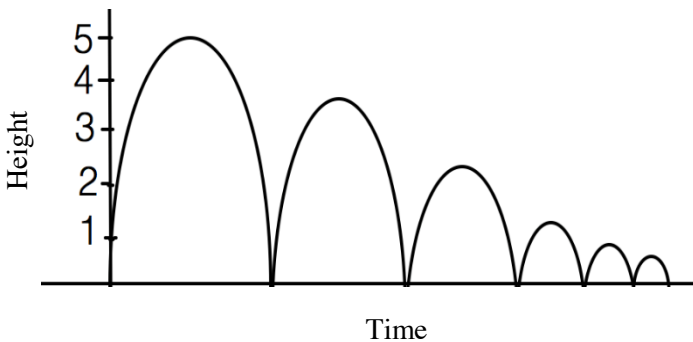
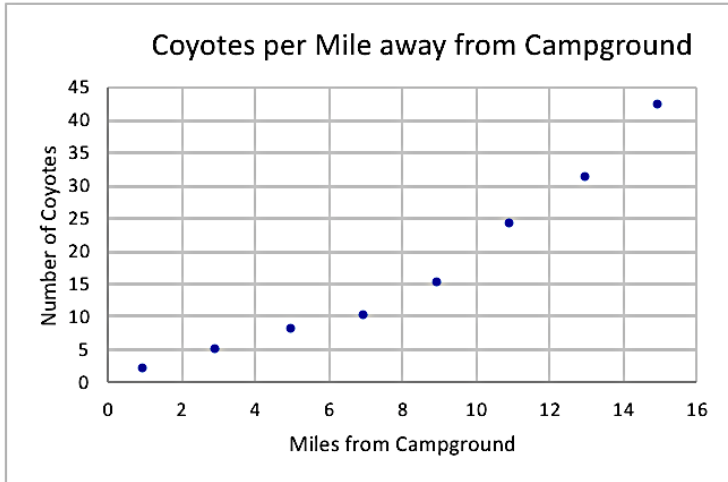## Calculator: Multiple Choice

11. Which of the following graphs shows the relationship $y = mx^n$ where m is negative, and n is positive and odd?

A)

C)

B)

D)

12. Which of the following equations best models the data in the scatterplot below?

A) $y = -0.6(x + 18)^2 + 16$
B) $y = 0.6(x - 18)^2 - 16$
C) $y = 0.6(x + 18)^2 + 16$
D) $y = -0.6(x - 18)^2 + 16$

Coyotes per Mile away from Campground

13. The scatterplot above shows the number of coyotes per mile from a campground in Yellowstone. According to the scatterplot, which of the following is true about the relationship between the number of coyotes and the distance from the campground?

A) There are fewer coyotes at greater distances away from the campground.
B) There are more coyotes closer to the campground.
C) There is a greater change in the number of coyotes per mile at distances further than 8 miles from the campground than within an 8-mile radius of the campground.
D) There is a greater change in the number of coyotes per mile within an 8-mile radius of the campground than distances further away than 8 miles.

Calculator: Grid In

Total Number of Trades over 4 Hours
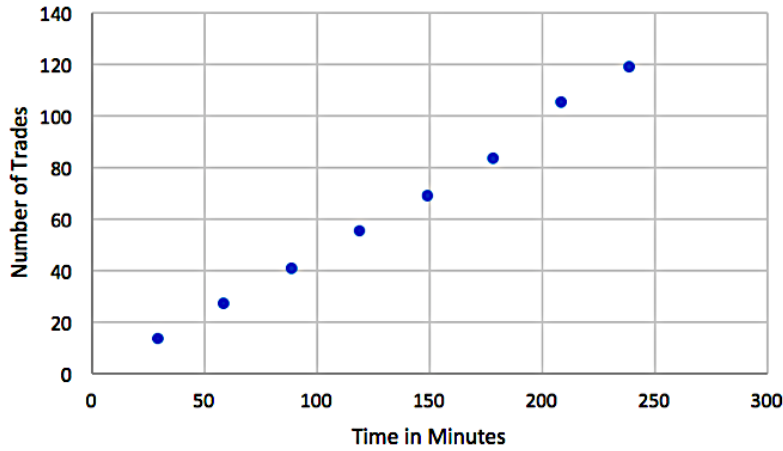
14. Tallulah trades magic cards for 4 hours. The time and number of trades she makes are shown in the graph below. According to the graph, the number of trades she makes in 80 minutes is what proportion of the number of trades that she makes in 2.5 hours?