Test #1 (9/23/2023)

1. Average cost per item from x = 200 to x = 700. Need C(200)=11,000 and C(700)=14,000. $\frac{\Delta y}{\Delta x} = \frac{14000-11000}{700-200} = \frac{3000}{500} = \$6$ per item
2. This is a two-part question
   a. $C(300) = 31200 + 15 \cdot 300 = 35{,}700$
   b. For y = 65,000 on the graph of C(x), what is x? Answer: From the graph, we can approximate that x = 2,200 items. Or we can solve $65000 = 31200 + 15x$ for x:
   $65000 - 31200 = 15x$
   $33800 = 15x$
   $2{,}253 = x$
3. To find the break-even point between two functions we need the point of intersection between the two lines. (Given a graph we look for the coordinates where the two lines intersect.)
   Answer: $Revenue = R(x) = 24x$ (if we use the points (0,0) and (2500,60000) we can determine the revenue equation) So the break-even point is the solution to:
   $C(x) = R(x)\ \ which\ means\ 31200 + 15x = 24x$
   $31200 = 24x - 15x = 9x$
   $3467 = x$
   Answer from graph: The two lines intersect approximately x = 3450 (3400 would also be an acceptable answer).

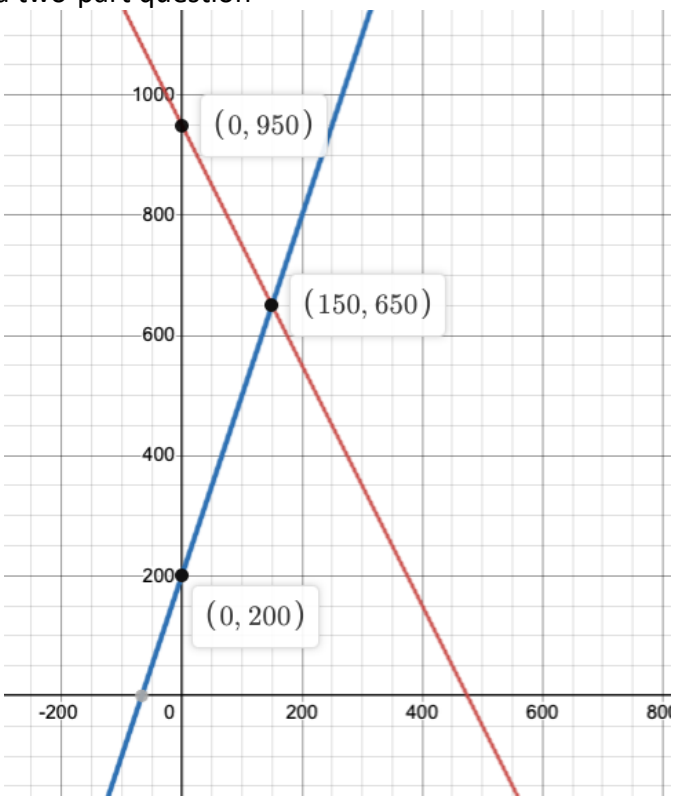
4. This is a two-part question
   a. Write an equation from the given information. In 2012, x = 0. We have two points: $(0, 44000) and\ (3, 37100)$ The equation will be $y = mx + b$ and we know that $b = 44000$.
   So, all we need is $m = \frac{\Delta y}{\Delta x} = \frac{37100-44000}{3-0} = \frac{-6900}{3} = -2300.$

   Answer to a: $y = -2300x + 44000$
   b. $m = -2300$ means the furniture will depreciate by -2300 every year. Starting with 37100 in 2015, we can make a table:

x	y	
2016	37100-2300	34800
2017	34800-2300	32500
2018	32500-2300	30200
2019	30200-2300	27900

Since the value is $30,200 in 2018, and $27,900 in 2019 the value falls below $28K sometime in 2019 (best guess).

5. This is a two-part question



a. (see graph) supply is the line starting at (0, 200); demand is the line starting at (0, 950)

b. the equilibrium between supply and demand occurs when production quantity (x) is 150 and price is $650.

6. This is a two-part question
   a. The equation is $y = -0.79x + 23.85$ where x is hours watched; y is number of sit-ups. For x = 19, we have $y = -0.79 \cdot 19 + 23.85 = 8.84$; prediction is 9 sit-ups
   b. If no TV, x = 0. So, 23.85 is rounded up to 24 sit-ups
7. The range of a function is the interval for y on x in [0, 192]. Calculate the y values for each of these x: $f(0) = \sqrt{4 + 6 \cdot 0} = \sqrt{4} = 2$ and $f(192) = \sqrt{4 + 6 \cdot 192} = 34$ which gives us the range everything in between: $2 \leq y \leq 34$
8. This is a two-part question
   a. f(5) = 93
   b. x = 3
9. $f(-4) = 2 \cdot (-4)^2 + 2 \cdot (-4) + 1 = 32 - 8 + 1 = 25$
10. Domain of the function is $-3 \leq x < 1$ or as an interval: $[-3,1)$
    Range of the function is $-5 \leq y \leq 4$ or as an interval $[-5, 4]$
11. Equation of the line is $y = x - 1$
12. Solution to the system of equations: $(8, 1)$ or $x = 8, y = 1$

Test #3 (November 20, 2023)

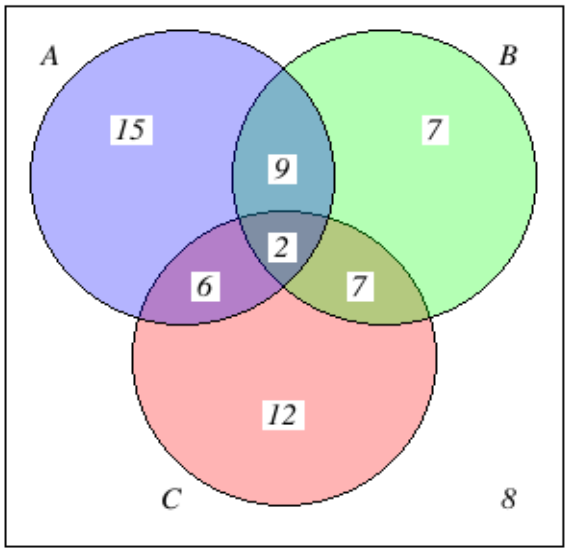
For questions 1, 2, and 3: Let S be the universal set, where:

$$S = \{1,2,3, \ldots ,18,19,20\}$$

Let sets A and B be subsets of S , where: Set $A = \{6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$
Set $B = \{odd\ numbers\ from\ 1\ to\ 19\}$

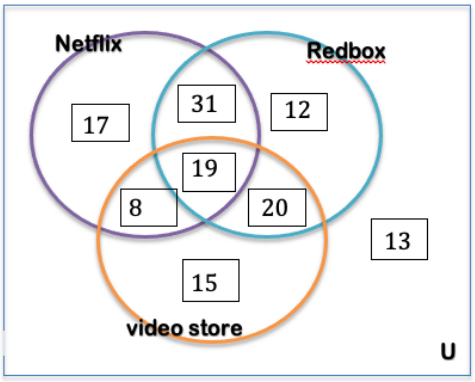
1. $A \cap B = \{\ 7, 9, 11, 13, 15\ \}$
2. $A^c = \{\ 1, 2, 3, 4, 5, 16, 17, 18, 19, 20\ \}$
3. $A^c \cap B = \{\ 1, 3, 5, 17, 19\ \}$

4. $n(A \cap B) = 9 + 2 = 11$
5. $n((A \cup B) \cap C^c)$ means inside A, B, outside C. There are 3 numbers. $15 + 9 + 7 = 31$



6. _____ ***people were surveyed*** asking whether they watch movies at home from Netflix, Redbox, or a video store. Use the results to determine how many people were surveyed.

17 only use Netflix	12 only use Redbox
15 only use a video store	20 use **only** a video store and Redbox
31 use **only** Netflix and Redbox	27 use ***both*** a video store and Netflix
19 use all three	13 use none of these



This diagram shows where the numbers go. The tricky one was 8 = 27 – 19 between Netflix and video store. The number of people surveyed was:

135

7. A group of people were asked if they had used an illegal substance last year. 152 responded "yes", and 361 responded "no".

   Find the probability that if a person is chosen at random, they have used an illegal substance in the last year.

   Answer: $Prob(yes) = \frac{n(Yes)}{n(All)} = \frac{152}{513} = 0.2963$

   For 8 and 9: Giving a test to a group of students, the grades and class section are summarized below

	A	B	C	Total
Morning	12	9	18	39
Afternoon	5	15	12	32
Total	17	24	30	71

   If one student was chosen at random, find the probability that the student was in the afternoon class.

8. Probability a student is in the afternoon class = $\frac{32}{71} = 0.45$
9. Probability a student is in the morning class, given that they got a 'C' = $\frac{18}{30} = 0.60$

10. Ilya buys a bag of cookies that contains 8 chocolate chip cookies, 5 peanut butter cookies, 2 sugar cookies and 7 oatmeal cookies.

    What is the probability that Ilya reaches in the bag to get 2 cookies and randomly selects a chocolate chip cookie and a peanut butter cookie from the bag?

    Probability = $\frac{8}{22} \cdot \frac{5}{21} = 0.08658$

11. This table shows the presence of flu in the general population. It also shows how accurate a certain flu test is.

    Percent of population with the flu is 8%.

	Tests positive	Tests negative	Row Totals
Has disease	**4.8**	**3.2**	**8**
Does not have disease	**1.84**	**90.16**	**92**
Column Totals	**6.64**	**93.36**	**100**

12. This table shows the presence of flu in the general population. It also shows how accurate a certain flu test is.

The question asks what is the probability that a person has the disease given that they test negative?

Answer: $\frac{4.8}{94.96} = 0.0505$ which rounds to 0.051

	Tests positive	Tests negative	Row Totals
Has disease	**3.2**	**4.8**	**8**
Does not have disease	**1.84**	**90.16**	**92**
Column Totals	**5.04**	**94.96**	**100**

13. A company estimates that ***7% of their products will fail*** after the original warranty period but within 2 years of the purchase, with a replacement cost of $550.

    If they offer a 2-year extended warranty for $39, what is the company's expected value of each warranty sold? Let "x" be the profit or loss to the company for each extended warranty sold.

x	Pr(x)	$x \cdot \Pr(x)$
39	0.93	36.27
-511	0.07	-35.77

Q: What is the expected value?
A: $E(x) = 39 \cdot 0.93 - 511 \cdot 0.07 = 0.50$

14. Surab offers the following game. A standard deck of cards is placed face down on the table. The player pays $1.00 to see the top card. If it is a face card the player gets $4.00 in return. If not, the player receives nothing. What can Surab expect to make each time someone plays (over time)?

x	Pr(x)	$x \cdot \Pr(x)$
+1	0.7692	0.7692
-3	0.2308	-0.6924

Expected Value = $1 \cdot 0.7692 - 3 \cdot 0.2308 = 0.0768$

15. The total cost function is $y = 300 + 25x - 0.03x^2$.

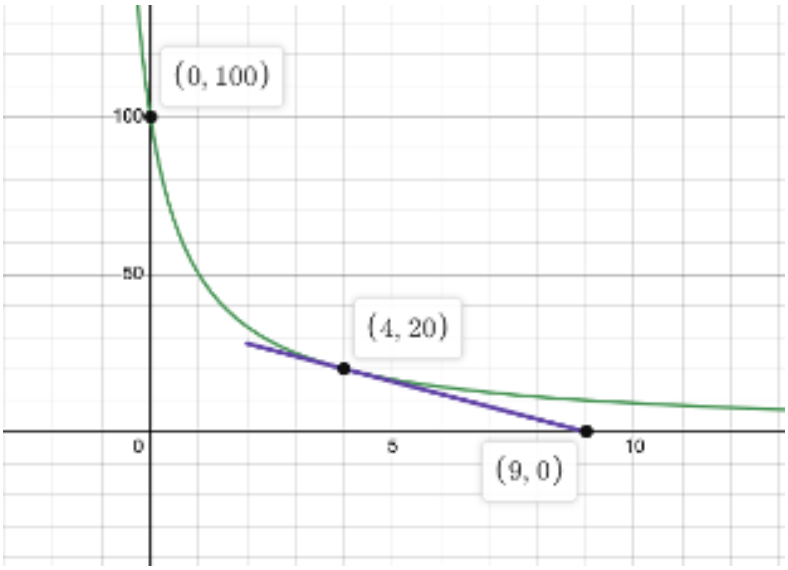
    Avg cost from x = 25 to x = 100 is $\frac{\Delta y}{\Delta x} = \frac{2500-906.25}{100-25} = 21.25$

16. Find the slope of the line through the points (4, 16) and (4.01, 16.081) on the graph of $y = x^2$. Use that answer to estimate the slope of the tangent line at (4, 16).

    slope = $\frac{\Delta y}{\Delta x} = \frac{16.081-16}{4.01-4} = 8.1$

    slope of tangent line is probably 8

17. The following image of a function and the tangent line at x = 4 is shown.



What is the rate of change of y with respect to x (on the curve) at x = 4?

Answer: calculate the slope of the line that passes through (4, 20) and (9, 0).

slope = $\frac{20-0}{4-9} = \frac{20}{-5} = -4$