MAT 100: Exam 2 **Name:** _____
Fall – 2022
11/14/2022
85 Minutes

Write your name on the appropriate line on the exam cover sheet. This exam contains 14 pages (including this cover page) and 13 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
11	10	
12	10	
13	10	
Total:	130	

1. (10 points) Suppose that the milage of a car, M, after t years is modeled by $M(t) = 8500t + 48000$.

   (a) Find the number of miles on the car after 4 years.

   (b) How long until the car's milage is 100,000 miles?

2. (10 points) Suppose that a worker at a local warehouse is paid an hourly wage of \$20/hour. Explain why the worker's net salary is a linear function.

3. (10 points) An oil company is selling off oil in one of their reserves. The amount of oil in the tank in gallons, O, after d days is given by $O(d) = 180000 - 19000d$.

   (a) Find and interpret the slope of $O(d)$ in the context of the problem.

   (b) Find and interpret the y-intercept of $O(d)$ in the context of the problem.

4. (10 points) If the CPI was \$284.581 last year and this year it is \$301.779, find the inflation rate from last year to this year.

5. (10 points) Suppose you make $72,000 in a year and take a standard deductible of $13,200. Find your federal income tax.

Tax Rate	Taxable Income
10%	Up to $10,275
12%	$10,276 – $41,775
22%	$41,776 – $89,075
24%	$89,076 – $170,050
32%	$170,051 – $215,950
35%	$215,951 – $539,900
37%	$\geq$ $539,901

6. (10 points) If you placed $500 into an account which earns 1.2% annual interest, compounded semiannually, how long until there is $600 in the account?

7. (10 points) Suppose that you take out a loan for $13,000 at 6.5% annual interest, compounded monthly. How much do you owe on the loan after 3 years?

8. (10 points) If you invest $5,400 in an account which earns 2.3% annual interest, compounded quarterly, how much interest has been earned from this investment after 6 years?

9. (10 points) Researchers at a think tank work in a variety of fields and have a wide range of ages. Below is a summary of the workers at the facility.

	Biology	Chemistry	Physics	Computer Science	Total
18 – 30	26	25	18	10	79
30 – 40	21	19	13	17	70
40 – 60	14	18	19	28	79
60+	13	19	22	22	76
Total	74	81	72	77	304

(a) Find the probability that a randomly selected worker is 30–40 or researches Physics.

(b) Find the probability that a randomly selected worker is over 60 and researchers Biology.

(c) Find the probability that Computer Science researcher is 18–30.

10. (10 points) Researchers are investigating people's movie preferences. Below is a summary of their data broken down by gender.

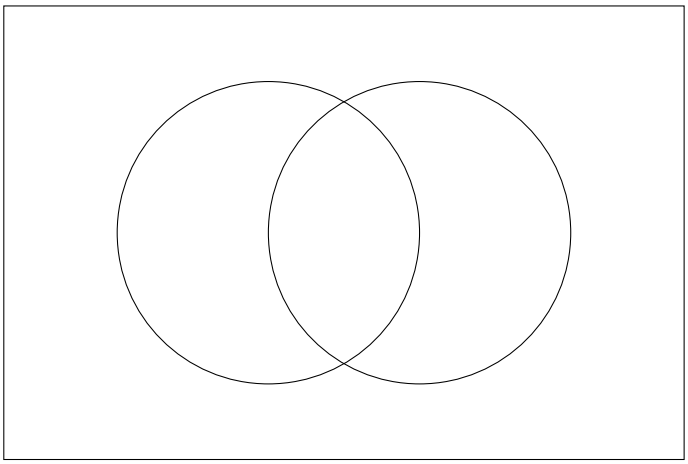
	Action	Horror	Comedy	Drama	Total
Male	60	45	70	53	228
Female	51	38	65	67	221
Unspecified	40	30	20	15	105
Total	151	113	155	135	554

(a) Find the percentage of people that were female or preferred horror.

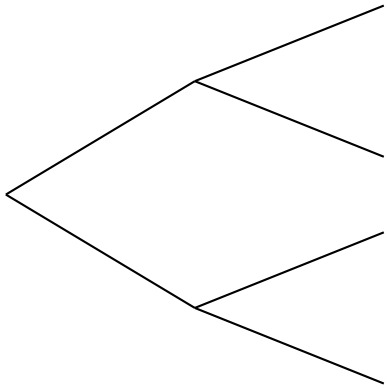
(b) Find the percentage of people that were male and preferred drama.

(c) Assuming a person preferred action, what was the probability that their gender was unspecified?

11. (10 points) At a local college with 1,540 students, 431 students have a minor in a STEM field, 687 students have a minor in the Humanities, and 84 students have a minor in both. Complete the Venn diagram below and find the percentage of students that do not have a minor in STEM or the Humanities.



12. (10 points) Suppose that if a student studies for an exam, there is an 85% chance that they pass the exam. If a student does not study for an exam, there is a 80% chance that they fail the exam. A school estimates that 70% of their students study for their exams. Complete the tree diagram below and find the percentage of students at this school that fail their exam.



13. (10 points) The probability of a car over 10 years old having a critical issue is 45%. Researchers estimate that 13% of cars are Ford brand cars. The same researchers then estimate that $0.45 \cdot 0.13 = 0.0585 \rightsquigarrow 5.85\%$ of cars that are over 10 years old having a critical issue are Ford brand. Explain what is wrong with the researchers mathematical calculation.