Math 105 Review For Final Exam.

Finance

I want to buy a car. I was looking at a used car for $11,000. Questions 1-4 are looking at the same situation.

1. If I put off the purchase for 2 years, I could start a savings annuity now and deposit an amount monthly. I located an account earning 4% interest. How much would I have to deposit each month to have $11,000 in 2 years?

2. Another way is to take out a loan now for 11,000 and pay it off over 2 years. For the sake of comparison, let's say the interest rate is 4% and I make monthly payments. What is the amount of my loan payment?

3. What is the total amount of money I paid if I use a savings annuity? What is the total amount of interest I earned in that case?

4. What is the total amount of money I paid if I take out a loan? What is the total amount of interest I paid in that case?

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5. I want to see which has a bigger impact, double the interest rate, or doubling the time. Start with $2000 and use the compound interest formula.
    a. Find the ending amount if you earn 5% compounded monthly for 10 years.

    b. Find the ending amount if you earn 10% compounded monthly for 10 years.

    c. Find the ending amount if you earn 5% compounded monthly for 20 years.

6. A student told me that if you save $100 each month from age 18 - 28 and then stop making deposits (but let the money keep earning interest until retirement), you will have more money than if you start saving $100 a month at age 28 and continue making deposits until retirement. This sounds crazy! I decided to test this claim with some numbers. Read through my results. For the starred values, use a formula to check my math.

Earlybird Saver
At age 18 you start saving $100 per month for 10 years. How much will you have at age 28?

4%	5%	10%
$14,724.98**	$15,528.23	$20,484.50

At that point you stop making regular deposits but leave the money in the account for 31.5 years (until you turn 59.5). Interest is still compounded monthly. Start with the amount above.

4%	5%	10%
$51,803.10	$74,767.81**	$471,828.69

Late Bloomer
Another person doesn't do anything until age 28. At that point they start an annuity and make $100 deposits for the next 31.5 years. Will they catch up with the person who started younger?

4%	5%	10%
$75,541.27	$91,559,05	$264,401.39**

    a. Confirm the starred numbers using the annuity and compound interest formulas. Show your work below.

    b. It turns out that this claim was true only in one of the three cases I tested. What is the determining factor in whether the early bird investor ends up with more money at the end?

Problem Solving

7. I read an article that advised you should only spend about 30% of your income on rent. If you spend $850 a month on rent, what should your total income be?


30%
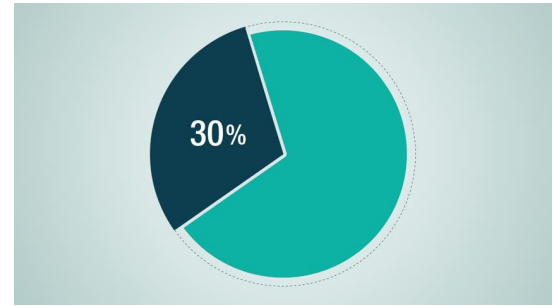
8. If I move to a new place that costs $1000 a month, by what percent did my rent increase?

9. Elise was living in a place that costs $1000 a month, but moved to a place costing $850/month. What percent did Elise's rent decrease?

10. I'm estimating the siding cost for a wall that is 48 feet long and 16 feet high. The siding I like best is a little pricey. A package covers 40 square feet. Each package costs $198.

   a. What is the cost per square foot of the siding?

   b. How much will I spend to cover the whole wall?

   c. If I use more affordable siding that costs $1.09/square foot, how much will the job cost?

Describing Data

The 80-20 rule comes from the work of an Italian economist, Vilfredo Pareto. Pareto observed that while any event has many factors which cause it, only a few factors make the greatest impact on the outcome. Roughly 80% of the effects or outputs come from 20% of the causes or inputs. "Stated simply, a few things are responsible for the majority of results in a given situation, system, or organization."[1]

11. A hospital analyzed 430 medication errors and classified them by cause. Is this a bar graph or a histogram?

Pareto Chart - Types of Medication Errors (n=430)
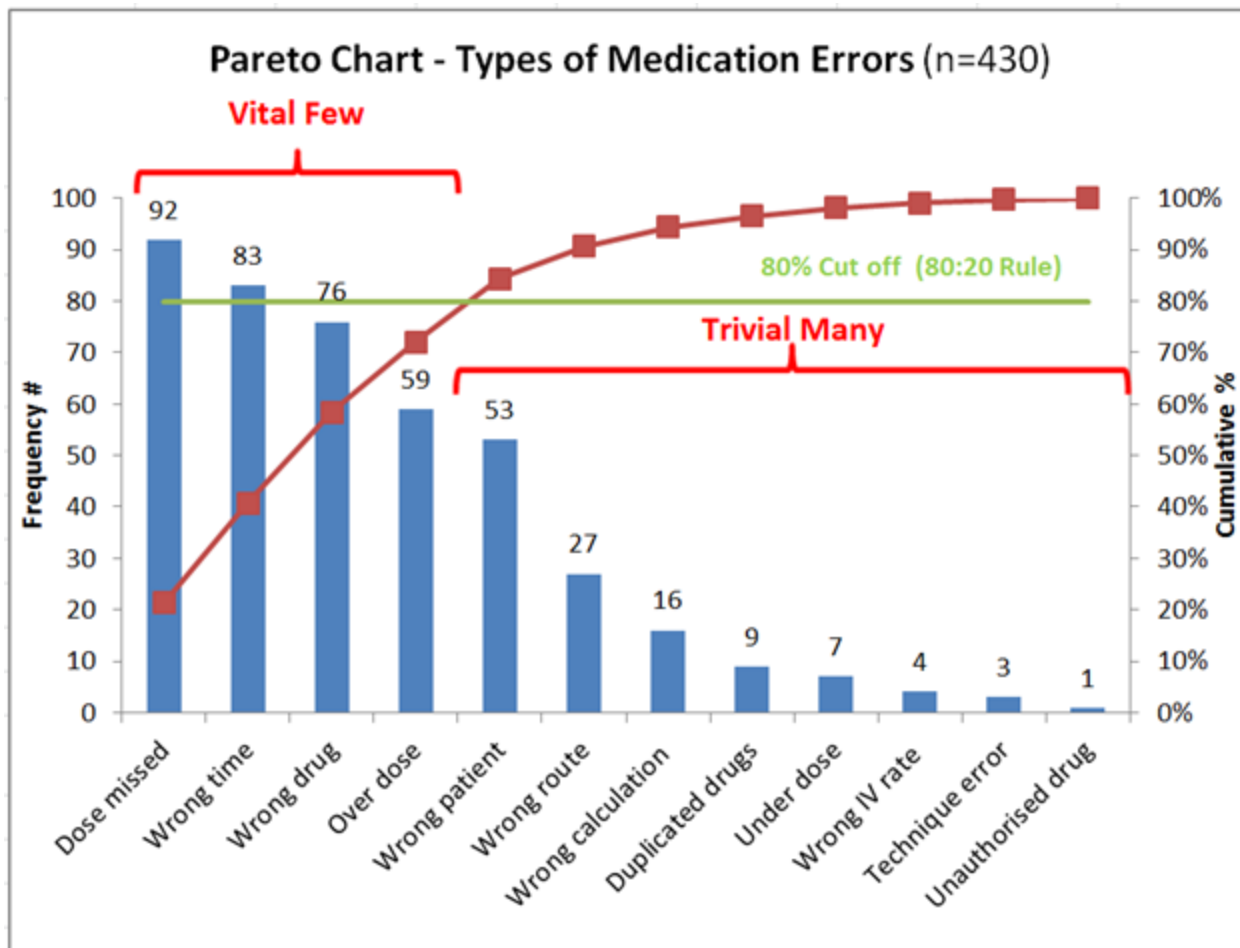
12. The Pareto Principle allows us to focus on the "vital few" rather than the "trivial many". If we could eliminate the top 4 causes of error, what percent of all medication errors would be eliminated? Use the frequencies in the bar graph to answer this question.

[1] https://www.boxtheorygold.com/blog/bid/27984/the-80-20-rule-is-a-system-thinker-s-tool

The graphs below[2] show the number of days (in January) at different temperatures (°C) in two different cities.

Portland

Minneapolis
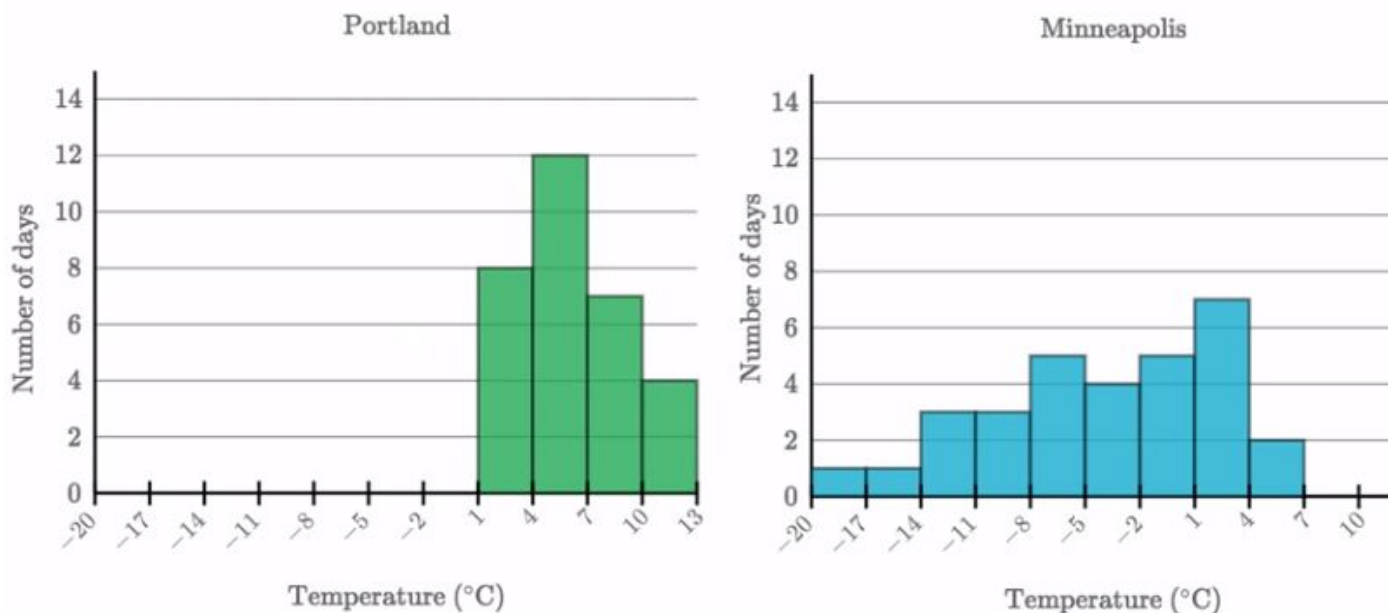
13. Are these graphs bar graphs or histograms?

14. Which city has a higher median, or center, of the data?

15. Which city has more consistent temperatures?

16. Which city has a bigger standard deviation of temperatures?

17. The Portland graph has a bar that is 12 units high. What is the meaning of this bar? Write a sentence.

18.

19. What is the range of temperatures for Portland? What is the range of temperatures for Minneapolis?

For the 31 days in January, the Portland temperatures were as follows. The values are sorted.

   1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 7, 7, 7, 7, 8, 8, 9, 10, 10, 11, 12

20. What is the mean?

21. What is the median?

22. What is the mode?

Probability

23. You apply for a job. You have a 25% chance of being invited to interview. If there are 5 candidates being interviewed, what is your probability of being asked to interview, and then of getting the job?

24. The probability that a person is left handed is 10%. If you randomly select two people, what is the probability that both of them are left handed?

The data below are from my statistics students. I asked them questions about how much they exercise, and whether they are feeling mostly stressed, or mostly not stressed.

	Hours of Exercise (per week)			
	0-2	3-5	6+	Total
Stressed	16	18	5	39
Not Stressed	19	36	35	90
Total	35	54	40	129

Write each probability as an unsimplified fraction, and then as a decimal rounded to the nearest hundredth.

25. What is the probability that a person is stressed?

26. What is the probability of being stressed given that you exercised 6 or more hours per week?

27. What is the probability that you exercised 6 or more hours per week given that you are stressed?

28. Name two events that are mutually exclusive in this example.

29. Name two events that are complementary in this example.

Match the expression with two other choices from the lists that would go with it.

30. $26 \cdot 25 \cdot 24 \cdot 23 \cdot 22$ 31. $\frac{26 \cdot 25 \cdot 24 \cdot 23 \cdot 22}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$ 32. $10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ 33. $26 \cdot 26 \cdot 26 \cdot 26 \cdot 26$ 34. $\frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$ 35. $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6$	A. The number of ways to choose a five digit pin made up of numbers 0 - 9 with no repetition B. The number of ways to choose a 5 digit pin made up of letters A - Z with no repetition C. The number of ways to choose a 5 digit pin made up of numbers 0 - 9 with repetition allowed. D. The number of ways to choose a 5 digit pin made up of letters A - Z with repetition allowed. E. The number of ways to choose 5 letters from the alphabet with no repetition, where order doesn't matter. F. The number of ways to choose 5 digits 0-9 with no repetition, where order doesn't matter.	1. 26^5 2. 26P5 3. 26C5 4. 10^5 5. 10P5 6. 10C5

~~36. If there are 20 people in the room, what is the probability of no repeated birthdays? What is the probability of at least 1 repeated birthday?~~

37. There's a 2% chance my shed burns. I pay $300/ year in insurance to cover the shed. If the shed burns I will get $20,000 to rebuild the shed. What is the expected value of my insurance policy?

	probability of event	amount won or lost	product