MATH 120 Final Review

Problems 1 – 14 Calculate the finance problems.

1. If $24000 is loaned for 4 months at 10.5% annual rate, how much interest is earned?
2. How much interest will you have to pay for a credit card balance of $1152 that is 1 month overdue, if a 13% annual rate is charged?
3. A loan of $26,000 was repaid at the end of 20 months. What size repayment check (principal and interest) was written, if a 4.3% annual rate of interest was charged?
4. If you paid $24 to a loan company for the use of $1750 for 190 days, what annual rate of interest did they charge?
5. You put $100 into a savings account at 5% interest compounded monthly. Determine the amount in the account after a) 6 months b) after 6 years.
6. You invest $100 into an account that earns 4% compounded continuously. Determine the amount in the account after a) 3 years b) 5 years
7. A newborn child receives a $12,000 gift toward a college education from her grandparents. How much will the $12,000 be worth in 22 years if it is invested at 5% compounded quarterly?
8. Find the APYs for the following banks which offer certificates of deposit (CDs). Round the percent to the nearest 3 decimal places. Which Bank is the best option?

Bank	Rate	Compounded
Advanta	4.93%	monthly
Charter One	4.97%	quarterly
Liberty	4.94%	continuously

9. Recently, More Money 4U offered an annuity that pays 7.5% compounded monthly. If $250 is deposited into this annuity every month, how much is in the account after 15 years? How much of this is interest?
10. Acme Annuities recently offered an annuity that pays 3.3% compounded monthly. What equal monthly deposit should be made into this annuity in order to have $500,000 in 40 years? How much of this amount is interest?
11. A company estimates that it will need $199,000 in 5 years to replace a computer. If it establishes a sinking fund by making fixed monthly payments into an account paying 3.1% compounded monthly, how much should each payment be?

12. Bob makes his first $2500 deposit into an IRA earning 6.4% compounded annually on his 23rd birthday and his last $2500 deposit on his 48th birthday (26 equal deposits in all). With no additional deposits, the money in the IRA continues to earn 6.4% interest compounded annually until Bob retires on his 64th birthday. How much is in the IRA when Bob retires?

13. E-Loan, an online lending service, recently offered 42-month auto loans at 6.6% compounded monthly to applicants with good credit ratings. If you have a good credit rating and can afford monthly payments of $225, how much can you borrow from E-Loan? What is the total interest you will pay for this loan?

14. A home in Rockville costs $575,000. You pay 20% down and finance the rest at 4.7% for 30 years. What is the mortgage? How much interest will you pay during the life of the loan?

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15. A company produces lawn mowers. The company's daily fixed costs are $42,000 and variable costs are $1500 per lawn mower. The mowers are sold for $1800 each. a) Find the cost function C(x). b) Find the revenue function R(x). c) Find the break-even point. Write your answer as an ordered pair. d) Graph the cost and revenue functions on the given coordinate system and show the break-even point. e) Write the meaning of the break-even point you found in part c using complete sentences with correct units. Include an interpretation of the regions between the lines that are to the left and to the right of the break-even point.

Problems 16 – 18 Directions: a) Assign variables to the unknowns. b) Write a system of equations. c) Write an augmented matrix. d) Write the augmented matrix in reduced row echelon form. e) Write your results using a complete sentence using correct units.

16. A fruit grower uses two types of fertilizer in an orange grove, brand A and brand B. Each bag of brand A contains 8 pounds of nitrogen and 4 pounds of phosphoric acid. Each bag of brand B contains 7 pounds of nitrogen and 6 pounds of phosphoric acid. The orange grove needs 720 pounds of nitrogen and 500 pounds of phosphoric acid. How many bags of each brand should be used to meet these requirements?

17. A dietitian in a hospital is to arrange a special diet compose of three basic foods. The diet is to include exactly 340 units of calcium, 180 units of iron, and 220 units of vitamin A. The number of units per ounce of each nutrient

contained in each of the foods is indicated in the table. How many ounces of each food must be used to meet the dietary requirements?

Nutrient	Food A	Food B	Food C
Calcium	30	10	20
Iron	10	10	20
Vitamin A	10	30	20

18. A farmer wants to use two brands of fertilizer for his corn crop. Brand A contains 20% nitrogen and 3% phosphate. Brand B contains 16% nitrogen and 8% phosphate. How many pounds of each brand of fertilizer should be used if the farmer's corn crop needs 132 pounds of nitrogen and 31 pounds of phosphate?

Problems 19 – 20 Directions: a) Define your variables. b) Write the problem constraints. c) Graph the feasible region. d) Determine the corner points. e) Write the objective function. f) Evaluate the objective function at each of the corner points. g) Write your solution using a complete sentence with correct units.

19. A furniture manufacturing company manufactures tables and chairs. The relevant manufacturing data are given in the table below. How many tables and chairs should be manufactured each day to maximize profit? What is the maximum profit?

Department	Table Labor-Hours per Unit	Chair Labor-Hours per Unit	Maximum Labor-Hours Available per Day
Assembly	8	2	400
Finishing	2	1	120
Profit per unit	$90	$25	

20. A gardener uses two types of fertilizer in her garden, Brand A and Brand B. Each pound of Brand A contains 8% nitrogen, 4% phosphoric acid, and 2% chloride. Each pound of Brand B contains 3% nitrogen, 4% phosphoric acid, and 1% chloride. The garden needs at least 10 pounds of phosphoric acid and at most 4 pounds of chloride. If the gardener wants to maximize the amount of nitrogen added to the garden, how many pounds of each brand should be used? What is the maximum amount of nitrogen?

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21. A survey was given to 100 randomly chosen students which included the following three questions and responses:

Do you own a TV?	Do you own a car?	Do you own a TV and a car?
75 said yes	45 said yes	35 said yes

a) How many students do not own a TV? b) How many students do not own a car? c) How many students do not own a car or a TV? d) How many students own a TV but not a car? e) How many students own a car but not a TV? f) How many students own either a TV or a car? [Draw a Venn Diagram]

22. You would like to make a salad that consists of lettuce, tomato, cucumber and croutons. At the store there are 11 varieties of lettuce, 3 varieties of tomatoes, 5 varieties of cucumbers and 4 varieties of croutons. How many different salads can you make?

23. A combination lock has 7 wheels each wheel having the digits 0 through 9. a) How many 7-digit combinations are possible if no digit is repeated? b) How many 7-digit combinations are possible if digits can be repeated?

24. How many different license plates are possible if the license plate contains 2 letters followed by 8 digits? Assume letters and digits can be repeated.

25. A corporation plans to fill 2 different positions for vice-president, V_1 and V_2, from administrative officers in 2 of its manufacturing plants. Plant A has 6 officers and plant B has 8. a) How many ways can these 2 positions be filled if the V_1 position is to filled from plant A and the V_2 position is to be filled from plant B? b) How many ways can the 2 positions be filled if the selection is made without regard to plant?

26. A survey of 1200 people indicates that 850 own DVD players, 740 own Blu-ray players, and 580 own both DVD players and Blu-ray players. Draw a Venn Diagram to answer the following: a) How many people own either a DVD player or a Blu-ray player? b) How many own neither a DVD player or a Blu-ray player? c) How many own a DVD player but not a Blu-ray player? d) How many own a Blu-ray player but not a DVD player. [Draw a Venn Diagram]

Problems 27 – 32: Determine if the situation is a permutation or combination and then do the calculation.

27. Suppose that 7 people enter a swim meet. Assuming that there are no ties, in how many ways could the gold, silver, and bronze medals be awarded?

28. In a horse race, how many different finishes among the first three places are possible if 22 horses are running?

29. John bought a machine to make fresh juice. He has five different fruits: strawberries, oranges, apples, pineapples, and lemons. If he only uses two fruits, how many different juice drinks can John make?

30. How many different committees of 3 people can be chosen to work on a special project from a group of 9 people?

31. From a committee of 10 people, how many ways can we choose a chair, a vice-chair and a secretary?

32. From a committee of 10 people, how many ways can we choose a subcommittee of 3 people?

Problems 33 – 39 Determine the probabilities.

33. Experiment: Rolling 1 die. Find the probability of the following events:
    a) rolling a 2 b) rolling an even number c) rolling a 7
    d) rolling a number that is divisible by 3 e) rolling a number less than 7

34. Experiment: Flipping 2 coins. Find the probability of the events:
    a) getting exactly one head b) getting two heads c) getting at least one head

35. Experiment: Rolling two dice. Find the probability of getting:
    a) sum of 7 b) sum of 11 c) sum less than 5 d) sum of 7 or 11
    e) a double f) sum greater than 5 g) snake eyes

36. Experiment: Drawing 1 card from a deck of cards. Find the probability of drawing :

a) an 8 b) a queen c) a face card d) a spade or an ace

e) a spade and an ace f) a red and a spade

37. A box of 20 gumdrops was found to contain the number of gumdrops listed in the table. Assume that each gumdrop has an equal chance of being selected. If one gumdrop is drawn from the box, what is the probability of drawing

a) an orange gumdrop b) a cherry gumdrop c) a lemon or orange gumdrop

Lemon	Orange	Cherry	Grape
6	8	3	3

38. In a family with two children, find the probability of having:

a) exactly one girl b) two girls c) at least one girl d) two boys

39. In a family of 3 children, find the probability of having:

a) one girl, b) two girls c) 3 girls d) having at least one girl

Problems 40 – 41 Determine the odds.

40. The probability that a candidate wins an election is 0.81.

a) What are the odds that he wins? c) What are the odds that he loses?

41. Compute the odds in favor of

a) obtaining an even number in a single roll of a die.

b) obtaining a sum of 7 in a single roll of two dice.

Problems 42 – 44 Determine the conditional probabilities.

42. Two marbles are drawn in succession out of a box containing 3 blue and 2 white marbles <u>with replacement</u>. Draw a probability tree-diagram and calculate the probability that the second marble was white.

43. Two marbles are drawn in succession out of a box containing 3 blue and 2 white marbles <u>without replacement</u>. Draw a probability tree-diagram and calculate the probability that the second marble was white.

44. A box contains 4 red, 5 white and 6 green marbles. Two marbles are drawn out of the box in succession without replacement. What is the probability that both marbles are the same color? Draw a probability tree diagram to write the sample space.

Problems 45 – 46 Use Bayes' Theorem to calculate the probabilities.

45. A manufacturer obtains clock-radios from three different subcontractors: 10% from A, 20% from B and 70% from C. The defective rates for these subcontractors are 2%, 4% and 3% respectively. If a defective clock-radio is returned by a customer, a) What is the probability that it came from subcontractor A? b) What is the probability that it came from subcontractor B? c) What is the probability that it came from subcontractor C?

46. A new test has been developed to detect a particular type of cancer. The test must be evaluated before it is put into use. A medical researcher selects a random sample of 3000 adults and finds (by other means) that 3% have this type of cancer. Each of the 3000 adults is given the test, and it is found that the test indicates cancer in 95% of those who have it and in 2% of those who do not. Based on these results, a) What is the probability of a randomly chosen person having cancer given the test indicates cancer? b) What is the probability of a randomly chosen person having cancer given that the test does not indicate cancer?

Answers

1. $840 2. $12.48 3. $27,863.33 4. 2.6% 5. a) $102.53 b) $134.90

6. a) $112.75 b) $122.14 7. $35,805.03 8. Advanta 5.043%, Charter One 5.063%, Liberty 5.064%, Liberty is the best option. 9. $82,778.07; $37,778.07

10. $502.44; $258,828.80 11. $3070.54 12. $423,424.17 13. $8417.37; $1032.63 14. $2385.73; $398,862.80

15. a) $C(x) = 1500x + 42000$ b) $R(x) = 1800x$ c) $(140; 252{,}000)$ d) Graph

e) To break even, the company must sell 140 lawn mowers. If the company sells fewer than 140 lawn mowers, it is operating at a loss. If the company sells more than 140 lawn mowers, it is operating at a profit.

16. To meet the requirements, 41 bags of Brand A and 56 bags of Brand B should be used.

17. To meet the dietary requirements, 8 ounces of Food A, 2 ounces of Food B and 4 ounces of Food C should be used.

18. The farmer should use 500 pounds of Brand A and 200 pounds of Brand B.

19. To maximize profit, 40 tables and 40 chairs should be manufactured each day. The maximum profit is $4600.

20. To maximize the nitrogen, 150 bags of Brand A and 100 bags of Brand B are needed. The maximum nitrogen is 1500 pounds.

21. a) 25 b) 55 c) 15 d) 40 e) 10 f) 85 22. 660 23. a) 604,800

b) 10,000,000 24. 6,760,000 25. a) 48 b) 182 26. a) 1010 b) 190 c) 270

d) 160 27. 210 28. 9240 29. 10 30. 84 31. 720 32. 120 33. a) 1/6

b) 1/2 c) 0 d) 1/3 e) 1 34. a) 1/2 b) 1/4 c) 3/4 35. a) 1/6 b) 1/18 c) 1/6

d) 2/9 e) 1/6 f) 13/18 g) 1/36 36. a) 1/13 b) 1/13 c) 3/13 d) 4/13 e) 1/52 f) 0

37. a) 2/5 b) 3/20 c) 7/10 38. a) 1/2 b) 1/4 c) 3/4 d) 1/4 39. a) 3/8

b) 3/8 c) 1/8 d) 7/8 40. a) 0.19 b) 81/19 c) 19/81 41. a) 1/1 b) 1/5

42. 2/5 43. 2/5 44. 31/105 45. a) 0.0645 b) 0.2581 c) 0.6774

46. a) 0.5950 b) 0.0016