Math 107 Practice Test 1: Chapters 2 & 5

Read all questions carefully! Answer the questions completely. Show all the work you do and turn in all papers that you use.

1. A coin is tossed 4 times and the sequence of heads and tails is recorded. Draw a tree diagram to list the outcomes of this activity.

2. Five soups, two entrees, and four desserts are listed on the 'Special' menu at the Neptune Restaurant. How many different selections consisting of one soup, one entree, and one dessert can a customer choose from this menu?

   \[5 \times 2 \times 4 = 40 \text{ meals}\]

3. How many different Zip Codes are possible using the new style (nine digits)?

   \[10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9\]

4. How many four-letter code words can be constructed from the first nine letters of the Greek alphabet if no repetitions are allowed?

   \[9 \times 8 \times 7 \times 6 = 3,024 \text{ code words}\]

5. Computers manufactured by a certain company have a serial number consisting of a letter of the alphabet followed by a five-digit number. If all the serial numbers of this type have been used, how many sets have already been manufactured?

6. Find the indicated value.

   \[
   \frac{6!}{2!4!} \quad \frac{6 \times 5 \times 4!}{2!A!} = 15
   \]
7. Find \( \binom{5}{3} \).

\[ \text{calculator} \quad 10 \]

8. Find \( \binom{6}{4} \).

\[ \text{calculator} \quad 120 \]

9. In how many ways can an investor select three mutual funds for his investment portfolio from a recommended list of eight mutual funds?

\[ \binom{8}{3} = 56 \text{ investment portfolios} \]

10. How many three-letter arrangements can be formed from the first four letters of the alphabet?

\[ \binom{4}{3} = 24 \text{ arrangements} \]

11. An English class consists of 26 students, and three are to be chosen to give speeches in a school competition. How many different ways can the teacher choose the team?

\[ \binom{26}{3} = 2,600 \text{ teams} \]

12. A group of seven seniors, eight juniors, five sophomores, and five freshmen must select a committee of four. How many committees are possible if the committee must contain one person from each class?

\[
\begin{array}{cccc}
\text{Sr} & \text{Jr} & \text{Soph} & \text{Fr} \\
7 & 8 & 5 & 5 \\
\end{array}
\]

Choose 1 ea. = 7 \cdot 8 \cdot 5 \cdot 5 = 1,400 \text{ committees}

13. Find the simple interest for a loan amount of $500 at 7% for 4 years.

\[ I = \frac{P \cdot r \cdot t}{100} = \frac{500 \cdot 0.07 \cdot 4}{100} = 140 \]

14. Find the simple interest for a loan amount of $5,660 at 6% for 234 days.

\[ I = \frac{P \cdot r \cdot t}{365} = \frac{5660 \cdot 0.06 \cdot 234}{365} = 217 \]

15. How much must be deposited now at 8% interest so that in 1 year and 9 months an account will contain $7,000?

\[ FV = P(1 + r \cdot t) \]

\[ 7000 = P \left( 1 + \frac{0.08 \cdot 1.75}{3} \right) \]

\[ 7000 = P \left( 1.14 \right) \]

\[ P = \frac{7000}{1.14} = 6140 \]

16. Helen and Dick Davis buy a refrigerator at Appliance Barn for $1,500. They put $200 down and finance the rest through the store at 11.9% add-on interest. If they agree to make 29 monthly payments, find the size of each payment.

\[ \overline{P} = 1300 \]

\[ FV = P \left( 1 + r \cdot t \right) = 1300 \left( 1 + \frac{0.119 \cdot 29}{12} \right) = 1673 \]

\[ \text{each month} = \frac{1673}{29} = 57 \]
17. Find the number of days. March 27 to December 18 of the same year.

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<td>Nov</td>
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18. Find the simple interest of the given loan amount: $2,000 borrowed at 15% for one year.

\[ I = Prt = 2000(0.15)(1) = 300 \]

19. Find the future value of the given present value: present value of $2,712 at 18% for 45 days. (Use 360 days per year for your calculation.)

Simple Interest

\[ FV = \frac{PV(1 + rt)}{1 + \frac{rt}{360}} = \frac{2712(1 + 0.18 \times \frac{45}{360})}{1.005} = 2773.24 \]

20. Find the maturity value of the given loan amount: $1,220 borrowed at 5% for 90 days. (Use 360 days per year for your calculation.)

Simple Interest

\[ FV = \frac{PV(1 + rt)}{1 + \frac{rt}{360}} = \frac{1220(1 + 0.05 \times \frac{90}{360})}{1.0125} = 1235.25 \]

21. If the final value is $4,260 at the end of 6 years and the simple rate of interest is 7%, what is the present value?

\[ 4260 = \frac{PV(1 + 0.07(6))}{1.42} \]

\[ PV = \frac{4260}{1.42} = 3000 \]

22. Tina and Mike have sold their house, but they will not get the proceeds from the sale for an estimated 45 days. The owner of the house they want to buy will not hold the house that long. Tina and Mike have two choices: let their dream house go or take out a bridge loan. The bridge loan would be for $74,880 at 7.5% simple interest, due in 45 days. How much interest would they pay for this loan? (Use 360 days per year for your calculation.)

\[ I = Prt = 74880(0.075)(\frac{45}{360}) = 702 \]

23. Find the periodic rate that corresponds to a compound rate of 6%, compounded monthly. Round to four decimal places, if necessary.

\[ i = \frac{0.06}{12} = 0.005 \]

24. Find the number of periods that corresponds to a time span of 20 years, if the period is monthly. Ignore leap years.

\[ n = 20(12) = 240 \text{ periods} \]

25. Find the future value of $8,000 compounded annually at 7% for 16 years.

\[ FV = PV(1 + i)^n = 8000(1 + 0.07)^{16} = 23,617.31 \]
26. Find the future value of the given amount: $13,000 at 5%, compounded monthly for 6 years.
\[ FV = \frac{\text{PV}}{1+i}^n \]
\[ i = \frac{0.05}{12} = 0.00416 \]
\[ n = 12(6) = 72 \]
\[ FV = 13000(1.00416)^{72} \approx 17,537.33 \]

27. Find the future value of the given amount: $5,000 at 12%, compounded quarterly for 5 years.
\[ FV = \frac{\text{PV}}{1+i}^n \]
\[ i = \frac{0.12}{4} = 0.03 \]
\[ n = 4(5) = 20 \]
\[ FV = 5000(1.03)^{20} \approx 6930 \text{SE} \]

28. Find the present value that will generate the given future value: $40,000 at 8% compounded monthly for 4 years.
\[ FV = \frac{\text{PV}}{1+i}^n \]
\[ 40000 = \frac{\text{PV}}{1.006^4} \]
\[ \text{PV} = \frac{40000}{1.006^4} \approx 37,982.62 \]

29. Find the future value of an ordinary annuity with a $190 monthly payment at 8% interest for 10 years.
\[ FV = \frac{\text{PV} + (FV\cdot i)}{1+i}^n \]
\[ i = \frac{0.08}{12} = 0.00667 \]
\[ n = 10(12) = 120 \]
\[ FV = 190(182.94604) \approx 34,759.75 \]

30. On February 20, Bert Sarkis joined a Christmas club. His bank will automatically deduct $50 from his checking account at the end of each month and deposit it into his Christmas club account, where it will earn 5% interest. The account comes to term on December 1. Find Bert's total contribution to the account.
\[ \text{ordinary annuity} \]
\[ \text{Feb-Nov} = 10\text{ months} \]
\[ i = \frac{0.05}{12} = 0.00416 \]
\[ n = 10 \]
\[ \text{Contribution} = 50(10) = 500 \]

31. Sam Whitney recently set up a TDA to save for his retirement. He arranged to have $200 taken out of each of his monthly checks; it will earn 7% interest. He just had his forty-fifth birthday, and his ordinary annuity comes to term when he is sixty-five. Find the future value of the account.
\[ FV = \frac{\text{PV} + (FV\cdot i)}{1+i}^n \]
\[ i = \frac{0.07}{12} = 0.00583 \]
\[ n = 30(12) = 360 \]
\[ FV = 200(520.927) \approx 104,185.40 \]

32. Find the monthly payment for an ordinary annuity that will yield the future value of $20,000 at 9% interest for 30 years.
\[ FV = \frac{\text{PV} + (FV\cdot i)}{1+i}^n \]
\[ i = \frac{0.09}{12} = 0.0075 \]
\[ n = 30(12) = 360 \]
\[ \frac{20000}{1830.743} = \frac{\text{PV} + (1830.743)}{1830.743} \]
\[ \text{PV} = 109,92 \]

33. Susan and Bill Stamp want to set up a TDA that will generate sufficient interest at maturity to meet their living expenses, which they project to be $1,800 per month. Find the amount needed at maturity to generate $1,800 per month interest if they can get 9% interest compounded monthly.
\[ \text{Monthly Interest} = \frac{\text{PV}}{1+i}^n \]
\[ 1800 = \frac{\text{PV}}{0.0075} \]
\[ 0.0075 \]
\[ \text{PV} = 240,000 \]
34. Toni Torres wants to save $1,700 over the next two years to use as a down payment on a new car. If her bank offers her 6% interest, what monthly payment would she need to put into an ordinary annuity in order to reach her goal?

\[ FV = PMT \left( \frac{1}{1 + \frac{i}{n}} \right) \]

\[ i = \frac{0.06}{12} = 0.005 \]

\[ n = 2(12) = 24 \]

\[ 1700 = PMT \left( \frac{1}{1 + \frac{0.005}{12}} \right) \cdot \frac{1}{1 - \left(1 + \frac{0.005}{12}\right)^{-24}} \]

\[ PMT = \frac{1700 \cdot 12}{25.43196} = \frac{20,400}{25.43196} \cdot \frac{1}{12} = 480 \text{ per month} \]

35. Anne Geyer buys some land in Utah. She agrees to pay the seller a lump sum of $80,000 in five years. Until then, she will make monthly simple interest payments to the seller at 9% interest. Find the amount of each interest payment. Round to the nearest cent.

\[ I = Prt = 80,000 \cdot \left( \frac{0.09}{12} \right) \cdot (12) = 24,000 \]

36. Find the monthly payment for an ordinary annuity that will yield the future value of $15,000 at 9% interest for 35 years.

\[ FV = PMT \left( \frac{1}{1 + \frac{i}{n}} \right) \cdot \frac{1}{1 - \left(1 + \frac{i}{n}\right)^{-n}} \]

\[ i = \frac{0.09}{12} = 0.0075 \]

\[ n = 35(12) = 420 \]

\[ 15,000 = PMT \left( \frac{1}{1 + \frac{0.0075}{12}} \right) \cdot \frac{1}{1 - \left(1 + \frac{0.0075}{12}\right)^{-420}} \]

\[ PMT = \frac{15,000 \cdot 12}{2941.784} = \frac{180,000}{2941.784} \cdot \frac{1}{12} = 851.99 \]

37. Fred and Melissa Furt's daughter Sally will be a freshman in college in six years. To help cover their extra expenses, the Furtths decide to set up a sinking fund of $16,000. If the account pays 7.1% interest and they wish to make quarterly payments, find the size of each payment.

\[ FV = PMT \left( \frac{1}{1 + \frac{i}{n}} \right) \cdot \frac{1}{1 - \left(1 + \frac{i}{n}\right)^{-n}} \]

\[ i = \frac{0.071}{4} = 0.01775 \]

\[ n = 4(6) = 24 \]

\[ 16,000 = PMT \left( \frac{1}{1 + \frac{0.01775}{4}} \right) \cdot \frac{1}{1 - \left(1 + \frac{0.01775}{4}\right)^{-24}} \]

\[ PMT = \frac{16,000 \cdot 4}{2970.58} = \frac{64,000}{2970.58} \cdot \frac{1}{4} = 540.52 \]

38. Wade Ellis buys a new car for $16,114.93. He puts 13% down and obtains a simple interest amortized loan for the balance at 11% interest for 7 years. Three years and 2 months later, he sells his car. Find the unpaid balance on his loan.

\[ FV = PMT \left( \frac{1}{1 + \frac{i}{n}} \right) \cdot \frac{1}{1 - \left(1 + \frac{i}{n}\right)^{-n}} \]

\[ i = \frac{0.13}{12} = 0.0010833 \]

\[ n = 7(12) = 84 \]

\[ PMT = \frac{16,114.93 \cdot \frac{12}{12}}{1 + \left( \frac{0.11}{12} \right) \cdot (84) - \left( \frac{0.13}{12} \right) \cdot (84)} \approx 240 \text{ per month} \]

\[ 19,830.69 - 10,851.27 = 8,979.42 \]

39. Ray and Helen Lee bought a house for $182,500. They put 11% down, borrowed 78% from their bank for 30 years at 11.5%, and convinced the seller to take a second mortgage for the remaining 11%. That 11% is due in full in 5 years (this is called a balloon payment), and the Lees agreed to make monthly interest-only payments to the seller at 12% simple interest in the interim. Find the Lees' down payment.

\[ \text{11% down} \]

\[ \frac{182,500(0.11)}{12} = 20,075 \]