MATH 1350 Review for Exam 2 by Dr. Poage

1. Is the set \{1, 2, 3\} closed under addition? Why or why not?

2. Mark takes a trip to another planet to visit his parents. On this planet the numeration system is in base three. His parents take him out to eat and the bill comes to $1221_{\text{three}}$.
   (a) If his parents hand the cashier $2000_{\text{three}}$, how much change do they receive (in base three)?
   (b) How much would this bill be in American money?

3. Place parentheses in the correct places below in order to make each expression TRUE.
   (a) $3 + 3 \div 3 \times 3 - 3 = 1$
   (b) $18 \div 2 \times 3 + 2 - 5 = 40$

4. Using the numbers 2, 4, 5, 6, 8 once and only once (all 5 must be used, but only one time) and addition, subtraction, multiplication, and division, create the number “11”.

5. What is the last step you would do when solving the following expression:
   $(1 + 3)^2 \div 2 \times 4 + 3 \times 2 \div 2$

6. A student says that 1 is the identity for division. How do you respond?

7. Find the difference (in base six) for: $5032_{\text{six}} - 2145_{\text{six}}$

8. Set $A$ contains the element 1. What other whole numbers must be in the set $A$ for it to be closed under addition?

9. Find the difference (in base 3) for: $20010_{\text{three}} - 2022_{\text{three}}$

10. Find the sum (in base 3) for: $10122_{\text{three}} + 22101_{\text{three}}$

11. Write the following statements in algebraic form:
   (a) five times a number cubed
   (b) the sum of three consecutive integers if the greatest one is $5x$
   (c) seven less than two times a number
   (d) the difference between the squared root of eleven and eleven squared
   (e) the product of three consecutive integers
   (f) the sum of four consecutive even integers

12. If the domain is 2, 4, 6, 8, 10 and the range is 1, 3, 5, 7,
   (a) draw a picture with arrows to demonstrate how this could be a function.
   (b) draw a picture with arrows to demonstrate how this could NOT be a function.

13. Set $A$ is closed under addition and contains the numbers 3, 6, and 7. List six other elements that must be in $A$.

14. Find the sum (in base 5) for:
   $2132_{\text{five}} + 3423_{\text{five}}$
15. Draw pictures to find a solution to the following:
   - two butterflies and a fish cost $14
   - 1 butterfly, 1 fish, and 1 bird cost $17
   - 1 bird and 1 butterfly cost $15

   What is the cost of each?

16. Write an example of base other than ten used in a real-life situation. How is it used?

17. Find the difference (in base eight) for:
   \[ 6207_{eight} - 4534_{eight} \]

18. Explain whether the following sets are closed under addition:
   (a) \( B = \{0, 1\} \)
   (b) \( T = \{0, 4, 8, 12, 16, \ldots\} \)
   (c) \( \{x \mid x \in W \text{ and } x > 5\} \)

19. Multiply \( 52_{six} \cdot 34_{six} \)

20. When one attempts to divide by zero, what is the difference between “undefined” and “indeterminate”?

21. Multiply \( 312_{four} \cdot 23_{four} \)

22. A student claims that for all whole numbers, \( a \div a = 1 \). How do you respond?

23. If the number 5 is removed from the set of whole numbers,
   (a) is the set closed under addition? EXPLAIN.
   (b) is the set closed under multiplication? EXPLAIN.

24. A student says that 0 is the identity for both addition and subtraction. How do you respond?

25. Divide \( 24312_{five} \div 4_{five} \)

26. Which of the following are functions?

27. Write the sum of five consecutive even numbers if the middle one is \( n \). Simplify your answer.

28. Divide \( 1423_{six} \div 3_{six} \)

29. Can 0 be the identity for multiplication? Explain why or why not.
30. Show how to use the PARTITION method to multiply $730 \times 3$

31. Use LATTICE multiplication to multiply $434_{\text{five}} \cdot 24_{\text{five}}$

32. Multiply $768_{\text{nine}} \cdot 57_{\text{nine}}$

33. Divide $1021_{\text{three}} \div 2_{\text{three}}$

34. Which property is being used?
   (a) $4 \times (5 + 2) = 4 \times 5 + 4 \times 2$
   (b) $(9 + 5) + (3 + 4) = (3 + 4) + (9 + 5)$

35. Write an algebraic expression representing:
   “the square of the difference between a number plus five and that same number cubed”

36. Does the associative property hold for division? If yes, explain. If no, give a counterexample.

37. Multiply $3024_{\text{five}} \cdot 43_{\text{five}}$

38. Set $C$ contains the elements 5 and 8. If set $C$ is closed under addition,
   (a) write at least 4 more elements that MUST be in set $C$.
   (b) Write at least 10 more elements that might NOT be in set $C$.

39. Divide $3763_{\text{eight}} \div 5_{\text{eight}}$

40. In a college, there are 13 times as many students as professors. If together the students and professors numbers 28,000, how many students are there in the college? (write the equations and solve the problem)

41. Write the sum of five consecutive even numbers if the middle one is $n$. Simplify your answer.

42. If the number 11 is removed from the set of whole numbers,
   (a) Is the set closed under multiplication? Why or why not?
   (b) Is the set closed under addition? Why or why not?

43. What does the following expression equal right now? By placing parentheses in different places, turn the following expression into 5 different values. $12 - 4 \div 2 + 6 \cdot 4 \div 4$

44. Use the PARTITION method to demonstrate how to multiply: $82 \times 4$

45. Set $B$ is closed under multiplication and contains the numbers 4, 7, and 9. List at least six other elements that must be in $B$.

46. A student claims that $0 \div 0 = 1$. How do you respond? Explain.

47. If Mason has twice as many CDs as Cooper and Tanner has 3 times as many as Mason, write an algebraic expression for the number of CDs each has in terms of one variable ($n$). (state what $n$ is)

48. Mike has 3 times as many baseball cards as Jordan, who has twice as many cards as Paige. Together, the three children have 999 cards. Set up an equation in one variable, $n$, and find how many cards each child has. (state what $n$ is)
49. On February 20th, the Poage family received 23 pieces of mail consisting of magazines, bills, letters, and ads. If they received the same number of magazines as letters, three more bills than letters, and five more ads than bills, how many magazines did they receive? Let \( L = \# \text{ of letters they received} \). Write an equation to solve this problem.

50. Multiply \( 75_{eight} \cdot 6_{eight} \)

51. Use LATTICE addition to add \( 562_{seven} + 694_{seven} \)

52. Ten years from now Tanner’s age will be 3 times his present age. Find Tanner’s age now. (set up the equation using one variable and solve)

53. \( 210_{three} \times 2_{three} \)

54. Explain how WHERE you put parentheses in the following problem could completely change the answer: \( 9 - 3 \div 3 + 2 \cdot 4 \)

55. \( 53_{six} \times 14_{six} \)

56. \( 10221_{four} \div 3_{four} \)

57. \( 342_{five} \times 11_{five} \)

58. What is the value of \( 32 - 36 ÷ 6 \cdot 2 + (4 + 8) ÷ 2 \cdot 2? \)

59. \( 10011_{two} \times 10_{two} \)

60. \( 34_{five} \cdot 22_{five} \)

61. \( 21403_{five} ÷ 2_{five} \)

62. Which properties are illustrated for each of the following?
   (a) \( 4 \cdot (5 \cdot 6) = (4 \cdot 5) \cdot 6 \)  
   (b) \( 2(6 + 9) = 2 \cdot 6 + 2 \cdot 9 \)  
   (c) \( 0 + 14 = 14 \)

63. \( 52_{six} \times 34_{six} \)

64. \( 353_{seven} ÷ 5_{seven} \)

65. Find the numeral to put in the blank to make each equation true.
   (a) \( 3423_{five} - \underline{} = 2131_{five} \)
   (b) \( 11011_{two} + \underline{} = 100000_{two} \)

66. Multiply: \( 4T8_{twelve} \cdot 2E_{twelve} \)

67. Divide \( 21403_{five} ÷ 2_{five} \)

68. Mika takes a trip to the moon where they have a base five number system. While on the moon, Mika buys a shirt for \( 132_{five} \), a pair of shoes for \( 343_{five} \), and a jacket for \( 1233_{five} \).
   (a) How much Moonian money does Mika owe?
   (b) How much does this little shopping spree equate to in American money?
   (c) If Mika hands the clerk \( 10000_{five} \) in Moonian bills, how much Moonian money should Mika get back from the clerk?

69. Show how to multiply \( 4 \times 6 \) using the array method.

70. Use LATTICE multiplication to find \( 123_{four} \cdot 32_{four} \) (show all work)