



**CURRICULUM AND INSTRUCTIONAL SERVICES  
MATHEMATICS COMMON ASSESSMENT REVIEW  
DISCRETE MATHEMATICS (343012)**

Name \_\_\_\_\_ Date \_\_\_\_\_

1. Three children must make fair division of a painting and sculpture left them by their mother. Using the Knaster inheritance procedure, the value each child places on the objects is shown below.

<b>OBJECT</b>	<b>A</b>	<b>B</b>	<b>C</b>
Painting	\$4,000	\$6,300	\$6,000
Sculpture	\$2,300	\$1,800	\$2,400

What does B get after the fair division?

- A. Painting and \$366.67
  - B. Painting and pays \$3,233.34
  - C. Painting and pays \$3,600
  - D. Painting and pays \$2,250
2. Suppose Kim and Chris want to take turns using the bottom-up strategy to allocate several textbooks jointly. Their ranked preferences are listed below.

	<b>FIRST</b>	<b>SECOND</b>	<b>THIRD</b>	<b>FOURTH</b>	<b>FIFTH</b>	<b>SIXTH</b>
Kim	Biology	Chemistry	Botany	Sociology	Ecology	Physiology
Chris	Botany	Sociology	Physiology	Biology	Ecology	Chemistry

If Kim chooses first, what is Chris's first choice?

- A. Botany
- B. Sociology
- C. Physiology
- D. Biology

3. Suppose Jack and Joe will take turns using the bottom-up strategy to allocate a selection of cookies. Their ranked preferences are listed below.

	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH
<b>Jack</b>	Chocolate chip	Peanut Butter	Macadamia	Macaroon	Sugar	Oatmeal
<b>Joe</b>	Peanut butter	Oatmeal	Macaroon	Macadamia	Chocolate chip	Sugar

If Jack chooses first when is the chocolate chip cookie chosen?

- A. It is Jack's second choice.  
 B. It is Joe's second choice.  
 C. It is Jack's third choice.  
 D. It is Joe's third choice.
4. In what types of real-life situations might you use the concepts learned from cake-division algorithms? List at least three.

5. Four people must make a fair division of two classic cars. They use the Knaster inheritance procedure. Their bids are shown below.

	A	B	C	D
<b>T-Bird</b>	\$60,000	\$90,000	\$50,000	\$50,000
<b>Mustang</b>	\$70,000	\$45,000	\$100,000	\$80,000
<b>Settlement Totals</b>				

Use the Knaster inheritance procedure to divide the estate. Show your work on a separate sheet of paper; record your final settlement answers in the space provided above.

6. We are scheduling 7 course sections for a total of 217 students. Enrollments are 109 in Calculus I, 79 in Calculus II, and 29 in Advanced Calculus. Find the apportionment for each course using the Jefferson method.
- A. 4, 2, 1  
 B. 3, 3, 1  
 C. 4, 3, 0  
 D. 3, 2, 2

7. Round the following to whole percentages using the Webster method:  $6.6\% + 38.1\% + 1.1\% + 17.0\% + 12.6\% + 24.6\% = 100\%$ .
- A.  $7 + 38 + 1 + 17 + 13 + 25$   
 B.  $7 + 38 + 1 + 17 + 12 + 25$   
 C.  $7 + 38 + 1 + 17 + 13 + 24$   
 D.  $6 + 38 + 1 + 17 + 13 + 24$

8. The manager of a busy restaurant is working on a schedule for the restaurant's 25 food servers. There are three shifts as identified below.

Shift	Average Number of Customers
1	164
2	560
3	328

Use the Webster method to determine how many food servers should be scheduled for each shift.

9. In American football the "third down and short" situation occurs often. The probabilities of obtaining a first down, shown below, are dependent on the choices of the offense and the anticipated choice of the defense.

		Defense	
		Run	Pass
Offense	Run	0.4	0.8
	Pass	0.6	0.2

In such situations what is the optimal solution for the offense?

- A. Always choose to run.  
 B. Always choose to pass.  
 C. Choose to run more often than pass.  
 D. Choose to pass more often than run.

10. Use the Hamiltonian method to round each of the numbers in the sum  $2.50 + 1.65 + 0.54 + 1.63 + 3.68 = 10$  to a whole number, preserving the total of 10.
- A.  $3 + 2 + 0 + 2 + 3 = 10$   
 B.  $2 + 2 + 1 + 1 + 4 = 10$   
 C.  $2 + 2 + 1 + 2 + 3 = 10$   
 D.  $3 + 2 + 0 + 1 + 4 = 10$
11. Given the cities and the populations below, use the Jefferson method of apportionment to distribute 25 seats on a regional board.

City	Population
Greenville	34,569
Riverdale	27,943
Oceanside	21,350
Parkview	16,138

12. Use the Hamilton method of apportionment to distribute 15 representatives to the 3 states with the populations shown below.

STATE	POPULATION
A	253,000
B	182,000
C	85,000

13. You own a painting whose dimensions are 24 inches by 30 inches. If you create a slide of this work so that the longest side of the image is 1 inch, what is the area of the slide image?
- A. 1 square inch  
 B.  $\frac{4}{5}$  square inch  
 C.  $\frac{16}{25}$  square inch  
 D.  $\frac{5}{4}$  square inch
14. The cost of photographic paper is nearly proportional to the area of the paper. You own a painting whose dimensions are 24 inches by 30 inches. You create a small photographic reproduction whose smaller side is 5 inches. What is the scaling factor for this reproduction?
- A. 0.2083  
 B. 0.1667  
 C. 0.0434  
 D. 0.0278

15. A model of a truck is built to a scale of 1 to 54. If the model will hold 7 cubic inches, how much will the actual truck hold?
- A. 378 cubic feet
  - B. 638 cubic feet
  - C. 1,544 cubic feet
  - D. 4,536 cubic feet
16. A dog food company sells food in cans of two sizes. A "petite" can is 4 inches tall, and a "super" can is 1 foot tall. The two types of cans are geometrically similar in shape. The petite can contains .04 cents worth of metal. What is the value of the metal in the super can?
- A. .48 cents
  - B. .36 cents
  - C. .16 cents
  - D. .12 cents
17. You want to copy a poster whose dimensions are 24 inches by 30 inches onto a piece of paper 11 inches by 17 inches. You want the image to be as large as possible but maintain the proportions of the original poster. What are the dimensions of the image?
18. A granite sculpture weighs approximately 4,500 pounds. If a smaller version  $\frac{2}{3}$  the height of the original is created from granite, how much will it weigh?
- A. Approximately 3,675 pounds
  - B. Approximately 3,000 pounds
  - C. Approximately 2,000 pounds
  - D. Approximately 1,300 pounds
19. 2 yards is how many millimeters?
20. One hundred fifty pounds is how many grams?

21. Write out the first 20 numbers of the Fibonacci Sequence. As you calculate the ratio of consecutive Fibonacci numbers, what number does it converge to? What is the number called?
22. Draw an example of each of the seven border patterns. Label each example appropriately. Include at least four iterations of your design.
23. Which of the following polygons can tile the plane?
- A. Regular pentagon
  - B. Regular hexagon
- I. A only
  - II. B only
  - III. Both A and B
  - IV. Neither A nor B
24. What is a fractal? Draw an example of a fractal in the space below, and briefly explain the iterative process you used.

25. You have \$2,500 that you invest at 6% simple interest. What is the balance after four years?
- A. \$310
  - B. \$600
  - C. \$3,100
  - D. \$6,000
26. Merrie borrowed \$500 from her parents, agreeing to pay them back when she graduated from college in four years. If she paid interest compounded daily at 16%, how much would she owe at the end of the 4 years?
- A. \$948
  - B. \$1,029
  - C. \$1,237
  - D. \$1,581
27. What is the APY for 6% compounded weekly?
- A. 6.00%
  - B. 6.09%
  - C. 6.18%
  - D. 7.25%
28. Stephen made an investment with a 9% annual yield. However, the real growth rate of his investment was only 4%. What was the inflation rate?
29. Sean deposits \$100 a month into a savings account earning 3% interest compounded monthly. How much will he have if he continues to make these deposits for seven years?
30. The Larsen Family has decided to save up for a trip to Florida. They want to save \$7,000 in four years. They find a savings account for which interest is compounded weekly at 5.4%. How much will they have to deposit to meet this goal?

31. What is the APY for 6.25% compounded daily?
- A. 6.25%
  - B. 6.45%
  - C. 6.95%
  - D. 7.25%
32. A 9% add-on loan is to be repaid in monthly installments over 2 years. The amount borrowed was \$500. How much is the monthly payment?
- A. \$12.51
  - B. \$20.83
  - C. \$24.58
  - D. \$25.60
33. A 12% discounted loan is to be repaid in monthly installments over 4 years. The total amount borrowed was \$5,400. How much is the monthly payment?
- A. \$112.50
  - B. \$162.50
  - C. \$166.50
  - D. \$282.75
34. Jim wants to borrow \$2,100 to start a small business. He has found a bank that offers a 7% add-on loan to be repaid in monthly installments over 5 years. How much is the monthly payment?
- A. \$16.67
  - B. \$26.00
  - C. \$35.00
  - D. \$47.25
35. Moe takes out a conventional loan to purchase a car. The interest rate is 8.3% compounded monthly; and Moe has 8 years to repay the \$12,000 he borrowed. What are Moe's monthly payments?
- A. \$385.07
  - B. \$305.21
  - C. \$186.49
  - D. \$171.48

36. How much would you have to invest each month in an annuity earning 6.5% interest to earn \$30,000 at the end of 15 years?
- A. \$84.77
  - B. \$98.83
  - C. \$146.93
  - D. \$152.15
37. Suppose a student loan has an interest rate of 7% compounded monthly with monthly payments, and the borrower has 10 years to repay. If \$12,000 is borrowed what are the monthly payments?
- A. \$95.46
  - B. \$139.33
  - C. \$169.53
  - D. \$290.15
38. A credit card bill shows a balance due of \$2,500 with a monthly interest rate of 1.53%. What is the EAR?
- A. 18.36%
  - B. 19.99%
  - C. 22.92%
  - D. 25.49%
39. A credit card bill shows a balance due of \$980 with a monthly interest rate of 1.91%. What is the APR?
- A. 18.36%
  - B. 19.99%
  - C. 22.92%
  - D. 25.49%
40. How much would you have to invest each month in an annuity earning 5% interest to earn \$30,000 at the end of 30 years?
- A. \$14.32
  - B. \$36.05
  - C. \$39.82
  - D. \$40.26

41. A 10.4% discounted loan is to be repaid in monthly installments over 10 years. The total amount borrowed was \$29,000. How much is the monthly payment?
42. A 5.8% add-on loan is to be repaid in monthly installments over 2 years. The total amount borrowed was \$1,200. How much is the monthly payment?
43. David takes out a conventional loan to purchase a car. The interest rate is 4.8% compounded quarterly; and David has 4 years to repay the \$8,000 he borrowed. What are David's quarterly payments?
44. You invest \$325 each quarter into an annuity earning 9% interest. How much do you have at the end of ten years?
45. Which is a more favorable savings rate: 3.5% compounded monthly or 3.55% compounded quarterly?
46. Which of these loan rates is most favorable?
- A. 12.05% compounded annually
  - B. 12.01% compounded monthly
  - C. 12.03% compounded quarterly
  - D. 12.00% continuously compounded
47. If you invest \$1,000 in a CD earning 8% interest compounded quarterly and leave it there for 10 years, how much money will you have?
48. Four people must make a fair division of two classic cars. They can use the Knaster inheritance procedure. Their bids are shown below.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
T-Bird	\$60,000	\$90,000	\$50,000	\$50,000
Mustang	\$70,000	\$45,000	\$100,000	\$80,000

What is the division of the objects if A receives 30% of the estate, B receives 5%, and the remainder is divided equally between C and D?