MATHEMATICS, IT'S FORM AND IMPACT
Section A Final Exam
December 1994

Name _____

(4 pts) 1. Name the first 8 Fibonacci numbers

_____, _____, _____, _____, _____, _____, _____, _____.

(4 pts) 2. Explain what the golden ratio is.

(4 pts) 3. What is the relationship between the golden ratio and the Fibonacci sequence?

(4 pts) 4. Write the first four terms of the sequence defined by

$$A_N = 4 - 2A_{N-1} \quad \text{with} \quad A_1 = 2$$

_____, _____, _____, _____.

(4 pts) 5. Give a concrete example of a geometric figure that is a gnomon to itself. (Give exact dimensions.)

(8 pts) 6. Consider the arithmetic sequence P with $P_1 = 20$ and $d = 6$.

a) Find P_{100}.

b) Find $P_1 + P_2 + \cdots + P_{100}$.

(8 pts) 7. Consider the geometric sequence with first four terms 3, 6, 12, 24.

a) Find P_{100}.

b) Find $P_1 + P_2 + \cdots + P_{100}$.

(4 pts) 8. If an honest coin is tossed three times, the probability that all three tosses will come up heads is

_____

(4 pts) 9. If an honest coin is tossed three times, the probability that at least one of the tosses will come up heads is

_____

Questions 10 through 12 refer to the following example: A Kansas license tag consists of three capital letters (A through Z) followed by three digits (0 through 9).

(4 pts) 10. How many different such license tags are possible?

(4 pts) 11. How many such license tags start with the letter S and do not contain the digit 4?

(4 pts) 12. How many such license tags have the digit 4 for every one of their three digits?

Questions 13 through 16 refer to the following example: Three heirs (A , B , and C) must divide fairly an estate consisting of two items – a house and a painting – using the method of sealed bids. The players' bids (in dollars) are:

	A	B	C
House	195,000	210,000	199,000
Painting	45,000	15,000	53,000
Totals	240,000	225,000	252,000

(4 pts) 13. The original fair share of player C is worth

A) \$252,000.

B) \$126,000.

C) \$84,000.

D) \$53,000.

E) None of the above.

(4 pts) 14. After the initial allocation to each player is made there is a surplus of

A) \$24,000.

B) \$32,000.

C) \$78,000.

D) \$0.

E) None of the above.

(4 pts) 15. After all is said and done, the final allocation to player A is:

A) \$80,000 in cash.

B) \$88,000 in cash.

C) the painting and \$43,000 in cash.

D) the house and A must pay \$107,000.

E) None of the above.

(4 pts) 16. After all is said and done, the final allocation to player C is:

A) \$84,000 in cash.

B) \$92,000 in cash.

C) the painting and \$40,000 in cash.

D) the painting and C must pay \$31,000.

E) None of the above.

Questions 17 through 21 refer to the following graph.

(4 pts) 17. Vertex B is adjacent to which other vertices? _____

(4 pts) 18. The degree of vertex C is _____

(4 pts) 19. Name all the bridges of the graph _____

(4 pts) 20. Does the graph of Figure 5.1 have an Euler circuit? _____ Why or why not?

_____

(4 pts) 21. Does the graph of Figure 5.1 have a Hamilton circuit? _____ If so, name one.

_____

(4 pts) 22. Use Kruskal's algorithm to find a minimal spanning tree for the graph below. [Mark the edges of the tree without covering up the edge values.]

(4 pts) 23. Which of the following statements is true about Kruskal's algorithm?

Ans. _____

A) It is an efficient algorithm but it doesn't always give a minimal spanning tree.

B) It is an efficient algorithm and it always gives a minimal spanning tree.

C) It is an inefficient algorithm but it always gives a minimal spanning tree.

D) It is an inefficient algorithm and it never gives a minimal spanning tree.

E) None of the above.