Math 164
Spring, 2003
Final Exam

Name:

Circle the letter corresponding to your answer. Circle only one answer per question. There is no partial credit on this portion of the exam. All answers must appear on this cover page. Answer the long answer questions on the exam itself.

1. T F	24. A B C D E
2. T F	25. A B C D E
3. T F	26. A B C D E
4. T F	27. A B C D E F
5. T F	28. A B C D E F
6. T F	29. A B C D E
7. T F	30. A B C D E F
8. T F	31. A B C D E
9. T F	32. A B C D E F
10. T F	33. A B C D E
11. T F	34. A B C D E
12. T F	35. A B C D E F
13. A B C D E	36. A B C D E F
14. A B C D	37. A B C D E F
15. A B C D E	38. A B C D E F
16. A B C D E	39. A B C D E F
17. A B C D E	40. A B C D E
18. A B C D E F	
19. A B C D	
20. A B C D E	
21. A B C D	
22. A B C D E	
23. A B C D	

Math 164
Fall, 2002
Final Exam

Name:

True / False Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle T if the statement is always true and circle F if the statement is sometimes false.

1. T F Let $A = \{a, b, c\}$. Then $\emptyset \in A$.

2. T F $\emptyset$ is a subset of every set A.

3. T F $a \subseteq \{a, b, c\}$.

4. T F If $\mathcal{U}$ is the universal set, then $\mathcal{U}' = \emptyset$.

5. T F If a statement is always true it is a paradox.

6. T F The set $\{a, b, c, d, e, f\}$ has $C(6, 3)$ subsets with 3 elements.

7. T F There are $26 \cdot 26$ ways to get a red card and a black card when two cards are drawn from a standard deck of 52.

8. T F It is possible for the probability of some event A to be $P(A) = \frac{5}{3}$

9. T F $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$.

10. T F If two events, A and B are independent, then $P(A \cap B) = P(A) \cdot P(B)$.

11. T F If two events are mutually exclusive then $P(A \cup B) = P(A) + P(B)$

12. T F If the odds in favor of an event are $19 : 81$ then $P(A) = \frac{19}{100}$

Multiple Choice Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle the letter corresponding to the best answer.

For questions 13 - 15, use the following sets:

$\mathcal{U}$ = set of employees in a company
M = set of male employees
F = set of female employees

13. $M \cap F =$

A. M B. F C. $\mathcal{U}$ D. $\emptyset$ E. none of the above

14. $F \cap \emptyset =$

A. F B. $\mathcal{U}$ C. $\emptyset$ D. none of the above

15. $F - \emptyset =$

A. F B. $\mathcal{U}$ C. $\emptyset$ D. M E. none of the above

For questions 16-17, use the following information:

The records of 1480 college students show that 1072 took biology, 679 took math, and 271 students who took math did not take biology.

16. How many students took neither math nor biology?

A. 137 B. 271 C. 664 D. 1072 E. none of the above

17. How many students took both math and biology?

A. 137 B. 271 C. 664 D. 408 E. none of the above

18. A computer chip is defective if it has a major defect or a minor defect or both. In a batch of 25 defective chips, 15 have major defects and 16 have minor defects. How many items in the batch have only minor defects?

A. 1 B. 6 C. 9 D. 10 E. 15 F. none of the above

19. Let $\mathcal{U} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$; $A = \{2, 4, 6, 8, 10\}$; and $B = \{1, 2, 3, 4, 5\}$. Find $(A \cap B')'$.

A. $\{1, 2, 3, 4, 5, 7, 9\}$ B. $\{1, 2, 3, 4, 5\}$ C. $\{2, 4, 6, 8, 10\}$ D. none of the above

20. What is the cardinality of the set $\{1, 2, 3, 4, 5, \ldots\}$?

A. 20 B. 5 C. $\mathfrak{N}_0$ D. ∞ E. none of the above

21. $\sim (p \vee q)$ is logically equivalent to the statement:

A. $\sim p \vee \sim q$ B. $\sim p \vee q$ C. $\sim p \wedge \sim q$ D. none of the above

22. Which of the following is **not** a logical equivalence?

A. $(p \to q) \Leftrightarrow (\sim p \vee q)$
B. $\sim (p \vee q) \Leftrightarrow (\sim p \wedge \sim q)$
C. $(\sim p \vee \sim q) \Leftrightarrow \sim (p \wedge q)$
D. $(p \to q) \Leftrightarrow (q \to p)$
E. None of the above.

23. Assume that "I live in California" is a true statement and "I live in San Francisco" is a false statement. The statement "If I live in San Francisco then I live in California" is

A. True B. False C. None of the above D. Both of the above

24. Which of the following is the negation of the statement: "He is 10 years old and he is in the fifth grade"?

A. "He is not 10 years old or he isn't in the fifth grade."
B. "Either he is not 10 years old or he is in the fifth grade."
C. "It is not true that he is not 10 years old and is not in the fifth grade."
D. "He is not 10 years old and isn't in the fifth grade."
E. None of the above.

25. If the statement "If it rains, then I will play golf" is a true statement, then which of the following conditional statements is also true?

A. "If it is not raining, then I will not play golf."
B. "If I do not play golf, then it is not raining."
C. "If I play golf, then it is raining."
D. "If it is raining, then I will not play golf."
E. None of the above.

26. Given the following premises;

If I drive to work, then I will not be late.
If I am not late, then I do not lose any pay.

Which of the following is a valid conclusion?

A. If I am not late, then I drive to work.
B. If I do not lose any pay, then I drive to work.
C. If I drive to work, then I do not lose any pay.
D. If I do not drive to work, then I lose some pay.
E. None of the above.

27. The serial number on a twenty dollar bill consists of two letters followed by eight digits and then a letter. How many different serial numbers are possible given that the first and last letters are repeatable consonants, the second letter is a vowel, and the digits can be repeated?

A. $26^2 \cdot 5 \cdot 10^8$
B. $C(26,3) \cdot C(10,8)$
C. $P(26,3) \cdot P(10,8)$
D. $21^2 \cdot 10^8 \cdot 5$
E. $26^3 \cdot 10^8$
F. none of the above

28. A soccer league has nine teams. How many different end-of-the-season rankings of first, second and third are possible assuming that there are no ties?

A. 336 B. 504 C.27 D.12 E. $9! \cdot 3!$ F. none of the above

29. A quilting store has 7 yellow fabrics, 6 blue fabrics, and 9 red fabrics on its shelves. If you want to buy 1 yellow fabric, 1 blue fabric, and 1 red fabric to make a quilt, how may choices do you have?

A. $7 \cdot 6 \cdot 9$ B. $P(22, 3)$ C. $C(22, 3)$ D. $C(13, 2) \cdot 9$ E. none of the above

30. Three men and 2 women are selected from a group of 5 men and 6 women. Determine the number of ways this selection can be made if one woman is president and the other is vice president.

A. 1800 B. 350 C. 340 D. 300 E. 150 F. none of the above

31. How many "words" can be made from the letters in PANDORA, if all of the letters must be used?

A. $C(7,7)$ B. $P(7,7)$ C. $\frac{C(7,7)}{2!}$ D. $\frac{7!}{2!}$ E. none of the above

32. How many five card hands drawn from a 52-deck contain two Aces and three Jacks?

A. 5! B. $P(4,2) \cdot P(4,3)$ C. 52! D. $C(4,2) \cdot C(4,3)$ E. $C(52,5)$ F.none of the above

33. A hand consists of five cards drawn from a 52-card deck. How many hands contain at least 2 aces?

A. $(C(4,2) \cdot C(48,3)) \cdot (C(4,3) \cdot C(48,2)) \cdot (C(4,4) \cdot C(48,1))$
B. $(C(4,2) \cdot C(48,3)) + (C(4,3) \cdot C(48,2)) + (C(4,4) \cdot C(48,1))$
C. $(P(4,2) \cdot P(48,3) + (P(4,3) \cdot P(48,2)) + (P(4,4) \cdot P(48,1))$
D. $(P(4,2) \cdot P(48,3) \cdot (P(4,3) \cdot P(48,2)) \cdot (P(4,4) \cdot P(48,1))$
E. none of the above

34. A hand consists of five cards drawn from a 52-card deck. How many ways are there to draw four of a kind?

A. $C(4,4) \cdot 48$ B. $13 \cdot 48$ C. $P(4,4) \cdot 48$ D. $13 \cdot C(4,4) \cdot 48$ E. none of the above

35. The music school has 3 women and 4 men audition for solo performances. In deciding an evening program, a director must choose 4 different soloists performing in a particular order. if the program is selected at random, determine the probability that the program consists of 3 women followed by a man.

A. $\frac{16}{35}$ B. $\frac{5}{35}$ C. $\frac{2}{35}$ D. $\frac{3}{35}$ E. $\frac{1}{35}$ F. none of the above.

36. Two six-sided dice are rolled. What is the probability that exactly one of the dice shows a 2?

A. $\frac{11}{36}$ B. $\frac{12}{36}$ C. $\frac{11}{35}$ D. $\frac{1}{2}$ E. $\frac{10}{36}$ F. none of the above.

37. Two six-sided dice are rolled and the number on each is noted. What is the probability that at least one of the dice shows a 3, given that both numbers are odd?

A. $\frac{11}{36}$ B. $\frac{5}{18}$ C. $\frac{5}{9}$ D. $\frac{5}{36}$ E. $\frac{5}{11}$ F. None of the above.

38. Captain Kirk has 3 blue shirts and 5 red shirts. He picked two shirts at random to take on a trip to Earth. What is the probability that he took a shirt of each color?

A. $\frac{1}{15}$ B. $\frac{2}{7}$ C. $\frac{8}{15}$ D. $\frac{15}{28}$ E. 1 F. none of the above

39. Use the table below to determine x so that the expected value is 0:

loss or gain	Probability
4	.1
-2	.7
x	.2

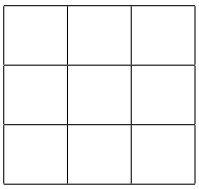
A. 1 B. 2 C. 3 D. 4 E. 5 F. none of the above

40. What is the probability of getting at least two heads on three flips of a fair coin given that the first flip lands tails?

A. $\frac{1}{8}$ B. $\frac{7}{8}$ C. $\frac{1}{4}$ D. $\frac{1}{6}$ E. none of the above.

Long Answer. Answer the following questions. **No work = no credit.**

41. (6 points) Use the numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 to fill in the following magic square. Explain your steps. Remember that a magic square has each row, column, and diagonal add to the same sum.



42. If a family has 7 children, in how many ways can the family have at most 2 girls? Give a number as your answer, but remember to show all work.

43. Create the truth table for $p \vee (q \wedge \sim p)$. What basic statement is this logically equivalent to?

44. Find the odds against getting exactly two heads when a fair coin is flipped twice.

45. Analyze the validity of the following argument using a truth table. Be sure to assign letters to the statements, and **explain** how your analysis works.

We will pay for collision loss only if collision coverage is afforded.
Collision coverage is not afforded.
Hence, we will not pay for collision loss.