MATH 104
TEST 1
February 15, 1996

1. Consider the following sets.

   $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$
   $A = \{2, 4, 6, 8\}$
   $B = \{1, 2, 3, 5, 7\}$

   $A \cup B'$ is the set
   a) $\varnothing$
   b) $\{2\}$
   c) $\{4, 6, 8\}$
   d) $\{2,4,6,8\}$
   e) none of the above

2. Consider the following sets.

   U = {all professors}
   A = {female professors}
   B = {professors under 40 years of age)

   $(A \cup B)'$ is the set

   a) {professors who are male or at least 40}
   b) {male professors who are at least 40}
   c) {professors who are male and under 40}
   d) {professors who are female or under 40}
   e) none of the above

3. The result of using De Morgan's Laws to simplify $(S' \cap T)'$ is
   a) $S \cup T'$
   b) $S \cap T'$
   c) $S' \cup T$

d) $S' \cap T$
e) none of the above

4. In which Venn diagram does the shaded portion represent $R' \cap (S \cup T)$?

e) none of the above

5. Of 95 students 62 are foreign and of those 62, 23 are female. If 45 of the students are male, how many female students are not foreign?

a) 27b) 39 c) 6 d) 23 e) none of the above

6. A survey of 100 bank customers revealed that 58 of them have a savings account, 63 of them have a checking account, 22 of them have a savings account and a loan, 16 of them have a checking account and a loan, 27 of them have only a checking account, 12 have a savings account and a checking account and a loan. Assume that every customer has at least one of the services. The number of customers who have a loan is

a) 11
b) 37
c) 38
d) 50
e) none of the above

7. An exam contains 5 multiple-choice questions, each having 4 possible answers. In how many different ways can the exam be completed?

a) $5!$
b) 5^4
c) 4^5
d) C(5,4)
e) none of the above

8. Eight horses are entered in a race. In how many ways can they cross the finish line if ties are not allowed?

a) 88
b) $8!$
c) 8
d) 28
e) none of the above

9. In a local election, there are 8 candidates running for 5 positions as judges on the Supreme Bench. The number of possible outcomes of the election is

a) 40
b) 56
c) 120
d) $\frac{8!}{3!}$
e) none of the above

10. How many poker hands consist of 4 clubs and a card of a different suit?

a) 39C(13, 4)
b) 39C(52, 4)
c) 48C(13, 4)
d) 48C(52, 4)
e) none of the above

11. In the street map shown below, how many of the routes from A to B do not pass through C (assume one moves only South and East)?

a) 56b) 30 c) 26d) 13 e) none of the above

12. The fourth term in the binomial expansion of $(a + b)^{12}$ is

a) $a^4 b^8$
b) $12a^4 b^4$
c) $12a^4 b^8$
d) $495a^4 b^4$
e) none of the above

13. In how many ways can a selection of at least 1 card be made from a hand of 5 cards?

a) 32 b) 31 c) 16 d) 120 e) none of the above

14. Which of the following events are mutually exclusive?

a) Being a coin collector and being a stamp collector
b) Living in Baltimore and working in Washington, D.C.
c) Being a college student and being a high school graduate
d) Being a mother and being an uncle
e) none of the above

15. A light bulb manufacturer tests a light bulb by letting it burn until it burns out. The experiment consists of observing how long (in hours) the light bulb burns. Let E be the

event "the bulb lasts less than 100 hours," F be the event "the bulb lasts less than 50 hours," and G be the event "the bulb lasts more than 120 hours."

The event $F' \cap G'$ is

a) all possible times
b) "the bulb lasts 50 hours or more"
c) "the bulb lasts 120 hours or less"
d) "the bulb lasts between 50 and 120 hours inclusive"
e) none of the above

16. Which of the following is a valid probability distribution for a sample space S = {a, b, c, d} ?

a) Pr (a) = .6, Pr (b) = 0, Pr (c) = .3, Pr (d) = .1
b) Pr (a) = .5, Pr (b) = .2, Pr (c) = .1, Pr (d) = .3
c) Pr (a) = .3, Pr (b) = .1, Pr (c) = .2, Pr (d) = .05
d) Pr (a) = – .2, Pr (b) = .5, Pr (c) = .4, Pr (d) = .3
e) none of the above

17. The probability of getting either a black card or an ace in one draw from an ordinary deck of 52 cards is

a) $\frac{26}{52}$

b) $\frac{28}{52}$

c) $\frac{29}{52}$

d) $\frac{30}{52}$

e) none of the above

18. The probability that a family with 6 children have exactly two girls is

a) $\frac{1}{3}$

b) $\frac{1}{64}$

c) $\frac{15}{64}$

d) $\frac{3}{8}$

e) none of the above

19. A student is studying mathematics and chemistry. The probability he passes mathematics is .75, the probability that he fails chemistry is .2 and the probability that he passes mathematics but fails chemistry is .05.

The probability that he passes mathematics or fails chemistry is

a) .15 b) .90 c) .95 d) 1.0 e) none of the above

20. Two cards are drawn (without replacement) from an ordinary deck of 52 cards. The probability that the second card is black if the first card is the ace of hearts is

a) $\frac{1}{104}$

b) $\frac{2}{51}$

c) $\frac{1}{2}$

d) $\frac{26}{51}$

e) none of the above