

Math 210

1. Compute $C(1000,2)$
 - (a) 499500.
 - (b) 1000000.
 - (c) 2.
 - (d) 999000.
 - (e) None of the above.

2. Suppose that 80% of students taking calculus have previously had a trigonometry course. Of those that did, 75% pass their calculus class. Of those that did not, 30% pass calculus. What is the overall failure rate for calculus?
 - (a) 52%
 - (b) 34%
 - (c) 59%
 - (d) 41%
 - (e) 27%

3. Let E and F be events with $Pr(E|F) = 1/8$ and $Pr(E \cap F) = 1/12$. Compute $Pr(F)$.
 - (a) $2/3$
 - (b) $12/8$
 - (c) $3/4$
 - (d) $3/2$
 - (e) None of the above.

4. The Bears, Bulls and DePaul play independent games on the same day. The probabilities of winning are .7, .8 and .5 respectively. What is the probability that only DePaul will lose?
 - (a) .07
 - (b) .28
 - (c) .14
 - (d) .12
 - (e) .5

5. A die is thrown 6 times. What is the probability of getting at least one 6?
- (a) $\frac{5}{6}$
 - (b) $1 - \left(\frac{5}{6}\right)^6$
 - (c) $\left(\frac{5}{6}\right)^6$
 - (d) $\frac{1}{6}$
 - (e) None of the above
6. A student is looking at her bookshelf to select a book to read. The bookshelf contains:
15 novels of which 10 are paperback,
20 books on current affairs of which 5 are paperback,
5 biographies of which 1 is paperback.
She selects a book at random. What is the probability that she selects a novel given that it is a paperback?
- (a) $\frac{5}{8}$.
 - (b) $\frac{1}{150}$.
 - (c) $\frac{3}{8}$.
 - (d) $\frac{2}{5}$.
 - (e) None of the above.
7. Two cards are selected at random from a standard deck. Find the probability that the second is black given that the first is either the Ace of Diamonds or the King of Diamonds. [Diamonds are red !!].
- (a) $\frac{26}{52}$
 - (b) $\frac{25}{52}$
 - (c) $\frac{26}{51}$
 - (d) $\frac{13}{52}$
 - (e) None of the above
8. Let E be the event that all children in a family are the same sex. Let F be the event that at most one child in a family is a boy. Which of the following are true assuming that having a girl and having a boy are equally likely? (I) In a family with two children E and F are independent. (II) In a family with three children E and F are independent.
- (a) (I) only.
 - (b) Neither (I) nor (II).
 - (c) (I) and (II).
 - (d) (II) only.

9. Given events A and B with $P(A) = .45$, $P(B) = .25$ and $P(B|A) = .6$, what is $P(A^c \cap B^c)$? (Hint: deMorgan)
- (a) -.02
 - (b) .53
 - (c) .57
 - (d) .18
 - (e) This is impossible.
10. At the end of their freshman year 200 students were surveyed. They were asked whether they had taken English, mathematics or philosophy during the year.
- The following results were recorded:
- 20 had taken none of the three subjects;
 - 50 had taken only English;
 - 30 had taken only mathematics;
 - 20 had taken only philosophy;
 - 10 had taken English and philosophy but not mathematics;
 - 40 had taken English and mathematics but not philosophy;
 - 15 had taken mathematics and philosophy but not English.
- How many had taken mathematics?
- (a) 40.
 - (b) 80.
 - (c) 60.
 - (d) 20.
 - (e) 100.
11. Which of the following is true if $A = \{1, 3, 5, 8, 9, 10\}$ and $B = \{2, 4, 6, 8, 10\}$?
- (a) $A^c \cap B = \{1, 3, 5, 9\}$
 - (b) A and B are disjoint.
 - (c) $3 \in A \cap B^c$
 - (d) $A \cup B = \{8, 10\}$
 - (e) $A \cap B = \{1, 2, 3, 4, 5, 6, 8, 9, 10\}$

12. Compute $P(1000,1)$
- (a) 999000.
 - (b) 1.
 - (c) 1000.
 - (d) 999.
 - (e) Too enormous to write down.
13. Eight horses are entered in a race in which a first, second and third prize will be awarded. Assuming no ties, how many different outcomes are possible?
- (a) 36
 - (b) 8
 - (c) 3!
 - (d) 8!
 - (e) 336
14. Urn I contains three balls, one red and two blue. Urn II contains five balls, two red and three green. An urn is chosen at random and a ball is selected from it. What is the probability that the ball is red?
- (a) $1/2$.
 - (b) $11/30$.
 - (c) $2/5$.
 - (d) $1/3$.
 - (e) $11/15$.
15. If two cards are drawn from a deck without replacement, what is the probability they are both diamonds?
- (a) $1/4 \cdot 12/52$
 - (b) $1/4 \cdot 1/4$
 - (c) $1/2 \cdot 25/52$
 - (d) $1/4 \cdot 12/51$
 - (e) $1/2 \cdot 25/51$

16. An exam contains five TRUE or FALSE questions. In how many different ways can it be completed?
- (a) 64
 - (b) 10
 - (c) 16
 - (d) 5
 - (e) 32
17. How many proper subsets has $\{a, b, c\}$?
- (a) 8
 - (b) 6
 - (c) 5
 - (d) 7
 - (e) None of the above.
18. A box contains five good bulbs and three defective ones. Bulbs are selected , one at a time without replacement, until a good bulb is found. Find the probability that the number of bulbs selected is two.
- (a) $5/7$
 - (b) $3/8$
 - (c) $15/56$
 - (d) $3/5$
 - (e) $61/56$
19. A red and a blue die are tossed and the numbers on the top faces observed. Find the probability that they differ by 5.
- (a) $1/9$
 - (b) $1/12$
 - (c) $1/18$
 - (d) $1/36$
 - (e) None of the above

20. Let E and F be events with $Pr(E) = 1/5$, $Pr(F) = 1/3$ and $Pr(E \cup F) = 1/2$. Compute $Pr(E|F)$.
- (a) $2/5$
 - (b) $2/3$
 - (c) $1/10$
 - (d) $1/6$
 - (e) $1/2$
21. Compute $P(100, 98)$
- (a) 4950.
 - (b) 9900.
 - (c) 200.
 - (d) 9800.
 - (e) None of the above.
22. An exam has 15 multiple choice problems with 5 “answers” to each, exactly one of which is correct. How many possible answer keys are there?
- (a) $5 \cdot 15 = 75$.
 - (b) $5^{15} = 30517578125$.
 - (c) $15^5 = 759375$.
 - (d) $5 + 15 = 20$.
 - (e) None of the above.
23. Two events A and B are independent. If $Pr(A|B) = 3/7$ and $Pr(B) = 1/3$, find $Pr(A)$.
- (a) $3/7$
 - (b) $1/7$
 - (c) $2/21$
 - (d) $16/21$
 - (e) None of the above.

24. If $n(A) = 7$, $n(B) = 9$ and $n(A \cap B) = 5$ then $n(A \cup B) =$
- (a) 16.
 - (b) 12.
 - (c) 11.
 - (d) 19.
 - (e) 14.
25. Two cards are drawn from a well shuffled deck of 52 cards. What is the probability that the second is red given that the first is a king?
- (a) $1/26$.
 - (b) $1/2$.
 - (c) $25/102$.
 - (d) $2/13$.
 - (e) $25/51$.
26. If $\Pr(E) = 1/12$, $\Pr(E \cup F) = 1/6$, and E and F are independent events then $\Pr(F) =$
- (a) $1/72$.
 - (b) $1/6$.
 - (c) $1/24$.
 - (d) $1/11$.
 - (e) None of the above.
27. If $P(E) = .6$, $P(F) = .7$, and $P(E \cup F) = .9$, then $P(E|F) =$
- (a) $7/9$.
 - (b) $4/7$.
 - (c) $2/3$.
 - (d) $.6$.
 - (e) None of the above.
28. $A^c \cap (B \cup C^c)^c =$
- (a) $A^c \cap (B^c \cup C^c)$.
 - (b) $A^c \cap (B^c \cap C^c)$.
 - (c) $A^c \cap (B^c \cup C)$.
 - (d) $A^c \cap (B^c \cap C)$.
 - (e) $A^c \cap (B \cap C^c)$.

29. If I draw a card from a deck, what is the probability that I get a face card or a heart?
- (a) $\frac{11}{26}$
 - (b) $\frac{1}{7}$
 - (c) $\frac{6}{13}$
 - (d) $\frac{4}{13}$
 - (e) $\frac{25}{52}$
30. Compute $P(10,2)$
- (a) 100
 - (b) 30
 - (c) 90
 - (d) 45
 - (e) None of the above.
31. Compute $C(9876, 9876 - 10) - C(9876, 10)$
- (a) 0.
 - (b) 10.
 - (c) 67458467874358.
 - (d) 9876.
 - (e) Too enormous to write down.
32. From a class of 68 students, 28 read the student newspaper, 30 read the Tribune, 29 read the Star, 13 read both the student paper and the Tribune, 12 read both the Tribune and the Star, 11 read the student paper and the Star, and 5 read all three. How many students read exactly one of these newspapers?
- (a) 42
 - (b) 30
 - (c) 12
 - (d) 26
 - (e) 21

33. Two hundred students are surveyed. It is found that 130 drive a car, 86 ride a bicycle, 24 ride a motorcycle, 40 drive a car and ride a bicycle, 12 drive a car and ride a motorcycle, 8 ride a bicycle and a motorcycle, and 2 drive a car, ride a bicycle and a motorcycle. How many drive a car and do not ride a bicycle?
- (a) 50
 - (b) 82
 - (c) 60
 - (d) 40
 - (e) None of the above.
34. A survey of 480 graduates revealed that 200 took Spanish, 178 took French, 140 took German, 33 took Spanish and French, 24 took Spanish and German, 18 took French and German and 3 took all three languages. How many of the graduates took exactly one of the three languages?
- (a) 446
 - (b) 377
 - (c) 480
 - (d) 318
 - (e) None of the above.
35. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4\}$, $B = \{1, 4, 6, 9\}$, $C = \{2, 4, 8\}$ then $A \cup (B^c \cap C) =$
- (a) $\{2, 4, 5\}$
 - (b) $\{2, 4\}$
 - (c) $\{2, 4, 8\}$
 - (d) $\{2, 4, 6, 9\}$
 - (e) None of the above.
36. Suppose 1 out of 200 emergency room visitors in China's Guangdong Province are infected by SARS. A new test is developed that is 99.9% accurate when a person has SARS and is 99.0% accurate when they don't. If the visitor tests positive for SARS using this test, what is the approximate probability they have this disease?
- (a) 50%
 - (b) 1/200
 - (c) 10%
 - (d) 33%
 - (e) 99.9%

37. In a shipment of 100 cars from Japan:
33 have a four-cylinder engine,
45 have tilt steering wheels,
27 have air conditioning,
30 have both four-cylinder engines and tilt steering wheels,
25 have tilt steering wheels and air conditioning,
18 have four-cylinder engines, tilt steering wheels and air conditioning,
20 have air conditioning and a four-cylinder engine. How many cars have air conditioning and neither tilt steering wheels nor four-cylinder engines?
- (a) 0
 - (b) 5
 - (c) 3
 - (d) 4
 - (e) None of the above.
38. Suppose $P(E) = .5$, $P(F) = .4$ and $P(E \cup F) = .9$. Which of the following is definitely false?
- (a) E and F are independent.
 - (b) E and F^c are independent.
 - (c) $P(E \cap F) = 0$.
 - (d) E and F are mutually exclusive.
 - (e) $P(E \cap F^c) = .3$
39. A sporting goods store has 12 pairs of ski gloves of the same size, but of all different brands, in a large bin. In how many ways can a left-hand glove and a right-hand glove be selected ?
- (a) 24.
 - (b) 12.
 - (c) 120.
 - (d) 132.
 - (e) 144.

40. A mall consists of three outlet stores: Fraudello, Cheapello and Sleazello. I shop at exactly one when I go to the mall and buy an article there: Fraudello with probability .2, Cheapello with probability .5 and Sleazello with probability .3. Goods at Fraudello have probability .7 of being faulty, those at Cheapello have probability .3 of being faulty and those at Sleazello have probability .1 of being faulty.
- I get home from a trip to the mall and notice that my purchase is faulty. What is the probability that I bought it at Fraudellos?
- (a) $5/23$
 (b) $3/32$
 (c) $7/16$
 (d) $1/3$
 (e) None of the above.
41. Let A and B be subsets of a universal set U. Suppose $n(U) = 300$, $n(A) = 150$, $n(A^c \cap B) = 110$, $n(A \cap B^c) = 130$. Then $n(A^c \cap B^c) =$
- (a) 0
 (b) 60
 (c) 40
 (d) 20
 (e) None of the above.
42. Two cards are selected at random from a standard deck, one at a time without replacement. Find the probability that the second is red given that the first is the Ace of Diamonds. (Recall that Diamonds are red.)
- (a) $25/52$
 (b) $13/52$
 (c) $26/52$
 (d) $26/51$
 (e) None of the above
43. If $\Pr(E) = .5$, $\Pr(E \cap F) = .3$, $\Pr(F) = .6$ then $\Pr(E|F) =$
- (a) .18
 (b) .6
 (c) .75
 (d) .5
 (e) None of the above.

44. An exam contains 10 multiple choice problems, each with 5 “answers”: 4 wrong and 1 correct. To get an A on the exam you need to get at least 9 problems correct. If you guess the answer to each question, what is the probability that you get an A?
- (a) $\frac{67}{5^{10}}$
 - (b) $\frac{41}{5^{10}}$
 - (c) $\frac{17}{5^{10}}$
 - (d) $\frac{9}{5^{10}}$
 - (e) None of the above.
45. A pair of fair dice are cast. Are the events “sum is 1, 2 or 3” and “both are odd” independent?
- (a) Insufficient information to tell.
 - (b) No.
 - (c) Yes.
46. An exam contains 10 TRUE or FALSE questions. In how many different ways can it be completed?
- (a) 10
 - (b) 100
 - (c) 1024
 - (d) 20
 - (e) 1000
47. How many different poker hands are there? (A poker hand consists of five cards.)
- (a) $P(52,5)$.
 - (b) $C(52,5)$.
 - (c) $5!$
 - (d) 5.
 - (e) None of the above.

48. A student is looking at her bookshelf to select a book to read. The bookshelf contains:
15 novels of which 10 are paperback,
20 books on current affairs of which 5 are paperback,
5 biographies of which 1 is paperback.
She selects a book at random. What is the probability that she selects a paperback?
- (a) $3/8$.
 - (b) $1/150$.
 - (c) $5/8$.
 - (d) $2/5$.
 - (e) None of the above.
49. How many ways are there of selecting a committee consisting of 4 new employees and 2 experienced employees from a total of 10 new and 15 experienced employees?
- (a) 11025
 - (b) 44100
 - (c) 22050
 - (d) 529200
 - (e) 1058400
50. For the next problem: $P(A) = .3$, $P(E|A) = .6$ and $P(E|A^c) = .8$ Find $P(E)$.
- (a) .74
 - (b) .84
 - (c) .37
 - (d) .46
 - (e) None of the above.
51. Compute $\frac{16!}{12!4!2!}$
- (a) 910.
 - (b) 5465570.
 - (c) 456760.
 - (d) 4536.
 - (e) 560.

52. In a group of 100 students, 30 take a French class, 50 take a Math class, and 10 take both. If a student is selected at random, what is the probability that he or she take French or Math?
- (a) $7/10$.
 - (b) $6/10$.
 - (c) $4/10$.
 - (d) $5/10$.
 - (e) None of the above.
53. A red and a blue die are tossed and the numbers on the top faces observed. Find the probability that they differ by 4.
- (a) $1/12$
 - (b) $1/9$
 - (c) $1/36$
 - (d) $1/18$
 - (e) None of the above
54. Let E and F be events with $P(E) = 1/5$, $P(F) = 1/6$ and $P(E \cup F) = 1/4$. Compute $P(E|F)$.
- (a) $1/6$
 - (b) $2/3$
 - (c) $1/30$
 - (d) $7/12$
 - (e) $7/10$
55. Let A and B be sets. Using Venn diagrams, or otherwise, simplify:

$$(A' \cap B) \cup (A \cap B') \cup (A \cap B)$$

- (a) $A \cap B$.
- (b) $A' \cap B'$.
- (c) $A' \cup B'$.
- (d) $A \cup B$.
- (e) None of the above.

56. A basket contains 3 good tomatoes and 5 rotten ones. Pick 4 tomatoes at random from the basket. What is the probability that at least 2 are good?
- (a) $1/4$.
 (b) $1/2$.
 (c) $2/5$.
 (d) $3/8$.
 (e) None of the above.
57. Which of the following are always true for any set A? (I) $(A')' = A$ (II) $(A \cup B)' = A' \cup B'$
 (III) $A \cap A' = \emptyset$ (IV) $(A \cap B)' = A' \cup B'$
- (a) I, II and III only.
 (b) II and III only.
 (c) I, III and IV only.
 (d) I and IV only.
 (e) None of the above.
58. Suppose that the space shuttle has twenty independent oxygen tanks, each with probability .9 of working. To survive, at least two tanks have to work. What is the probability of survival?
- (a) $(.1)^{20} + 20(.9)(.1)^{19}$
 (b) $1 - (.9)^{20} - 20(.1)(.9)^{19}$
 (c) $1 - (.1)^{20} - 20(.9)(.1)^{19}$
 (d) $20(.9)(.1)^{19}$
 (e) $1 - 20(.9)(.1)^{19}$
59. A family of six is to be seated on nine chairs in a row. In how many ways can this be done if the father insists on sitting in the middle chair?
- (a) $8!/3!$
 (b) $8!/2!$
 (c) $9!/3!$
 (d) $9!/6!$
 (e) 54

60. A mall consists of three outlet stores: Fraudello, Cheapello and Sleazello. I shop at exactly one when I go to the mall and buy an article there: Fraudello with probability .2, Cheapello with probability .5 and Sleazello with probability .3. Goods at Fraudello have probability .7 of being faulty, those at Cheapello have probability .3 of being faulty and those at Sleazello have probability .1 of being faulty.
- If I go shopping at the mall, what is the probability that the article I purchase is faulty?
- (a) .021
 - (b) .32
 - (c) .46
 - (d) .24
 - (e) None of the above.
61. A pair of fair dice are cast and the top faces observed. What is the probability that one of the numbers is 6 given that their sum is 8?
- (a) $1/3$.
 - (b) $6/8$.
 - (c) $1/6$.
 - (d) $2/5$.
 - (e) None of the above.
62. If $\Pr(E)=1/36$, $\Pr(E \cup F)=1/6$, and E and F are mutually exclusive events then $\Pr(F)=$
- (a) 0.
 - (b) $1/7$.
 - (c) $1/6$.
 - (d) $5/36$.
 - (e) None of the above.
63. Out of a class of 100 students, 40 have blue eyes, 30 have blonde hair and 12 have both. Which of the following is true?
- (a) Blonde hair and blue eyes are independent.
 - (b) The conditional probability of having blonde hair given that you have blue eyes is .12.
 - (c) The conditional probability of having blue eyes given that you have blonde hair is .12.
 - (d) The probability of having blonde hair or blue eyes is .7.
 - (e) Blonde hair and blue eyes are mutually exclusive.

64. $A \cup \emptyset =$
- (a) Impossible to determine.
 - (b) The Universe.
 - (c) A.
 - (d) \emptyset .
 - (e) None of the above.
65. A store receives a shipment of ten calculators including three that are defective. Four of the calculators are selected for a high school. How many selections are possible?
- (a) 210
 - (b) 120
 - (c) 17
 - (d) 200
 - (e) None of the above
66. 1000 students are surveyed about their diet:
- 250 eat meat and fish,
 - 350 eat vegetables but not meat,
 - 500 eat meat and vegetables,
 - 200 eat all three,
 - 600 eat meat,
 - 300 eat fish and vegetables,
 - 400 eat fish. How many eat at most one of these three foods ?
- (a) 150
 - (b) 50
 - (c) 200
 - (d) 100
 - (e) None of the above.
67. A store receives a shipment of ten calculators including three that are defective. Four of the calculators are selected for a high school. How many selections have at least one defective calculators?
- (a) 200
 - (b) 120
 - (c) 175
 - (d) 150
 - (e) None of the above

68. If $P(E) = 7P(E^c)$ then $P(E) =$
- (a) $1/6$.
 - (b) $7/8$.
 - (c) $1/8$.
 - (d) $1/7$.
 - (e) $6/7$.
69. If $\Pr(E) = .5$, $\Pr(E \cap F) = .4$, $\Pr(F) = .7$ then $\Pr(F|E) =$
- (a) $5/7$.
 - (b) $4/5$.
 - (c) $1/5$.
 - (d) $4/7$.
 - (e) None of the above.
70. If $P(E) = 1/2$, $P(E \cap F) = 1/6$, and E and F are independent events then $P(F) =$
- (a) $1/6$.
 - (b) $2/3$.
 - (c) $1/3$.
 - (d) $1/2$.
 - (e) None of the above.
71. How many subsets has a set with six elements?
- (a) 6
 - (b) 30
 - (c) $6!$
 - (d) 2^6
 - (e) None of the above.
72. In how many ways can ten cooks be assigned to three kitchens if five cooks are needed for kitchen I, two cooks are needed for kitchen II, and three cooks are needed for kitchen III?
- (a) $C(10, 5) \cdot C(5, 2)$.
 - (b) $P(10, 5) \cdot P(5, 2)$.
 - (c) $C(10, 5) \cdot C(5, 2) \cdot C(5, 3)$.
 - (d) $C(10, 5) + C(5, 2) + C(5, 3)$.
 - (e) $P(10, 5) \cdot P(5, 2) \cdot P(5, 3)$.

73. El Cheapos has 16 cameras for sale of which 4 are defective. If four are selected at random, what is the probability that all 4 are duds?
- (a) $1/64$.
 - (b) $4/16$.
 - (c) 1.
 - (d) $1/1820$.
 - (e) None of the above.
74. Ten athletes enter a race in which a first, second and third prize will be awarded. Assuming no ties, how many different outcomes are possible?
- (a) $3!$
 - (b) 120
 - (c) $10!$
 - (d) 27
 - (e) 720
75. A company manufactures 1000 radios a week at three plants. Plant A produces 300 a week, plant B produces 500 a week and plant C produces 200 a week. Production records indicate that 6% of the radios from plant A will be defective, 3% of the radios from plant B will be defective and 1% of the radios from plant C will be defective. hat percentage of the radios are defective?
- (a) 3.5 %
 - (b) 5 %
 - (c) 6.5 %
 - (d) 10 %
 - (e) None of the above
76. Simplify $(n - 3)!/(n - 4)!$
- (a) $(n-3)$
 - (b) $(n-4)$
 - (c) $(n-3)!$
 - (d) $(n-4)!$
 - (e) None of the above.

77. Compute $C(10,2)$

- (a) 100
- (b) 90
- (c) 30
- (d) 45
- (e) None of the above.

78. The coefficient of x^5y^4 in the expansion of $(x + y)^9$ is:

- (a) $\frac{9!}{5!}$
- (b) 9
- (c) 26
- (d) 126
- (e) None of the above

79. If E, F, G are independent events with $P(E) = .1$, $P(F) = .2$, $P(G) = .3$, then $P(E \cap F \cap G) =$

- (a) .321
- (b) .06
- (c) .123
- (d) .006
- (e) .6

80. In a poll of 100 Freshman students it was found that 30 liked softball, 40 liked baseball and 20 liked both sports. How many like neither softball nor baseball?

- (a) 20
- (b) 30
- (c) 10
- (d) 40
- (e) 50

81. During orientation, new students are divided into groups of five people. In how many ways can four such groups be chosen from twenty students if you only care who is in your group.
- (a) $\frac{20!}{5!(4!)^5}$
- (b) $\frac{20!}{(4!)^5}$
- (c) $\frac{20!}{(5!)^4}$
- (d) $\frac{20!}{4!(5!)^4}$
- (e) None of the above
82. A committee of two is to be selected from three people R, S, and T. What is the sample space?
- (a) {R, S, T, RS, RT, ST }
- (b) {R, S, T }
- (c) {RS, RT, ST }
- (d) {RS, ST, TS, SR, RT, TR }
- (e) None of the above
83. Find $P(E^c|F^c)$, given that $P(E) = .5$, $P(F) = .6$ and $P(E \cap F) = .1$.
- (a) 5/6
- (b) 1/5
- (c) 2/3
- (d) 1/4
- (e) 0
84. How many distinct letter arrangements can be made using all the letters of the word *Massachusetts*?
- (a) $8!4!2!2!$
- (b) $8!$
- (c) $\frac{13!}{4!2!2!}$
- (d) $13!$
- (e) None of the above.

85. A student is looking at her bookshelf to select a book to read. The bookshelf contains:
15 novels of which 10 are paperback,
20 books on current affairs of which 5 are paperback,
5 biographies of which 1 is paperback.
She selects a book at random. What is the probability that she selects a novel?
- (a) $2/5$.
 - (b) $1/150$.
 - (c) $3/8$.
 - (d) $5/8$.
 - (e) None of the above.
86. A Scrabble player has seven different letters. She wants to consider all possible 5-letter sequences before playing. If she is able to test one sequence per second, how many minutes will elapse before she can play?
- (a) 5.
 - (b) 658.
 - (c) 42.
 - (d) 35.
 - (e) None of the above.
87. What is the coefficient of x^3y^7 in the binomial expansion of $(x + y)^{10}$?
- (a) 240.
 - (b) 10.
 - (c) 1.
 - (d) 720.
 - (e) None of the above.
88. Urn I contains three balls, one red and two blue. Urn II contains five balls, two red and three green. An urn is chosen at random and a ball is selected from it.
Given that the ball is red, what is the probability that Urn I was chosen?
- (a) $5/11$.
 - (b) $6/11$.
 - (c) $1/2$.
 - (d) $2/3$.
 - (e) $1/3$.

89. A company manufactures 1000 radios a week at three plants. Plant A produces 300 a week, plant B produces 500 a week and plant C produces 200 a week. Production records indicate that 6% of the radios from plant A will be defective, 3% of the radios from plant B will be defective and 1% of the radios from plant C will be defective. If a customer purchases a defective radio, what is the probability it came from plant C?
- (a) $3/35$
 - (b) $1/35$
 - (c) $2/35$
 - (d) $4/35$
 - (e) None of the above
90. If $A = \{a, d, g, j\}$ and $B = \{a, b, c, d, p, q, r\}$ then $A \cup B =$
- (a) $\{a, d\}$.
 - (b) $\{b, c, g, j, p, q, r\}$.
 - (c) $\{h, i, e, d, i, s\}$.
 - (d) $\{a, b, c, d, g, j, p, q, r\}$.
 - (e) None of the above.
91. Let A and B be subsets of a universal set U and suppose $n(U) = 90$, $n(A) = 25$, $n(B) = 35$, $n(A \cap B) = 5$, then $n(A' \cup B) =$
- (a) 30.
 - (b) 70.
 - (c) 20.
 - (d) 65.
 - (e) None of the above.
92. Find $Pr(E'|F)$, given that $Pr(E) = .5$, $Pr(F) = .6$ and $Pr(E \cap F) = .1$.
- (a) $1/4$
 - (b) $3/4$
 - (c) $1/5$
 - (d) $5/6$
 - (e) $2/3$

93. A survey of 480 graduates revealed that 200 took Spanish, 178 took French, 140 took German, 33 took Spanish and French, 24 took Spanish and German, 18 took French and German and 3 took all three languages. How many of the graduates took at least one of the three languages?
- (a) 318
 - (b) 377
 - (c) 480
 - (d) 446
 - (e) None of the above.
94. In how many ways can the positions of President, Vice-President and Secretary of a club be filled if they are to be chosen from the 15 members and no member can hold more than one position?
- (a) 3.
 - (b) 15.
 - (c) 2730.
 - (d) 42.
 - (e) 3375.
95. In a group of 200 students, 40 take English, 50 take Math, and 30 take both. If a student is selected at random, what is the probability that he or she takes neither English nor Math?
- (a) $3/5$.
 - (b) $9/10$.
 - (c) $2/5$.
 - (d) $7/10$.
 - (e) None of the above.
96. For the next problem: $P(A) = .3$, $P(E|A) = .6$ and $P(E|A^c) = .8$ Find $P(A|E)$.
- (a) $5/39$
 - (b) $9/37$
 - (c) $4/73$
 - (d) $6/29$
 - (e) None of the above.

97. Let A and B be sets and suppose $n(A) = 25$, $n(B) = 35$, $n(A \cup B) = 55$, then $n(A \cap B) =$
- (a) 55.
 - (b) 20.
 - (c) 10.
 - (d) 5.
 - (e) 30.
98. A box contains 12 eggs of which 4 are rotten. If six are selected at random, what is the probability that at least one is rotten?
- (a) $32/33$.
 - (b) $14/33$.
 - (c) $1/3$.
 - (d) $1/33$.
 - (e) None of the above.
99. In how many ways can a jury of nine be selected from twenty candidates?
- (a) $C(20,9)$.
 - (b) $P(20,9)$.
 - (c) $C(29,20)$.
 - (d) $C(11,9)$.
 - (e) $P(29,20)$.
100. A box contains five good bulbs and two defective ones. Bulbs are selected, one at a time, without replacement, until a good bulb is found. Find the probability that the number of bulbs selected is two.
- (a) $5/7$
 - (b) $2/5$
 - (c) $1/21$
 - (d) $5/21$
 - (e) $3/7$

101. Mom and Dad and their 3 children line up for a picture. How many different pictures can be taken if Mom and Dad do not have the three children between them?
- (a) 112
 - (b) 108
 - (c) 110
 - (d) 114
 - (e) None of the above.
102. In a class of 8 students, 1 will get an A, 2 a B, 3 a C and 2 a D. In how many ways can these grades be assigned?
- (a) 2400.
 - (b) 2840.
 - (c) 96.
 - (d) 1680.
 - (e) None of the above.
103. If $\Pr(E)=1/12$, $\Pr(E \cup F)=1/6$, and E and F are mutually exclusive events then $\Pr(F)=$
- (a) $1/72$.
 - (b) $1/11$.
 - (c) $1/24$.
 - (d) $1/6$.
 - (e) None of the above.
104. If I flip an unbiased coin 6 times, what is the probability of getting at least one head?
- (a) $1/64$
 - (b) $C(6,1)$
 - (c) $1/6$
 - (d) $63/64$
 - (e) None of the above.

105. Mom and Dad and their 4 children line up for a picture. How many different pictures can be taken if Mom and Dad do not have the four children between them?
- (a) 124
 - (b) 672
 - (c) 964
 - (d) 240
 - (e) 480
106. How many committees of 3 which include at least one woman can be chosen from 8 men and 4 women?
- (a) 220
 - (b) 56
 - (c) 4
 - (d) 52
 - (e) 164
107. 1000 students are surveyed about their diet:
- 250 eat meat and fish,
 - 350 eat vegetables but not meat,
 - 500 eat meat and vegetables,
 - 200 eat all three,
 - 600 eat meat,
 - 300 eat fish and vegetables,
 - 400 eat fish. How many eat at most one of these three foods ?
- (a) 350
 - (b) 300
 - (c) 400
 - (d) 250
 - (e) None of the above.
108. A card is drawn from a well shuffled deck of 52 cards. What is the probability that it is either a spade or a king?
- (a) $13/52$.
 - (b) $16/52$.
 - (c) $46/52$.
 - (d) $17/52$.
 - (e) $4/52$.

109. Two hundred students are surveyed. It is found that 130 drive a car, 86 ride a bicycle, 24 ride a motorcycle, 40 drive a car and ride a bicycle, 12 drive a car and ride a motorcycle, 8 ride a bicycle and a motorcycle, and 2 drive a car, ride a bicycle and a motorcycle. How many do not drive a car and do not ride a bicycle?
- (a) 6
 - (b) 12
 - (c) 20
 - (d) 8
 - (e) None of the above.
110. A player tosses a fair coin. If it's Heads, he then rolls a single die and records the top number. If it's Tails he rolls a pair of dice, and records the sum of the top numbers. What is the probability the coin was Tails given that the number recorded is 2?
- (a) $1/2$.
 - (b) $1/3$.
 - (c) $1/5$.
 - (d) $1/4$.
 - (e) None of the above.
111. If $\Pr(E)=1/36$, $\Pr(E \cup F)=1/6$, and E and F are independent events then $\Pr(F)=$
- (a) $5/36$.
 - (b) $1/7$.
 - (c) 0.
 - (d) $1/6$.
 - (e) None of the above.
112. If E and F are mutually exclusive events with $P(E) = 1/3$ and $P(F) = 1/2$ then $P(E \cup F) =$
- (a) 0.
 - (b) $5/6$.
 - (c) $1/6$.
 - (d) 1.
 - (e) $2/5$.

ababbacdce - 10
ccebdeccc - 20
ebacbdbdac - 30
abebcdaaec - 40
cedbbc bdca - 50
aabedbccab - 60
ddacaecbbc - 70
dadeaaddde - 80
dceccceacd - 90
bddcdedaad - 100
bdedbeabee - 110
bb