

- 1-
 - a) $n(A) = 20$, $n(A \cup B) = 58$, and $n(A \cap B) = 16$, find $n(B)$
 - b) $n(A) = 65$, $n(B) = 54$, $n(A \cup B) = 100$, find $n(A \cap B)$.
 - c) $n(A) = 240$, $n(A \cap B) = 50$, $n(A \cup B) = 500$, find $n(B)$.
 - d) $n(A) = 115$, $n(A \cap B) = 40$, $n(B) = 135$, $n(U) = 300$, find $n(A' \cap B')$.
- 2- A second grade class of thirty students conducted a pet ownership survey. Results of the survey indicate that 8 students own a cat, 15 students own a dog, and 5 students own both a cat and a dog. How many of the students surveyed own no cats?
- 3- A group of 75 people includes 32 who play tennis, 37 who play golf, and 8 who play both tennis and golf. How many people in the group play neither sport?
- 4- A group of 56 students, includes 25 taking Math, 26 taking Biology, 24 taking English, 10 of them taking math and Biology, 5 taking Math and English, 7 taking Biology and English, and 2 taking English, Biology, and Math. How many student(s) in the group is/are not taking neither course?
- 5- A survey of a group of 113 tourists was taken. The survey showed the following: 61 of the tourist plan to visit Space Center; 49 plans to visit the zoo; 11 plan to visit the Museum and the zoo, but not the Space Center; 12 plan to visit the Museum and the Space Center, but not the zoo; 16 plan to visit the Space Center and the zoo, but not the Museum; 9 plan to visit the Museum, the zoo, and the Space Center; 16 plan to visit none of the tree places. How many plan to visit the Museum only?
- 6- The college president selected 2 of her vice-presidents to attend the dedication ceremony of a new branch.
 - a) Addition Principle
 - b) Permutation
 - c) Combination
- 7- Choose the most appropriate method to answer the question. Ten contestants are running in the district track meet. How many ways can the top three places be awarded?
 - a) Addition Principle
 - b) Permutation
 - c) Combination
- 8- From a committee of 12 people, In how many ways can we choose a subcommittee of 4 people.
 - a) Addition Principle
 - b) Permutation
 - c) Combination
- 9- A committee of 4 must be selected from a group of 5 men and 6 women.
 - a) How many committees will have 2 men and 2 women?
 - b) How many committees will have 3 men and 1 woman?
 - c) How many committees will have all women?
 - d) How many ways can this be done if men sit side by side & women side by side?
- 10- A restaurant offered pizza with 3 types of crusts and 7 different toppings. How many different types of pizzas could be offered?

- 11- License plates are made using 3 letters followed by 3 digits (0 - 9). How many plates can be made if repetition of letters and digits is allowed?
- 12- A software company employs 9 sales representatives and 8 technical representatives. How many ways can the company select 5 of these employees to send to a computer convention if at least 4 technical representatives must attend the convention?
- 13- 1 coin is tossed 10 times?
 - a) How many different outcomes are possible?
 - b) How many different outcomes have exactly 4 heads?
- 14- From a standard card deck, how many 5-card hands will have face cards?
All face cards, but no kings?
- 15- A class consists of 6 women and 4 men.
 - a) How many ways can they select a class leader, a backup leader, and a sub-leader?
 - b) If the positions in part a) are selected by lottery, what is the probability that women are selected for all 3 positions?
 - c) How many ways can they select a team of 3 leaders to class on a particular project?
- 16- A bag contains 5 red marbles, 6 blue marbles, and 2 green marbles. What is the probability of choosing a blue marble?
- 17- Two 6-sided dice are rolled.
 - a) What is the probability that the sum of the two numbers on the dice will be greater than 9?
 - b) What is the probability that the 2 dice show the same number?
 - c) What is the probability that the sum is less than 5?
- 18- In a hotly contested three-way race for the U.S. Senate, polls indicate the two leading candidates are running neck-to-neck while the third candidate is receiving half the support of either of the others. Registered voters are chosen at random and are asked which of the three will get their vote. Describe an appropriate sample space for this random survey experiment and assign acceptable probabilities to the simple events.
- 19-
 - a) What are the odds for rolling a sum of 5 in a single roll of two dice?
 - b) If you bet \$1 that a sum of 5 will turn up, what should the house pay (plus returning your \$1 bet) if a sum of 5 turns up for the game?
- 20- What are the odds for rolling a sum of 7 in a single roll of two dice?
- 21- Suppose you are playing a game of chance. If you bet \$9 on a certain event, you will collect \$360 (including your \$9 bet) if you win. Find the odds used for determining the payoff.
- 22- A classroom of children contains 12 boys and 10 girls, in which seven students are chosen to go to the blackboard.
 - a) What is the probability that at least 2 girls are chosen?
 - b) What is the probability no boys are chosen?
 - c) What is the probability that more boys than girls are chosen?

- 23- Let the event A: card is a spade, and B is the face card.
- What is the probability of A?
 - What is the probability of B?
 - What is the probability of $A \cap B$?
- 24- A survey of 50 students shows 30 enjoy football, 25 enjoy basketball, and 20 enjoy both. If a student is selected at random, what is the probability
- The student enjoys football
 - The student does not enjoy basketball.
 - The student enjoys basketball or football.
 - The student enjoys neither basketball nor football.
- 25- A sample space consists of 75 separate events that are equally likely.
- What is the probability of each?
 - What is the probability of 76?
- 26- A sample of 4 different calculators is randomly selected from a group containing 13 that are defective and 26 that have no defects. What is the probability that at least one of the calculators is defective?
- 27- A lottery game contains 28 balls numbered 1 through 28. What is the probability of choosing a ball numbered 28, $P(28)$?
- 28- An experiment consists of tossing three fair coins, expect one of the three coins has a heads on both sides. What is the probability:
- 0 head
 - 1 head
 - 2 heads
 - 3heads
 - More than 1 head
- 29- In a lottery game, a single ball drawn at random from a container that contains 25 balls numbered from 1 through 25. What is the probability that the number drawn is divisible by 3 or divisible by 4.
- 30- Let S be a sample space and E and F events associated with S. Suppose that $\Pr(E) = .5$, $\Pr(F) = .3$ and $\Pr(E \cap F) = .1$
- Calculate: $\Pr(E|F)$ and $\Pr(F|E)$
 - Are E and F independent events?
- 31- According to a survey, 8% of students at a college are left handed, 53% are female, and 4.24% are both female and left handed. Is being left handed independent of gender?
- Yes
 - No
- 32- A group of 25 people contains 10 brunettes, 8 blondes, and 7 redheads. Of the 20 girls in the group, 8 are brunettes, 6 are blondes, and 6 are redheads. A person is selected at random. Are the events of being a girl and having brown hair independent?
- Yes
 - No

- 33- 2 balls are drawn in succession out a box containing 2 red and 5 white balls. Find the probability that the second ball was red, given that the first ball was
- a) Replaced before the second draw.
 - b) Not replaced before the second draw.
- 34- Suppose 1 of the 13 cards is chosen at random and not found to be the ace spades. What is the probability that none of the 13 cards is the ace of spades?
- 35- A crime investigator feels 70% certain that the suspect being held for a theft is guilty. She then discovers that the thief was left-handed. Twenty percent of the population is left-handed, and the suspect is also left handed. In light of this new evidence, what probability should the investigator now assign to the guilt of the suspect?
- 36- A company has rated 75% of its employees as satisfactory and 25% as unsatisfactory. Personnel records indicate that 80% of the satisfactory workers had previous work experience, while only 40% of the unsatisfactory workers had any previous work experience. If a person with previous work experience is hired, what is the probability that this person will be a satisfactory employee? If a person with no previous work experience is hired, what is the probability that this person will be a satisfactory employee?
- 37- A computer store sells three types of microcomputer, brand *A*, brand *B*, brand *C*. Of the computers sell, 60% are brands *A*, 25% are brand *B*, 15% are brand *C*. They have found that 20% of the brand *A* computers, 15% of the brand *B* computers, and 5% of the brand *C* computers are returned for service during the warranty period. If a computer is returned for service during the warranty period, what is the probability that it is a brand *A* computer, A brand *B* computer? A brand *C* computer?
- 38- A manufacturer obtains clock-radios from three different subcontractors: 20% from *A*, 40% from *B*, and 40% from *C*. The defective rates for these subcontractors are 1%, 3%, and 2%, respectively. If a defective clock-radio is returned by a customer, what is the probability that it came from subcontractor *A*? From *B*? From *C*?
- 39- Motor Inc. has 3 plants. Plant I produces 35% of the car output, plant II produces 20%, and plant III produces the remaining 45%. One percent of the output of plant I is defective, as is 1.8% of the output of plant II is defective, and 2% of the output of plant III is defective. The annual total output of Motors Inc. is 1,000,000 cars. A car is chosen at random from the annual output and it is found to be defective. What is the probability that it came from plant I? Plant II? Plant III?
- 40- A box contains 12 light bulbs, of which are 5 defective. All bulbs look alike and have equal probability of being chosen. Pick 3 light bulbs and place them in a box.
- a) What is the probability that all 3 are defectives?
 - b) What is the probability that exactly 2 are defectives?
 - c) What is the probability that at least 2 are defective?

Solution

- 1- **a)** 54 **b)** 19 **c)** 310 **d)** $n(A' \cap B') = 90$
- 2- 22
- 3- 14
- 4- $M \cap B = 10, \quad M \cap E = 5, \quad B \cap E = 7, \quad M \cap B \cap E = 2$
 # of students neither course = $56 - (25 + (26 - 8 - 2) + (24 - 3 - 2 - 5)) = 1$
- 5- 12
- 6- **c)** Combination
- 7- **b)** Permutation
- 8- **c)** Combination
- 9- **a)** $C_{5,2} \cdot C_{6,2} = 150$ **b)** $C_{5,3} \cdot C_{6,1} = 60$ **c)** $C_{5,0} \cdot C_{6,4} = 15$ **d)** $5!.6! + 6!.5! = 172,800$
- 10- 21
- 11- 17,576,000
- 12- 686
- 13- **a)** $2^{10} = 1024$ outcomes **b)** $C_{10,4} = 210$ outcomes
- 14- **a)** 792 **b)** 56
- 15- **a)** 720 **b)** 0.167 **c)** 120
- 16- $\frac{6}{13}$
- 17- **a)** $P(E) = \frac{1}{6}$ **b)** $P(E) = \frac{1}{6}$ **c)** $P(E) = \frac{1}{6}$
- 18- $P(C_1) = \frac{2}{5}, P(C_2) = \frac{2}{5}, P(C_3) = \frac{1}{5}$
- 19- **a)** Odds: 1 to 8 **b)** House pays \$8
- 20- 1:5
- 21- 39:1
- 22- **a)** $1 - [\Pr(\text{no Girls}) + \Pr(1 \text{ G})] = 1 - \frac{C(12,7) + C(12,6)C(10,1)}{C(22,7)} \approx .94$
 b) $\Pr(\text{no boys}) = \Pr(\text{all Girls}) = \frac{5}{7106}$
 c) $P(B > G) = \frac{C(12,4).C(10,3) + C(12,5).C(10,2) + C(12,6).C(10,1) + C(12,7)}{C(22,7)} \approx .616$
- 23- **a)** $\frac{1}{4}$ **b)** $\frac{3}{13}$ **c)** $\frac{3}{52}$
- 24- **a)** $30/50=0.6$ **b)** $25/50=0.5$ **c)** $35/50=0.7$ **d)** $15/50=0.3$
- 25- **a)** $\frac{1}{75}$ **b)** 0

26- .818

27- $\frac{1}{28}$

28- $S = \{(H, H, H), (H, H, T), (H, T, H), (H, T, T)\}$

a) $P(0 \text{ heads}) = 0$

b) $P(1 \text{ head}) = \frac{1}{4}$

c) $P(2 \text{ heads}) = \frac{1}{2}$

d) $P(3 \text{ heads}) = \frac{1}{4}$

e) $P(\text{more than 1 head}) = \frac{3}{4}$

29- $P(E) = P(\text{div by 3}) + P(\text{div by 4}) - P(D3 \cap D4) = \frac{8}{25} + \frac{6}{25} - \frac{2}{25} = .48$

30- **a)** $P(E|F) = \frac{1}{3}$ $P(F|E) = \frac{1}{5}$ **b)** Not independent events

31- Yes

32- Yes

33- **a)** $\frac{2}{7}$ **b)** $\frac{2}{7}$

34-
$$P(\text{None} | 1 \text{ is not}) = \frac{\Pr(\text{none}) \times \Pr(\text{random 1 is not found} | \text{none})}{\Pr(\text{none}) \times \Pr(1 \text{ is not found} | \text{none}) + \Pr(1 \text{ is}) \times \Pr(\text{Ace is not} | \text{ace is})}$$

$$= \frac{\frac{3}{4} \times 1}{\frac{3}{4} \times 1 + (\frac{1}{4} \times \frac{12}{13})} = \frac{39}{51} = \frac{13}{17} \approx .765$$

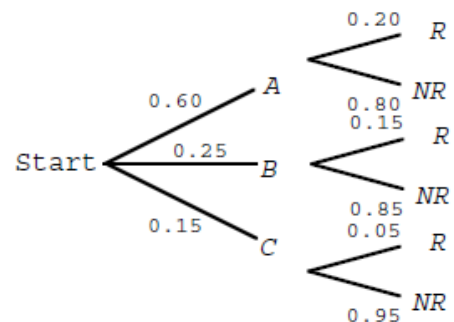
35- $P(\text{Guilty} | \text{Left handed}) = \frac{P(G).P(Lh|G)}{P(G).P(Lh|G) + p(\text{not}G).P(Lh|\text{not}G)} = .92$

36- **a)** .86 **b)** .5

37- $P(A | R) = \frac{(.6)(0.2)}{(.6)(0.2) + (.25)(0.15) + (.15)(0.05)} = 0.73$

$P(B | R) = \frac{(.25)(0.15)}{(.6)(0.2) + (.25)(0.15) + (.15)(0.05)} = 0.23$

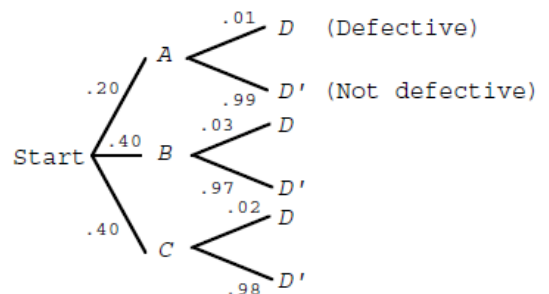
$P(C | R) = \frac{(.15)(0.05)}{(.6)(0.2) + (.25)(0.15) + (.15)(0.05)} = 0.05$



38- **a)** $P(A | D) = \frac{(0.2)(.01)}{(0.2)(.01) + (0.4)(.03) + (0.4)(.02)} = \frac{.002}{.022} = 0.91$

b) $P(B | D) = \frac{(0.4)(.03)}{(0.2)(.01) + (0.4)(.03) + (0.4)(.02)} = 0.545$

c) $P(C | D) = \frac{(0.4)(.02)}{(0.2)(.01) + (0.4)(.03) + (0.4)(.02)} = 0.364$



$$39- \quad P(I | D) = \frac{(.35)(.1)}{(.35)(.1) + (.02)(.018) + (.45)(.02)} \approx .217$$

$$P(II | D) = \frac{(.02)(.018)}{(.35)(.1) + (.02)(.018) + (.45)(.02)} \approx .224$$

$$P(III | D) = \frac{(.45)(.02)}{(.35)(.1) + (.02)(.018) + (.45)(.02)} \approx .559$$

$$40- \quad a) \quad P(E) = \frac{C_{5,3}}{C_{12,3}} \approx .045$$

$$b) \quad P(\text{exactly } 2) = \frac{C_{5,2}C_{7,1}}{C_{12,3}} \approx .318$$

$$c) \quad P(@ \text{ least } 2) = P(\text{exactly } 2) + P(3) = .318 + .045$$