Math 165 Test 2 Name ____________________

Show all necessary steps Clearly, Neatly, and Systematically with proper notation. Any incorrect or without proper notation statement will be penalized.

1. Elementary and secondary schools were classified by the number of computers they had.

Computers	1 – 10	11 – 20	21 – 50	51 – 100	100 +
Schools	3170	4590	16741	23753	34803

83057

Choose one school at random. Find the probability that it has

a. 50 or fewer computers

$P(50 \text{ or fewer}) = \frac{3170+4590+16741}{83057} = \frac{24501}{83057} \approx 0.2950$

b. More than 100 computers

$P(\text{more than } 100) = \frac{34803}{83057} \approx 0.4190$

c. No more than 20 computers

$P(\text{No more than } 20) = P(20 \text{ or fewer}) = \frac{3170+4590}{83057} = \frac{7760}{83057} \approx 0.0934$

2. A breakdown of the sources of energy used in the United States is as shown: Oil 39%, Natural Gas 24%, Coal 23%, Nuclear 8%, Hydropower 3%, and Other 3%.
Choose one energy source at random. Find the probability that it is

a. Not Oil

$P(\text{Not Oil}) = 1 - P(\text{oil}) = 1 - 0.39 = 0.61$

b. Natural Gas or Oil

$P(\text{NG or Oil}) = P(\text{NG}) + P(\text{oil}) = 0.24 + 0.39 = 0.63$

c. Nuclear

$P(N) = 0.08$

3. In a fish tank, there are 24 goldfish, 2 angle fish, and 5 guppies. If a fish is selected at random, find the probability that it is a gold fish or an angle fish.

$P(\text{GF or AF}) = P(\text{GF}) + P(\text{AF}) = \frac{24}{31} + \frac{2}{31} = \frac{26}{31} \approx 0.8387$

4. The probability that a given tourist goes to the amusement park is 0.47, and the probability that she goes to the water park is 0.58. If the probability that she goes to either the water park of the amusement park is 0.95, what is the probability that she visits both of the parks on vacation?

$P(\text{WP or AP}) = P(\text{WP}) + P(\text{AP}) - P(\text{both})$

$0.95 = 0.58 + 0.47 - P(\text{both})$

$0.95 = 1.05 - P(\text{both})$

$-0.10 = -P(\text{both})$

$0.10 = P(\text{both})$

5. If one card is drawn from an ordinary deck of cards, find the probability of getting the following.

a. A king or a queen or a jack

$P(K \text{ or } Q \text{ or } J) = P(K) + P(Q) + P(J) = \frac{4}{52} + \frac{4}{52} + \frac{4}{52} = \frac{3}{13} \approx 0.2308$

b. A king or a queen or a diamond

$P(K \text{ or } Q \text{ or } D) = P(K) + P(Q) + P(D) - P(K \text{ and } D) - P(Q \text{ and } D)$

$= \frac{4}{52} + \frac{4}{52} + \frac{13}{52} - \frac{1}{52} - \frac{1}{52}$

$= 19/52 \approx 0.3654$

	Ficition	Non Ficition	
Adult	30	70	100
Children	100	60	160
	130	130	

6. At a used-book sale, 100 books are adult books and 160 are children's books. Of the adult books, 70 are nonfiction while 60 of the children's books are nonfiction. If a book is selected at random, find the probability that it is

   a. Fiction

   $= P(\text{Fiction}) = \frac{130}{260} = \frac{1}{2} = 0.5$

   b. Not a children's nonfiction book

   $= P(\text{not children's nonficition})$

   $= P(\text{adult book}) + P(\text{children's ficition})$

   $= \frac{100}{260} + \frac{100}{260} \approx 0.7692$

   $= \frac{10}{13}$

   c. An adult book or a children's nonfiction book

   $= P(\text{adult book or children's nonfiction})$

   $= P(\text{adult book}) + P(\text{childre's nonficition})$

   $= \frac{100}{260} + \frac{60}{260} \approx 0.6154$

   $= \frac{8}{13}$

7. The Gallup Poll reported that 52% of Americans used a seat belt the last time they got into a car. If 4 people are selected at random, find the probability that they all used a seat belt the last time they got into a car.

   $= P(\text{all 4 used seat belt}) = P(1^{st} \text{ and } 2^{nd} \text{ and } 3^{rd} \text{ and } 4^{th}) = (0.52)^4 \approx 0.07312$

8. In a scientific study there are 8 guinea pigs, 5 of which are pregnant. If 3 are selected at random without replacement, find the probability that all are pregnant.

   $= P(\text{all pregnant}) = P(1^{st}\,P \text{ and } 2^{nd}\,P \text{ and } 3^{rd}\,P) = \frac{5}{8} \cdot \frac{4}{7} \cdot \frac{3}{6} = \frac{5}{28} \approx 0.1786$

9. Below are listed numbers of doctors in various specialties by gender.

	Pathology	Pediatrics	Psychiatry	
Male	12575	33020	27803	73398
Female	5604	33351	12292	51247
	18179	66371	40095	124645

Choose one doctor at random.

   a. Find the probability of the doctor is male, given that he is a pediatrician.

   $= P(M \mid Ped.) = \frac{P(M \text{ and } Ped.)}{P(Ped)} = \frac{33020/124645}{66371/124645} = \frac{33020}{66371} \approx 0.4975$

   b. Find the probability that a doctor is pathologist, given that the doctor is a female.

   $= P(Path \mid F) = \frac{P(Path. \text{ and } F)}{P(F)} = \frac{5604/124645}{51247/124645} = \frac{5604}{51247} \approx 0.1094$

10. At a local university 54.3% of incoming first-year students have computers. If 3 students are selected at random, find the following probabilities.

   a. None have computers.

   $= P(\text{None have comp.}) = P(1^{st} \text{ doesn't and } 2^{nd} \text{ doesn't and } 3^{rd} \text{ doesn't}) = (0.457)^3 \approx 0.0954$

   b. At least one has a computer.

   $= P(\text{at least one has comp}) = 1 - P(\text{none have comp.}) = 1 - (0.457)^3 \approx 0.9046$

   c. All have computers.

   $= P(\text{all have comp.}) = P(1^{st} \text{ has and } 2^{nd} \text{ has and } 3^{rd} \text{ has}) = (0.543)^3 \approx 0.1601$

11. If 4 cards are drawn from a deck of 52 and not replaced, find the probability of getting at least 1 club.

$= P(\text{at least 1 club})$

$= 1 - P(\text{no club})$

$= 1 - \left(\frac{39}{52} \cdot \frac{38}{51} \cdot \frac{37}{50} \cdot \frac{36}{49}\right)$

$= 1 - 0.303817\ldots$

$= 0.6962$

12. There are 2 major roads from city X to Y and 4 major roads from city Y to Z. How many different trips can be made from city X to city Z passing through city Y?

$2 \times 4 = 8$

13. How many different ways can a city health department inspector visit 5 restaurants in a city with 10 restaurants?

${}_{10}C_5 = 252$

14. The call letters of a radio station must have 4 letters. The first letter must be a K or a W. How many different station call letters can be made if the repetitions are not allowed?

$\underline{K}\ \underline{25}\ \underline{24}\ \underline{23} = 13800$

$\underline{W}\ \underline{25}\ \underline{24}\ \underline{23} = 13800$

$+ = 27600$

15. How many ways can 4 baseball players and 3 basketball players be selected from 12 baseball players and 9 basketball players?

${}_{12}C_4 \cdot {}_9C_3 = (495)(84) = 41580$

16. In a board of directors composed of 8 people, how many ways can one chief executive officer, one director and one treasurer be selected?

${}_8P_3 = 336$ or $\underline{8} \cdot \underline{7} \cdot \underline{6} = 336$

17. A package contains 12 resisters, 3 of which are defective. If 4 are selected, find the probability of getting

a. 0 defective resistors

$P(0 \text{ defective}) = \frac{{}_9C_4}{{}_{12}C_4} = \frac{126}{495} = \frac{14}{55} \approx 0.2545$

b. 1 defective resistor

$P(1 \text{ defective}) = \frac{{}_9C_3 \cdot {}_3C_1}{{}_{12}C_4} = \frac{(84)(3)}{495} = \frac{252}{495} = \frac{28}{55} \approx 0.5091$

c. 3 defective resistors

$P(3 \text{ defective}) = \frac{{}_9C_1 \cdot {}_3C_3}{{}_{12}C_4} = \frac{(9)(1)}{495} = \frac{1}{55} \approx 0.0182$

18. At a recent graduation at a naval flight school, 18 Marines, 10 members of Navy, and 3 members of the Cost Guard got their wings. Choose 3 pilots at random to feature on a training brochure. Find the probability that there will be

a. 1 of each

$P(1 \text{ of each}) = \frac{{}_{18}C_1 \cdot {}_{10}C_1 \cdot {}_3C_1}{{}_{31}C_3} = \frac{18 \cdot 10 \cdot 3}{4495} = \frac{540}{4495} \approx 0.1201$

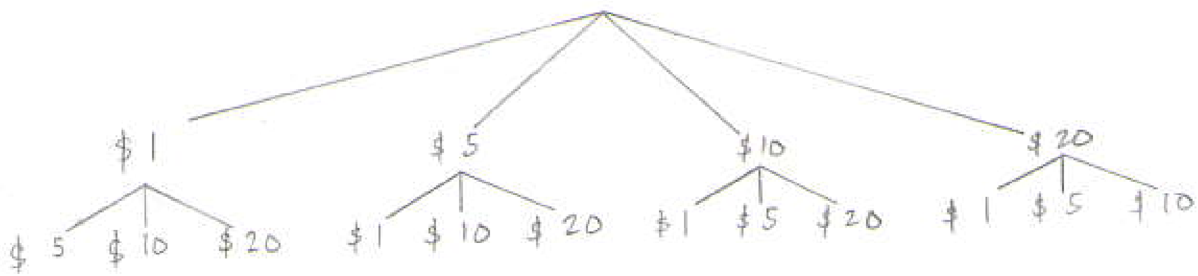
b. 0 members of the Navy

$$P(0\ \text{Navy}) = \frac{{}_{21}C_3}{{}_{31}C_3} = \frac{1330}{4495} \approx 0.2959$$

c. 3 Marines

$$P(3\ \text{Marines}) = \frac{{}_{18}C_3}{{}_{31}C_3} = \frac{816}{4495} \approx 0.1815$$

19. A box contains a \$1 bill, a \$5 bill, a \$10 bill, and a \$20 bill. A bill is selected at random, and it is not replaced; then a second bill is elected at random. Draw a tree diagram and determine the sample space.

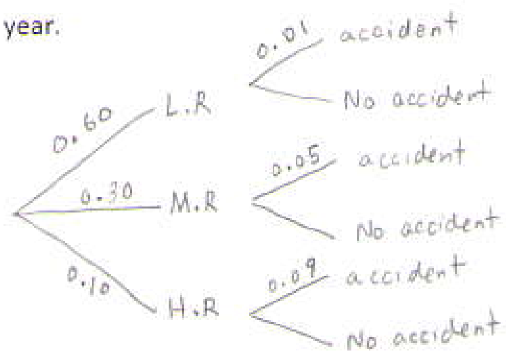


Sample Space :

\$1, \$5	\$5, \$1	\$10, \$1	\$20, \$1
\$1, \$10	\$5, \$10	\$10, \$5	\$20, \$5
\$1, \$20	\$5, \$20	\$10, \$20	\$20, \$10

Sample Space : 12

20. An insurance company classifies drivers as low-risk, medium-risk, and high-risk. Of those insured, 60% are low-risk, 30% are medium-risk, and 10% are high-risk. After a study, the company finds that during a 1-year period, 1% of the low-risk drivers had an accident, 5% of the medium-risk drivers had an accident, and 9% of the high-risk drivers had an accident. If a driver is selected at random, find the probability that the driver will have had an accident during the year.



$P(\text{had an accident})$

$= P(\text{L.R and A}) + P(\text{M.R and A}) + P(\text{H.R and A})$

$= P(\text{L.R}) \cdot P(A \mid \text{L.R}) + P(\text{M.R}) \cdot P(A \mid \text{M.R}) + P(\text{H.R}) \cdot P(A \mid \text{H.R})$

$= (0.60)(0.01) + (0.30)(0.05) + (0.10)(0.09)$

$= 0.03$