63. Public transportation and the automobile are two methods an employee can use to get to work each day. Samples of times recorded for each method are shown. Times are in minutes.

Public Transportation:	28	29	32	37	33	25	29	32	41	34
Automobile:	29	31	33	32	34	30	31	32	35	33

a. Compute the sample mean time to get to work for each method.
b. Compute the sample standard deviation for each method.
c. On the basis of your results from parts (a) and (b), which method of transportation should be preferred? Explain.
d. Develop a box plot for each method. Does a comparison of the box plots support your conclusion in part (c)?

63.

x_1	$\bar{x}_1$	$(x_1-\bar{x}_1)$	$(x-\bar{x}_1)^2$	x_2	$\bar{x}_2$	$(x_2-\bar{x}_2)$	$(x_2-x_2)^2$
28	32	-4	16	29	32	-3	9
29	32	-3	9	31	32	-1	1
32	32	0	0	33	32	1	1
37	32	5	25	32	32	0	0
33	32	1	1	34	32	2	4
85	32	-7	49	30	32	2	4
29	32	-3	9	31	32	1	1
32	32	0	0	32	32	0	0
41	32	9	81	35	32	3	9
34	32	2	4	33	32	1	1
	$n=10$		194				30

a) $\bar{x}_1 = \frac{\Sigma x_1}{n_1} = \frac{320}{10} = 32$ $\quad$ $\bar{x}_2 = \frac{\Sigma x_2}{n_2} = \frac{320}{10} = 32$

b) variance $= S_1^2 = \frac{\Sigma(x_1-\bar{x}_1)^2}{n_1-1}$ $\quad$ Variance $= S_2^2 = \frac{\Sigma(x_2-\bar{x}_2)^2}{n_2-1}$

$= \frac{194}{9} = 21.55$ $\quad$ $= \frac{30}{9} = 3.3$

standard deviation $= S_1 = \sqrt{S_1^2}$ $\quad$ Standard deviation $= S_2 = \sqrt{S_2^2}$

$= 4.64$ $\quad$ $= 1.82$

c) Based on a & b result. it shows that mean time of both transport are same. but the public transport has more variance and so the automobile has less variance and it is preffered//

d) $S_1 = 4164$ $S_2 = 1182$ $n = 10$

$Q_1 = 25\% = \frac{np}{100} = \frac{25 \times 10}{100} = 2.5 \approx 3 = 29$

25, 28, 29, 29, 30, 32, 33, 34, 35, 37

$Q_2 = \frac{50 \times 10}{100} = 5 = \frac{32 + 30}{2} = 31$

$Q_3 = \frac{75 \times 10}{100} = 7.5 \approx 8 = 34$

$IQR_1 = Q_3 - Q_1 = 34 - 29 = 5$

$Q_{min\,limit} = Q_1 - 1.5 \times IQR_1 = 29 - 1.5 \times 5$
$= 21.5$

$Q_{max\,limit} = Q_3 + 1.5 IQR_1 = 34 + 1.5 \times 5 = 41.5$

$Q_1 = 25\% = \frac{25 \times 10}{100} = 2.5 \approx 3 = 31$

$Q_2 = 32$

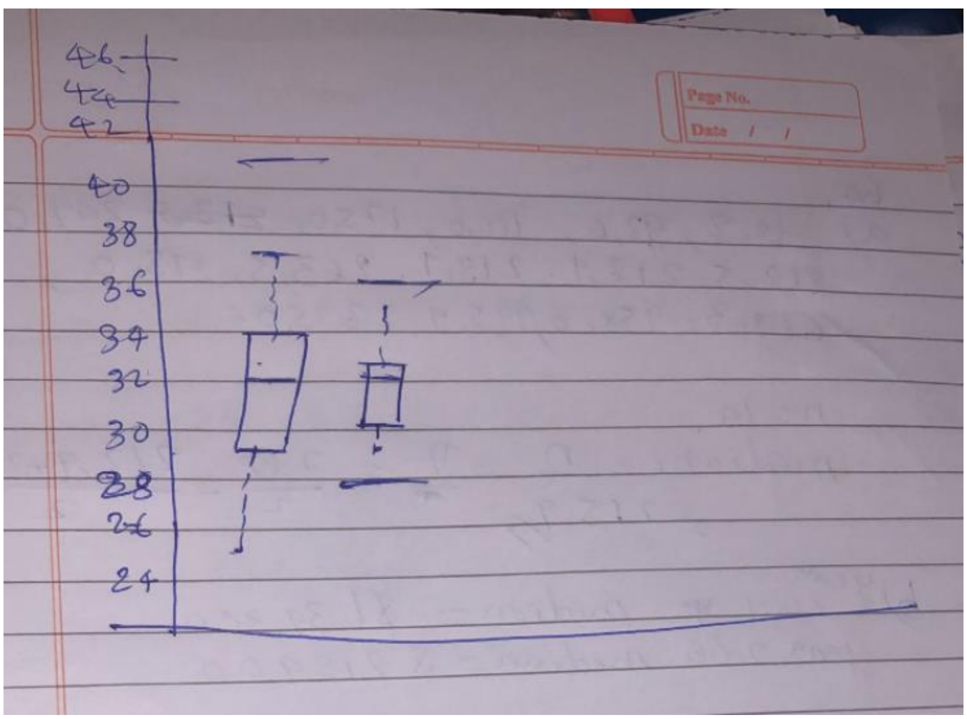
29, 30, 31, 31, 32, 32, 33, 33, ~~34~~, 35

$Q_3 = 75\% = \frac{75 \times 10}{100} = 7.5 \approx 8 = 33$

$IQR = Q_3 - Q_1 = 33 - 31 = 2$

$Q_{min} = Q_1 - 1.5 \times 2 = 31 - 3 = 28$

$Q_{max} = Q_3 + 1.5 \times 2 = 33 + 3 = 36$



64. The National Association of Realtors reported the median home price in the United States and the increase in median home price over a five-year period (*The Wall Street Journal,* January 16, 2006). Use the sample home prices shown here to answer the following questions.

995.9	48.8	175.0	263.5	298.0	218.9	209.0
628.3	111.0	212.9	92.6	2325.0	958.0	212.5

a. What is the sample median home price?
b. In January 2001, the National Association of Realtors reported a median home price of $139,300 in the United States. What was the percentage increase in the median home price over the five-year period?
c. What are the first quartile and the third quartile for the sample data?
d. Provide a five-number summary for the home prices.
e. Do the data contain any outliers?
f. What is the mean home price for the sample? Why does the National Association of Realtors prefer to use the median home price in its reports?

64.

a) 48.8, 92.6, 111.0, 175.0, ~~212.5~~ 209.0
212.5, 212.9. 218.9. 263.5, 298.0,
628.3, 958.0, 995.9, 2325.0.

$n = 14$

median $= \frac{n}{2} = \frac{14}{2} = 7, \frac{7+8}{2} = \frac{212.9+218.9}{2}$
$= 215.9$

b) year 2001 median = $139,300
year 2006 median = $215900

~~$\frac{215900 - 139300}{100}\% = \frac{76600}{100} = 766$~~

~~$\frac{766}{215900}$~~ $\frac{766}{215900} =$

$\frac{215900 - 139300}{139300} = \frac{76600 \times 100}{139300} = 0.54 = 54.9\%$

c) $Q_1 = 25\% = \frac{np}{100} = \frac{14 \times 25}{100} = 3.5 \approx 4 = 175.0$

$Q_3 = 75\% = \frac{np}{100} = \frac{14 \times 75}{100} = 10.5 \approx 11 = 628.3$

d) Five point summary.

1) min = 48.8
2) max = 2325.0
3) Q_1 = 175.0
4) Q_3 = 628.3.
5) $Q_2 = 50\% = \frac{np}{100} = \frac{14 \times 50}{100} = \frac{7+8}{2} =$

$= \frac{212.9 + 218.9}{2} = 215.9$//

e) $IQR = Q_3 - Q_1 = 628.3 - 175.0 = 453.3$

$\text{min limit} = Q_1 - 1.5 \times IQR = 175 - 1.5 \times 453.3$

$= -504.95$//

$\text{max limit} = Q_3 + 1.5\, IQR = 628.3 + 1.5 \times 453.3$

$= 1308.25$//

Yes there is a outlier as 2325 which above the maximum limit 1308.5//

g) $\bar{x} = \frac{\sum x_i}{n} = \frac{6749.4}{14} = 482.1$

National Association of realtors prefer to use the median price in its reports because the mean is improved and skewed to the right due to extreme high value

65. The U.S. Census Bureau's American Community Survey reported the percentage of children under 18 years of age who had lived below the poverty level during the previous 12 months (U.S. Census Bureau website, August 2008). The region of the country, Northeast (NE), Southeast (SE), Midwest (MW), Southwest (SW), and West (W) and the percentage of children under 18 who had lived below the poverty level are shown for each state.

State	Region	Poverty %	State	Region	Poverty %
Alabama	SE	23.0	Montana	W	17.3
Alaska	W	15.1	Nebraska	MW	14.4
Arizona	SW	19.5	Nevada	W	13.9
Arkansas	SE	24.3	New Hampshire	NE	9.6
California	W	18.1	New Jersey	NE	11.8
Colorado	W	15.7	New Mexico	SW	25.6
Connecticut	NE	11.0	New York	NE	20.0
Delaware	NE	15.8	North Carolina	SE	20.2
Florida	SE	17.5	North Dakota	MW	13.0
Georgia	SE	20.2	Ohio	MW	18.7
Hawaii	W	11.4	Oklahoma	SW	24.3
Idaho	W	15.1	Oregon	W	16.8
Illinois	MW	17.1	Pennsylvania	NE	16.9
Indiana	MW	17.9	Rhode Island	NE	15.1
Iowa	MW	13.7	South Carolina	SE	22.1
Kansas	MW	15.6	South Dakota	MW	16.8
Kentucky	SE	22.8	Tennessee	SE	22.7
Louisiana	SE	27.8	Texas	SW	23.9
Maine	NE	17.6	Utah	W	11.9
Maryland	NE	9.7	Vermont	NE	13.2
Massachusetts	NE	12.4	Virginia	SE	12.2
Michigan	MW	18.3	Washington	W	15.4
Minnesota	MW	12.2	West Virginia	SE	25.2
Mississippi	SE	29.5	Wisconsin	MW	14.9
Missouri	MW	18.6	Wyoming	W	12.0

a. What is the median poverty level percentage for the 50 states?

b. What are the first and third quartiles? What is your interpretation of the quartiles?

c. Show a box plot for the data. Interpret the box plot in terms of what it tells you about the level of poverty for children in the United States. Are any states considered outliers? Discuss.

d. Identify the states in the lower quartile. What is your interpretation of this group and what region or regions are represented most in the lower quartile?

65

9.6	17.6
9.7	17.9
11.0	18.1
11.8	18.3
11.9	18.6
12.0	18.7
12.2	19.5
12.2	20.0
12.4	20.2
13.0	20.2
13.2	22.1
13.9	22.7
14.4	22.8
14.9	23.0
15.1	23.9
15.1	24.3
15.1	24.3
15.4	25.2
15.6	25.6
15.7	27.8
15.8	29.5
16.8	
16.9	
16.9	
17.1	
17.3	
17.5	

a) $n = 50$

median $= \frac{50}{2} = 25 = \frac{25+26}{2}$

$= \frac{16.8 + 16.9}{2}$

$= 16.85$

b) $Q_1 = 25\% = \frac{25 \times 50}{100} = 12.5$

$Q_1 = 13.7$

$Q_3 = 75\% = \frac{75 \times 50}{100}$

$= 37.5 \approx 38 = 20.2$

$Q_2 = 50\% = \frac{50 \times 50}{100} = 25$

$= \frac{25+26}{2} = \frac{16.8+16.9}{2}$

$= 16.85$

$IQR = Q_3 - Q_1 = 20.2 - 13.7$

$= 6.5$

min limit $= Q_1 - 1.5\, IQR$

$= 13.7 - 1.5 \times 6.5$

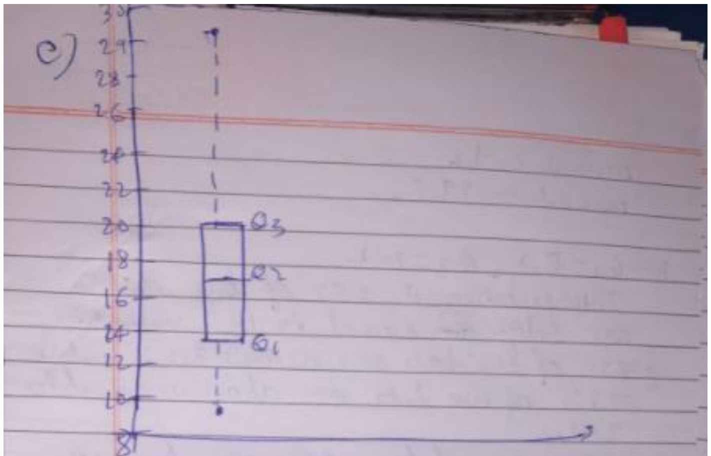
$= 3.95$

max limit $= Q_3 + 1.5\, IQR$

$= 20.2 + 1.5 \times 6.5$

$= 29.95$

c)



min = 9.6
max = 29.5
Q1 = 13.7
Q2 = 16.85
Q3 = 20.2
min limit = 3.95
max limit = 29.95

As the minimum poverty % 9.6 and maximum poverty % 29.5 are within the minimum limit 3.95 and maxlimit 29.95.

Exercise-4

Methods

1. An experiment has three steps with three outcomes possible for the first step, two outcomes possible for the second step, and four outcomes possible for the third step. How many experimental outcomes exist for the entire experiment?

1) $n_1 = 3$, $n_2 = 2$, $n_3 = 4$.

As per the counting rule of multiple steps experiment the total number of outcomes

$= n_1 \times n_2 \times n_3 \ldots n_i$

$= 3 \times 2 \times 4 = 24$

$\therefore$ 24 experimental outcomes exist for the entire

2. How many ways can three items be selected from a group of six items? Use the letters A, B, C, D, E, and F to identify the items, and list each of the different combinations of three items.

2) $n=3$ $N=6$

As per the counting rule of combinations the total number of experimental out comes $= {}^{N}C_{n} = \frac{N!}{n!(N-n)!}$

$$= \frac{6!}{3!(6-3)!} = \frac{6!}{3!\,3!} = \frac{6\times5\times4\times3\times2\times1}{3\times2\times1\times3\times2\times1}$$

$= 20$

∴ There are 20 ways we can select 3 items from a group of 6 items.

A, B, C, D, E, F.

ABC, ACD, ADE BCD BCE BDF
ABD ACE ADF BDE BCF
ABE ACF BEF
ABF
CDE CDF DEF, ABF
CEF

3. How many permutations of three items can be selected from a group of six? Use the letters A, B, C, D, E, and F to identify the items, and list each of the permutations of items B, D, and F.

3) $n=3$ $N=6$

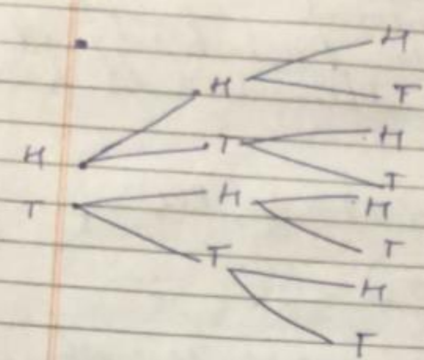
As per the counting rule of permutation combinations.
Total number of experimental outcomes ~~of~~ of permutation combination $= {}^{N}P_{n} = \frac{N!}{(N-n)!} = \frac{6!}{(6-3)!}$

$$= \frac{6\times5\times4\times\cancel{3\times2\times1}}{\cancel{3\times2\times1}} = 120$$

$\therefore$ Total 120 permutations of three items can be selected from group of six items.

4. Consider the experiment of tossing a coin three times.
   a. Develop a tree diagram for the experiment.
   b. List the experimental outcomes.
   c. What is the probability for each experimental outcome?

4.



= HHH, HHT, HTH, HTT.

THH, THT, TTH, TTT

$n_1=2,\ n_2=2,\ n_3=2$.

∴ Total number of 3 step experiment Outcomes

$= n_1 \times n_2 \times n_3 = 2\times 2\times 2 = 8$

Since all outcomes have equally likely

∴ probability of each outcome $= \frac{1}{8} = .125$

$.125+.125+.125+.125+.125+.125+.125+.12$

$=1$

5. Suppose an experiment has five equally likely outcomes: E_1, E_2, E_3, E_4, E_5. Assign probabilities to each outcome and show that the requirements in equations (4.3) and (4.4) are satisfied. What method did you use?

5. As per the probability of ~~equal~~ assignment of equally likely outcomes. Probability of each event = 1/number of events/outcomes.

$\Rightarrow P(E_1) = \frac{1}{5}$, $P(E_2) = \frac{1}{5}$, $P(E_3) = \frac{1}{5}$, $P(E_4) = \frac{1}{5}$, $P(E_5) = \frac{1}{5}$.

As per the main 2 rules of probability assignment

1) ~~All~~ probability of any out come must be between 0 and 1

$\frac{1}{5} = .2$, so, is the probability of each ~~to~~ outcome here.

2) Sum of ~~all~~ probability of all ~~to~~ outcomes of an experiment $= 1$

$= \frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5} = \frac{5}{5} = 1$

6. An experiment with three outcomes has been repeated 50 times, and it was learned that E_1 occurred 20 times, E_2 occurred 13 times, and E_3 occurred 17 times. Assign probabilities to the outcomes. What method did you use?

6

E_1	20
E_2	13
E_3	17
	50

Here as per the relative frequency method of probability assignment which is applicable for an experiment which is repeated large number of times

$P(E_1) = \frac{20}{50} = .4$

$P(E_2) = \frac{13}{50} = .26$

$P(E_3) = \frac{17}{50} = .34$

Here we have used relative frequency probability assignment method is used.

7. A decision maker subjectively assigned the following probabilities to the four outcomes of an experiment: $P(E_1) = .10$, $P(E_2) = .15$, $P(E_3) = .40$, and $P(E_4) = .20$. Are these probability assignments valid? Explain.

7) $P(E_1) = .10$
$P(E_2) = .15$
$P(E_3) = .40$
$P(E_4) = .20$
$.85$

These probabilitiles are not valid. because it is not satisfying the main 2nd main rule of the probability assignment i.e sum of all probabilities of all the outcomes should be 1,,, but here it is .85. Hence it is not a valid probability assignment.

Applications

8. In the city of Milford, applications for zoning changes go through a two-step process: a review by the planning commission and a final decision by the city council. At step 1 the planning commission reviews the zoning change request and makes a positive or negative recommendation concerning the change. At step 2 the city council reviews the planning commission's recommendation and then votes to approve or to disapprove the zoning change. Suppose the developer of an apartment complex submits an application for a zoning change. Consider the application process as an experiment.
   a. How many sample points are there for this experiment? List the sample points.
   b. Construct a tree diagram for the experiment.

8) $n_1 = 2$.
$n_2 = 2$.

First step has 2 sample points
= {positive, negative}

Second step has 2 sample points
= (approve, disapprove).

∴ Total sample points $= n_1 \times n_2 = 2 \times 2$
$= 4$ //

P — A, D = PA, PD,

N — A, D NA, ND //

Sample points = {PA, PD, NA, ND}.

9. Simple random sampling uses a sample of size n from a population of size N to obtain data that can be used to make inferences about the characteristics of a population. Suppose that, from a population of 50 bank accounts, we want to take a random sample of four accounts in order to learn about the population. How many different random samples of four accounts are possible?

9) $n=4$ $N=50$

As per the counting rules of combinations. The total number of outcomes of an n items from N total itemes

$$= {}^{N}C_{n} = \frac{N!}{n!(N-n)!} = \frac{50!}{4!(50-4)!}$$

$$= \frac{50!}{4!\,46!} = \frac{50\times 49\times 48\times 47\times \cancel{46!}}{4\times 3\times 2\times 1\times \cancel{46!}}$$

$$= 230300$$

$\therefore$ 230300 different random samples of four accounts are possible.

10. Many students accumulate debt by the time they graduate from college. Shown in the following table is the percentage of graduates with debt and the average amount of debt for these graduates at four universities and four liberal arts colleges (*U.S. News and World Report, America's Best Colleges,* 2008).

University	% with Debt	Amount($)	College	% with Debt	Amount($)
Pace	72	32,980	Wartburg	83	28,758
Iowa State	69	32,130	Morehouse	94	27,000
Massachusetts	55	11,227	Wellesley	55	10,206
SUNY—Albany	64	11,856	Wofford	49	11,012

a. If you randomly choose a graduate of Morehouse College, what is the probability that this individual graduated with debt?
b. If you randomly choose one of these eight institutions for a follow-up study on student loans, what is the probability that you will choose an institution with more than 60% of its graduates having debt?
c. If you randomly choose one of these eight institutions for a follow-up study on student loans, what is the probability that you will choose an institution whose graduates with debts have an average debt of more than $30,000?
d. What is the probability that a graduate of Pace University does not have debt?
e. For graduates of Pace University with debt, the average amount of debt is $32,980. Considering all graduates from Pace University, what is the average debt per graduate?

10)

a) Probability of randomly choosing the graduate of Morehouse college with debt = the % given in the table = .94 % = 94%

b) Probability = $\frac{\text{\# of favourable outcome}}{\text{Total number of outcome}}$

# of institute with more than >60% debt = 5

Probability = $\frac{5}{8}$ = .625

c) Probability = $\frac{\text{\# of favourable outcome}}{\text{\# of outcomes}}$

The institute with more than \$30,000 debt = 2

Probability = $\frac{2}{8}$ = .25 %

d) Probability of graduate of pace university = 1 − probability of graduate of pace university having debt = 1 − .72 = .28

11. The National Highway Traffic Safety Administration (NHTSA) conducted a survey to learn about how drivers throughout the United States are using seat belts (Associated Press, August 25, 2003). Sample data consistent with the NHTSA survey are as follows.

	Driver Using Seat Belt?	
Region	**Yes**	**No**
Northeast	148	52
Midwest	162	54
South	296	74
West	252	48
Total	858	228

a. For the United States, what is the probability that a driver is using a seat belt?

b. The seat belt usage probability for a U.S. driver a year earlier was .75. NHTSA chief Dr. Jeffrey Runge had hoped for a .78 probability in 2003. Would he have been pleased with the 2003 survey results?

c. What is the probability of seat belt usage by region of the country? What region has the highest seat belt usage?

d. What proportion of the drivers in the sample came from each region of the country? What region had the most drivers selected? What region had the second most drivers selected?

e. Assuming the total number of drivers in each region is the same, do you see any reason why the probability estimate in part (a) might be too high? Explain.

11)

a) Total numbers of drivers

$= 852 + 228 = 1086$

Driver using the seat belt $= \frac{852}{1086}$

$= .7845$

b) Yes, since as per the survey conducted in 2003 the probability of drivers using seatbelt in USA ~~is~~ is .7845 it has reached the Dr Jeffery Runge hope of .78

c) Probability of seat belt usage in northeast $= \frac{148}{858} = .172$

$P(\text{midwest}) = \frac{162}{858} = .188$

$P(\text{south}) = \frac{296}{858} = .34$

$P(\text{west}) = \frac{252}{858} = .293$

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e) yes, because not all drivers ~~will~~ will be truthful in their answer.

12. The Powerball lottery is played twice each week in 28 states, the Virgin Islands, and the District of Columbia. To play Powerball a participant must purchase a ticket and then select five numbers from the digits 1 through 55 and a Powerball number from the digits 1 through 42. To determine the winning numbers for each game, lottery officials draw five white balls out of a drum with 55 white balls, and one red ball out of a drum with 42 red balls. To win the jackpot, a participant's numbers must match the numbers on the five white balls in any order and the number on the red Powerball. Eight coworkers at the ConAgra Foods plant in Lincoln, Nebraska, claimed the record $365 million jackpot on February 18, 2006, by matching the numbers 15-17-43-44-49 and the Powerball number 29. A variety of other cash prizes are awarded each time the game is played. For instance, a prize of $200,000 is paid if the participant's five numbers match the numbers on the five white balls (Powerball website, March 19, 2006).

a. Compute the number of ways the first five numbers can be selected.
b. What is the probability of winning a prize of $200,000 by matching the numbers on the five white balls?
c. What is the probability of winning the Powerball jackpot?

answer,

12 a) $n=5$ $N=55$

Number of ways the 5 numbers can be picked is.

$$^{N}C_n = \frac{N!}{(N-n)!} = \frac{55!}{(55-5)!} = \frac{55\times 54\times 53\times 52\times 51\times 50!}{50!}$$

$= 417,451,320$

b) Probability of winning $200,000 by making the numbers on the given white balls. $= \frac{1}{417451320}$

c) Number of ways of selecting one red ball out of 42 =

$n=1$ $N=42$

$$= \frac{N!}{(N-n)!} = \frac{42!}{42-1} = \frac{42\times 41!}{41!} = 42$$

Probability of picking one red ball $= \frac{1}{42}$

Probability of powerball jackpoint $= \frac{1}{417451320} \times \frac{1}{42}$

$= 0.0000000000574$

South region has the highest seat belt usage.

d) N 148 + 52 = 200
M 167+59 = 216
S 296+74 = 370
W 252 + 48 = 300

1086

$P(N) = \frac{200}{1086} = .184$

$P(M) = \frac{216}{1086} = .198$

$P(S) = \frac{370}{1086} = .340$

$P(W) = \frac{300}{1086} = .276$

South region had the most driver selected
West region had the second most driver selected.

13. A company that manufactures toothpaste is studying five different package designs. Assuming that one design is just as likely to be selected by a consumer as any other design, what selection probability would you assign to each of the package designs? In an actual experiment, 100 consumers were asked to pick the design they preferred. The following data were obtained. Do the data confirm the belief that one design is just as likely to be selected as another? Explain.

Design	Number of Times Preferred
1	5
2	15
3	30
4	40
5	10

13) Probability of each of the 5 package

$P(P_1) = \frac{1}{5}$

$P(P_2) = \frac{1}{5}$

$P(P_3) = \frac{1}{5}$

$P(P_4) = \frac{1}{5}$

$P(P_5) = \frac{1}{5}$ //

b) $P(1) = \frac{5}{100} = 0.05$ //

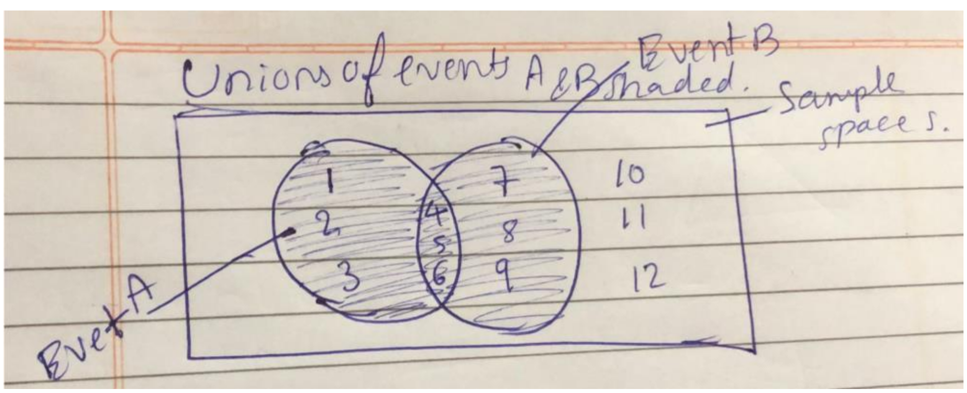
$P(2) = \frac{15}{100} = 0.15$ //

$P(3) = \frac{30}{100} = .30$

$P(4) = \frac{40}{100} = .40$

$P(5) = \frac{10}{100} = 0.1$ //

No, ~~the~~ when the same experiment repeated large number of times. the probabilities of each package differ from another one



Methods

14. An experiment has four equally likely outcomes: E_1, E_2, E_3, and E_4.
    a. What is the probability that E_2 occurs?
    b. What is the probability that any two of the outcomes occur (e.g., E_1 or E_3)?
    c. What is the probability that any three of the outcomes occur (e.g., E_1 or E_2 or E_4)?

14) E1, E2 E3 E4

a) Total number of outcomes = 4

$P(E2) = \frac{1}{4}$

b) EV1 = Any ~~two~~ of the out outcomes.

= n = 2 / N = 4

$C^N_n = \frac{N!}{n!(N-n)!} = \frac{4!}{2!(4-2)!} = \frac{4 \times 3 \times 2 \times 1}{2 \times 1 \times 2 \times 1}$

= 6

EV1 sample space count = { 6 }

= ~~probability~~ probability (EV1) = $\frac{1}{6}$ //

b) EV1 = Any two of the outcomes.

$P(EV1) = \frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ //

Probability of

c) EV2 = Any three of the outcomes

$P(EV2) = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4} = .75$ //

15. Consider the experiment of selecting a playing card from a deck of 52 playing cards. Each card corresponds to a sample point with a 1/52 probability.
    a. List the sample points in the event an ace is selected.
    b. List the sample points in the event a club is selected.
    c. List the sample points in the event a face card (jack, queen, or king) is selected.
    d. Find the probabilities associated with each of the events in parts (a), (b), and (c).

15) total number of deck = 52

a) Probability of any 1 card = $\frac{1}{52}$

Sample space (A-♥, A-♣, A-♦, A♠)

Probability of ace = $\frac{\text{Total number of ace}}{\text{Total number of cards}}$

$= \frac{4}{52} = 0.076$

b) Total number of club cards = 13

Sample space = {2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A}

∴ Probability of club cards = $\frac{13}{52} = \frac{1}{4}$

$= .25$

c) Total number of face cards = 3+4 = 12

Sample space {J-♥, J-♣, J-♠, J-♦, Q-♥, Q-♣, Q-♠, Q-♦, K-♥, K-♣, K-♠, K-♦}

∴ probability of face cards = $\frac{12}{52} = .23$

16. Consider the experiment of rolling a pair of dice. Suppose that we are interested in the sum of the face values showing on the dice.
    a. How many sample points are possible? (*Hint:* Use the counting rule for multiple-step experiments.)
    b. List the sample points.
    c. What is the probability of obtaining a value of 7?
    d. What is the probability of obtaining a value of 9 or greater?
    e. Because each roll has six possible even values (2, 4, 6, 8, 10, and 12) and only five possible odd values (3, 5, 7, 9, and 11), the dice should show even values more often than odd values. Do you agree with this statement? Explain.
    f. What method did you use to assign the probabilities requested?

16 1 2 3 4 5 6
1 2 3 4 5 6

2 4 6 8 10 12
3 7 5 9 11

S_1 : $n_1 = 6$ $n_2 = 6$

a) Total number of sample points $= n_1 \times n_2 = 36$
$6 \times 6 = 36$

b) ((1,1) (1,2) (1,3) (1,4) (1,5) (1,6), (2,1) (2,2) (2,3) (2,4) (2,5) (2,6)
(3,1) (3,2) (3,3) (3,4) (3,5) (3,6) (4,1) (4,2), (4,3) (4,4)
(4,5) (4,6) (5,1) (5,2) (5,3) (5,4) (5,5) (5,6), (6,1)
(6,2) (6,3) (6,4) (6,5) (6,6))

c) $P(7) = \frac{6}{36} = 0.166$

d) $P(\geq 9) = \frac{10}{36} = 0.277$

e) No because each dice shows odd number equally as even number. even outcomes of dice are 2,4,6. odd number outcome are 1,3,5

g) Since each possible combination are equally likely we have used classical method of assigning probabilities

18. To investigate how often families eat at home, Harris Interactive surveyed 496 adults living with children under the age of 18 (*USA Today,* January 3, 2007). The survey results are shown in the following table.

Number of Family Meals per Week	Number of Survey Responses
0	11
1	11
2	30
3	36
4	36
5	119
6	114
7 or more	139

For a randomly selected family with children under the age of 18, compute the following.

a. The probability the family eats no meals at home during the week.
b. The probability the family eats at least four meals at home during the week.
c. The probability the family eats two or fewer meals at home during the week.

~~17~~ 18)

a) Total number of responses

$= 496$

a) $\frac{11}{496} = 0.022$ //

b) probability of at least 4 meals

$= P(4) + P(5) + P(6) + P(7+)$

$= \frac{36}{496} + \frac{119}{496} + \frac{114}{496} + \frac{139}{496}$

$= 0.072 + .239 + .229 + .280$

$= .82$ //

c) Probability of 2 or fewer meals

$= P(2) + P(1) + P(0)$

$= \frac{30}{496} + \frac{11}{496} + \frac{11}{496} =$

19. The National Sporting Goods Association conducted a survey of persons 7 years of age or older about participation in sports activities (*Statistical Abstract of the United States*, 2002). The total population in this age group was reported at 248.5 million, with 120.9 million male and 127.6 million female. The number of participants for the top five sports activities appears here.

	Participants (millions)	
Activity	**Male**	**Female**
Bicycle riding	22.2	21.0
Camping	25.6	24.3
Exercise walking	28.7	57.7
Exercising with equipment	20.4	24.4
Swimming	26.4	34.4

a. For a randomly selected female, estimate the probability of participation in each of the sports activities.
b. For a randomly selected male, estimate the probability of participation in each of the sports activities.
c. For a randomly selected person, what is the probability the person participates in exercise walking?
d. Suppose you just happen to see an exercise walker going by. What is the probability the walker is a woman? What is the probability the walker is a man?

19)

a) Total female participant $= 21 + 24.3 + \ldots = 161.8$

$P(\text{Biking})_f = \frac{21}{161.8} = .129$

$P(\text{can})_f = \frac{24.3}{161.8} = .150$

$P(EW)_f = \frac{57.7}{161.8} = .356$

$P(EE)_f = \frac{24.4}{161.8} = 0.150$

$P(\text{Swi})_f = \frac{34.4}{161.8} = .212$

b) Total male participants $= 22.2 + 25.6 + \ldots = 123.3$

$P(\text{Bri})_m = \frac{22.2}{123.3} = 0.18$

$P(EE)_m = \frac{20.4}{123.3} = 0.165$

$P(\text{com})_m = \frac{25.6}{123.3} = .207$

$P(\text{Sw})_m = \frac{26.4}{123.3} = 0.214$

$P(EW)_m = \frac{28.7}{123.3} = .232$

c) Total participants $= 123.3 + 161.8$
$= 283.1$

Total All participants in exercise walking

$= 28.7 + 57.7 = 86.4$

Probability (person in exercise walking)

$= \frac{86.4}{283.1} = 0.305$

d) Total exercise walker $= 86.4$

$P(\text{women exercise walker}) = \frac{57.7}{86.4} = .667$

20. *Fortune* magazine publishes an annual list of the 500 largest companies in the United States. The following data show the five states with the largest number of *Fortune* 500 companies (*The New York Times Almanac,* 2006).

State	Number of Companies
New York	54
California	52
Texas	48
Illinois	33
Ohio	30

Suppose a *Fortune* 500 company is chosen for a follow-up questionnaire. What are the probabilities of the following events?

a. Let N be the event the company is headquartered in New York. Find $P(N)$.

b. Let T be the event the company is headquartered in Texas. Find $P(T)$.

c. Let B be the event the company is headquartered in one of these five states. Find $P(B)$.

20)

a) $n = 500$

$N = 54$

$P(N) = \frac{54}{500} = 0.108$

b) $T = 48$

$P(T) = \frac{48}{500} = 0.096$

c) number of companies in all state = 217

$\therefore$ ~~P(B)~~ $B = 217$

$P(B) = \frac{217}{500} = .434$

21. The U.S. adult population by age is as follows (*The World Almanac,* 2009). The data are in millions of people.

Age	Number
18 to 24	29.8
25 to 34	40.0
35 to 44	43.4
45 to 54	43.9
55 to 64	32.7
65 and over	37.8

Assume that a person will be randomly chosen from this population.

a. What is the probability the person is 18 to 24 years old?

b. What is the probability the person is 18 to 34 years old?

c. What is the probability the person is 45 or older?

21) Total population $= 29.8 + 40.0 + \dots + 37.8$

$= 227.6$

a) $P(18-24) = \frac{29.8}{227.6} = .130$

b) $P(18-34) = P(18-24) + P(25 \text{ to } 34)$

$= \frac{29.8}{227.6} + \frac{40}{227.6} = .130 + .1757$

$= .305$

c) $P(\geq 45) = P(45 \text{ to } 54) + P(55 \text{ to } 64) + P(\geq 65)$

$= \frac{43.9}{227.6} + \frac{32.7}{227.6} + \frac{37.8}{227.6}$

$= .192 + .143 + .166$

$= .50$

Methods

22. Suppose that we have a sample space with five equally likely experimental outcomes: E_1, E_2, E_3, E_4, E_5. Let

$$A = \{E_1, E_2\}$$
$$B = \{E_3, E_4\}$$
$$C = \{E_2, E_3, E_5\}$$

a. Find $P(A)$, $P(B)$, and $P(C)$.
b. Find $P(A \cup B)$. Are A and B mutually exclusive?
c. Find A^c, C^c, $P(A^c)$, and $P(C^c)$.
d. Find $A \cup B^c$ and $P(A \cup B^c)$.
e. Find $P(B \cup C)$.

22. $A = \{E1, E2\}$

$B = \{E3, E4\}$

$C = \{E2, E3, E5\}$

$S = \{E1, E2, E3, E4, E5\}$

a) $P(A) = P(E_1) + P(E_2)$

$= \frac{1}{5} + \frac{1}{5} = 0.4$

$P(B) = P(E3) + P(E4)$

$= \frac{1}{5} + \frac{1}{5} = 0.4$

$P(C) = (P(E2) + P(E3) + P(E5))$

$= \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = .6$

b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= .4 + .4 - 0$

$= .8$

yes A & B are mutually exclusive as there are no common sample points

c) $A^c = \{E3, E4, E5\}$

$C^c = \{E1, E4\}$

$P(A^c) = 1 - P(A) = 1 - .4 = .6$

$P(C^c) = 1 - P(C) = 1 - .6 = .4$

d) $A = \{E1, E2\}$.

$B^c = \{E1, E2, E5\}$.

$A \cup B^c = \cancel{P}A + B - A \cap B^c$

$= \{E1, E2 + \cancel{E1} + \cancel{E2} + \cancel{E5} - \cancel{E1 E2}\}$

$= \{E1, E2, E5\}$

$P(A \cup B^c) = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = .6$

or $P(A \cup B^c) = P(A) + P(B^c) - P(A \cap B^c)$

$= .4 + .6 - .4 = .6$

e) $P(B \cup C) = P(B) + P(C) - P(B \cap C)$

$= .4 + .6 - .2 = .8$

$= \cancel{.4 + .6} - P\{E3\}$

$= .4 + .6 - .2 = .8$

23. Suppose that we have a sample space $S = \{E_1, E_2, E_3, E_4, E_5, E_6, E_7\}$, where $E_1, E_2, \ldots, E_7$ denote the sample points. The following probability assignments apply: $P(E_1) = .05$, $P(E_2) = .20$, $P(E_3) = .20$, $P(E_4) = .25$, $P(E_5) = .15$, $P(E_6) = .10$, and $P(E_7) = .05$. Let

$$A = \{E_1, E_4, E_6\}$$
$$B = \{E_2, E_4, E_7\}$$
$$C = \{E_2, E_3, E_5, E_7\}$$

a. Find $P(A)$, $P(B)$, and $P(C)$.
b. Find $A \cup B$ and $P(A \cup B)$.
c. Find $A \cap B$ and $P(A \cap B)$.
d. Are events A and C mutually exclusive?
e. Find B^c and $P(B^c)$.

23) $A = \{E_1, E_4, E_6\}$

$B = \{E_2, E_4, E_7\}$

$C = \{E_2, E_3, E_5, E_7\}$.

a) $P(A) = P(E_1) + P(E_4) + P(E_6)$

$= .05 + .25 + .10 = .4$

$P(B) = P(E_2) + P(E_4) + P(E_7)$

$= .20 + .25 + .05 = .5$

$P(C) = P(E_2) + P(E_3) + P(E_5) + P(E_7)$

$= .20 + .20 + .15 + .05 = .6$

b) $A \cup B = A + B - A \cap B$

$= \{E_1 + E_4 + E_6 + E_2 + \cancel{E_4} + E_7 - \cancel{E_4}\}$

$= \{E_1 + E_4 + E_6 + E_2 + E_7\}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= .4 + .5 - P(E_4)$

$= .9 - .25 = .65$

c) $A \cap B = E_4$

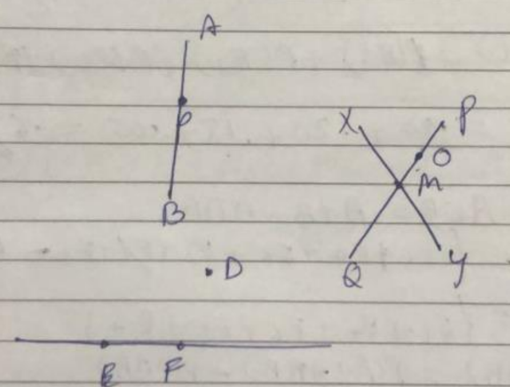
$P(A \cap B) = P(E_4) = .25$

d) yes A and C are mutually exclusive as ~~if A occurs~~ there are no common sample points between A and C

e) $B^c = \{E_1, E_6, E_3, E_5\}$.

$P(B') = 1 - P(B)$

$= 1 - .5 = .5$



Applications

24. Clarkson University surveyed alumni to learn more about what they think of Clarkson. One part of the survey asked respondents to indicate whether their overall experience at Clarkson fell short of expectations, met expectations, or surpassed expectations. The results showed that 4% of the respondents did not provide a response, 26% said that their experience fell short of expectations, and 65% of the respondents said that their experience met expectations.
    a. If we chose an alumnus at random, what is the probability that the alumnus would say their experience *surpassed* expectations?
    b. If we chose an alumnus at random, what is the probability that the alumnus would say their experience met or surpassed expectations?

24.

~~E no =~~

$P(A) = P(\text{No response}) = .4$

$P(B) = P(\text{Short expectation}) = .26$

$P(C) = P(\text{met expectation}) = .65$

D = Surpassed expection = complement of $\{P(A) + P(B) + P(C)\}$.

$P(D) = 1 - (P(A) + P(B) + P(C))$

$P(D) = 1 - (.4 + .26 + .65)$

$P(D) = 1 - .95 = .05$

b) $P(C) \cup P(D) = P(C) + P(D) - P(C \cap D)$

$= .65 + .05 - P\{0\}$

$= .70$

25. The U.S. Census Bureau provides data on the number of young adults, ages 18–24, who are living in their parents' home.[1] Let

M = the event a male young adult is living in his parents' home

F = the event a female young adult is living in her parents' home

If we randomly select a male young adult and a female young adult, the Census Bureau data enable us to conclude $P(M) = .56$ and $P(F) = .42$ (*The World Almanac,* 2006). The probability that both are living in their parents' home is .24.

a. What is the probability at least one of the two young adults selected is living in his or her parents' home?

b. What is the probability both young adults selected are living on their own (neither is living in their parents' home)?

25.

$P(M) = .56$ $\quad P(F) = .42.$ $\quad P(M \cap F) = .24$

a) $P(M \cup F) = P(M) + P(F) - P(M \cap F)$

$= .56 + .42 - .24$

$= .74$//

b) probability of young adults selected are living in their is = compliment of at least one of the young adult living in his parents house.

$= 1 - P(M \cup F) = 1 - .74 = .26$//

26. Information about mutual funds provided by Morningstar Investment Research includes the type of mutual fund (Domestic Equity, International Equity, or Fixed Income) and the Morningstar rating for the fund. The rating is expressed from 1-star (lowest rating) to 5-star (highest rating). A sample of 25 mutual funds was selected from *Morningstar Funds500* (2008). The following counts were obtained:

- Sixteen mutual funds were Domestic Equity funds.
- Thirteen mutual funds were rated 3-star or less.
- Seven of the Domestic Equity funds were rated 4-star.
- Two of the Domestic Equity funds were rated 5-star.

Assume that one of these 25 mutual funds will be randomly selected in order to learn more about the mutual fund and its investment strategy.

a. What is the probability of selecting a Domestic Equity fund?
b. What is the probability of selecting a fund with a 4-star or 5-star rating?
c. What is the probability of selecting a fund that is both a Domestic Equity fund *and* a fund with a 4-star or 5-star rating?
d. What is the probability of selecting a fund that is a Domestic Equity fund *or* a fund with a 4-star or 5-star rating?

26.

events	Type	count	Rating
E_1	DE	16	
E_2		13	$3 \le$
E_3	DE	7	4
E_4	DE	2	5

E_1 = 16 Domestic funds out of 25

a) $P(E_1) = \frac{16}{25} = .64$

b) E_2 = total 13 mutual funds are less than equal to 3☆ ratings.

Probability Selecting fund with 4 or 5-star rating = Probability compliment of mutual fund with 3 or less ~~stars~~ ratings.

$P(E_5) = 1 - P(E_2) = 1 - \frac{13}{25} = 1 - .52 = .48$

c) $P(E_3 \,\&\, E_4) = P(E_3) + P(E_4)$
$= \frac{7}{25} + \frac{2}{25} = \frac{9}{25} = .36$

d) $P(E_1 \cup E_5) = P(E_1) + P(E_5) - P(E_1 \cap E_5)$
$= .64 + .48 - P(E_3 \,\&\, E_4)$
$= .64 + .48 - .36 = .76$

27. What NCAA college basketball conferences have the higher probability of having a team play in college basketball's national championship game? Over the last 20 years, the Atlantic Coast Conference (ACC) ranks first by having a team in the championship game 10 times. The Southeastern Conference (SEC) ranks second by having a team in the championship game 8 times. However, these two conferences have both had teams in the championship game only one time, when Arkansas (SEC) beat Duke (ACC) 76–70 in 1994 (NCAA website, April 2009). Use these data to estimate the following probabilities.

a. What is the probability the ACC will have a team in the championship game?
b. What is the probability the SEC will have team in the championship game?
c. What is the probability the ACC and SEC will both have teams in the championship game?
d. What is the probability at least one team from these two conferences will be in the championship game? That is, what is the probability a team from the ACC or SEC will play in the championship game?
e. What is the probability that the championship game will not a have team from one of these two conferences?

27. Total 20

ACC = 10

SEC = 8

Both $ACC \cap SEC = 1$

a) $P(ACC) = \frac{10}{20} = .5$

b) $P(SEC) = \frac{8}{20} = .4$

c) $P(ACC \cap SEC) = \frac{1}{20} = 0.05$

d) $P(ACC \cup SEC) = P(ACC) + P(SEC) - P(ACC \cap SEC)$

$= .5 + .4 - .005$

$= .85$

e) P(champin game will not have one of ACC or SEC) team

= Compliment of $P(ACC \cup SEC)$

$= 1 - P(ACC \cup SEC)$

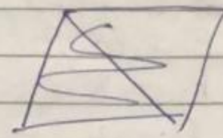
$= 1 - .85 = .15$

28. A survey of magazine subscribers showed that 45.8% rented a car during the past 12 months for business reasons, 54% rented a car during the past 12 months for personal reasons, and 30% rented a car during the past 12 months for both business and personal reasons.
    a. What is the probability that a subscriber rented a car during the past 12 months for business or personal reasons?
    b. What is the probability that a subscriber did not rent a car during the past 12 months for either business or personal reasons?

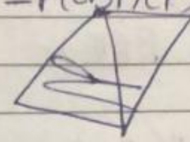
28) $CB = 45.8$

$CP = 54\%$

$CB \cap CP = 30\%$

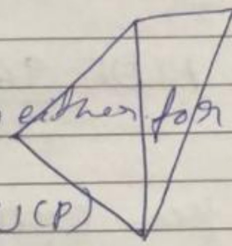


a) $P(CB \cup CP) = P(CB) + P(CP) - P(CB \cap CP)$



$= .45 + .54 - .30$

$= .69$



b) P(subscriber did not rent for either for personal or business)

= P(compliment of P(CB∪CP)

$= 1 - P(CB \cup CP)$

$= 1 - .69 = .31$

29. High school seniors with strong academic records apply to the nation's most selective colleges in greater numbers each year. Because the number of slots remains relatively stable, some colleges reject more early applicants. The University of Pennsylvania received 2851 applications for early admission. Of this group, it admitted 1033 students early, rejected 854 outright, and deferred 964 to the regular admission pool for further consideration. In the past, Penn has admitted 18% of the deferred early admission applicants during the regular admission process. Counting the students admitted early and the students admitted during the regular admission process, the total class size was 2375 (*USA Today*, January 24, 2001). Let E, R, and D represent the events that a student who applies for early admission is admitted early, rejected outright, or deferred to the regular admissions pool.
    a. Use the data to estimate $P(E)$, $P(R)$, and $P(D)$.
    b. Are events E and D mutually exclusive? Find $P(E \cap D)$.

c. For the 2375 students admitted to Penn, what is the probability that a randomly selected student was accepted during early admission?

d. Suppose a student applies to Penn for early admission. What is the probability the student will be admitted for early admission or be deferred and later admitted during the regular admission process?

29) A = 2851
E = 1033
R = 854
D = 964

a) $P(E) = \frac{1033}{2851} = .36$

$P(R) = \frac{854}{2851} = .299$

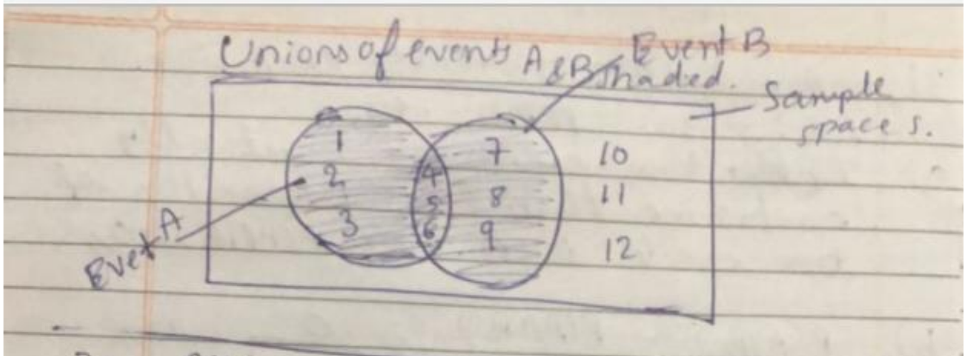
$P(D) = \frac{964}{2851} = .338$

b) yes event early admitted and deferred are mutually exclusive.
$P(E \cap D) = 0$

c) TA = 2375
E = 1033
$P(\text{early admitted}) = \frac{1033}{2375} = .43$

d) $P(E) = 1033 = .36$
~~P(D) = 964~~ $P(\text{~~Deferred~~ Deferred \& late admitted}) = .18$ given

~~$P(E) \cup P(DA) = P(E) + P(DA) - (P(E \cap DA))$~~
$= P(B) + P(DA) - P(B \cap DA)$
$= P(B) + P(DA) - 0 = .36 + .18 = .54$



Methods

30. Suppose that we have two events, A and B, with $P(A) = .50$, $P(B) = .60$, and $P(A \cap B) = .40$.
    a. Find $P(A \mid B)$.
    b. Find $P(B \mid A)$.
    c. Are A and B independent? Why or why not?

30 $P(A) = .50$, $P(B) = .60$, $P(A \cap B) = .40$

a) $P(A/B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{.40}{.60} = .66$

b) $P(B/A) = \dfrac{P(A \cap B)}{P(A)} = \dfrac{.4}{.50} = .8$

c) No A and B are not independent because $P(A|B) \neq P(A)$ i.e Probability of A is altered by the accurance of ~~pro~~ B. And $P(B|A) \neq P(B)$ which is also altered by accourence of event A.

31. Assume that we have two events, A and B, that are mutually exclusive. Assume further that we know $P(A) = .30$ and $P(B) = .40$.

a. What is $P(A \cap B)$?

b. What is $P(A \mid B)$?

c. A student in statistics argues that the concepts of mutually exclusive events and independent events are really the same, and that if events are mutually exclusive they must be independent. Do you agree with this statement? Use the probability information in this problem to justify your answer.

d. What general conclusion would you make about mutually exclusive and independent events given the results of this problem?

3), A and B are mutually exclussive.
$P(A) = .30 \quad P(B) = .40$.

a) If the two events are mutually exclussive then the intersection of two event is 0. i.e. $P(A \cap B) = 0$ //

b) $P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{.40} = 0$ //

i.e In mutually exclussive events, if the one event occurs then the probability of occurrence of other even gets reduced to zero//

c) No, mutually exclussive events and independant events are not the ~~no~~ same. In case of mutually exclussi-ve events if one event accurce then it makes the probability of occurrence of other unit to zero. And two events are said to be independant events if ~~there is~~ one event occurs then it should not make any changes in the ~~occ~~ probability of occurrence of the other event.

d) General conclusion mutually exclusive and independent events are not the same//

32. The automobile industry sold 657,000 vehicles in the United States during January 2009 (*The Wall Street Journal,* February 4, 2009). This volume was down 37% from January 2008 as economic conditions continued to decline. The Big Three U.S. automakers—General Motors, Ford, and Chrysler—sold 280,500 vehicles, down 48% from January 2008. A summary of sales by automobile manufacturer and type of vehicle sold is shown in the following table. Data are in thousands of vehicles. The non-U.S. manufacturers are led by Toyota, Honda, and Nissan. The category Light Truck includes pickup, minivan, SUV, and crossover models.

		Type of Vehicle	
		Car	**Light Truck**
Manufacturer	**U.S.**	87.4	193.1
	Non-U.S.	228.5	148.0

a. Develop a joint probability table for these data and use the table to answer the remaining questions.
b. What are the marginal probabilities? What do they tell you about the probabilities associated with the manufacturer and the type of vehicle sold?
c. If a vehicle was manufactured by one of the U.S. automakers, what is the probability that the vehicle was a car? What is the probability it was a light truck?
d. If a vehicle was not manufactured by one of the U.S. automakers, what is the probability that the vehicle was a car? What is the probability it was a light truck?
e. If the vehicle was a light truck, what is the probability that it was manufactured by one of the U.S. automakers?
f. What does the probability information tell you about sales?

32.

~~a)~~

	Type of vehicles car	Light truck	
U.S	87.4	193.1	280.5
Non-US	228.5	148.0	376.5
	315.9	341.1.	657

a) Joint probability Table.

	car	light truck	
US	0.133	.293	.426
NONUS	.347	.225	.5730
	.480	.519	

$P(US \cap Car) = \frac{87.4}{657} = 0.133$

$P(US \cap truck) = \frac{193.1}{657} = .293$

$P(Non \cap Car) = \frac{228.5}{657} = .347$

$P(Non \cap truck) = \frac{148}{657} = .225$

32

b). Marginal probabilities are the probabilities calculated for the margin values. It tells us that.

* total 48% of the vechiles were car
* total 52% of the vechiles were truck.
* US sold 42.6% of vechiles
* Non US sold 57.4% of vechles.

c) ~~If the~~

Probability of ~~car~~ being car given that manufacturer is US $= \frac{87.4}{280.5} = .31$

$$P(C/US) = \frac{P(US \cap car)}{P(US)} = \frac{0.133}{.426} = .312$$

$$P(truck/US) = \frac{P(US \cap truck)}{P(US)} = \frac{.293}{.426} = .687$$

d) $$P(car/nonUS) = \frac{P(NonUS \cap car)}{P(nonUS)} = \frac{.347}{.5730} = .605$$

$$P(truck/nonUS) = \frac{P(nonUS \cap truck)}{P(nonUS)} = \frac{.225}{.5730} = .39$$

e) $P(US/truck) = \frac{P(US \cap truck)}{P(truck)} = \frac{.293}{\cancel{.341}\ .519}$

$= .564$

f).

* ~~Vechiles manufactured by US has~~
* US mafactures 31.3% ~~of~~ vechiles as car and 68.7% of vechiles as ~~light~~ light truck
* Non US manufacturers manufactures 60.5% of vechiles as car and 39.5% vechiles as light truck.
* overall 42.6% of the vechiles are manufactured by US.
* overall 57.4% of the vechiles are manufactured by Non-US.
* overall 48% of the vechiles manufactured are of type car and 52% of the vechiles manufactured are of type light truck.

33. In a survey of MBA students, the following data were obtained on "students' first reason for application to the school in which they matriculated."

		Reason for Application			
		School Quality	School Cost or Convenience	Other	Totals
Enrollment Status	Full Time	421	393	76	890
	Part Time	400	593	46	1039
	Totals	821	986	122	1929

a. Develop a joint probability table for these data.
b. Use the marginal probabilities of school quality, school cost or convenience, and other to comment on the most important reason for choosing a school.

c. If a student goes full time, what is the probability that school quality is the first reason for choosing a school?
d. If a student goes part time, what is the probability that school quality is the first reason for choosing a school?
e. Let *A* denote the event that a student is full time and let *B* denote the event that the student lists school quality as the first reason for applying. Are events *A* and *B* independent? Justify your answer.

33.

	SQ	SCC	O	Total
FT	421	393	76	890
PT	400	593	46	1039
Tot	821	986	122	1929

$P(FT \cap SQ) = \frac{421}{1929} = .218$ $P(PT \cap SQ) = \frac{400}{1929} = .207$

$P(FT \cap SCC) = \frac{393}{1929} = .203$ $P(PT \cap SCC) = \frac{593}{1929} = .307$

$P(FT \cap O) = \frac{76}{1929} = .039$ $P(PT \cap O) = \frac{46}{1929} = .023$

$P(FT) = \frac{890}{1929} = .461$ $P(PT) = \frac{1034}{1929} = .539$

$P(SQ) = \frac{821}{1929} = .425$ $P(SCC) = \frac{986}{1929} = .511$

$P(O) = \frac{122}{1929} = .063$

Joint probability table

	SQ	SCC	O	total
FT	.218	.203	.039	.461
PT	.207	.307	.023	.5389
Total	.425	.511	.063	1

b) $P(SQ) = .425$ $P(SCC) = .511$ $P(O) = .063$

42.5% of ~~students~~. the reason for student to chose the school is its quality

51.1% reason is due to S cost & convinience

6% reason is due to other reason.

c) $P(SQ/FT) = \frac{P(SQ \cap FT)}{P(FT)} = \frac{.218}{.461} = .472$

d) $P(SQ/PT) = \frac{P(SQ \cap PT)}{P(PT)} = \frac{.207}{.539} = .384$

e) $A = FT.$

$B = SQ.$

$P(A) = P(FT) = .461$

$P(B) = P(SQ) = .425$

$P(FT/SQ) = \frac{P(FT \cap SQ)}{P(SQ)} = \frac{.218}{.425} = .5127$ $P(FT) = .461$

$P(SQ/FT) = .472 \neq P(SQ) = .425$

Since there is a alteration in the probability of one event due to the occurence of another event hence A & B are not independent event

34. The U.S. Department of Transportation reported that during November, 83.4% of Southwest Airlines' flights, 75.1% of US Airways' flights, and 70.1% of JetBlue's flights arrived on time (*USA Today,* January 4, 2007). Assume that this on-time performance is applicable for flights arriving at concourse A of the Rochester International Airport, and that 40% of the arrivals at concourse A are Southwest Airlines flights, 35% are US Airways flights, and 25% are JetBlue flights.

   a. Develop a joint probability table with three rows (airlines) and two columns (on-time arrivals vs. late arrivals).
   b. An announcement has just been made that Flight 1424 will be arriving at gate 20 in concourse A. What is the most likely airline for this arrival?
   c. What is the probability that Flight 1424 will arrive on time?
   d. Suppose that an announcement is made saying that Flight 1424 will be arriving late. What is the most likely airline for this arrival? What is the least likely airline?

34.

	OT	LT	% Airlines
SW	.834	.166	.40
US	.751	.249	.35
JB	.701	.299	.25

Considering the OT arrivals are occuring at Concourse A.

	OT	LT	
SW	.3336	0.066	.40
US	.2629	.087	.35
JB	.1752	.074	.25
	.7718	.2284	1

$P(SW \cap OT) = .834 \times .40 = .3336$

$P(SW \cap LT) = .166 \times .40 = .066$

$P(US \cap OT) = .751 \times .35 = .2629$

$P(US \cap LT) = .249 \times .35 = .087$

$P(JB \cap OT) = .701 \times .25 = .1752$

$P(JB \cap LT) = .299 \times .25 = .074$

b) SW is the most likely airline which has the highest row total.

c) $P(OT) = .7718$

d) US air lines has highest late arrival possibility. SW is the lowest late arrival possibility.

35. According to the Ameriprise Financial Money Across Generations study, 9 out of 10 parents with adult children ages 20 to 35 have helped their adult children with some type of financial assistance ranging from college, a car, rent, utilities, credit-card debt, and/or down payments for houses (*Money,* January 2009). The following table with sample data consistent with the study shows the number of times parents have given their adult children financial assistance to buy a car and to pay rent.

		Pay Rent	
		Yes	**No**
Buy a Car	**Yes**	56	52
	No	14	78

a. Develop a joint probability table and use it to answer the remaining questions.
b. Using the marginal probabilities for buy a car and pay rent, are parents more likely to assist their adult children with buying a car or paying rent? What is your interpretation of the marginal probabilities?
c. If parents provided financial assistance to buy a car, what it the probability that the parents assisted with paying rent?
d. If parents did not provide financial assistance to buy a car, what is the probability the parents assisted with paying rent?
e. Is financial assistance to buy a car independent of financial assistance to pay rent? Use probabilities to justify your answer.
f. What is the probability that parents provided financial assistance for their adult children by either helping buy a car or pay rent?

35.

	YR	NR	
YC	56	52	108
NC	14	78	92
	70	130	200.

a) Joint probability table

	YR	NR	Tot
YC	.28	.52	.54
NC	.07	.39	.46
	.35	.65	1

a

$P(YC \cap YR) = \frac{56}{200} = .28$ $\quad P(YR) = \frac{70}{200} = .35$

$P(YC \cap NR) = \frac{52}{200} = .52$ $\quad P(NR) = \frac{130}{200} = .65$

$P(NC \cap YR) = \frac{14}{200} = 0.07$

$P(NC \cap NR) = \frac{78}{200} = .39$

$P(YC) = \frac{108}{200} = .54$

$P(NC) = \frac{92}{200} = .46$

b) 54 % of times parents have assisted thier children in buying a car. And ~~5R~~ for 35% of times parent have assited their children in ~~buying~~ paying Rent.

c) $P(YR/YC) = \frac{P(YR \cap YC)}{P(YC)} = \frac{.28}{.54} = .5184$

d) $P(YR/NC) = \frac{P(YR \cap NC)}{P(NC)} = \frac{.07}{.46} = .1524$

e) $P(YC/YR) = \frac{P(YR \cap YC)}{P(YR)} = \frac{.28}{.35} = .8$

$P(YC) = .54$. $P(YC/YR) = .8 \neq P(YC)$

Financial assistance to buy a car is not independent of financial assistance to pay a rent as paying rent has influence on probability of buying a car as well.

f) $P(YC \cup YR) = P(YC) + P(YR) - P(YC \cap YR)$

$= .54 + .07 - .28$

$= .33$

36. Jerry Stackhouse of the National Basketball Association's Dallas Mavericks is the best free-throw shooter on the team, making 89% of his shots (ESPN website, July, 2008). Assume that late in a basketball game, Jerry Stackhouse is fouled and is awarded two shots.

   a. What is the probability that he will make both shots?
   b. What is the probability that he will make at least one shot?
   c. What is the probability that he will miss both shots?

d. Late in a basketball game, a team often intentionally fouls an opposing player in order to stop the game clock. The usual strategy is to intentionally foul the other team's worst free-throw shooter. Assume that the Dallas Mavericks' center makes 58% of his free-throw shots. Calculate the probabilities for the center as shown in parts (a), (b), and (c), and show that intentionally fouling the Dallas Mavericks' center is a better strategy than intentionally fouling Jerry Stackhouse.

26 Probability one shot = 89%
probability of first shot = 89%
probability of second shot = 89%

a) ~~As per~~ probability of multiple step assignment.
~~As per~~ probability of both shots = .89 × .89
= .7921

b) Probability of at least one shot

P(shot 1 ∪ shot 2) = P(shot 1) + P(shot 2) − P(both shot)
= .89 + .89 − .7921
= .9879

~~c) Probability of (he will miss both shot)~~
~~= compliment of probability of both shots.~~
~~= 1 − .7921~~
~~= .2079~~

c) Probability of 1st no shot = 1 − P(one shot)
= 1 − .89
= .11
Probability of 2nd not shot = 1 − P(one shot)
= 1 − .89 = .11
Probability of (both no shot) = .11 × .11 = .0121

a) · probability of one shot by Dallas $= .58$

probability of 1st shot $= .58$

probability of 2nd shot $= .58$

As per the probability assignment of multiple steps $= n_1 \times n_2$ $P(\text{both shot}) = .58 \times .58 = .3364$

b) $P(1^{st}\text{ shot}) \cup P(2^{nd}\text{ shot}) = P(1\text{ shot}) + P(2\text{ shot}) - P(\text{both shot})$

$= .58 + .58 - .3364 = .8236$

c) 1^{st} No shot $= 1 - .58 = .42$

2^{nd} No shot $= .42$

$P(\text{Both No shot}) = n_1 \times n_2 = .42 \times .42 = .1764$

37. Visa Card USA studied how frequently young consumers, ages 18 to 24, use plastic (debit and credit) cards in making purchases (Associated Press, January 16, 2006). The results of the study provided the following probabilities.
 - The probability that a consumer uses a plastic card when making a purchase is .37.
 - Given that the consumer uses a plastic card, there is a .19 probability that the consumer is 18 to 24 years old.
 - Given that the consumer uses a plastic card, there is a .81 probability that the consumer is more than 24 years old.

 U.S. Census Bureau data show that 14% of the consumer population is 18 to 24 years old.
 a. Given the consumer is 18 to 24 years old, what is the probability that the consumer use a plastic card?
 b. Given the consumer is over 24 years old, what is the probability that the consumer uses a plastic card?
 c. What is the interpretation of the probabilities shown in parts (a) and (b)?
 d. Should companies such as Visa, MasterCard, and Discover make plastic cards available to the 18 to 24 year old age group before these consumers have had time to establish a credit history? If no, why? If yes, what restrictions might the companies place on this age group?

37 $P(\text{card}) = .37$

$P(18\text{–}24)|\text{card} = .19$

$P(>24)/\text{card} = .81$

$P(18\text{–}24) = .14$

a) $P(18\text{–}24)|\text{card} = \dfrac{P(18\text{–}24) \cap P(\text{card})}{P(\text{card})}$

$\therefore P(18-24) \cap P(\text{card}) = P(\text{card}) \times P(18-24)/\text{card}$

$= .37 \times .19 = .0703$

$P(\text{card}/18\text{–}24) = \dfrac{P(18\text{–}24) \cap P(\text{card})}{P(18\text{–}24)} = \dfrac{.0703}{.14} = .5021$

b) $P(>24/\text{card}) = \dfrac{P(>24) \cap P(\text{card})}{P(\text{card})}$

$\therefore P(>24) \cap P(\text{card}) = P(>24/\text{card}) \times P\text{card}$

$= .81 \times .37 = .2997$

$P(\text{card}/>24) = \dfrac{P(\text{card} \cap P(>24))}{P(>24)} = \dfrac{.2997}{1-.14} = \dfrac{.2997}{.86} = .348$

c ~~P(card)~~ 50.21% of 18 to 24 years old consumers uses plastic cards for the purchase 34.8% of >24 years old consumers uses plastic card for the purchase.

d). Yes. you should restrict the amount of the monthly payment that can be made using the plastic card and not allow them make the payment until the amount of the previous month paid.

38. A Morgan Stanley Consumer Research Survey sampled men and women and asked each whether they preferred to drink plain bottled water or a sports drink such as Gatorade or Propel Fitness water (*The Atlanta Journal-Constitution*, December 28, 2005). Suppose 200 men and 200 women participated in the study, and 280 reported they preferred plain bottled water. Of the group preferring a sports drink, 80 were men and 40 were women.

Let

M = the event the consumer is a man
W = the event the consumer is a woman
B = the event the consumer preferred plain bottled water
S = the event the consumer preferred sports drink

a. What is the probability a person in the study preferred plain bottled water?
b. What is the probability a person in the study preferred a sports drink?
c. What are the conditional probabilities $P(M \mid S)$ and $P(W \mid S)$?
d. What are the joint probabilities $P(M \cap S)$ and $P(W \cap S)$?
e. Given a consumer is a man, what is the probability he will prefer a sports drink?
f. Given a consumer is a woman, what is the probability she will prefer a sports drink?
g. Is preference for a sports drink independent of whether the consumer is a man or a woman? Explain using probability information.

38. $n_1 = 200$ $n_2 = 200$

$P(\text{plain } w) = \frac{280}{400}$

$P(\text{spotted}) = \frac{120}{400}$

$P(\text{men/spart}) = 80/120$

$P(\text{woman/spart}) = 40/120$

a) $P(\text{plain } B) = \frac{280}{400} = .7$

b) $P(\text{sparted } S) = \frac{80+40}{400} = \frac{120}{400} = .3$

c) $P(\text{me/spart}) = \frac{80}{120} = .66$

~~d)~~ $P(W/\text{spart}) = \frac{40}{120} = .33$

d) $P(M \cap S)$ $P(W \cap S)$

$P(M/S) = \frac{P(M \cap S)}{P(S)} =$

$\therefore P(M \cap S) = P(M/S) \times P(S) = .66 \times .3 =$

$P(W/S) = \frac{P(W \cap S)}{P(S)} =$

$\therefore P(W \cap S) = P(W/S) \times P(S) = .33 \times .3 = 0.0$

e) $P(S/M) = \dfrac{P(S \cap M)}{P(M)} =$

$P(M) = \dfrac{200}{400} = .5$

$P(W) = \dfrac{200}{400} = .5$

$P(S/M) = \dfrac{.198}{.5} = .396$

$P(S/W) = \dfrac{P(S \cap W)}{P(W)} = \dfrac{.099}{.5} = .198$

g) No sport drinks are not independent of weather the consumer is man or women. Because probability of sport drink increase given if the consumer is man and it decreases if the consumer is women.