Virtual Lab #1

FUNDAMENTAL STATISTICAL CONCEPTS AND PROBABILITY

Problem #1

The United States Department of Transportation wants to estimate the number of **all** flights that arrived on-time to their destination over the last week. All large airlines have to report complete reports of daily flights to the DOT. Smaller airlines do not have to report the detail of information. The DOT estimated that 82% of all flights arrived on time.

Is this number a parameter or a statistic?

Problem #1

The United States Department of Transportation wants to estimate the number of **all** flights that arrived on-time to their destination over the last week. All large airlines have to report complete reports of daily flights to the DOT. Smaller airlines do not have to report the detail of information. The DOT estimated that 82% of all flights arrived on time.

Is this number a parameter or a statistic?

STATISTIC

Problem #2

The United States Department of Transportation wants to estimate the number of **all** flights that arrived on-time to their destination over the last week. All large airlines have to report complete reports of daily flights to the DOT. Smaller airlines do not have to report the detail of information. The DOT estimated that 82% of all flights arrived on time.

Is there any potential for selection or sampling bias in this study by the DOT?

Problem #2

The United States Department of Transportation wants to estimate the number of **all** flights that arrived on-time to their destination over the last week. All large airlines have to report complete reports of daily flights to the DOT. Smaller airlines do not have to report the detail of information. The DOT estimated that 82% of all flights arrived on time.

Is there any potential for selection or sampling bias in this study by the DOT?

YES. THERE IS A SELECTION BIAS (OR MORE SPECIFICALLY, UNDERCOVERAGE (WILL NOT HAVE ALL INFORMATION ON THE SMALLER AIRLINES)

Problem #3

A research firm wanted to estimate the proportion of Americans that have 3 or more televisions in their home. After sampling 1568 households throughout the United States, the estimate of the proportion is 15%.

Is this number a parameter or a statistic?

Problem #3

A research firm wanted to estimate the proportion of Americans that have 3 or more televisions in their home. After sampling 1568 households throughout the United States, the estimate of the proportion is 15%.

Is this number a parameter or a statistic?

STATISTIC

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line.

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service.

Calculated the average age of employees at a company from sampling a company database.

Manager evaluates a new company policy by asking the morning shift employees the next morning.

Survey company collected information about family income by mailing a survey and see who responds.

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service.

Calculated the average age of employees at a company from sampling a company database.

Manager evaluates a new company policy by asking the morning shift employees the next morning.

Survey company collected information about family income by mailing a survey and see who responds.

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service. **STRATIFIED RANDOM SAMPLE**

Calculated the average age of employees at a company from sampling a company database.

Manager evaluates a new company policy by asking the morning shift employees the next morning.

Survey company collected information about family income by mailing a survey and see who responds.

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service. **STRATIFIED RANDOM SAMPLE**

Calculated the average age of employees at a company from sampling a company database.

SIMPLE RANDOM SAMPLE

Manager evaluates a new company policy by asking the morning shift employees the next morning.

Survey company collected information about family income by mailing a survey and see who responds.

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service. **STRATIFIED RANDOM SAMPLE**

Calculated the average age of employees at a company from sampling a company database.

SIMPLE RANDOM SAMPLE

Manager evaluates a new company policy by asking the morning shift employees the next morning.

CONVENIENCE SAMPLE

Survey company collected information about family income by mailing a survey and see who responds.

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service. **STRATIFIED RANDOM SAMPLE**

Calculated the average age of employees at a company from sampling a company database.

SIMPLE RANDOM SAMPLE

Manager evaluates a new company policy by asking the morning shift employees the next morning.

CONVENIENCE SAMPLE

Survey company collected information about family income by mailing a survey and see who responds. **VOLUNTARY RESPONSE SAMPLE**

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states.

Problem #4

What type of sampling was probably used for each of the following situations?

An airline manufacturer tests the quality of every hundredth engine off the line. **SYSTEMATIC**

Audit a random sample from each of six tax-brackets determined by the Internal Revenue Service. **STRATIFIED RANDOM SAMPLE**

Calculated the average age of employees at a company from sampling a company database.

SIMPLE RANDOM SAMPLE

Manager evaluates a new company policy by asking the morning shift employees the next morning.

CONVENIENCE SAMPLE

Survey company collected information about family income by mailing a survey and see who responds. **VOLUNTARY RESPONSE SAMPLE**

Trying to estimate daily sales of a product from stores nationwide. Randomly selected 5 states - FL, AZ, NC, TX, ME and obtained estimates of daily sales from all stores in these states. **CLUSTER**

Problem #5

Explain the difference between stratified and cluster sampling.

Problem #5

Explain the difference between stratified and cluster sampling.

IN STRATIFIED RANDOM SAMPLING, EACH GROUP HAS A RANDOM SAMPLE OF UNITS IN THE SELECTED SAMPLE. IN CLUSTER SAMPLING, ONLY A SAMPLE OF GROUPS ARE REPRESENTED IN THE SELECTED SAMPLE.

ALSO, IN STRATIFIED RANDOM SAMPLING, A SAMPLE IS SELECTED FROM EACH GROUP. IN CLUSTER SAMPLING, ONCE A GROUP IS SELECTED, ALL UNITS WITHIN THAT GROUP ARE SELECTED FOR THE SAMPLE.

Problem #6

Explain one of the potential advantages of stratified sampling compared to simple random sampling.

Problem #6

Explain one of the potential advantages of stratified sampling compared to simple random sampling.

IF THERE IS A GROUP OF INTEREST BUT IS RELATIVELY SMALL, YOU WOULD NEED A LARGE SRS IN ORDER TO GET ENOUGH UNITS TO MAKE INFERENCE ON THIS GROUP OF INTEREST. HOWEVER, IN STRATIFIED RANDOM SAMPLING, WE CAN OVERSAMPLE FROM THIS GROUP AND GET SAME PRECISION AS SRS BUT WITH A SMALLER SAMPLE.

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory.

Sales Region

Blood pressure of patients after taking an experimental drug

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder.

Stock price for Microsoft

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region

Blood pressure of patients after taking an experimental drug

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder.

Stock price for Microsoft

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder.

Stock price for Microsoft

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region　　**QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug　**QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder.

Stock price for Microsoft

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug   **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug   **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft   **QUANTITATIVE**

Revenues by software company

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug   **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft   **QUANTITATIVE**

Revenues by software company   **QUANTITATIVE**

Breed of dog

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft **QUANTITATIVE**

Revenues by software company **QUANTITATIVE**

Breed of dog **QUALITATIVE (NOMINAL)**

Length of trip of cruise ships (measured in days) for a cruise line company

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug   **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft   **QUANTITATIVE**

Revenues by software company   **QUANTITATIVE**

Breed of dog **QUALITATIVE (NOMINAL)**

Length of trip of cruise ships (measured in days) for a cruise line company   **QUANTITATIVE**

ZIP code of customer

Problem #7

For each of the following, indicate whether the data are quantitative or qualitative.

Responses to survey measured on the Likert scale. The Likert scale is 1-5 with 1 being exceptional, 2 being very good, 3 being good, 4 being satisfactory, and 5 being unsatisfactory. **QUALITATIVE (ORDINAL)**

Sales Region   **QUALITATIVE (NOMINAL)**

Blood pressure of patients after taking an experimental drug   **QUANTITATIVE**

Size of engine in car measured as 4 cylinder, 6 cylinder, or 8 cylinder. **QUALITATIVE (ORDINAL)**

Stock price for Microsoft   **QUANTITATIVE**

Revenues by software company   **QUANTITATIVE**

Breed of dog **QUALITATIVE (NOMINAL)**

Length of trip of cruise ships (measured in days) for a cruise line company   **QUANTITATIVE**

ZIP code of customer **QUALITATIVE (NOMINAL)**

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year

GPA of all students in the fall semester of 2011

Number of customers entering a bank on March 25

Yearly GDP for the United States since 1983

Your GPA per semester over your college career

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year   **Cross-sectional**

GPA of all students in the fall semester of 2011

Number of customers entering a bank on March 25

Yearly GDP for the United States since 1983

Your GPA per semester over your college career

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year   **Cross-sectional**

GPA of all students in the fall semester of 2011   **Cross-sectional**

Number of customers entering a bank on March 25

Yearly GDP for the United States since 1983

Your GPA per semester over your college career

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year   **Cross-sectional**

GPA of all students in the fall semester of 2011   **Cross-sectional**

Number of customers entering a bank on March 25   **Cross-sectional**

Yearly GDP for the United States since 1983

Your GPA per semester over your college career

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year   **Cross-sectional**

GPA of all students in the fall semester of 2011   **Cross-sectional**

Number of customers entering a bank on March 25   **Cross-sectional**

Yearly GDP for the United States since 1983 **Time-Series**

Your GPA per semester over your college career

Problem #8

Indicate whether each of the following is cross-sectional or time-series.

Your income last year   **Cross-sectional**

GPA of all students in the fall semester of 2011   **Cross-sectional**

Number of customers entering a bank on March 25   **Cross-sectional**

Yearly GDP for the United States since 1983 **Time-Series**

Your GPA per semester over your college career   **Time-Series**

Problem #9

Number of Credit Cards Per Age Group

	Age Group				
Credit Cards	20 − 29	30 − 39	40 − 49	50+	**Total**
0	56	24	33	97	**210**
1 − 2	182	273	187	387	**1029**
3 − 4	147	358	413	212	**1130**
5 − 6	65	195	154	157	**571**
7 − 8	32	101	98	88	**319**
9+	10	67	123	11	**211**
Total	**492**	**1018**	**1008**	**952**	**3470**

1. Person is between the age of 20-29 **and** owns 3-4 credit cards

2. Person is between the age of 20-29 or owns 3-4 credit cards

Problem #9

Number of Credit Cards Per Age Group

Credit Cards	Age Group				
	20 − 29	30 − 39	40 − 49	50+	**Total**
0	56	24	33	97	**210**
1 − 2	182	273	187	387	**1029**
3 − 4	147	358	413	212	**1130**
5 − 6	65	195	154	157	**571**
7 − 8	32	101	98	88	**319**
9+	10	67	123	11	**211**
Total	492	**1018**	**1008**	**952**	**3470**

1. Person is between the age of 20-29 **and** owns 3-4 credit cards

   147/3470 = 0.042 OR 4.2%

2. Person is between the age of 20-29 or owns 3-4 credit cards

   492/3470 + 1130/3470 – 147/3470 = /3470=0.425 OR 42.5%

Problem #9

Number of Credit Cards Per Age Group

Credit Cards	Age Group				
	$20-29$	$30-39$	$40-49$	$50+$	**Total**
0	56	24	33	97	**210**
$1-2$	182	273	187	387	**1029**
$3-4$	147	358	413	212	**1130**
$5-6$	65	195	154	157	**571**
$7-8$	32	101	98	88	**319**
$9+$	10	67	123	11	**211**
Total	**492**	**1018**	**1008**	**952**	**3470**

3. Person owns 5-6 credit cards

4. Person owns at least one credit card

Problem #9

Number of Credit Cards Per Age Group

Credit Cards	20 − 29	30 − 39	40 − 49	50+	Total
0	56	24	33	97	210
1 − 2	182	273	187	387	1029
3 − 4	147	358	413	212	1130
5 − 6	65	195	154	157	571
7 − 8	32	101	98	88	319
9+	10	67	123	11	211
Total	492	1018	1008	952	3470

3. Person owns 5-6 credit cards

571/3470= 0.165 OR 16.5%

4. Person owns at least one credit card

1-210/3470= 0.939 OR 93.9%

Problem #9

Number of Credit Cards Per Age Group

| | Age Group | | | | |
Credit Cards	20 − 29	30 − 39	40 − 49	50+	Total
0	56	24	33	97	210
1 − 2	182	273	187	387	1029
3 − 4	147	358	413	212	1130
5 − 6	65	195	154	157	571
7 − 8	32	101	98	88	319
9+	10	67	123	11	211
Total	492	1018	1008	952	3470

5. Person owns 1-2 credit cards given they are between the age of 30-39

6. Person is above the age of 40 given they own 9 or more credit cards

Problem #9

Number of Credit Cards Per Age Group

Credit Cards	Age Group				Total
	20 − 29	30 − 39	40 − 49	50+	
0	56	24	33	97	**210**
1 − 2	182	273	187	387	**1029**
3 − 4	147	358	413	212	**1130**
5 − 6	65	195	154	157	**571**
7 − 8	32	101	98	88	**319**
9+	10	67	123	11	**211**
Total	**492**	**1018**	**1008**	**952**	**3470**

5. Person owns 1-2 credit cards given they are between the age of 30-39

273/1018 = 0.268 OR 26.8%

6. Person is above the age of 40 given they own 9 or more credit cards

(123+11)/211 = 0.635 OR 63.5%

Problem #10

Over the last 360 days of winter in Raleigh, NC (5 winters) we have had snow on 24 days. What is the probability that we will have snow on any random winter day this year?

Problem #10

Over the last 360 days of winter in Raleigh, NC (5 winters) we have had snow on 24 days. What is the probability that we will have snow on any random winter day this year?

24/360 = 0.0667

Problem #11

For an airline many times small cities have limited flights that go into their airports. To get a flight to Columbia, SC you must go through one of three cities Raleigh, NC, Atlanta, GA, or Charlotte, NC. Two customers from Orlando, FL are trying to get to Columbia, SC with only one stop (one of the three above mentioned cities). Assume that they are equally likely to go through any of the above cities.

What is the probability neither of the customers fly through Charlotte, NC?

Problem #11

For an airline many times small cities have limited flights that go into their airports. To get a flight to Columbia, SC you must go through one of three cities Raleigh, NC, Atlanta, GA, or Charlotte, NC. Two customers from Orlando, FL are trying to get to Columbia, SC with only one stop (one of the three above mentioned cities). Assume that they are equally likely to go through any of the above cities.

What is the probability neither of the customers fly through Charlotte, NC?

(2/3)*(2/3) = 4/9 = 0.4444

Problem #12

For an airline many times small cities have limited flights that go into their airports. To get a flight to Columbia, SC you must go through one of three cities Raleigh, NC, Atlanta, GA, or Charlotte, NC. Two customers from Orlando, FL are trying to get to Columbia, SC with only one stop (one of the three above mentioned cities). Assume that they are equally likely to go through any of the above cities.

What is the probability one of the customers fly through Charlotte, NC while the other customer doesn't fly through Charlotte, NC?

Problem #12

For an airline many times small cities have limited flights that go into their airports. To get a flight to Columbia, SC you must go through one of three cities Raleigh, NC, Atlanta, GA, or Charlotte, NC. Two customers from Orlando, FL are trying to get to Columbia, SC with only one stop (one of the three above mentioned cities). Assume that they are equally likely to go through any of the above cities.

What is the probability one of the customers fly through Charlotte, NC while the other customer doesn't fly through Charlotte, NC?

(1/3)*(2/3) + (2/3)*(1/3) = 4/9 = 0.4444

Problem #13

A steel beam manufacturer collected the following table of information about two different factories and the sizes of beams produced. If beams are either too big or too small, they are not fit for selling.

Factory	Too Big	Correct Size	Too Small
A	25	240	12
B	5	180	16

Based on the data, what is the probability that a beam from either of the two factories will be too small?

Problem #13

A steel beam manufacturer collected the following table of information about two different factories and the sizes of beams produced. If beams are either too big or too small, they are not fit for selling.

Factory	Too Big	Correct Size	Too Small
A	25	240	12
B	5	180	16

Based on the data, what is the probability that a beam from either of the two factories will be too small?

(12+16)/478 = 0.0586

Problem #14

A steel beam manufacturer collected the following table of information about two different factories and the sizes of beams produced. If beams are either too big or too small, they are not fit for selling.

Factory	Too Big	Correct Size	Too Small
A	25	240	12
B	5	180	16

What is the probability that a random beam will come from factory A?

(25+240+12)/478 = 0.5795

Problem #15

A steel beam manufacturer collected the following table of information about two different factories and the sizes of beams produced. If beams are either too big or too small, they are not fit for selling.

Factory	Too Big	Correct Size	Too Small
A	25	240	12
B	5	180	16

For a beam from factory B, what is the probability that it is too big?

Problem #15

A steel beam manufacturer collected the following table of information about two different factories and the sizes of beams produced. If beams are either too big or too small, they are not fit for selling.

Factory	Too Big	Correct Size	Too Small
A	25	240	12
B	5	180	16

For a beam from factory B, what is the probability that it is too big?

5/(5+180+16) = 0.0249

Problem #16

You run a deli mart and have figured out certain patterns for your customers. You have figured out the probabilities that a customer orders lettuce on their sandwich is 0.8, a tomato on their sandwich as 0.75, and cheese on their sandwich as 0.5. Use this information to answer the next two questions.

Assuming that the events are independent, what is the probability that a customer orders a sandwich with lettuce and no tomato?

Problem #16

You run a deli mart and have figured out certain patterns for your customers. You have figured out the probabilities that a customer orders lettuce on their sandwich is 0.8, a tomato on their sandwich as 0.75, and cheese on their sandwich as 0.5. Use this information to answer the next two questions.

Assuming that the events are independent, what is the probability that a customer orders a sandwich with lettuce and no tomato?

0.8*0.25 = 0.2 [This is assuming that lettuce and tomato are INDEPENDENT!]

Problem #17

You run a deli mart and have figured out certain patterns for your customers. You have figured out the probabilities that a customer orders lettuce on their sandwich is 0.8, a tomato on their sandwich as 0.75, and cheese on their sandwich as 0.5. Use this information to answer the next two questions.

You have also determined that the probability that a customer orders cheese on their sandwich after they ordered lettuce on their sandwich is 0.6. What is the probability that a customer orders both cheese and lettuce on a sandwich?

Problem #17

You run a deli mart and have figured out certain patterns for your customers. You have figured out the probabilities that a customer orders lettuce on their sandwich is 0.8, a tomato on their sandwich as 0.75.

You have also determined that the probability that a customer orders cheese on their sandwich after they ordered lettuce on their sandwich is 0.6. What is the probability that a customer orders both cheese and lettuce on a sandwich?

0.8*0.6=0.48 [P(Cheese AND Lettuce) = P(Lettuce)P(Cheese|Lettuce)]

Problem #18

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs.

What is the probability that a customer will not be able to print on a given day?

Problem #18

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs.

What is the probability that a customer will not be able to print on a given day?

0.15*0.15 = 0.0225

Problem #19

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs. Use this to answer the next 3 questions.

What is the probability that all seven computers will be up and running at the same time?

Problem #19

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs. Use this to answer the next 3 questions.

What is the probability that all seven computers will be up and running at the same time?

$(0.85)^2(0.95)^5 = 0.5591$

Problem #20

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs. Use this to answer the next 3 questions.

If the manager wants a 98% chance of having at-least one computer with internet access at all times, is the present configuration sufficient?

Yes

No

Problem #20

A local internet cafe has 5 computers with internet access only and 2 computers with both internet access and printer capabilities. Historically, each computer with only internet access is down for repairs 5% of the time, but each computer with both internet and printer access is down 15% of the time for repairs. Use this to answer the next 3 questions.

If the manager wants a 98% chance of having at-least one computer with internet access at all times, is the present configuration sufficient?

At least one with internet access: 1 – NO Internet access:

$1-(0.15)^2(0.05)^5 \approx 1$....YES