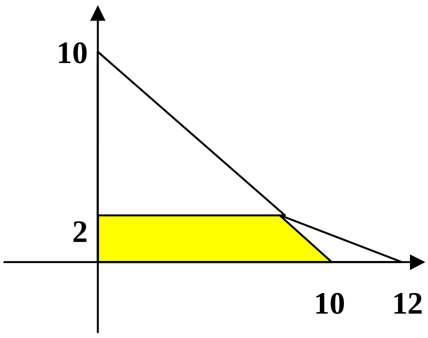
## Math 1313 Course Objectives

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 1.2 | **Slopes, Equations of a line.**<br><br>Example: Find the equation of the line, in point-slope form and slope-intercept form, that passes through (3, 5) and (0,1).<br><br>**Parallel and Perpendicular Lines$_1$.**<br><br>Example: Line $L_1$ passes through (2, 1). The equation for line $L_2$ is $2x + 3y = 5$. Write an equation for line $L_1$, given that line $L_1$ is parallel to line $L_2$.<br><br>Example: Line $L_1$ passes through (2, 1). Line $L_2$ passes through (3, 2) and (5, 1). Write an equation for line $L_1$, given that line $L_1$ is perpendicular to line $L_2$. | 1 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 1.4 | **Linear System of Inequalities**<br><br>Example: Determine the solution set for the following system of linear inequalities.<br>$2x + 4y > 16$<br>$-x + 3y \geq 7$<br><br>Example: Write the system of linear inequalities that describes the shaded region.<br> | 1 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 1.5 | **Linear depreciation**<br><br>Example: A company purchased a car in 2000 for \$13,000. The car is depreciated linearly for 5 years. The scrap value of the car is \$4,000. What is the rate of depreciation? Write the expression that expresses the book value of the car after t years of use. What is the value of the car in 2003?<br><br>**Cost, Revenue, Profit Functions, Break-Even Analysis**<br><br>Example A company has a fixed cost of \$100,000 and a production cost of \$14 for each unit produced. The product sells for \$20 per unit.<br><br>What is the cost function?<br>What is the revenue function?<br>What is the profit function?<br>What is the break-even point?<br>What is the profit or loss corresponding to a production level of 12,000 and 20,000 units? | 1 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 1.5 | **Break-Even Analysis.**<br><br>Example: A company has a fixed cost of \$100,000 and a production cost of \$14 for each unit produced. The product sells for \$20 per unit.<br><br>What is the break-even quantity?<br>What is the break-even revenue?<br>What is the break-even point? | 2 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 2.1, 2.2 | **Linear Programming Problem.**<br><br>Example: A company manufactures two products, A and B, on two machines I and II. It has been determined that the company will realize a profit of \$3 on each unit of product A and a profit of \$4 on each unit of product B. To manufacture a unit of product A requires 6 min on machine I and 5 min on machine II. To manufacture a unit of product B | 2, 3 |

| | | |
|---|---|---|
| | requires 9 min on machine I and 4 min on machine II. The company has 5 hours of machine time on machine I and 3 hours of machine time on machine II in each work shift. How many units of each product should be produced in each shift to maximize the company's profit? Set up the linear programming problem then solve it. | |

| **Chapter.Section** | **Objective and Examples** | **Week Covered** |
|---|---|---|
| 3.1 | **Matrices.**<br><br>Example: Refer to the following matrices:<br><br>$A = \begin{pmatrix} -9 & 2 & 3 & 4 \\ -5 & -8 & -10 & 11 \\ 9 & 0 & 6 & 7 \\ -2 & 1 & 0 & 0 \end{pmatrix}$<br>a. What is the size of A?<br>b. Find $a_{34}$.<br>c. Find the transpose of A. | 3 |
| 3.2 | **Linear System of Equations**<br><br>Example: Write the augmented matrix corresponding to the given system of equations.<br>2x – 3y = 7<br>3x + y = 4<br><br>Example: Write the system of equations corresponding to the given augmented matrix.<br><br>$\left(\begin{array}{cc\|c} 1 & 6 & 9 \\ 0 & 31 & -7 \end{array}\right)$<br><br>**Row-Reduced Form**<br><br>Example: Indicate whether the matrix is in row reduced form.<br><br>$\left(\begin{array}{cc\|c} 1 & 0 & 9 \\ 0 & 1 & -7 \end{array}\right)$ | 3, 4 |

| | | |
|---|---|---|
| | **Gauss-Jordan Elimination Method.**<br><br>Example: Solve the system of linear equations using the Gauss-Jordan elimination method.<br>2x – 3y = 7<br>3x + y = 4<br><br>Example: Given that the augmented matrix in row-reduced form is equivalent to the augmented matrix of a system of linear equations. Determine whether the system has a solution and find the solution(s) to the system, if they exist.<br><br>$\left(\begin{array}{cc\|c} 1 & 0 & 3 \\ 0 & 1 & 9 \\ 0 & 0 & 0 \end{array}\right)$<br><br>Example: Solve the system of linear equations using the Gauss-Jordan elimination method.<br><br>2x – y =3<br>x + 2y = 4<br>2x + 3y = 7 | |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 3.3 | **Matrix Operation.**<br><br>Example: Refer to the following matrices:<br><br>$A=\begin{pmatrix} 6 & 5 \\ 9 & 0 \end{pmatrix}, \quad B=\begin{pmatrix} -8 & 5 & 6 \\ 3 & 3 & 2 \\ -4 & -7 & 0 \end{pmatrix}, C=\begin{pmatrix} 9 & 2 & 4 \\ 1 & 3 & 8 \\ 1 & -7 & -1 \end{pmatrix},$<br>$D=\begin{pmatrix} 9 & -3 \\ 7 & 2 \end{pmatrix}$<br><br>Perform the indicated operation, if possible.<br><br>a. A+C<br>b. B – D<br><br>Example: Solve for a-g and y. | 4 |

| | | |
|---|---|---|
| | $-5\begin{pmatrix}9&4&-2\\8&9&1\\0&3&6\end{pmatrix}+\begin{pmatrix}-5&-9&-1\\8&6&7\\-8&10&y\end{pmatrix}=-8\begin{pmatrix}a&b&c\\4&d&\frac{1}{-4}\\e&f&9\end{pmatrix}$ | |

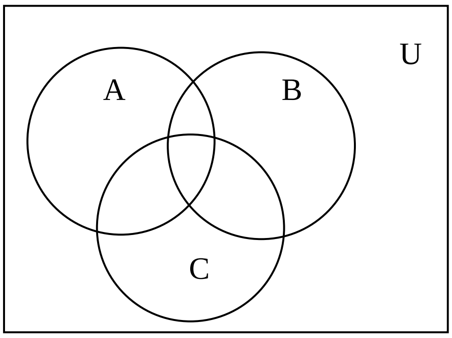
| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 3.4 | **Matrix Multiplication.**<br>Example: Let $A=\begin{pmatrix}6&9&3\\0&0&7\end{pmatrix}$ and<br>$B=\begin{pmatrix}9&2&3&-4\\-5&6&1&9\\3&0&1&1\end{pmatrix}$. Compute the product AB, if possible.<br><br>Let $A=\begin{pmatrix}-9&6\\-2&1\\8&7\\3&-7\end{pmatrix}$ and $B=\begin{pmatrix}7&-2\\1&2\\44&50\end{pmatrix}$. Compute the product AB, if possible.<br><br>Example: The total output of loudspeaker systems of the Acrosonic Company in their three production facilities for May and June is given by the matrices A and B, respectively, where<br><br>$A=\begin{array}{c\|cccc} & ModelA & ModelB & ModelC & ModelD\\ \hline LocationI & 120 & 321 & 200 & 130\\ LocationII & 340 & 560 & 333 & 110\\ LocationIII & 630 & 230 & 34 & 0\end{array}$<br>$B=\begin{array}{c\|cccc} & ModelA & ModelB & ModelC & ModelD\\ \hline LocationI & 143 & 340 & 230 & 100\\ LocationII & 200 & 440 & 200 & 100\\ LocationIII & 22 & 400 & 3 & 200\end{array}$<br>The unit production costs and selling prices for these loudspeakers are given by matrices C and D, respectively, where | 4, 5 |

| | | |
|---|---|---|
| | $C = \begin{array}{ll} ModelA & 130 \\ ModelB & 240 \\ ModelC & 330 \\ ModelD & 500 \end{array}$ and $D = \begin{array}{ll} ModelA & 230 \\ ModelB & 340 \\ ModelC & 440 \\ ModelD & 670 \end{array}$<br>Compute AC and explain the meaning of the entries. | |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 3.5 | **Inverse Matrices**<br><br>Example: Show that the given matrices are inverses of each other.<br><br>$\begin{pmatrix} 1 & -3 \\ 1 & -2 \end{pmatrix}$ and $\begin{pmatrix} -2 & 3 \\ -1 & 1 \end{pmatrix}$<br><br>Example: Find the inverse of the given matrix, if it exists. Verify your answer.<br><br>$\begin{pmatrix} 6 & 7 \\ -1 & 9 \end{pmatrix}$<br><br>Example: A cruise ship charges \$8/adult and \$4/child for a round-trip ticket. On a certain weekend in July, 1,000 people took the cruise on Friday and 800 people took the cruise on Saturday. The total receipts for Friday were \$6,400 and the total receipts for Saturday were \$4,800.<br>a. Write the each system of equations as a matrix equation.<br>b. Determine how many adults and children took the cruise on Friday and Saturday. | 5 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 4.1, 4.2, 4.3 | **Finance Problems.**<br><br>Example: A company would like to have \$50,000 in 2 years to replace machinery. The account they wish to invest in earns 3.45% per year compounded quarterly. How much should they deposit into this account each quarter to have the desired funds in 2 | 5, 6 |

| | | |
|---|---|---|
| | years?<br>a. What kind of problem is this?<br>b. Solve the problem.<br><br>Example: Karen has decided to deposit $300 each month into an account that earns 2.34% per year compounded monthly. How much will she have in this account after 3 years?<br>a. What kind of problem is this?<br>b. Solve the problem. | |

| **Chapter.Section** | **Objective and Examples** | **Week Covered** |
|---|---|---|
| 5.1 | **Set, and Set Operations.**<br><br>Example: Let U = {1,2,3,4,5,6,7,a,b,c,d,e}A = {1,2,3,4,5,a,b,c}, B = {1,3,5,6,a,c,d}, and C = {2,4,7,b,d,e}, and D = {1,2,a}<br>a. List the subsets of D.<br>b. Find<br>$(A \cup B)$<br>$(B^c \cap C) \cup A$.<br><br>Example: Given the following Venn diagram, shade the given set.<br>$(C \cap B^c) \cup A^c$<br> | 7 |

| **Chapter.Section** | **Objective and Examples** | **Week Covered** |
|---|---|---|
| 5.2 | **Number of Elements in a Set** | 8 |

| | | |
|---|---|---|
| | Example: Of 30 elementary school children, 15 read a book last summer, 17 practiced math last summer and 7 read a book and practiced math last summer.<br><br>How many of the 30 children:<br><br>a. did not read a book last summer?<br><br>b. read a book but did not practice math last summer?<br>c. did not read a book and did not practice math last summer? | |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 5.3, 5.4 | **General Multiplication Principle**<br><br>Example: In how many ways can you arrange 3 different pictures from 5 available on a wall from left to right?<br><br>**Counting Techniques**<br><br>Example: In how many ways can you choose 3 mystery books from a collection of 15 mystery books and 5 romance books from a collection of 20 romance books?<br><br>Example: A coin is tossed 20 times, how many outcomes are there? | 8, 9 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 6.1, 6.2 | **Events, Probability**<br><br>Example: A pair of dice is cast. List the simple events. Assign probabilities to each of the simple events. Find the probability distribution of the experiment. Find the probability that the sum of the numbers is even. | 9 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 6.3 | **Probability with Sets.**<br><br>Example: Of 30 elementary school children, 15 read | 10 |

| | | |
|---|---|---|
| | a book last summer, 17 practiced math last summer and 7 read a book and practiced math last summer.<br><br>What is the probability that a child selected at random<br>a. did not read a book last summer?<br>b. read a book but did not practice math last summer?<br>c. did not read a book and did not practice math last summer? | |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 6.4 | **Counting Techniques with Probability.**<br><br>Example: A box contains 25 batteries of which 5 are defective. A random sample of 4 is chosen. What is the probability that at least 2 are defective? | 10 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 6.5 | **Conditional Probability**<br><br>Example: A group of senators is comprised of 48 Democrats and 52 Republicans. Seventy-one percent of the Democrats served in the military, whereas 68% of the Republicans served in the military. What is the probability that a senator chosen at random<br><br>a. is Republican?<br>b. Is a Democrat and did not serve in the military?<br>c. served in the military?<br>d. did not serve in the military, given that he/she is a Democrat?<br><br>**Independent events.**<br><br>Example: If A and B are independent events and P(A)=0.4 and P(B)=0.6, find $P(A \cup B)$. | 12 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 6.6 | **Bayes' Formula.**<br><br>Example: A group of senators is comprised of 48 | 12 |

| | | |
|---|---|---|
| | Democrats and 52 Republicans. Seventy-one percent of the Democrats served in the military, whereas 68% of the Republicans served in the military. What is the probability that a senator chosen at random is a Republican, given that he/she served in the military? | |

<table>
<tr><th>Chapter.Section</th><th>Objective and Examples</th><th>Week Covered</th></tr>
<tr><td>7.1</td><td>Probability Distribution.<br><br>Example: The probability distribution of the random variable X is shown below.<br>
<table>
<tr><th>x</th><th>P(X=x)</th></tr>
<tr><td>1</td><td>0.2</td></tr>
<tr><td>2</td><td>0.3</td></tr>
<tr><td>3</td><td>0.5</td></tr>
</table>
a. Find $P(1 < X \leq 3)$.<br>b. Draw the histogram corresponding to the given probability distribution.<br>Example: Given the following frequency table, construct the probability distribution associated with the random variable X.<br>
<table>
<tr><th>x</th><th>P(X=x)</th></tr>
<tr><td>1</td><td>45</td></tr>
<tr><td>2</td><td>20</td></tr>
<tr><td>3</td><td>32</td></tr>
</table>
</td><td>13</td></tr>
</table>

<table>
<tr><th>Chapter.Section</th><th>Objective and Examples</th><th>Week Covered</th></tr>
<tr><td>7.2</td><td>Expected Value.<br><br>Example: The following probability distribution tables describes the number of cars, x, that a certain car dealer will sell in a given day along with its associated probability.<br>
<table>
<tr><th>x</th><th>P(X=x)</th></tr>
<tr><td>1</td><td>0.2</td></tr>
<tr><td>2</td><td>0.3</td></tr>
<tr><td>3</td><td>0.5</td></tr>
</table>
</td><td>13</td></tr>
</table>

| | | |
|---|---|---|
| | Find the expected number of cars the car dealer will sell in a given day.<br><br>**Odds**<br><br>Example: The odds in favor of an event occurring are 4 to 5. What is the probability of the event not occurring? | |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 7.3 | **Variance and Standard Deviation.**<br><br>Example: Given<br>$$\begin{array}{c\|c} x & P(X=x) \\ \hline 1 & 0.2 \\ 2 & 0.3 \\ 3 & 0.5 \end{array}$$<br>Find the variance and standard deviation.<br><br>**Chebychev's Inequality**<br><br>Example: The expected lifetime of a certain machine is 24 mo and the standard deviation is 3 mo. Use Chebychev's inequality to estimate the probability that one of these machines will last between 20 and 28 mo. | 14 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 7.4 | **Binomial Experiments**<br><br>Example: The probability that a certain CD player will be defective is 0.04. If a sample of 15 CD players is chosen at random, what is the probability that the sample contains<br>a. no defective CD players?<br>b. at most 3 defective CD players?<br>c. Find the mean, variance and standard deviation of this experiment. | 14 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 7.5 | **Standard Normal Distribution**<br><br>Example: Let Z be a standard normal random variable. Find:<br>a. $P(Z < 1.34)$<br>b. $P(Z > -2.33)$<br>c. $P(-0.23 < Z < 1.22)$<br><br>Example: Let Z be a standard normal random variable. Find the value of z if:<br><br>a. $P(Z > z) = 0.8749$<br>b. $P(-z < Z < z) = 0.4908$<br><br>Example: Let X be a normal random variable. The mean is 25 and the standard deviation is 4. Find:<br><br>a. $P(X < 30)$<br>b. $P(X > 10)$<br>c. $P(15 < X < 25)$ | 15 |

| Chapter.Section | Objective and Examples | Week Covered |
|---|---|---|
| 7.6 | **Approximation of a Binomial Distribution**<br><br>Example: Use the normal distribution to approximate the following binomial distribution. A biased coin is tossed 100 times. The probability of obtaining a head is 30%. What is the probability that the coin will land heads at least 90 times? | 15 |