MATHEMATICS FOR THE HOSPITALITY/GAMING INDUSTRY

A MANUAL FOR STUDENTS

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CHAPTER 1

Course Introduction

In this course, you will be using an applied approach to learn math skills relevant to the hospitality/gaming industry. You will be working with examples and data collected from the industry. In addition, the use of computers and calculators will be integrated into the applications as they are in the work place. Since teamwork is highly valued by most employers, you will be working in teams on some projects and activities.

Each chapter contains some basic information about the skills being used, classroom activities in which you will practice the skills as encountered in the work place, and an activities and project section that you will complete on your own or with your team.

In your projects *you* will often be the person creating the problems that need solving. You will also have to make decisions about the validity of your answers to many questions. To practice making a decision and backing it up, let's consider the following scenario:

> A local luxury hotel with 4,400 suites had attractive, 4-color "Do Not Disturb" signs made up to hang on the suite doors. The signs were laminated so that they would not easily wear out. The problem was, however, that guests found them to be great souvenirs. The hotel had to replace 1,300 of the signs each year at a cost of 27 cents each.
>
> A suggestion was made that the hotel switch to signs with the same design, but with only two colors, at a cost of 17 cents each. Although not as attractive, it was estimated that the hotel would only have to replace 700 of the signs each year, and at a lower cost per sign.

You are responsible for the final decision. What are the pros and cons of each kind of sign? Would you replace the 4-color signs with the less expensive version? On what criteria did you base your decision?

Note that the above problem involved not only math, but also knowledge of other aspects of the hotel industry such as advertising and the kind of guests the hotel caters to. Mathematics is only part of the decision making process.

Now consider the following facts gathered from hotel statistics:

> One hotel's breakfast buffet uses 900 dozen eggs per day. Another hotel used a total of 122,400 eggs in a 30-day month in its 6 restaurants.

One hotel uses 750 pounds of bacon per day at its breakfast buffet. There are approximately 14 slices of bacon per pound.

There are 72 English muffins in a case. One hotel issued 207 cases to its various restaurants in one 30-day month. A case of English muffins has a cost of $31.28.

Use any or all of these facts to generate a math question (application). Compute and write the answer to the question.

Did you label your answer? Does it make sense as an answer to your question? Would your question be one that someone might ask at a hotel or restaurant?

Now you are ready to share your self-generated word problem with your team or with the whole class. Remember that this is just a warm-up, so don't be afraid of making mistakes. We learn best by trying something out and then revising our thinking if necessary.

One last warm-up: Use the Internet to find Internet URLs (addresses) concerning hotels, restaurants, visitor statistics, or anything related to the hospitality/gaming industry. A few to get you started are:

www.lasvegas24hours.com
www.luxor.com
http://stats.bls.gov

Have fun!

CHAPTER 2

Whole Numbers, Fractions and Decimals

Whole Numbers

Problem Solving Techniques

1. READ the problem thoroughly.
2. Write down all the given information
3. Decide on operations (add, subtract, multiply, divide). Look at indicator words. When the problem involves fractions, substitute whole numbers for the fractions and see how you would solve the problem with those numbers. Then substitute the fractions back in for the whole numbers.
4. Solve the problem.
5. Check to see if your answer is reasonable. If not, try another operation or check your arithmetic.

Indicator Words

Addition

- Plus
- More, more than
- Added to
- Increased by
- Sum
- Total
- Gain of

Subtraction

6 less 5	(6-5)
6 subtract 5	(6-5)
6 *subtracted from* 5	(5-6)
Difference of 6 and 5	(6-5)
6 *less than* 5	(5-6)
6 *fewer than* 5	(5-6)
6 decreased by 5	(6-5)
6 minus 5	(6-5)

Multiplication

- Product
- Times

Of

Double

Twice

Triple

Division

Divided by

Divided into

Divided equally

Per

Quotient of 6 and 5 (6÷5)

Note: Divide the total amount by the number of recipients to get the amount each. Divide the total amount by the size of each item to get the number of items.

Equals

Is

The same as

Yields

Results in

Are

Measures (angles)

Whole Number Classroom Activities

1. The Advertising/Marketing Department encumbered the following amounts for promotions (radio, trade show booths, etceteras) during the past month: $15,000, $500, $2000, and $800. What would you forecast for a yearly *total* for promotions?

2. A hotel received the following number of calls from Arizona on their 800-reservation line during the last month: 1576; 2058; 2192; and 1800. What was the *total* number of calls received? If the monthly cost was $129,642, what was the average cost *per* call?

3. The Food & Beverage Department of our hotel uses 750 pounds of bacon, 900 dozen eggs, 450 pounds of sausage and 350 dozen assorted rolls each day for the breakfast buffet. How many pounds of each meat product must be ordered each month (use 31 days for a month)? How many dozen eggs and how many dozen rolls must be ordered each month? How many eggs and how many rolls are ordered per month?

Fractions

Write in Lowest Terms

10/12 = 10÷2/12÷2 = 5/6 Divide numerator and denominator by the same number.

17/12 = 1 5/12 Divide numerator by denominator, remainder over original denominator.

Mixed to Improper

5 2/3 = 17/3 Multiply denominator times whole number and add numerator. Put this number over the denominator.

Multiply

3/5 • 1/8 = 3/40 Multiply numerators, multiply denominators.

3 1/3 • 2 2/5 = 10/3 • 12/5 = 120/15 = 24/3 = 8 Change to improper fractions. Multiply and write in lowest terms.

Divide

3/5 ÷ 2/3 = 3/5 • 3/2 = 9/10 Invert second fraction and multiply.

2 1/3 ÷ 4 2/5 = 7/3 ÷ 22/5 = 7/3 • 5/22 = 35/66 Change to improper fractions. Invert second fraction and multiply.

Add

3/5 + 2/3 = 9/15 + 10/15 = 19/15 = 1 4/15 Find a common denominator (3 and 5 divide evenly into 15). Write equivalent fractions (multiply numerator and denominator by same number). Add the numerators and keep the denominator the same. Write in lowest terms.

1 2/3 + 2 ¾ = 1 8/12 + 2 9/12 = 3 17/12 = 3 + 1 5/12 = 4 5/12 Put fractions over common denominators. Add the whole numbers, add the fractions, then write in lowest terms.

Subtract

5 2/3 – 2 5/6 = 5 4/6 – 2 5/6 = 4 + 6/6 + 4/6 – 2 5/6 = 4 10/6 – 2 5/6 = 2 5/6 Put fractions over common denominators. Borrow, if necessary (1 = 6/6) and add to fraction in the numerator. Subtract whole numbers, subtract fractions (subtract numerators, keep denominator the same).

Calculator Method

Find your "a b/c" button. Use this button to insert a fraction: For 5/6, press 5, then a b/c button, then 6; for 1 2/3, press 1, then a b/c, then 2, then a b/c, then 3. Use your operation buttons as usual.

Fraction Classroom Activities

1. A recent ad for an IMax Theater at a local hotel cost $4016 per week to run in 2 *LA Times* insertions. This ad ran for 4 weeks. The hotel splits the cost of these ads with IMax. If the hotel pays 3/8 of the total cost, what fraction of the total cost does IMax pay? How much in dollars does each contribute to the cost?

2. A marinade for strip steak used in a hotel steakhouse is based on a recipe for 8 people that appeared in *Restaurant Business* (May 1, 1998, p.94). The recipe calls for several ingredients, including 1½ tablespoons minced ginger root and ½ cup soy sauce for 2 ½ pounds of strip steak. How much of each of these 3 ingredients is needed for 1 serving? If the restaurant sells an average of 17 strip steak entrees per day, how much ginger root, how much soy sauce and how much strip steak do they use on average in a month (31 days)?

Decimals

Add/Subtract

1. Line up decimals
2. Fill in with zeros where necessary.
3. Add or subtract as usual.
4. Line up decimal point in answer with other decimal points.

1.0039 + 2.03	1.0039	2.013 – 1.9999	2.0130
	2.0300		- 1.9999
	3.0339		0.0131

Multiply

1. Multiply as usual.
2. Count the number of decimal places to the right of the decimal in both numbers multiplied.
3. In answer, from right to left, count off the number of decimal places previously counted.

1.23
1.1
123
123
1.353

Divide

Quotient
Divisor |Dividend

1. If necessary, move the decimal point in the divisor to the right of the number.
2. Move the decimal point in the dividend the same number of places to the right. Add zeros, if necessary.
3. Bring decimal point straight up in the quotient and divide as usual.
4. If answer does not come out without a remainder, continue adding zeros and dividing until it does, or round off as instructed, or write as a repeating or unending decimal (see 5).
5. To write an unending decimal, write several decimal places plus three dots (3.14159…). To write a repeating decimal without rounding off, write part that repeats with a line over the number or numbers (6.6666…= $6.\overline{6}$)

Rounding Off

To round off, go to the next decimal place. If it is 5 or more, round the number in the desired place up. If it is less than 5, leave the number as is.

6.6666…≅ 6.7 to the nearest tenth. 3.14159 ≅ 3.14 to the nearest hundredth.

Decimal Classroom Activities

1. On May 26, the day after a holiday, 264.75 guest room attendants (GRAs) worked during the day shift (including part-time workers). If they cleaned 3864 rooms, what was the average number of rooms cleaned per attendant (round to the nearest hundredth)? Referring to the Housekeeping Daily Report of May 26 below, find the average number of rooms cleaned per trainee, per swing shift employee, and per grave shift employee.

Housekeeping Daily Report May 26, 1998 (Extract)

Number of GRAs	Today	Average (M-T-D)	Sum (M-T-D)
Day	264.75	107.68	6910.2
Trainees	16	3.77	98
Swing	17	18.58	483
Grave	6	8.83	229.5

Number of Rooms Cleaned	
Day	3864
Trainees	36
Swing	159
Grave	49

Average Number of Rooms Cleaned	
Day	_____
Trainees	_____
Swing	_____
Grave	_____

What explains the different averages?

Why are there more GRAs on May 26 than the MTD average?

2. A recent hotel promotional postcard for a special summer package was sent to 420,000 previous guests. The promotion offered rooms for $59 per night for the first 2 nights, and $49 per night for the 3rd and 4th night, plus a free spa visit and $35 off gift shop purchases. The hotel expected a response equal to 0.015 times the number of postcards sent (1.5%).

a. What was the **expected** number of responses?

b. If the average stay per room was 2.7 room nights, at an average rate per night of $56.40, what was the **expected** room revenue?

c. If the gross revenue for the promotion was computed as 0.65 times the total revenue, what was the expected gross?

d. If the hotel spent $130,000 on the promotion, what was the expected net revenue?

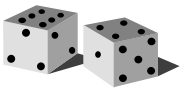
e. How much net revenue was expected per response?

3. Make up a hotel bill for a person taking advantage of the above promotion. Include 3 nights and room tax (0.07 times rate), gift shop purchase with tax (0.07 times purchase price), and spa treatment (no tax). Don't forget the adjustments for the gift shop purchase and spa treatment.

Whole Numbers, Fractions and Decimals Activities and Project

Activity #1

Your computer is down! You have a hotel guest waiting to settle his bill, and he has to catch a plane. Since he is a cash-paying customer, he can not just leave and have you charge his bill to his credit card. Use the following earlier printout to answer the questions.



Gambler's Hote1
1-800-555-1234

CHECK OUT TIME IS 12:00 NOON
LATE CHECK OUT SUBJECT TO ADDITIONAL CHARGES

GRENZ, R
135 Wall Street
Springfield, VT 05156

arrive 05/15/97 Thu
depart 05/17/97 Sat

05/15/97	PHONE SERVICE	1047/06:12PM	12/(800)-225-5288	$ .50
05/15/97	ROOM 1407			$25.00
05/15/97	ROOM TAX			$ 2.50
05/16/97	PHONE SERVICE	1047/12:51PM	5/651-4546	$ .50
05/16/97	PHONE SERVICE	1047/05:06PM	7/(800)-225-5288	$ .50
05/16/97	ROOM 1407			$50.00
05/16/97	ROOM TAX			$ 5.00

1. The guest asks to use the phone one more time, and the charge for the call is $2.81. He asks you to add this to his bill. How much is his total bill?

2. He left a deposit of $100.00 when he checked in. How much do you owe him?

3. The guest wants to know the total tax and what fraction it is of his room rate. Find the tax and the fraction of the room rate.

Activity #2

1. Gaming stock went down from \$9 1/8 to \$8 9/16 per share. What was the decrease in value per share (written as a fraction)?

2. If Susan held 2,000 shares of stock, how much did she lose?

Project

Create a hotel bill and use the given information to write and solve **at least two problems** involving decimals and/or fractions. You must include room charges, phone charges (\$0.75 per local call) and meal charges in the bill. To find room tax, you will multiply the room rate by 0.09. To find meal tax, multiply the charges times 0.07. If you choose to add gift shop charges, the tax rate is 0.0725. For entertainment, the tax rate is 0.10.

CHAPTER 3

Ratio, Proportion and Percents

Conversions

1. To change a **fraction to a decimal**, divide the numerator by the denominator.
2. To change a **decimal to a percent**, move the decimal point 2 places to the right.
3. To change a **percent to a decimal**, move the decimal point 2 places to the left.
4. To change a **decimal to a fraction**, read the decimal (0.78 is 78 hundredths), write as a fraction and reduce.
5. When working with unending decimals and percents, write the first two decimal places and then write the remainder as a fraction.

   5/8 = 5÷8 = .625 = 62.5%

   25% = .25 = 25/100 = ¼

   1/3 = .33 1/3 = 33 1/3%

Percents

Solving Basic Percent Problems

The percent × the whole = the part. The number following the word "of" is usually the whole.

1. To find the **part**, given the whole and the percent, you multiply the percent, written as a decimal, times the whole.

   What is 2% of 24?
   2% of 24 is .02 × 24 = 4.8.

2. To find the **percent**, given the whole and the part, divide the part by the whole, and then change the decimal to a percent.

   10 is what percent of 50?
   10 ÷ 50 = 0.2 = 20%

3. To find the **whole**, divide the part by the percent (as a decimal).

   6 is 25% of what number?
   6 ÷ 0.25 = 24

Increase/Decrease Problems

1. To find the **increase or decrease**, multiply the percent increase or decrease (as a decimal) by the original number.
2. To find the **new number**, add the increase (subtract the decrease) to the original number.
3. To find the **percent increase or decrease**, find the increase or decrease and divide it by the original number. Change the decimal to a percent.

Gasoline prices went up 25% last month. The previous price was $1.20 per gallon. How much did the price of a gallon of gasoline increase?

$0.25 \times \$1.20 = \$0.30$ per gallon

What was the new price per gallon?

$\$1.20 + \$0.30 = \$1.50$ per gallon

If the cost of a stamp went from $0.30 to $0.32, what was the percent increase (to the nearest percent)?

$\$0.32 - \$0.30 = \$\ 0.02$
$0.02 \div 0.30 = 0.0666\ldots \cong 0.07 = 7\%$ increase

Percent Classroom Activities

1. Three people stay for 2 nights in a hotel. The room rate is $119 for 2 people in the same room. The rate increases 15% per night if 3 people stay in one room. What is the total room charge for the 2 nights if the 3 guests stay in one room?

2. A hotel reservation clerk was successful in getting 6 couples to upgrade from a standard room @ $65 per night to a 1 bedroom suite @ $170 per night. She also persuaded 2 couples to upgrade from a mini suite @ $85 per night to a 1 bedroom suite @ 170 per night. The commission rate for the clerk is 5% on the net difference between upgraded rates for suites and the normal rack rate for the first fully paid day. What was the clerk's commission for the above upgrades?

3. A smoothie shop in Arizona averaged 275 drinks per day at $4.00 per drink. Some of the smoothies at this shop contain 2500% of the DRV (daily recommended value) of Vitamin C (*Restaurant Business*, May 1, 1998, pp 109-110). The DRV of Vitamin C is 60 mg. How many milligrams of Vitamin C are in one drink with the Vitamin C additive? If 275 drinks all had the Vitamin C added, how many milligrams of Vitamin C would there be in all these smoothies?

4. In 1997, the Outback Steak House had $1.15 billion in sales. This was what percent increase (to the nearest percent) from the 1996 sales of $937 million? (*Restaurant Business*, May 1, 1998, p 63).

Ratio and Proportion

Ratio

A ratio is a comparison of 2 numbers, written as a fraction in lowest terms: 1st number/2nd number.

Rate

A rate is a comparison of different quantities per unit. Write the ratio of the quantities, and then divide the numerator by the denominator. Keep the units and write numerator units per denominator unit.

Unit Pricing

Unit pricing is the ratio of price to quantity, written as a rate. The *better buy* is the lowest cost per unit.

Proportion

$$\frac{200 \text{ miles}}{10 \text{gallons}} = \frac{550 \text{ miles}}{\text{x gallons}}$$

A proportion is a statement that 2 ratios are equal. Set up proportion problems with the units in each fraction in the same order. If a/b = c/d, then ad = bc.

Ratio, Proportion and Percent Classroom Activities

1. A basketball player is observed, over time, to make 300 out of 500 shots from 3-point range. What is his ratio of 3-point shots made to 3-point shots attempted? What is his 3-point shot percentage?

2. 50 percent of the profit at a Las Vegas hotel comes from gaming. This is down from 80 percent 10 years ago. What is the present ratio of profit from gaming to total profit? What was the ratio ten years ago of the percent profit from **non-gaming** revenues to the percent profit from **gaming** revenues?

3. 6 ounces of soda can be "gunned" into a drink in 4 seconds. What is the rate in ounces per second?

4. As Director of Purchasing, I received 3 bids on prices for cards asking guests to call when they were ready to have their rooms made up. The bids were $1017 for 50,000 cards; $651 for 40,000 cards; and $556 for 39,000 cards. Assuming they were all of equal quality, which was the best buy?

5. Housekeeping purchased 4000 plastic spray bottles for $4240. They are doing an inter-department sale of 12 bottles to the Front Office. Use proportion to find the cost to the front office.

Ratio, Proportion and Percent Activities and Project

Activity #1

The *Las Vegas Sun* (Gary Thompson, February 15, 1998) reported: "Nearly 27 percent of the almost 700,000 workers in the Las Vegas area are employed directly by the gaming industry. Another 11 percent labor in the construction field, which is enjoying boom times due to about $8 billion in hotel-casino construction under way."

Answer the following questions (show all work):

1. Approximately how many workers in the Las Vegas area were employed directly by the gaming industry at the time of the article?

2. Approximately how many were employed in the construction field?

3. If the Las Vegas area had a population of approximately 1,100,000, what percent **of the population** was employed directly by the gaming industry?

Activity #2

1. The number of hotel rooms available in Las Vegas went from 99,072 in December 1996 to 105,347 in December 1997. Find the percent increase in the number of rooms for the year.

2. Give 2 possible effects the increase in the number of rooms available might have on employers, employees or guests.

Activity #3

The Employment Cost Index (ECI) measures changes in compensation costs (wages, salaries, and employer costs for employee benefits). From December 1996 to December 1997, the ECI for private industry workers rose from 128.9 to 133.4 in the West, according to the US Department of Labor's Bureau of Labor Statistics. Nationally, the ECI increased from 130.6 to 135.1 during the same period.

1. To the nearest tenth of a percent, what was the percent increase for the West?

2. To the nearest tenth of a percent, what was the percent increase for the nation?

3. Give 3 examples of how the increase in the ECI might effect the guests, employers or employees of the hotel industry in Las Vegas.

Project

Write and solve two percent application problems relating to the hotel industry. Find your data from a newspaper or magazine article, on the Internet, from a local hotel or other information source. Attach a copy of the information you use and list the source. For your presentation, write an introductory paragraph setting the scenario and giving the data and resource(s) for your problems.

CHAPTER 4

Measurements

Unit Fractions

A unit fraction is a fraction made up of 2 equivalent measures. Since 1 foot = 12 inches, 1foot/12inches and 12 inches/1 foot are unit fractions. If reduced, unit fractions equal 1.

To use unit fractions for conversions, start with the unit being changed. Multiply by a unit fraction with the measure to be eliminated in the denominator. Cancel the like measurements. Continue until the only measure left (in the numerator) is the measure for your answer.

Example: Convert 5 gallons to pints.

$$5 \text{ **gallons**} \bullet \frac{4 \textit{ quarts}}{1 \text{ **gallon**}} \bullet \frac{2 \textbf{ pints}}{1 \textit{ quart}} = 40 \text{ pints}$$

Metric Conversion Line

The basic metric units are meters (length), liters (capacity), and grams (weight). The prefixes added to the basic units are defined on the line below. For example, one kilometer is 1000 meters, and one centigram is one hundredth of a gram.

kilo	hecto	deka	**unit**	deci	centi	milli
(1000 x)	(100 x)	(10 x)		(.1 x)	(.01 x)	(.001 x)

Find the given unit. Count the number of spaces to the unit you want in your answer. Move the decimal point in the given unit the same number of places in the same direction.

Example: Convert 3.5 meters to millimeters.

Start at **unit** and count over 3 spaces to the right to milli. Move the decimal point in 3.5 three spaces to the right. 3.5 m = 3500 mm.

English/Metric Conversions

Length, Capacity and Weight

1 m ≅ 1.09 yard	1 yard ≅ 0.91 m
1 cm ≅ 0.39 inch	1 inch ≅ 2.54 cm
1 g ≅ 0.035 oz	1 oz ≅ 28.35 g
1 kg ≅2.20 lb	1 lb ≅ 0.45 kg
1 L ≅ 0.26 gal	1 gal ≅ 3.70 L
1 L ≅1.06 qt	1 qt ≅ 0.94 L
1 km ≅ 0.6 mi	1 mi ≅ 1.61 km

Temperature

In the US system, we measure temperature in degrees Fahrenheit (F). In the metric systems, degrees Celsius (C) are used. The ° symbol us used in both systems for degrees.

$$C = \frac{5(F-32)}{9} \qquad F = \frac{9C}{5} + 32$$

Measurement Classroom Activities

1. I ordered soda in 2 liter bottles. How many ounces are in each bottle?

2. I ordered 6 cases of 4-ounce cans of tomato paste. There are 36 cans per case. How many pints of tomato paste do I have in all?

3. I need 0.5 ounces of fresh basil for each serving of Scampi Provincial. Approximately how many grams is this? How many kilograms of fresh basil do I need for this menu item per month if we serve an average of 116 servings per month?

4. It is 60 degrees Fahrenheit today. How many degrees Celsius is that?

5. The material for the draperies in the presidential suite comes from Europe, where material is sold by the meter. I need 11 feet of material per drapery. How many **meters** do I need per drapery?

Measurement Activities and Project

Activity #1

The new shopping center at the XYZ Hotel will have marble tile on the floors. The entrance area is using 250,983,291 pounds of tile. Approximately how many tons is this?

Activity #2

The distance from your hotel to the nearest shopping center is 5.3 miles. Your customer from London asks how many kilometers this is. She also asks what the speed limits of 35 miles per hour, 55 miles per hour and 65 miles per hour mean in kilometers per hour. What are the answers to her four questions?

Activity #3

How many 500 ml glasses can be filled from one kiloliter of soda?

Project

On the Internet, or in a Las Vegas Magazine, look up the average monthly high temperatures for Las Vegas for each of the 12 months in the year. Also look up the distances from Las Vegas to: Phoenix, Los Angeles, San Francisco and Reno.

For the brochure you are producing for your foreign customers, you need to print the temperature in degrees Fahrenheit and Celsius and the distances in miles and kilometers. Compute these numbers to the nearest degree C/F and the nearest mile/kilometer and write copy for this section of your brochure. Make sure you give the source of your data, and attach a copy, if possible.

CHAPTER 5

Geometry

Definition of Exponent

$5^3 = (5)(5)(5) = 125$ $2^5 = (2)(2)(2)(2)(2) = 32$

An **exponent** is the superscript number (the "3" in 5^3). It means you multiply the **base** (the "5" in 5^3) by itself the number of times stated by the exponent.

Order of Operations

1. Do any computations inside grouping symbols such as ( ), [ ], { }, or above and below fraction bars.
2. Evaluate any numbers with exponents or radicals.
3. Do multiplication and division from left to right.
4. Do addition and subtraction from left to right.

Geometry Formulas and Definitions

Perimeter

Perimeter, P, is the sum of the sides of a polygon. Perimeter is, for example, the measure of a fence enclosing an area or the measure of a frame around a picture. Perimeter is labeled with "plain" units.

Circumference

Circumference, C, is the distance around a circle. $C = 2\pi r$.

Area

Area is the amount of surface in square units.

Area of: Rectangle = length x width
Triangle = ½ x base x height
Parallelogram = base x height
Circle = πr^2

Volume

Volume is the space enclosed by a solid, measured in cubic units.
Volume of a rectangular solid = length x width x height = area of base x height.

Pythagorean Theorem

In a right triangle, the sum of the squares of the legs is equal to the hypotenuse squared. Also, the length of hypotenuse is equal to the square root of the sum of the squares of the legs.

Geometry Classroom Activities

1. The Presidential Suite at your hotel has floor area of 2,175 square feet and a ceiling height of 10 feet. How many cubic feet of air space need to be considered when designing the sir conditioning/heating system for the suite?

2. We are designing a rectangular promotional post card that will measure 10 inches by 4 inches. The front will have a diagonal dividing it into two equal triangular areas. One area will contain a picture of the hotel, and the other will have a picture of Red Rock Canyon.

a. What is the area of each triangular area?

b. What is the length of the diagonal line separating the areas? (Use your calculator and round to the nearest hundredth of an inch).

c. Draw the rectangle and measure the diagonal to check answer to b.

Geometry Activities and Project

Activity #1

You are ordering new air conditioning units for some of the hotel rooms. In order to get the right size unit, you need to know how many cubic feet of air there are in each room. Each room measures 15 feet by 10 feet by 9 feet. How many cubic feet of air to cool are there in each room?

Activity #2

You are doing the layout for a poster advertising your hotel. The poster will measure 3 feet by 4 feet. You are dividing the poster into 2 sections by drawing a diagonal from the left bottom corner to the top right corner.

a. What is the length of the diagonal?

b. How many square feet of space do you have to work with in each section?

c. Sketch the poster (with words and illustrations).

Project

You are in charge of redesigning one type of suite in a hotel. The suite measures 24' by 18' by 10' (L x W x H). You need to include a bath (9' x 12'), sitting room (12' x 18'), and a bedroom (9' x 12').

a. Sketch the suite, giving the dimensions of each room, including the ceiling height.

b. The bedroom and sitting room will have a border of patterned wallpaper around the top of each wall. How much wallpaper will you need for each room? (Do not subtract for doors and windows – this will allow for extra material for matching, mistakes, hard to cover areas, etc.)

c. How much paint will you need for all the walls if 1 gallon covers 250 square feet? (Again, do not subtract for doors and windows). Remember that you will have to paint both sides of any wall separating rooms in the suite.

CHAPTER 6

Probability

Probability

The **probability** of an event E happening, P (E), is defined as:

P (E) = Number of favorable outcomes ÷ Total number of possible outcomes.

For example, the probability of getting a 1 on a roll of one die is P (1) = 1 ÷ 6 = 1/6 ≈ 0.167 ≈ 17%. The probability of getting a 1 **or** a 2 on one roll is P (1 or 2) = (1+1) ÷ 6 = 1/3 ≈ 33%.
This is the **theoretical probability**. In actual practice, the more often you roll a die, the closer the ratio of the number of 1s rolled to the total number of rolls should get to 1/6 .

Odds

In gaming, the **odds** of an event happening are A to B, where A/B is the reduced fraction equivalent to:

The number of ways the event does **not** occur ÷ The number of ways the event occurs.

For example, if 2 dice are rolled once, there are 36 possible outcomes: {(1,1), (1,2), (1,3)…(6,5), (6,6)}. Since the pairs that give a sum of 7 are (1,6), (2,5), (3,4), (4,3), (5,2) and (6,1), the odds of getting a 7 on the sum of the 2 dice is:

Ways of not getting a sum of 7 ÷ Ways of getting a sum of 7 = 30/6 = 5/1 or 5 to 1.

Probability Classroom Activities

1. In a coin toss, what is the **probability** of :

    a. Getting a head on one toss?

    b. Getting 1 head and 1 tail on 2 tosses?

2. In a coin toss, what are the **odds** of:

    a. Getting a head on one toss?

    b. Getting 1 head and 1 tail on 2 tosses?

3. In a deck of cards without jokers there are 52 cards.

    a. What is the probability of drawing a queen on one draw?

    b. What is the probability of drawing a 4 of clubs, given that a queen has already been drawn?

    c. What are the **odds** of getting a king on the first draw?

Probability Activities and Project

Activity #1

In craps, where two dice are tossed and the sum of the numbers is considered, the "natural numbers" are 7 and 11. The numbers 2, 3 and 12 are "craps". The remaining numbers are "point numbers" (4,5,6,8,9 and 10). Compute the **odds** of getting each of the 11 possible outcomes.

Activity #2

In craps, what is the **probability** of getting a 7 or an 11 on any one toss? Write the probability as a fraction, a decimal and a percent rounded to the nearest percent.

Project

In your groups, toss two dice 50 times and record the results. Write the ratio, as a fraction, of the number of times your group tossed a 7 or 11 to the total number of tosses. Then write this fraction as percent, rounded to the nearest tenth of a percent. Collect the totals from the other groups, and write the ratio again using the grand total of the number of 7 or 11s and the grand total of the number of tosses. How do these ratios compare to the probability you computed in activity #2 above? How do you explain this?

CHAPTER 7

Statistics

Introductory Activity

Each class member has a box of raisins. Half of the class have boxes of a national brand and half have a store brand. Count the raisins in your box and jot down the number below. Now list in a column the number of raisins in the store brand boxes from each class member, and do the same for the numbers from the national brand. Take a total of each column and then find the average number of raisins per box for each brand.

Which brand do you think is the better buy and why (class discussion)?

Which of the things discussed in class are quantitative (having to do with numbers) and which are qualitative (having to do with attributes)?

Definitions

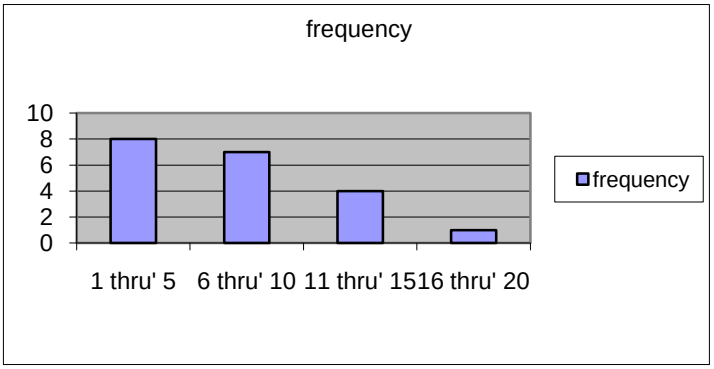
Statistics is the collection, organization, presentation and analysis of data.

One way to describe a group of numbers (data) is to give the **central tendency** (average) of those numbers. In statistics, there are three common ways to define central tendency:

> The **mean** is the sum of the individual values divided by the number of values (n). The mean is used when you want the numeric average of the data.
>
> The **median** is found by arranging the values in order of size and finding the middle point of those values. If the middle point is between two values, you add those two values and divide by 2 to get the median. The median gives you the middle value – half the numbers are above this value, and half are below.
>
> The **mode** is the value or values that occur most often. There may be none, one or more than one mode. The mode is the "typical" value in a set of data.

Once data is collected, it can be presented visual in a variety of forms. For example, data can be presented as a list of numbers (usually in ascending or descending order) or as a **bar graph**:

> Data: 1, 2, 3, 3, 3, 4, 4, 5, 6, 7, 7, 7, 8, 9, 10, 11, 11, 11, 15, 20.
>
> Bar Graph:



In the bar graph above, the data was grouped into 4 groups of equal size (each contain 5 possible data values) and the **frequency** (how many times these values appear in the data) was calculated.

Another way to talk about data is to give a value for the **spread** of the data. The ***range*** is the highest value minus the lowest value. The ***standard deviation*** is the average distance of the data items from the mean (For n items, subtract the mean from each data item. Square the resulting numbers and find their sum. Divide the sum by n and then take the square root of the result).

Statistics Classroom Activities

You have asked hotel visitors to fill out a survey about the degree of satisfaction with their stay. One question asked them to rank their level of overall satisfaction using a scale of 1 (very dissatisfied) to 5 (very satisfied). The results:

4, 4, 3, 1, 5, 4, 3, 5, 5, 3, 2, 4, 4, 4, 4, 5, 4, 3, 1, 3, 3, 3, 3, 5, 4, 4, 3, 3, 4, 5.

1. Count the number of data items. Call this number **n**. List the items in ascending order (called an **array**). Find the mean, median and mode of the data.

Array n = _____ Mean = _____

Median = _____ Mode = _____

2. Are more than half of your customers reasonably satisfied with their hotel stay? Which measure of central tendency did you use to answer the question and why?

3. Sketch a bar graph that represents this data using a "bar" to represent each possible data number (1,2,3,4 and 5).

Statistics Activities and Project

Below is the 1998 end of the month inventories, in cases, of a particular item used in your hotel.

Month	Number of cases
Jan	18
Feb	22
Mar	14
Apr	20
May	21
Jun	28
Jul	23
Aug	22
Sep	17
Oct	19
Nov	22
Dec	19

Activity #1

Find the mean, median and mode, in cases, of the above data.

Activity #2

Your target inventory for the end of each month was 19. Which measure of central tendency supports this target and why? Which does not?

Activity #3

Sketch a bar graph of the data, using the frequency of 4 groups: 14-17 cases, 18-21 cases, 22-25 cases and 26-30 cases.

Project

You have been assigned one of the data sets (see pages 38-40) of cases of breakfast items issued to various restaurants in the hotel for the month of April (30 days).

1. Compute the mean, median and mode for your data (quantities issued).

2. Note that the items are not always issued once every day. **How could this effect your "averages"?** Regroup your data and compute new measures of central tendency. Hint: On days with no cases issued, the quantity issued = 0; on some days there is more than one issue.

3. Which measure of central tendency from #2 do you think would be more useful? Why?

4. Sketch a bar graph of your data in #2. Use cases issued (0, 1, 2, …) and frequency.

Bonus: Find the range and standard deviation of your data.

ISSUE DETAIL REPORT FOR FOOD WAREHOUSE BY ITEM
4-1-98 TO 4-30-98

Item Description	Issue Unit	To	Date	Quantity Issued
Jelly, Strawberry	Case	Café	4-08	2
		Café	4-09	2
		Café	4-10	1
		Café	4-11	2
		Café	4-17	1
		Coffee House	4-18	1
		Café	4-18	1
		Café	4-19	1
		Café	4-22	1
		Café	4-23	1
		Café	4-24	1
		Café	4-25	1
		Café	4-29	3
	Item total			18
Waffle/Pancake Mix	Case	Café	4-02	1
		Café	4-03	1
		Café	4-05	1
		Café	4-06	1
		Café	4-07	1
		Café	4-08	1
		Café	4-09	1
		Room Service	4-10	1
		Café	4-10	1
		Café	4-10	1
		Café	4-11	1
		Café	4-12	1
		Café	4-16	2
		Café	4-17	2
		Room Service	4-18	1
		Café	4-19	2
		Café	4-19	1
		Café	4-22	1
		Room Service	4-23	1
		Café	4-25	1
		Café	4-25	2
		Café	4-28	2
	Item total			27

ISSUE DETAIL REPORT FOR FOOD WAREHOUSE BY ITEM
4-1-98 TO 4-30-98

Item Description	Issue Unit	To	Date	Quantity Issued
Oats Kwik	Case	Buffet-Bkfst	4-01	3
		Buffet-Bkfst	4-05	3
		Buffet-Bkfst	4-09	1
		Buffet-Bkfst	4-10	1
		Buffet-Bkfst	4-11	3
		Employee Dining	4-13	1
		Buffet-Bkfst	4-15	2
		Buffet-Bkfst	4-17	2
		Buffet-Bkfst	4-19	1
		Buffet-Bkfst	4-21	2
		Buffet-Bkfst	4-24	2
		Buffet-Bkfst	4-27	1
		Buffet-Bkfst	4-28	3
	Item total			25
Jelly, Orange	Case	Room Service	4-05	1
		Room Service	4-06	2
		Room Service	4-07	1
		Room Service	4-07	1
		Room Service	4-08	2
		Room Service	4-09	1
		Room Service	4-10	1
		Room Service	4-12	3
		Room Service	4-15	1
		Room Service	4-16	3
		Room Service	4-17	1
		Room Service	4-19	3
		Room Service	4-20	1
		Room Service	4-22	1
		Room Service	4-23	1
		Room Service	4-24	2
		Room Service	4-25	2
		Room Service	4-26	2
		Room Service	4-28	2
		Room Service	4-30	1
	Item total			37

ISSUE DETAIL REPORT FOR FOOD WAREHOUSE BY ITEM
4-1-98 TO 4-30-98

Item Description	Issue Unit	To	Date	Quantity Issued
Crepes, Peach	Case	Buffet-Bkfst	4-01	4
		Buffet-Bkfst	4-02	7
		Buffet-Bkfst	4-03	7
		Buffet-Bkfst	4-09	7
		Buffet-Bkfst	4-11	8
		Buffet-Bkfst	4-12	6
		Buffet-Bkfst	4-14	3
		Buffet-Bkfst	4-16	7
		Buffet-Bkfst	4-17	3
		Buffet-Bkfst	4-19	8
		Buffet-Bkfst	4-23	7
		Buffet-Bkfst	4-24	7
		Buffet-Bkfst	4-25	7
		Buffet-Bkfst	4-30	7
	Item total			88
Cereal, Granola	Case	Café	4-02	1
		Room Service	4-03	1
		Room Service	4-06	1
		Café	4-17	1
		Room Service	4-18	1
		Room Service	4-23	1
		Café	4-29	1
	Item total			7

CHAPTER 8

Mixed Applications

Mixed Applications Activities and Project

Activity #1

One hotel in Las Vegas used 12,600 eggs for breakfasts served in its restaurants in one month. If one case contains 30 dozen eggs, how many **cases** of eggs were used?

Activity #2

Suppose the revenues and expenses for your hotel chain last year are broken down as follows:

Revenues:		
Casino Dept		59.3%
Rooms Dept		14.8%
Food Dept		11.2%
Beverage Dept		8.2%
Other		6.5%
Cost and Expenses:		
Cost of Sales		6.8%
Direct Expense		45.5%
General & Admin. Expense	38.1%	
Taxes & Other		2.4%
Net Income after Taxes		**___%**

Find the percent for Net Income after Taxes and fill in above. Assume that the total revenue for the year was $5.32 billion. Find the casino **revenue**, the rooms **revenue**, the taxes and other **cost**, and the net income after taxes. If any of your answers are less than 1 billion dollars, write out the number, or state in millions of dollars.

Activity #3

You are the dealer at a craps table.

a. The shooter has established a point number of 5. A player has placed a red chip ($5) and a white chip ($1) as his odds bet, for which the casino has 3 to 2 odds (the player gets $3 for every $2 bet). The player wins. How much does he win, and how do you, the dealer, pay him (how many chips of what color(s) do you give/take)?

b. The player later wants to buy a point number 4 or 10. The casino charges 5% commission for the buy bet. The player wants to wager $20. How much money do you charge him for the 4 red chips he buys?

Project

The hospitality/gaming industry involves many operations that keep the hotels, restaurants and entertainment segments running smoothly. These operations include: preparing and serving food and beverages; cleaning and maintaining the premises; providing light, power, heating and cooling; entertaining guests with gaming services, shows and other activities; and computing building and operating costs (including supplies, advertising, employee pay and benefits). **Pick one area** of the hospitality/gaming industry and **collect some data**. Then **write and solve** three everyday problems using the math methods that you have learned and the data that you have collected. Include your data and sources with your project.