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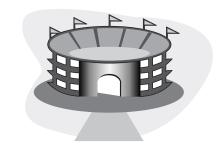
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# TACKLE MATH WITH THE BUFFALO BILLS

Welcome to
Tackle Math with the BUFFALO BILLS.
We hope that as you and your students use Tackle Math with the Buffalo Bills, you discover the excitement of learning mathematics.



### **COACH'S TALK**

### PROGRAM ORGANIZATION

Tackle Math with the **BUFFALO BILLS** activities are designed to teach and reinforce the New York State Key Ideas: Mathematical Reasoning, Number Sense and Numeration, Operations, Modeling and Multiple Representation, Measurement, Uncertainty, Patterns and Functions. It is designed for use with sixth grade students. The activities can be selected in any order to match your instructional program. Learning experiences have been formulated to capture the interest of students regardless of gender and background.

The Coach's Manual is the teacher's guide and the Playbook is the student's workbook. Each section begins with a short Overview followed by Learning Outcomes, New York State Standards: Key Ideas and Performance Indicators and Activities. Many of the primary activities are followed by Overtime (enrichment) activities, and Mathematics Notes.

Overtime activities provided in each section are to be used to supplement the regular activities. Overtime activities should be used at the discretion of the teacher and may be used to create additional learning stations, provide additional experiences for the students who finish early, or to enhance learning that has already taken place.

A student Playbook has been provided for each student and is consumable. The Playbook contains activity pages the student completes as well as data that will be referenced in order to complete some of the activities.

A Warm Up packet of activities has been provided for bell work.

### **COACH'S TALK**

## TACKLE MATH WITH THE BUFFALO BILLS

### **TEAM ACKNOWLEDGMENTS**

This project was funded by the Buffalo Bills. Considerable credit for this project goes to the Tampa Bay Buccaneers, the National Football League, and the authors of Project PASS. Tackle Math with the Buccaneers was used as a model for Tackle Math with the BUFFALO BILLS with the majority of the activities updated and adapted to fit New York State Education Standards and the Buffalo Bills.

This project was possible through the collaborative effort of the Buffalo Bills organization and the Buffalo Public School Mathematics Department.

### **EQUIPMENT/MATERIALS MANAGEMENT**

Your Tackle Math with the Buffalo Bills Kit contains the following:

- Coach's Manual
- Playbooks-one per student
- Warm Up & Activity Transparencies
- Posters
- Rulers



The following educators were involved in the development of these materials.

### **Debra Sykes**

Director of Mathematics Buffalo Public Schools

### Arlene Rosowski

Supervisor of Instruction Buffalo Public Schools

### **Sharyn Miller**

Math Support Teacher Buffalo Public Schools

### Claudette Rivera

Math Support Teacher Buffalo Public Schools



### **COACH'S TALK**

### **COACH'S STRATEGIES**

When planning for instruction, note that a clock icon is followed by the approximate amount of time the activity should take. However, this time may vary due to special circumstances surrounding any teaching situation. The suggested times should help you plan activities and the number of days needed.

### WHOLE GROUP ACTIVITY SUGGESTIONS

Introduce activities to the class in a large group setting. For teachers who choose to use stations/small groups, the following is provided:

### **SMALL GROUP ACTIVITY SUGGESTIONS**

Cooperative groups or teams of students are recommended for instructional grouping in Tackle Math with the **BUFFALO BILLS**. The activities lend themselves naturally to student interaction and small group work. This organization of students provides more flexibility in assigning activities, enabling you to maximize the use of available technology, while providing an approach to learning that is highly recommended by mathematics educators at all levels. The following suggestions are offered:

- Prior to beginning small groups, introduce each activity to the entire class
- For general instruction, organize your students in groups of four, if possible. Groups larger than six are ineffective and therefore not recommended.

# TACKLE MATH WITH THE BUFFALO BILLS

### **OVERVIEW**

It is important that athletes do warm up exercises before they play a game or begin a practice session. Likewise, it is important that students do warm up exercises before the day's lesson to reinforce prior skills that they have learned. Warm up exercises are provided on transparencies for this purpose. Choose one exercise per day.

### FOOTBALL HISTORY

Q: During the Buffalo Bills vs. New York Giants game a total of 30 tackles were made. Bruce Smith made 9 of those tackles. What was the percentage of tackles that Bruce Smith made during the game? Use a proportion to find the answer.

**A:** 
$$\frac{n}{100} = \frac{9}{30}$$
  $n = 30\%$ 

- Q: Jerry Rice and Andre Reed have both played in the NFL for 14 years. Together they have scored 243 touchdowns. Rice has scored 77 more touchdowns than Reed. How many touchdowns has each scored?
- A: Andre Reed scored 83 touchdowns and Jerry Rice scored 160 touchdowns.

### **COMMUNITY RELATIONS DEPARTMENT**

Q: The Bills Community Relations department orders 1350 items for signing. On the average, they donate 30 signed items each week to local charities. How many weeks will they be able to send out donations?

**A:** 1350/30 = 45 appearances

Q: If they sign 525 footballs, what percent of the signed items are footballs? (Round your answer to the nearest percent.)

**A:** 525/1350 = .389 = .39 = 39%

Q: If the Community Relations department decides to increase the number of signed footballs by 20%, how many footballs will be needed?

**A:**  $525 \times .20 = 105 \text{ more}$ ; 525 + 105 = 630 footballs

### **TEACHER NOTES:**

Answers for each warm-up transparency are included here.



### **WARM IIPS**

- Q: In the month of June, eight of the Bills players signed 440 footballs. What is the average number of footballs signed by each player?
- A: 55 footballs



### **USING THE LETTERS**

Using the letters, BUFFALO BILLS

- Q: a) What is the probability of choosing an A?
- **A:** 1/12
- Q: b) What is the probability of choosing an L?
- **A:** 3/12 = 1/4
- Q: c) What is the probability of choosing a B or an F?
- **A:** 4/12 = 1/3
- Q: d) What is the probability of choosing a Z ?
- **A:** 0/12
- Q: e) What is the probability of choosing B, U, F, A, L, O, I, S?
- **A:** 12/12 = 1

### **RALPH WILSON STADIUM**

- Q: Ralph Wilson Stadium cost \$23.3 million to build. Write 23.3 million in standard form.
- **A:** 23,300,000
- Q: Round the answer above to the nearest million, then write in scientific notation.
- **A:**  $23,000,000 = 2.3 \times 10^7$



- Q: There are over 40 locations to purchase food, beverages, and merchandise. This is a ratio of one location for every 1850 seats. Write this ratio as a fraction.
- **A:** 1/1850
- Q: Write the next equivalent fraction
- **A:** 2/3700
- Q: Write this fraction as a decimal. Round off your answer to the nearest thousandth.
- A: .001

### **JUMBOTRON**

- Q: The Jumbotron features six massive videoboards. Each measures 8 feet by 39 feet. What is the perimeter of each videoboard?
- **A:** 94 feet
- Q: What is the area?
- A: 312 square feet
- Q: Double the length and width of the videoboard.
- A: 16 feet by 78 feet
- Q: What is the perimeter of the new videoboard?
- A: 188 feet
- Q: What is the area?
- A: 1248 square feet
- Q: Describe the relationship between the first perimeter and the second perimeter.
- A: The perimeter doubled.
- Q: Describe the relationship between the first area and the second area.
- A: The second area is 4 times larger than the first.



### TIME OUT

Q: A football game is 3 1/4 hours long including half-time. How many minutes is that?

A: 195 minutes

Q: If half-time is 15 minutes long, how many minutes is each quarter?

A: 45 minutes

Q: If there are 3.5 minutes left in the final quarter, how many minutes have been played since the start of the second quarter?

**A:** 131.5 minutes

### **SUPER BOWL SEATING**

Q: Raymond James Stadium in Tampa Bay increased its seating capacity for the Super Bowl from 65,000 seats to 75,000 seats. How many additional seats were added?

**A:** 10,000 seats

Q: What was the percent of increase? Round your answer to the nearest percent.

**A:** (75,000-65,000) / 65,000 = 15%

Q: If the stadium increases its seating capacity by another 12%, how many seats will there be then?

**A:** 84,000 seats



### **CHEERLEADERS**

Q: Create a bar graph using the heights of 20 of the Buffalo Jills. Remember to title your graph, label the axes, and use appropriate and consistent scales.

5'4", 5'8", 5'3", 5'8", 5'6", 5'8", 5'4", 5'7", 5'9", 5'5", 5'8", 5'7", 5'4", 5'5", 5'8", 5'7", 5'6", 5'8", 5'7", 5'7".

A: Check the students' graphs. Each graph needs a title, axes labeled, and appropriate and consistent scales for the axes.

Q: What is the mode? (Which height(s) occur most often?)

**A:** 5′8″

Q: What is the range?

**A:** 5'9'' - 5'3'' = 6'' range

### **BILLS CAREER CONNECTIONS**

The **Media Relations Coordinator** is in charge of the weekly game releases that are sent out to the media. A media guide is printed with a history of Bills statistics. Mathematics is very important in this job because of the many different statistics that are compiled on the players and the games. For example:

Q: The quarterback completed 174 of 220 passes this season. What percentage of passes did he complete?

**A:** 79%

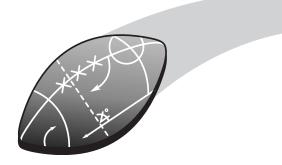


The **Equipment Manager** and **Assistant Equipment Managers** are responsible for ordering, maintaining and outfitting all players with protective equipment (shoulder pads, helmets, shoes, etc.) and practice and game day uniforms. They also outfit the coaching staff, scouting staff and support staff. The Equipment Managers are responsible for issuing, maintaining, and repairing all athletic supplies and equipment used for practices and games. They are also responsible for packing equipment for road games.

Q: In order to get all the jerseys clean for the next practice game the Equipment Managers must do laundry! A broken dryer needs to be repaired in a hurry, so the Equipment Manager must complete a purchase order to fix it. Help him fill out the order form.

| Quantity | Part                      | Cost    |  |
|----------|---------------------------|---------|--|
| 1        | Motor Belt                | \$12.50 |  |
| 1        | Heat Coil                 | \$89.60 |  |
|          | Labor \$45/hr for 2 hours |         |  |
|          | Tax                       | \$15.37 |  |
|          | Total Cost                |         |  |

**A:** Labor = \$90.00 Total Cost = \$207.47



### **COACH'S TALK**



The **Special Events Manager** organizes stadium activities for game day, such as the Buffalo Bills experience, pre-game and half-time activities and Training Camp. The special events manager also coordinates Bills related events with the Buffalo Bills Youth Foundation which requires managing the budget allocated for each event. For example:

Q: The Buffalo Bills Youth Foundation's Flag Football Tournament has an operating cost of \$10,000. The cost to enter the tournament is \$175 per team. How many teams must enter the flag football tournament in order to raise \$5,000 for charity?

Which equation below will you need to solve the problem above? Let t = the number of teams.

a) 
$$$175t = $5,000$$

b) 
$$$175t + $5,000 = $10,000$$

c) 
$$$175t = $10,000 - $5,000$$

d) 
$$$175t - $10,000 = $5,000$$

A: D

The **Team Trainer** supervises the team weight training facility.

In a season, the team uses:

24,000 rolls of tape

5,000 bandages

1,500 gloves

3,000 Band-Aids

1,200 cases of Gatorade

Q: Now, if each roll of tape contains 15 yards of tape and the team uses 24,000 rolls a year, how many complete times around the perimeter of a football field including the end zones could we walk unwinding the tape? (The football field is 100 yards by 53 1/3 yards. Each end zone is 10 yards by 53 1/3 yards.)

**A:** 1,038 times

# TACKLE MATH WITH THE BUFFALO BILLS

### **PEP TALK**

### **OVERVIEW**

Pep Talk introduces students to Tackle Math with the **BUFFALO BILLS** with a series of learning activities incorporating State Standards with major emphasis on geometry, measurement, data analysis and probability in real world applications. Pep Talk provides an introduction to Tackle Math with the **BUFFALO BILLS** regardless of which activity you choose first.

### **LEARNING OUTCOMES**

The student will:

- Explore attitudes and actions needed for success in mathematics, sports or any other real-life endeavor
- Become familiar with Tackle Math with the BUFFALO BILLS materials.



### A. VIDEO INTRODUCTION

MATERIALS: VCR, Videotape: Pep Talk segment, Poster

- 1. Have the Welcome to Tackle Math with the **BUFFALO BILLS** transparency projected for viewing when the students enter the room on the day the program is to be introduced.
- 2. Show the "Pep Talk" segment of the video. Following the video, discussion topics may include:
  - Success in the classroom compared to success on the football field
  - Teamwork/cooperation
  - Motivational factors

Examples of questions that could lead to discussion:

- What are some skills that successful students have in common with good athletes?
- What problems arise when you are doing group work and one person does not cooperate or carry out his or her assigned task?
- What are some important reasons that would convince you to do your homework or study for a test?

### PEP TALK



### **B. PLAYBOOK INTRODUCTION**

**MATERIALS:** Playbook, Poster

- 1. Distribute the Playbooks
- 2. Discuss the organization of the Playbook.
- 3. Refer to and discuss the Poster.
- **4.** Students open their Playbook to p.1. Ask students to respond to one of the following writing prompts.
  - Compare and contrast being a successful athlete to being a successful student.
  - Compare and contrast the qualities of a successful coach and a successful mathematics teacher.
  - Choose one of the strategies from the Poster. Describe how you can use that skill to become a successful student.

### C. WINNING STRATEGIES

| On the Field  | In the Classroom                  |  |  |
|---------------|-----------------------------------|--|--|
| Competition   | Striving to be the best           |  |  |
| Cooperation   | Helping others                    |  |  |
| Leadership    | Taking the lead in a group        |  |  |
| Organization  | Planning the time                 |  |  |
| Practice      | Doing exercises in class          |  |  |
| Preparation   | Completing assignments on time    |  |  |
| Setting Goals | Working to complete team projects |  |  |
| Teamwork      | Problem-solving in groups         |  |  |

Respond to one of the following writing prompts.

- Compare and contrast being a successful athlete to being a successful student.
- Compare and contrast the qualities of a successful coach and a successful mathematics teacher.
- Choose one of the strategies from the Winning Strategies poster. Describe how you can use that skill to become a successful student.

# TACKLE MATH WITH THE BUFFALO BILLS

### **TEACHER NOTES:**

Activity A must be done before Activity B. Factors needed to evaluate a player fairly could be fumbles, passing yards, sacks, experience, etc. Point out that significant factors are yardage gained and the number of times the player carries the ball.



### **DRAFT DAY**

### **OVERVIEW**

Decisions made by people are often made in haste. This activity is intended to convey to students that sufficient data must be collected before decisions are made. The "First Series" has students count the number of yards run by different running backs and use the information to rank them. The other activities deal with sampling and graphing the resulting data.

### **LEARNING OUTCOMES**

The students will:

- Identify factors involved in making decisions
- Gather, record, and analyze data

### **NEW YORK STATE STANDARDS**

Standard 3: 1A, 2A, 1B, 3A, 5D

### A. FIRST SERIES

MATERIALS: Calculators (optional), Playbook, First Series Transparency

- Have the students open Playbooks to p.2 and read the directions.
- 2. Students should record their statistics then find and record the average (mean) number of yards per carry. The teacher then uses the First Series Transparency to record class results.
- 3. The ensuing discussion should revolve around which running back would be drafted and whether there was sufficient information to make a good choice after calculating the results of the three carries.

### DRAFT DAY



### **B. SECOND SERIES**

**MATERIALS:** Calculators (optional), Playbook, and Second Series Transparency

- 1. After finding the averages (mean) for the total number of carries, they rank the runners again based on the total data collected.
- 2. Complete the questions on p.3 and p.4 of your Playbook.
- 3. Summarize with a discussion of how much information is needed to reach sound decisions. Why did you need more information?



### C. GRAPHING

#### **MATERIALS:**

Colored pencils, Playbook p.5, computer spreadsheet program (optional for overtime activity)

Have the students use the data from the First Series and Second Series pages in their Playbooks, and make a double bar graph showing the mean for each player after three carries and after thirteen carries.

# TIME: 20 minutes, Small Group Activity

### **BILLS FIELD**

### D. GOING THE DISTANCE

**MATERIALS:** Playbook p.6 and 7, Transparency of Bills field

In this activity, the students use a picture of a football field to answer questions involving integers.

The transparency could be used to explain the example on p.6. The students will complete each question by showing all their work in the space provided.



### **TEACHER NOTES:**

Use of the number line on p. 43 may be helpful in completing this activity.

# TACKLE MATH WITH THE BUFFALO BILLS



### **TEACHER NOTES:**

Use Number Line on p. 43, to help students solve problems.





### **DRAFT DAY**

### **E. DRAFT PAPER**

MATERIALS: Playbook, p.8

In this activity, the students need to create word problems about football situations involving integers. Give the students a set of equations and have them write a football situation that describes each equation.

**EXAMPLE:** 
$$-3 + x = 7$$

Sample student response: The quarterback falls back three yards from the line of scrimmage, and makes a pass for a total gain of 7 yards. How many yards did he really throw the football?

Answer: 10 yards

$$1. -5 + 14 = x$$

Sample student response: The quarterback is sacked and loses 5 yards on first down. On second down he completes a 14 yard pass. What is the gain after two plays? Did he get a first down?

Answers: 9, NO

2. x = 7 (Written responses vary.)

3. x = 24 (Written responses vary.)

### F. KEEPING SCORE

MATERIALS: Playbook p.9

In this activity, the students will calculate the points scored by other NFL players. They will also create their own plays, given a certain score, and make their own score and plays.

### **OVERTIME**

### G. SPREADSHEET ACTIVITY

MATERIALS: Computer and a spreadsheet program

Have the students enter the data from First Series and Second Series activities into a spreadsheet on the computer. They can create various types of graphs –bar graphs, line graphs, and circle graphs– to see the different way this same data can be presented. The students can be asked to write a descriptive paragraph about the data presented on their computers and determine which graph best displays the data.

### CROWD COUNT



### **OVERVIEW**

Sampling is a technique used to make predictions about the behaviors or characteristics of a population or collection by noting the frequency of the behaviors or characteristics in a sample of the population.

### **LEARNING OUTCOMES**

The students will:

- Use counting to determine the distribution of given data within a sample population
- Represent comparisons as ratios
- Express fractions as decimal and percents
- Use sampling to estimate the frequency of given behaviors/characteristics in a total population.

### **NEW YORK STATE STANDARDS**

Standard 3: 2B, 3A, 3F, 6C

### A. SELECT A SECTION

**MATERIALS:** Playbook and calculators

- 1. Use the picture on p.10.
  - **a.** By section, count the number of fans with hats and the total number of fans in the section.
  - **b.** Record the data on the board while students record the data on p.11 of the Playbook.
  - c. Demonstrate how to complete the table.
  - **d.** Discuss predictions about the whole crowd based on the sampling.
  - **e.** Have students use the proportion to make a projection about the number of hats in a crowd of 74,000.





### **CROWD COUNT**

- 2. Use the picture on page 12.
  Students should repeat the activity above using the characteristics of their choice and record the data on the Ralph Wilson Stadium Sampler–II, p.13 in their Playbooks. (Bills shirts, sunglasses, etc.) Use the information to predict the incidence of the characteristic in the total population of 74,000.
- **3.** Have students engage in a summarizing discussion. Questions for their consideration could include:
  - Why do we use sampling?
  - What conclusions can be drawn from sampling?
  - What factors can affect the validity of the conclusions?
  - Does sampling give exact measures? (You may want to revisit these questions later.)



### **B. GRAPH TYPES**

**MATERIALS:** Playbook

1. Students complete p.14 and 15 in Playbook using data from Sampler II data collection page. You may use a Blank Bar Graph and Line Graph Transparency for demonstration.

### **TEACHER NOTES:**

Sampling
suggestions:
number of left
handed students
in class, number
of students who
walk to school,
number of students whose birthday is in a specified month, etc.

### **OVERTIME**

### C. "REAL WORLD" SAMPLING



- 1. As a class, choose something else to sample. Students should repeat the entire sampling process for this activity and discuss ways of presenting the data and the conclusions that may be drawn. The students then can use the information to predict the incidence of the characteristic in the total school population.
- 2. Contact a local business and write a report on how the business uses sampling for decision making.

### **BILLS STATS**



### **OVERVIEW**

These activities provide students with the opportunity to examine numerical and graphic displays of data, make predictions based on the data, and explore ways statistics are used in real life.

### **LEARNING OUTCOMES**

The students will:

- Determine relevant data in a given situation
- Use relevant statistical information to test, refine, and defend inferences drawn from sets of data
- Describe how statistics are used in real-world situations

### **TEACHER NOTES:**

Activities A and B may be done independently or by teamwork.

### A. BILLS CAREER CONNECTIONS

MATERIALS: Playbook p.16, calculators

### **SPOTLIGHT:**

"As Vice President of Business Development and Marketing, I work with our local sponsors to maximize their relationships with the Bills. I oversee the marketing programs and promotions that our sponsors do involving the Bills both inside the stadium and out in the marketplace."

In broadcast terms, "Share" means the percentage of all televisions in an area that are tuned into a program. The Bills Marketing Department keeps track of the average "Share" for each game broadcast on TV for the purpose of encouraging sponsor participation. For each game televised during the 2001 season, the Bills received the following "Share":

61, 58, 57, 65, 61, 62, 67, 61, 62, 62, 62, 58, 61, 51, 49

Q: What was the average (mean) "Share" for the season?

**A:** 59.8

Q: What is the median and mode for the same data?

**A:** Median: 61, Mode: 61, 62





### **BILLS STATS**



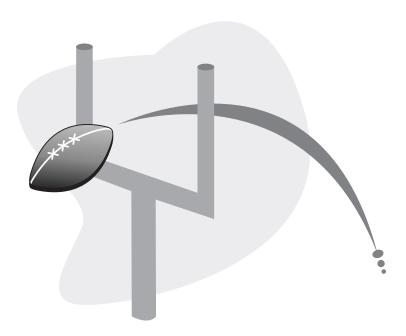
### **B. BUFFALO BILLS STATISTICS CONNECTION**

MATERIALS: Playbook p.17

The students will discuss the Bills statistics given, why they are important and how they can be utilized.

Next, the students will choose three situations in which statistics are used in real life experiences. The information should include specific data and use actual sources.

**Example:** Newspaper–the number sold per month; per year; total cost; profit, etc.



### MID FIELD



### **OVERVIEW**

This activity uses Bills Stats to investigate mean, median and mode. The "average" of selected measurements of football players will be compared with those of students. Data from other areas of interest to students will be collected, displayed and analyzed to determine measures of central tendency. Special attention should be given to the selection of the most appropriate measure in various contexts. Students will explore ways of displaying data. In addition, the problem solving strategy of using logical reasoning will be explored.

### **LEARNING OUTCOMES**

The students will:

- Explain the concepts of mean, median, and mode, and how each is obtained from a set of data
- Explain the uses and importance of measures of central tendency and contexts in which the use of each would be appropriate
- Use logical reasoning

### **NEW YORK STATE STANDARDS**

Standard 3: 1A, 3A, 5D, 5F

### **MATHEMATICS NOTES**

- **Mean** is the sum of the numbers in a data set divided by the number of members of the set.
- Median is the middle number in a group of numbers when they
  are listed in numerical order. When there is an even number of
  data, the median is the mean of the two middle numbers.
- Mode is the number(s) that occur(s) most often in a set of data.
- Measures of central tendency include the mean, median, and mode.
- The **range** of a set of data is the difference between the greatest and least value of the set.
- A frequency table is a means of organizing a set of data to show the number of times each item or number appears.

# TACKLE MATH WITH THE BUFFALO BILLS

# TIME: 1-2 Class Periods, Small Group

**Station Activity** 



### MEASUREMENTS

**Hat Size** 

**Neck Size** 

**Wrist Size** 

**Ankle Size** 

**Hand Span** 

Forearm Length

**Upper Arm Length** 

**Arm Length** 

Horizontal Reach (fingertip)

Shoulder-to-

**Shoulder Width** 

**Foot Length** 

**Shoe Length** 

Stride or Pace

Heartbeats per

minute

Length of Finger or

**Thumb** 

**Length of Hair** 

Blinks per Minute

### MID FIELD

### A. 3 Ms

**MATERIALS:** Calculators, Playbook

 Students will work in small groups or teams to enter Bills player data found on p.18 through 21 of the Playbook.

Complete questions 3 and 4 on p.21 of the Playbook comparing data.

### **B. BODY RATIOS**

MATERIALS: String, Scissors and Playbook

- 1. Working with a partner, have students cut a piece of string equal to their height.
- 2. Students will estimate the number of times the string will wrap around their head. They will record their estimation on the chart on Playbook p.23.
- 3. Students will measure the actual number of times the string actually wraps around their head.
- 4. Students will calculate the ratio of the number of times the string actually wrapped around their head to their height. (approximately 3:1)
- 5. Students will write the ratio as a fraction.
- **6.** Students will complete the chart using any of the attributes found on the Measurement Menu, p. 22.

### MID FIELD



### C. ARE YOU A SQUARE?

**MATERIALS:** String from the above activity, Playbook, Chart Paper

- Students will compare their height to their reach by holding their height string with their fingers and stretching their arms out as far as possible. If the string is exactly the same size as their reach, they are a "square." If the string is shorter, then they are a "tall rectangle." If the string is longer, then they are a "wide rectangle."
- 2. The students will draw their shape.
- 3. Post chart paper of the three shapes for them to record their names in their shape.

### TIME:

**Small Group Station** 

30-45 Minutes,

Activity

### D. MEASURING UP

**MATERIALS:** Tape measures, calculators (optional), Playbook

- 1. Use the Measurement Menu, p. 22 and p.24 of the Playbook to involve the whole class in the selection of 10 physical attributes to be measured to the nearest centimeter.
- 2. Students will write the selected attributes in the first column of the chart in the Measuring Up activity on Playbook p.24.
- 3. Students will estimate and record their own measurements and enter them in the second column of the chart.
- **4.** Students will find their actual measurements and enter them in the third column on the chart.
- Students will calculate the difference and record their answers in column four on the chart. Students should use positive or negative numbers where applicable.



### MEASUREMENTS

**Hat Size Neck Size Wrist Size Ankle Size Hand Span Forearm Length Upper Arm Length Arm Length Horizontal Reach** (fingertip to fingertip) Shoulder-to-**Shoulder Width Foot Length Shoe Length Stride or Pace** Heartbeats per minute Length of Finger or **Thumb Length of Hair Blinks per Minute** 





**Small Group Station** 

15-20 Minutes,

**Activity** 

### MID FIELD

### **E. LOCKER ROOM SCRAMBLE**

**MATERIALS:** Playbook

- Discuss logical reasoning and ask students to define in their own words. Encourage students to relate the idea to if-then statements.
- 2. The students can use any of the problem solving strategies such as make a table and/or work backwards. The use of a table will help the students organize their possibilities and eliminate combinations to complete the activity on p.25.

### **Answers:**

Brutus : Kicker Brawny : Receiver Husky : Running Back Sturdy : Quarterback



### HALF-TIME



### **OVERVIEW**

These activities will apply a variety of reasoning strategies and include justifying conclusions involving simple and compound statements.

### **LEARNING OUTCOMES**

The students will:

- Apply basic computational skills to real world situations
- Use a variety of problem solving strategies
- Complete a Venn diagram

### **NEW YORK STATE STANDARDS**

Standard 3: 1A, 1D

### A. SNACK TIME

**MATERIALS:** Playbook

- 1. The students will use the menu on p.26 to solve the problems on p.27.
- 2. In question 3, the Guess and Check strategy will give students a systematic process of making reasonable guesses.

### **Answers:**

- 1. About 36,549 had 1 hot dog; about 18,275 had 2 hot dogs
- **2.** \$219,297.00
- Possible choices: hot dog, french fries, soft drink; hamburger, popcorn, soft drink



### **TEACHER NOTES:**

Answers may vary depending on how students estimated. Accept any reasonable estimation.

# TACKLE MATH WITH THE BUFFALO BILLS



**Large Group Teacher** 

**Directed Activity** 

### HALF-TIME

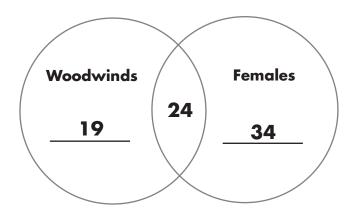
### **B. MARCHING BAND**

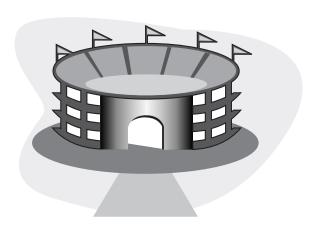
**MATERIALS:** Playbook

1. Use the Venn diagram below to help the students complete the Venn diagram on Playbook p.28.

### **Answers:**

- 2. 34 females do NOT play a woodwind instrument
- 3. 19 members are NOT female and play a woodwind instrument





### **BEST GUESS**



### **OVERVIEW**

In this activity, predictions are based on the outcomes of selected plays. These predictions will be determined through experiments enabling students to find the probability of a desired outcome.

### **LEARNING OUTCOMES**

The students will:

- Be able to determine the probability of a specific outcome
- Express probabilities as fractions, decimals, and percents
- Find probabilities based on experiments

### **NEW YORK STATE STANDARDS**

Standard 3: 6C, 6D, 2A, 2B, 5D

### A. PICK THE PLAY

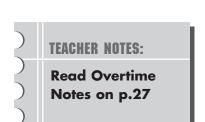
MATERIALS: Playbook

1. Have the students open their Playbooks to p.29. Have them discuss and complete questions 1-5.

### **B. COIN TOSS**

MATERIALS: Two coins per student, Playbook

- Discuss the possible outcomes of tossing one coin and then tossing two coins recording their predictions on p.30.
- 2. The students will toss two coins simultaneously 25 times and record their results after each toss and record the total of their tallies.







## TACKLE MATH WITH THE BUFFALO BILLS

### **BEST GUESS**

### C. BEHIND THE SCENES

MATERIALS: Calculator, Playbook

- 1. Have students turn to Playbook p.31.
- 2. Instruct students to take their best guess for each of the 10 questions.
- 3. Have the students correct their own paper and complete p. 32.

### **Answers:**

- 1.) True, 2.) False-correct answer is 5, 3.) False-correct answer is 20 deliveries, 4.) True, 5.) False-correct answer is 180,000, 6.) D, 7.) A, 8.) B, 9.) C, 10.) A
- **4.** Instruct the students to complete the questions in this section of their Playbook.

### **OVERTIME**

### D. PROBABILITY

Generate a discussion about the differences among theoretical, empirical and subjective probability. Write down examples of each type that the students can generate. (Refer to Mathematics Notes below for explanation of each type of probability.)

### **MATHEMATICS NOTES**

Theoretical (or mathematical) probabilities are obtained by logical reasoning. **Example:** The probability of rolling a number cube and obtaining a 3 is 1/6 since there are six possible outcomes, each with the same chance of occurring.

Empirical probabilities are obtained from experimental data.

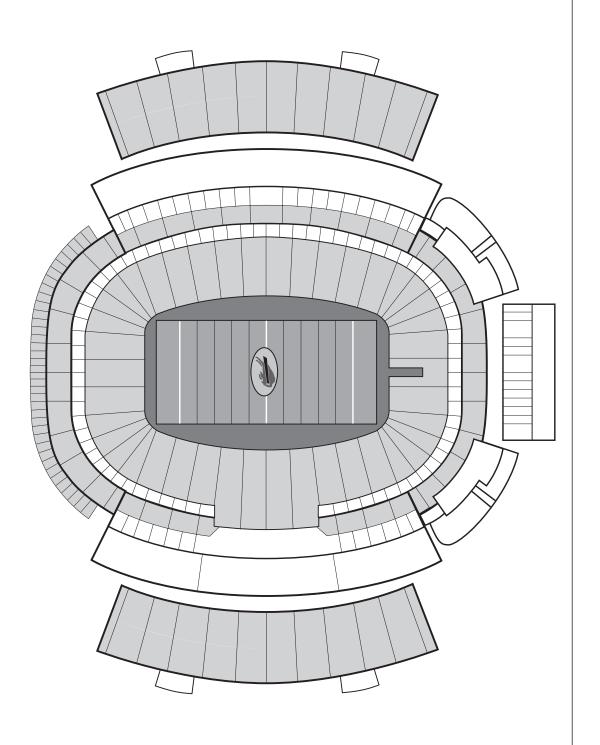
Example: a number cube is rolled 100 times and a 3 is obtained 20 times. The empirical probability is 20/100 or 1/5. With greater number of trials, the empirical probability should more closely approximate the mathematical probability.

Subjective probabilities are obtained by experience. **Example:** A TV weatherperson studies satellite pictures and makes predictions (80% chance of rain) based on past experience under similar conditions. A football coach uses both empirical data and subjective judgements based on past experience to make decisions about which play to run as was assumed in the "Pick the Play" exercise.

### **GAME TALK**

# TACKLE MATH WITH THE BUFFALO BILLS

### **RALPH WILSON STADIUM SEATING DIAGRAM**



# TACKLE MATH WITH THE BUFFALO BILLS

### **TEACHER NOTES:**

Geometric terms have been included on p.30



### **OVERVIEW**

A photograph is used to provide the setting for the discovery of geometric concepts in the football stadium.

Chalk Talk introduces geometric terms, which are included on pages 35 and 36. Additional activities develop the students' appreciation for the many uses of geometry.

### **LEARNING OUTCOMES**

The students will:

- Identify, represent and define basic geometric terms
- Pair geometric terms with football field representations

### **NEW YORK STATE STANDARDS**

Standard 3: 4A, 4I, 1C



### A. CHALK TALK

**MATERIALS:** Playbook, Chalk Talk Transparency

- 1. Have students turn to Playbook pages 34, 35 and 36.
- 2. Students should complete the table in their Playbooks by drawing a corresponding geometric figure and finding an example of it in the Stadium Diagram on p. 34.

### **TEACHER NOTES:**

Two-minute Drill activity on p.33 is a fun puzzle using the vocabulary words for this section.

### **GAME TALK**



### **CHALK TALK**

| TERM                | DEFINITION  |  |
|---------------------|---|--|
| Point               | An exact location in a plane, in space, or on a graph.                                  |  |
| Plane               | A flat surface that extends forever.  |  |
| Line                | A set of points that form a straight path that goes in opposite directions without end. |  |
| Line Segment        | A part of a ray or line that has two endpoints.   |  |
| Vertical Line       | A line that runs straight up and down.  |  |
| Ray                 | A part of a line that has one endpoint and continues without end in one direction.      |  |
| Vertex              | A common endpoint of two rays or two line segments.                                     |  |
| Horizontal Line     | A line that runs straight across.   |  |
| Angle               | A figure formed by two rays that have the same endpoint.                                |  |
| Intersecting Lines  | Lines that cross each other.  |  |
| Parallel Lines      | Two lines, segments, or rays that do not cross, no matter how far they end.             |  |
| Perpendicular Lines | Lines that intersect to form right angles.  |  |



### **GAME TALK**

### **B. STRUCTURAL SKETCH**

**MATERIALS:** Teacher-provided: blank paper or graph paper, ruler, colored pencils or markers

Students can sketch various views (front, back, etc.) of any building or other structure. Examples of geometric terms studied in Chalk Talk should be marked with different colors, coded and keyed.



### C. GEOMETRY CONNECTIONS

MATERIALS: Student Playbook, p.37

Have students respond to one of the following journal prompts.

- State and support your viewpoint to the statement, "There are connections between geometry and real life."
- 2. Have students list examples of geometric figures in sport, hobby, or game that they either participate in or watch.

### **OVERTIME**

### D. REFEREE SIGNALS

**MATERIALS:** Referee Transparencies

The Referee Signals transparencies can be used in class discussions such as: "Which signal can be used to illustrate a geometry concept? Which concept?"

### SHAPE UP



### **OVERVIEW**

Students explore the relationships between perimeter and area through hands-on measurement experiences and computer activitites.

### **LEARNING OUTCOMES**

The students will:

- Explore the relationship between perimeter and area
- Use linear units when measuring perimeter and use square units when measuring area
- Discover that figures having the same perimeter do not necessarily have the same area, and that the areas of regular polygons with equal perimeters increase as the number of sides increase
- Discover that the rectangle with the largest area for a given perimeter is a square, and that the plane figure with the greatest area for a given perimeter is the circle

### **NEW YORK STATE STANDARDS**

Standard 3: 1A, 1C, 5C

### **A. BILLS PRO SHAPES**

**MATERIALS:** Playbooks and Calculators

- 1. Students will complete the Bills Pro Shapes activity in their Playbooks p.39-40. Students will select 6 of the 28 Bills Pro Shapes on p.38 to use in their chart. Allow the use of calculators in computing perimeters and areas.
- 2. Conduct a summarizing discussion to ensure understanding of the relationship between perimeter and area, the use of linear units for dimensions and perimeter, the use of square units for area, and a recognition that the area of a rectangle does not necessarily increase or decrease as the perimeter increases or decreases.



### **TEACHER NOTES:**

Refer to definitions of types of rectangles on Playbook p.23



# TIME:

20 Minutes,

Whole or Small

**Group Activity** 

### SHAPE UP

### **B. FIELDS AND OTHER FIGURES**

**MATERIALS:** Playbooks and Calculators

 Students follow the directions in the Fields and Other Figures activity in their Playbooks, p.41. The students can use the Lotsadots, p.42 when drawing their rectangles. Students will need to pick a scale.

**Example:** 1 square = 20 feet

- 2. In the first activity, the students create several shapes maintaining a constant perimeter of 920 feet.
- 3. In the second activity, the students create several more rectangular shapes maintaining a constant area of 36 square centimeters.

### **FIELDS AND OTHER FIGURES ANSWERS:**

Q: A football field is 100 yards between the goal lines and 160 feet between the sidelines. Determine the following:

The perimeter of a football field is \_\_\_\_\_ feet.

The area of a football field is \_\_\_\_\_ square feet.

A: 920 feet, 48,000 square feet

Q: Complete the graph below using the given data. Create rectangles whose perimeter equals 920 feet. Enter your data in the chart below. (Use the Lotsadots page to help you visualize your rectangles. You will have to select a scale.

**Example:** 1 unit = 20 feet.)

A: Rectangles with Constant Perimeter

|           | Rectangle<br>One | Rectangle<br>Two | Rectangle<br>Three | Rectangle<br>Four | Rectangle<br>Five |
|-----------|------------------|------------------|--------------------|-------------------|-------------------|
| Width     | 100              | (285)            | 280                | (230)             |                   |
| Length    | (360)            | 175              | (180)              | 230               |                   |
| Perimeter | 920              | 920              | 920                | 920               | 920               |
| Area      | (36,000)         | (49,875)         | (50,400)           | (52,900)          |                   |

### SHAPE UP



Q: What are the measurements of the rectangle with

the largest area?

A: Length: 230 feet Width: 230 feet

Perimeter: 920 feet Area: 52,900 square feet

Q: Is there anything special about this rectangle? Explain.

A: It is a square.

Q: Complete the following table by creating 5 different rectangles with an area of 36 square feet. Again, you can use the Lotsadots page 43 to help you.

A: Rectangles with Constant Area

|           | Rectangle<br>One | Rectangle<br>Two | Rectangle<br>Three | Rectangle<br>Four | Rectangle<br>Five |
|-----------|------------------|------------------|--------------------|-------------------|-------------------|
| Width     | 12               | (4)              |                    |                   |                   |
| Length    | (3)              | 9                |                    |                   |                   |
| Perimeter | (30)             | (26)             |                    |                   |                   |
| Area      | 36               | 36               | 36                 | 36                | 36                |

### **OVERTIME**

### C. JOURNAL ENTRY: THINK, SOLVE, AND EXPLAIN

Pose the following problem: The Bills are involved in a public service project and they intend to build a new swimming pool at a recreational center. It has been decided that the pool will cover 1,800 square feet of ground space. The Bills want to get the most for their money and they are being billed based on the distance around the pool. What shape should the pool be to have the least distance around (perimeter) and an area of 1,800 square feet? Explain your choice and calculate the distance around the pool. Use Playbook p.44.



### **GREAT SHAPES**

### **OVERVIEW**

These activities are designed to develop understanding of the attributes and properties of geometric solids and the relationships among them.

### **LEARNING OUTCOMES**

The students will:

- Identify common three-dimensional figures and their attributes
- Distinguish similarities and differences of bases and faces
- Construct three-dimensional representations of geometric solids

### **NEW YORK STATE STANDARDS**

Standard 3: 4A



### A. ATTRIBUTES OF GREAT SHAPES

**MATERIALS:** Playbooks, Attributes of Great Shapes Transparency

- 1. Have the students turn to Playbook, page 45. Review the terms that are listed.
- 2. Have the students fill in the information for all the solids on their Playbook page. (Skip the last column for now. See Activity C.)

| 3-D geometric figure | # of<br>bases | Shape of bases | # of<br>Vertices | # of<br>faces | # of<br>edges | Vertices +<br>faces |
|----------------------|---------------|----------------|------------------|---------------|---------------|---------------------|
| Cube                 | 6             | square         | 8                | 6             | 12            | 14                  |
| Rectangular prism    | 6             | rectangle      | 8                | 6             | 12            | 14                  |
| Triangular prism     | 2             | triangle       | 6                | 5             | 9             | 11                  |
| Pentagonal prism     | 2             | pentagon       | 10               | 7             | 15            | 17                  |
| Octagonal prism      | 2             | octagon        | 16               | 10            | 24            | 26                  |
| Tetrahedron          | 4             | triangle       | 4                | 4             | 6             | 8                   |
| Square pyramid       | 1             | square         | 5                | 5             | 8             | 10                  |
| Rectangular pyramid  | 1             | rectangle      | 5                | 5             | 8             | 10                  |
| Cylinder             | 2             | circle         | 0                | -             | -             | -                   |
| Cone                 | 1             | circle         | 1                | -             | -             | -                   |

### **GREAT SHAPES**



### **B. 3-D PATTERNS**

MATERIALS: Playbook, scissors, tape, and markers

- 1. Have students remove pages 47-61 from their Playbooks.
- 2. Call students' attention to the instructions given on the pattern sheet for assembling the 3-D shape. Monitor and provide assistance as needed.
- The polyhedra that are constructed may be colored and used for classroom decorations. Mobiles can be made, if desired.

### **OVERTIME**

### C. EULER'S FORMULA

**MATERIALS:** Playbook, and Attributes of Great Shapes Transparency.

Direct each student's attention to the V, F and E columns of the Playbook attributes chart on Playbook p.45, Great Shapes. Ask students to write V + F in the heading space of the last column and then write the sum of the number of the vertices and the number of faces for each polyhedron in the corresponding spaces of this column. This should lead to a discussion of Euler's (pronounced "oiler's") Formula, V + F = E + 2. If other polyhedra models are available, they can use them to check the validity of the formula.

- 1. Given models of selected solids (e.g. soup can, cereal box). Students sketch the "unfolded" surface (envelope) of the solid.
- 2. Students identify, name, and list the attributes of geometric solids represented by objects in their environment.
- 3. Students select their favorite solid shapes and give reasons for their choices that include references to at least three attributes of the shape.



### **TEACHER NOTES:**

It is easier to decorate the shapes before they are cut out.



### **GREAT SHAPES**

**4.** Collect all the assembled polyhedra, have students record them by name, and give the number of bases, faces, edges, and vertices. Sketch each of the common three-dimensional figures on isometric dot paper, Playbook p.63.

### **MATHEMATICS NOTES**

A polyhedron is a solid figure made up of flat surfaces called faces. Each face is a polygon. The designation of the "base" of a three-dimensional shape is generally associated with the process of finding the volume of a solid. This results in thinking of the two triangular faces of a triangular prism as bases, the square face of a square pyramid as its base, any face of a tetrahedron or rectangular prism as a base, the two circular faces of a cylinder as bases, etc.



### **TRANSFORMS**



### **OVERVIEW**

Students will explore transformations (reflections, rotations, and translations) in a plane using hands-on activities to demonstrate understanding.

### **LEARNING OUTCOMES**

The students will:

- Identify translations, rotations, and reflections of figures in a plane.
- Construct translations, reflections, and rotations of figures in a plane.
- Use one or more transformations in a design project.

### **NEW YORK STATE STANDARDS**

Standard 3: 4H

### A. INTRODUCTION TO TRANSFORMATIONS

**MATERIALS:** Playbook

1. Use a coordinate grid to demonstrate translations, reflections, and rotations using the shapes provided following the Mathematics Notes or those of your choosing. Students complete questions on top of Playbook p.64.

### **MATHEMATICS NOTES**

The three kinds of transformations considered in these activities are translations, reflections, and rotations. The following discussion may be helpful.

• Reflections are always with respect to a line. The line of reflection may or may not be external to the figure. If the line of reflection intersects the figure in such a way that the part of the figure on one side of the line is the mirror image of the part on the other side of the line, the line of reflection is also a line of symmetry. Reflections are sometimes referred to as "flips." Shape is unchanged but orientation is reversed in a reflection (mirror image).

#### **TEACHER NOTES:**

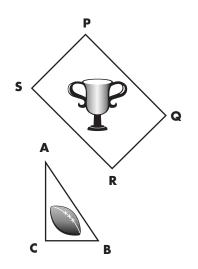
A general discussion of transformations and the relation to symmetry is contained in the Mathematics Notes section.

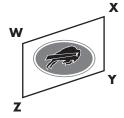


### **TEACHER NOTES:**

**Cut out the figures** below to demonstrate translations, reflections and rotations on a coordinate grid.







### TRANSFORMS

- Translations result in a transformation of the figure in a horizontal or vertical direction or both. Translations are sometimes referred to as "slides." Both shape and orientation are unchanged in a translation.
- A rotation is with respect to a point, which may or may not be in the interior of the figure. If the point of rotation is the centroid of the figure, and if the rotation is such that the figure maps onto itself in less than 360 (as does a star), the point of rotation is also a point of rotational symmetry.

### **B. FLIP - SLIDE - ROTATE**

**MATERIALS:** Playbook, scissors

- 1. Students are to cut out the figures on the Flip-Slide-Rotate Diagram on p.63 of their Playbooks. Students are to follow the directions at the top of the page. Using the cutout figures, students will translate the three figures pictured on the grid to answer the questions on p.64 and 65. These figures may be transformed to other positions on the grid by translating, reflecting, or rotating them.
- 2. To check the correct answers with the class, have the students demonstrate the transformation of each figure and the new coordinates using a coordinate grid.

#### FLIP-SLIDE-ROTATE ANSWERS:

1. 
$$P = (-4,5)$$

$$Q = (-1,2)$$

$$R = (-3,0)$$

**2.** 
$$P' = (0,2)$$

$$Q' = (3,-1)$$

$$R' = (1,-3)$$

$$C' = 1-2.31$$

**3.** 
$$A' = (-2,6)$$
  
**4.**  $W' = (-2,-5)$ 

$$B' = (-4,3)$$

$$C' = (-2,3)$$

$$Y' = (-1, -2)$$
  $Z' = (0, -5)$ 

S' = (-2,0)

- Translation
- Reflection with respect to y-axis

### TAILGATE



### **OVERVIEW**

In these activities the application of reasoning strategies will be used to solve real life experiences and the development of an understanding, representation and use of decimals and percents. Mathematical operations will be developed. The use of a coordinate plane will be used to explore geometric ideas.

### **LEARNING OUTCOMES**

The students will:

- Understand the basic role of place value in decimals
- Identify represenations of a given percent
- Multiply whole numbers and decimals
- Solve problems in which decimals and percents are used in everyday life
- Graph ordered pairs of numbers

### **NEW YORK STATE STANDARDS**

Standard 3: 1A, 2A, 2B, 3A

### A. TAILGATE PARTY

**MATERIALS:** Playbook

- 1. Discuss real life experiences involving sales, increases and total expenses.
- Have students complete the questions in Playbook on p.67.
   The students will complete the circle graph on p.68.
   Note: Answers on the next page.



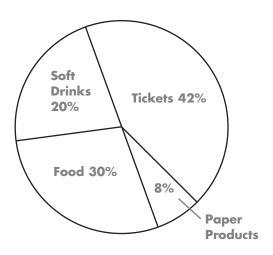


### **TAILGATE**

### **TAILGATE PARTY ANSWERS**

- 1. \$9,430.00
- **2.** \$134.71
- **3.** \$102.47
- **4.** \$152.73
- **5.** \$9,685.90
- **6.** \$186.25

**Expenses for Tailgate Party** 



### **B. BILLS MYSTERY GRID**

**MATERIALS:** Playbook

1. The students will use the list of ordered pairs on Playbook p.69 to graph each point on the coordinate grid on p.70. They should be careful when connecting the series of points between breaks.

### **ADVICE FROM THE BILLS**

TACKLE MATH WITH THE BUFFALO BILLS

### **ADVICE FROM THE BILLS ANSWERS**



# TACKLE MATH WITH THE BUFFALO BILLS

### **NUMBER LINES**

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