Math #1

Football Field (Square Footage)

Superintendents use math on the golf course in many ways and area measurements are the most important. A golf course superintendent should be able to accurately calculate the size of an area. Once the size is calculated and an application rate is chosen, the total amount of seed, fertilizer, or topdressing sand to be used can be determined.

Student Learning Objectives

1. **What is a square foot?**

2. **What is a rectangle and how do you calculate the area of a rectangle?**

3. **What is an acre and how many square feet are in an acre?**

4. **A football field is a rectangle.**
   How many square feet are in a football field?
   [120 yards long-end zones included, and 53.33 yards wide]
   How many acres is one football field?

Note: The teacher may want to have additional material covered. Take time to talk with the teacher in advance of the field trip.

Field Trip Requirements

- 100 foot measuring tape
- Calculator
- Clipboards and pencils
- Irrigation flags or spray paint to determine the corners of the area being measured

Field Trip Activity Outline

Take the students out to an area on the golf course to calculate the size of an area. Start out with a smaller rectangle -- about 20 X 30 feet and have the students measure that area. Mark the corners with irrigation flags or spray paint so the students can see the total area being measured.

Ask The Students

- How do you determine the area of a rectangle?
- What is a square foot and how big is it?
- How many square feet are in the sample area?

Steps

1. Ask students to pair up.

2. Give each pair of students a worksheet, and a pencil. These calculations can easily be done without a calculator.
3. Instruct the students to fill in the numbers on the worksheet.

4. Have the students ask any questions they may have completing the worksheet.

5. Go over their results and compare to the worksheet answers.

6. End with a discussion of what they learned and why it is important to be able calculate area measurements.

Additional Recommended Reference

Christians, Nick, and Michael L. Agnew. The Mathematics of Turfgrass Maintenance. 3rd ed. N.p.: Wiley, 2000. Print.

Worksheet #1 for Math on the Golf Course

Date_____ Golf Course_____

Student Name_____

Calculating Area Measurements

1. The area of a rectangle is determined by length (l) X width (w).
   One square foot is 12 inches by 12 inches. How many square inches are in one square foot?

2. A yard is three feet long. One square yard is 3 feet by 3 feet, or 9 square feet.
   What are the dimensions of the sample area (in feet or meters)?
   length_____ width_____

3. What is the area in square feet (or square meters) of the sample area? _____

4. An American football field is 53.33 yards wide by 120 yards long (end zones included).
   How many square feet is one football field? _____
   How many square yards? _____

Extra Credit/Extension

1. One acre is 43,560 square feet. How many acres is one football field?

2. If a golf course is 145 acres in size, how many football fields would fit on the golf course?

Math #2

Square Footage of an Irregular Space

Superintendents use math on the golf course in many ways and understanding area measurements is essential in managing the golf course. A golf course superintendent should be able to accurately calculate the size of an area. Once the size is calculated and an application rate is chosen, the total amount of seed, fertilizer, or topdressing sand to be used can be determined.

Student Learning Objectives

1. **What is a square foot?**

2. **How do you calculate the area of an irregularly-shaped space?**

3. **What is an acre and how many square feet are in an acre?**

4. **Why is it important to be able to calculate area measurements?**

Note: The teacher may want to have additional material covered. Take time to talk with the teacher in advance of the field trip.

Field Trip Requirements

- 100 foot measuring tape
- Calculator
- Clipboards and pencils
- An irregularly-shaped area to measure such as a green or a sand bunker

Field Trip Activity Outline

Take the students out to an area on the golf course to calculate the size of an irregularly-shaped area. A putting green or a sand bunker works well. Explain what a square foot is and how big it is. Explain the offset method for determining the area. Help them determine what distance between the offset lines to use. How many square feet are in the sample area?

Ask The Students

- How do you determine the area of a rectangle?
- How could you figure out the square footage of an irregular shape?
- How many square feet are in the sample area?

Steps

1. Ask students to pair up.

2. Give each pair of students a worksheet, and a pencil. These calculations can easily be done without a calculator.

3. Instruct the students to fill in the numbers on the worksheet.

4. Have the students ask any questions they may have completing the worksheet.

5. Go over their results and compare to the worksheet answers.

6. End with a discussion of what they learned and why it is important to be able calculate area measurements.

Additional Recommended Reference

Christians, Nick, and Michael L. Agnew. The Mathematics of Turfgrass Maintenance. 3rd ed. N.p.: Wiley, 2000. Print.

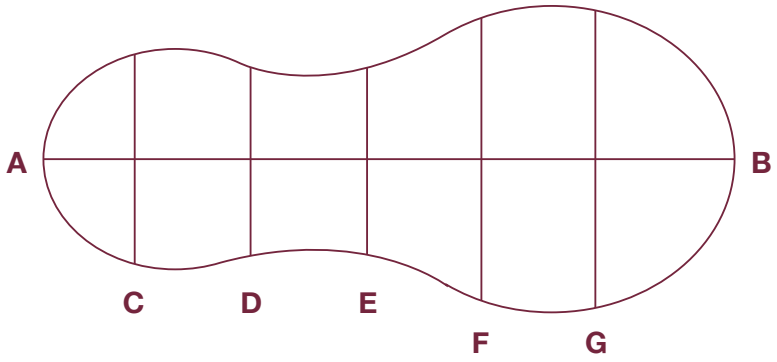
Worksheet #2 for Math on the Golf Course

Date_____ Golf Course_____

Student Name_____

Calculating Area Measurements

1. The area of an irregular shaped area is calculated by using the offset method.



Step 1. Determine the lenght line, the distance between points A & B _____.

Step 2. Determine the distance between the offset lines _____.

Step 3. Add the lengths of the offset lines, C + D + E + F + G
(your area may use more) _____.

Step 4. The length of the combined offset lines is _____ feet (X).

Step 5. The distance between the offset lines is _____feet (Y).

Step 6. Area = X times Y _____ square feet.

Extra Credit/Extension

One acre is 43,560 square feet. How many acres is the irregular shaped area?

Math #3

Measuring and Calculating Stream Flow

Superintendents use math on the golf course in many ways and understanding volume measurements is essential in managing the golf course. A golf course superintendent should be able to accurately calculate volume to properly apply sand topdressing, apply pesticides, or determine the volume of water in a pond. This lesson will determine the volume of water in a stream and calculate its velocity.

Student Learning Objectives

1. **What is a square foot?**

2. **What is a cubic foot, and how many gallons are there in a cubic foot of water?**

3. **What is an acre and how many gallons are there in one acre foot of water?**

Note: The teacher may want to have additional material covered. Take time to talk with the teacher in advance of the field trip.

Field Trip Requirements

- Slow moving stream with depth below 18 inches and banks low enough for easy access (the flow needs to be slow enough for kids to safely move around in it).
- 100 foot measuring tape
- 2 pairs of rubber boots (appropriately sized for the age of kids attending the field trip) to wade in the stream
- Yardstick or other measuring device for depth measurements
- Calculator
- Pen and paper
- Stream flow worksheets with clipboards
- Stopwatch
- Orange or tennis ball to float down the stream

Field Trip Activity Outline

1. Take the students out to an area on the stream that is out of play on the golf course where the banks are low enough for easy access.
2. Explain what is a cubic foot (a square that is one foot high, one foot long, and one foot wide.) One cubic foot of water contains 7.48 gallons.
3. Explain an acre foot of water contains 325,000 gallons. (You can relate that to the size of your irrigation pond or other pond on the course).
4. Talk about stream flow and how it is expressed as in cubic feet per second (CFS).

Ask The Students

- What is a square foot?
- What is a cubic foot?
- Why would a superintendent need to know the square footage of areas of the course?
- Why would a superintendent need to know the cubic footage of an irrigation pond?

Steps

1. Ask students to pair up. Get two volunteers to put on the rubber boots for in stream measurements. Another student is needed to record the time measurements.

2. Give each pair of students a worksheet, clipboard, and a pencil. These calculations need to be done with a calculator.

3. Instruct the students to mark out a 50 foot section of the stream. Drop a tennis ball, orange, or marshmallow in the stream and record the amount of time it takes to travel 50 feet. Do this 4 times and record the findings on the worksheet. Add the four numbers together and divide by 4 to get the average surface velocity of the stream. Record the number on the worksheet.

4. Pick an area within the 50 foot section to measure the width of the stream. Stretch the tape measure across the stream and record the width on the worksheet. Have one of the students use a yardstick or other measuring device to take the depth readings at one foot intervals along the tape measure. Record the findings on the worksheet then add the depth interval numbers together. Divide by the number of readings to get the average depth of stream.

5. Work through the rest of the worksheet to determine stream velocity in cubic feet per second (CFS). Ask students why they think a correction factor is used in calculating velocity.

6. Extra Credit
   If a stream is flowing at 8.5CFS, what is the flow rate in gallons per second? What is the flow rate in gallons per hour? What is the flow rate in gallons per day? What is the flow rate in acre feet per day?

7. End with a discussion of what they learned and why it is important to be able calculate volume measurements.

Additional Recommended Reference

Christians, Nick, and Michael L. Agnew. The Mathematics of Turfgrass Maintenance. 3rd ed. N.p.: Wiley, 2000. Print.

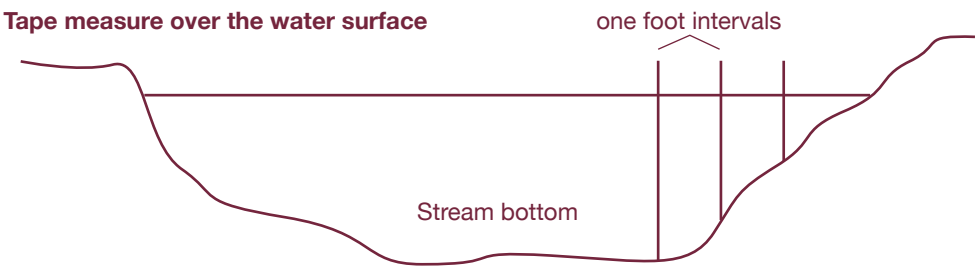
Worksheet #2 for Math on the Golf Course

Date_____ Golf Course_____

Student Name_____

Measuring and Calculating Stream Flow

AREA X CORRECTED VELOCITY = FLOW



First, let's calculate the area of a "slice" of the stream.

AREA = WIDTH X AVERAGE DEPTH

Width of Stream_____ (in tenths of feet)

Depth of stream at 1-foot intervals

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

Average depth of stream:

_____

AREA = Width x Avg. depth =

_____

Calculate Corrected Velocity

Surface velocity of stream (20 feet in seconds). Take 4 measurements.

1.

2.

3.

4.

Calculate the average surface velocity of stream for 20 feet _____ (seconds)

1-foot stream velocity_____ (ft/second)

Select **Correction Factor** based on river bed characteristics.

a) Rough, loose rocks, coarse gravel or weeds - .0.8

b) Smooth, mud, sand or bedrock – 0.9

CORRECTED VELOCITY of stream for 1 foot _____ (ft/second)
(Multiply 1-foot stream velocity by correction factor above.)

AREA X CORRECTED VELOCITY = FLOW

STREAM AREA: Multiply stream width by average stream depth _____ ft2
(You calculated this on p. 1 of the worksheet.)

CORRECTED VELOCITY: _____
(You calculated this above.)

FLOW: _____ ft3/sec or cfs
(Multiply STREAM AREA by CORRECTED STREAM VELOCITY.)