Math TODAY™
Teacher Edition

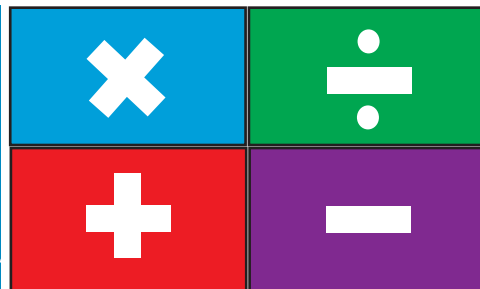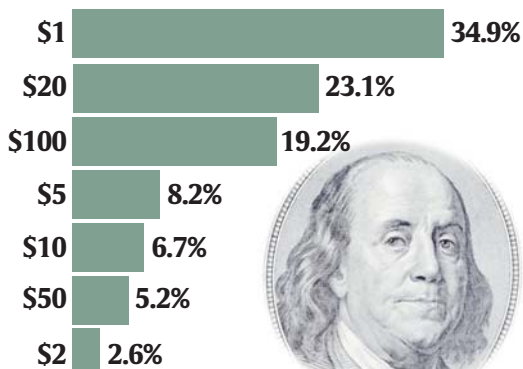**USA TODAY**

NO. 1 IN THE USA

The New Color of Money

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USA TODAY Snapshots®

USA money in circulation

About 22 billion bills were circulating as of Dec. 31, 2001. Percentage of bills:

$1	34.9%
$20	23.1%
$100	19.2%
$5	8.2%
$10	6.7%
$50	5.2%
$2	2.6%

Source: Federal Reserve   By Sarah Renner and Quin Tian, USA TODAY

Activity Overview:

Students will determine the approximate number of $20 bills in circulation as of December 31, 2001, using percent and total number of bills from the USA TODAY Snapshot® "USA money in circulation." Students will write their answers in decimal and scientific notation. The Science Tools APP will be used to convert from one unit of measure to another.

Concepts:

- Scientific notation
- Percent of a number
- Volume of rectangular solid
- Unit conversion
- Reading and interpreting graphs

Objectives:

Students will:
- express numbers in scientific notation.
- determine the percent of a number.
- convert from one unit of measure to another.
- determine the volume of a rectangular solid.

Activity at a Glance:

- Grade level: 9-12
- Subject: Algebra
- Estimated time required: 15-20 minutes

Materials:

- TI-83 Plus or TI-83 Plus Silver Edition
- Overhead view screen handheld for instruction/demonstration
- Student handout
- Transparency
- Science Tools APP

Prerequisites:

Students should be able to:

- write numbers in scientific notation.
- use the Science Tools APP for unit conversion.
- convert from one unit of measure to another unit.
- find the volume of a rectangular solid.

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Background:

The USA TODAY Snapshot "USA money in circulation" gives the student the opportunity to use scientific notation with real-life data. The student will work with large numbers when determining the height of a stack of $20 bills. Unit conversion will be used to change from inches to miles and cubic inches to cubic feet.

Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.
- When using Science Tools make sure that each handheld has this APP.

Classroom Management Tips:

- Students will have a better understanding of how to read the graphic and retrieve data if you use the transparency for a class discussion before the students start working.

- Remind students to carefully read all parts of the graphic before they start collecting data.

- Students can work individually or in small groups on this activity.

- Students can work individually or in groups to assist each other as they learn the various features of the handheld.

- Allow students to talk about the "how" and "why" approach they used to find the solution.

- This activity can be used as a review of concepts or a culminating activity with the class.

- This is a great opportunity to have students express numbers in scientific notation.

- You may need to remind students about the formula for the volume of a rectangular solid before they start on this activity.

Data Source:

Federal Reserve

National Council of Teachers of Mathematics (NCTM) Standards*:

Number and Operations Standard
- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- Work flexibly with fractions, decimals, and percents to solve problems.
- Develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation.

Connections Standard
- Recognize and apply mathematics in contexts outside of mathematics.

Measurement Standard
- Understand measurable attributes of objects and the units, systems, and processes of measurement.
- Apply appropriate techniques, tools, and formulas to determine measurements.

*Standards are listed with the permission of the National Council of Teachers of mathematics (NCTM), www.nctm.org. NCTM does not endorse the content or validity of these alignments.

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Activity Extension:

- Have students interview a local bank officer to determine how many $20 bills are maintained in that bank for normal daily transactions.

- Work with students to determine the range of dimensions of a room with a volume equivalent to the volume of all of the $20 bills found in Step 4 of the student activity. Discuss the advantages and disadvantages of the different shapes for the room.

- Have students call a building contractor to find out what the average cost per square foot of office space is in your area. Ask students to determine the approximate expense for constructing a room/building to hold all the $20 bills in circulation as of Dec. 31, 2001. Compare that to the average monthly cost per square foot for renting storage space in your area.

- Encourage students to explore www.usatoday.com for articles related to the new $20 bill and summarize the information in their journals or write a short related story.

- Use the Money section of USA TODAY and ask students to find five articles that include dollar amounts that are in the millions, billions or higher. Then, have them make a poster for the classroom of the articles they found.

- Ask your building administrator for the dimensions of the school and have students determine if the number of $20 bills would fit in your school.

Curriculum Connections:

- Tech classes-building industry standards and building expense
- Business classes-expense reports and business plans

Additional Resources:

Student Handout

Transparency

TI Technology Guide, for information on the following:

- TI-83 Plus
- ScienceTools APP

Teacher Notes:

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Assessment and Evaluation:

Step 1
Decimal 5,100,000,000 bills   Scientific 5.1×10^9 bills

Step 2
233 bills

Step 3
2.2×10^7 inches
about 350 miles (2 significant digits accuracy)

Step 4
1.728×10^3 in^3 (1,728 cu. in.)
0.069 in^3
3.5×10^8 in^3 (350,000,000 cu. in.)
2.0×10^5 ft^3 (200,000 cu. ft)

Focus Questions

Q. According to the USA TODAY Snapshot "USA money in circulation," about how many $20 bills were in circulation as of December 31, 2001?

A. About 5,100,000,000

Q. What would be the height (measured in miles) of a single stack of all of the $20 bills in circulation as of December 31, 2001?

A. About 350 miles

Q. What is the minimum volume of a room that could store, at one time, all of the $20 bills in circulation as of December 31, 2001?

A. About 200,000 cubic feet or 2.0×10^5 (two significant digits accuracy)