The Case of the Gigantic $100,000 Bill

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LESSON DESCRIPTION
In this lesson, students participate in a demonstration of the money creation process using a large $100,000 bill. Expansions of the money supply caused by successive deposits and loans are traced on the board so that students can observe the process. Required reserves are cut from the large bill during each stage of the process. Students learn to calculate the upper limits of the money creation process using the simple money multiplier.

INTRODUCTION
Depository institutions provide numerous valuable services to customers. These services include offering a safe place for customers to store money and earn interest, enabling customers to write checks, pay bills, or send money to other people.

Fractional reserve banking is a system in which banks are required to hold only a fraction of their deposits (reserve requirement) available for withdrawal by depositors. The rest may be lent, thus creating money. When depository institutions make loans, they create money because these loans become new deposits from which borrowers can withdraw cash to spend. The size of the reserve requirement has a direct impact on the amount of money that can be created when depository institutions make loans.

The money multiplier is the mathematical relationship between the monetary base and money supply an economy. It explains the increase in the amount of circulated money that is created when a bank makes loans using funds previously deposited by customers.

ESSENTIAL QUESTION
How do loans made by depository institutions (banks) affect the size of the money supply?

CONCEPTS
Excess reserves
M1
Money creation
Money multiplier
Money supply
Required reserves
Reserve requirements

OBJECTIVES
Students will be able to:
- Demonstrate how successive deposits and loans by depository institutions cause the money supply to expand.
- Calculate the simple money multiplier when a required reserve ratio is provided.
- Explain that money is created when banks make loans and destroyed when loans are repaid.

CONTENT STANDARDS
Voluntary National Content Standards in Economics
- Standard 11: Money makes it easier to trade, borrow, save, invest, and compare the value of goods and services. The amount of money in the economy affects the overall price level. Inflation is an increase in the overall price level that reduces the value of money.

Common Core State Standards
- CCSS.ELA-Literacy.RST.11-12.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

TIME REQUIRED
60 minutes

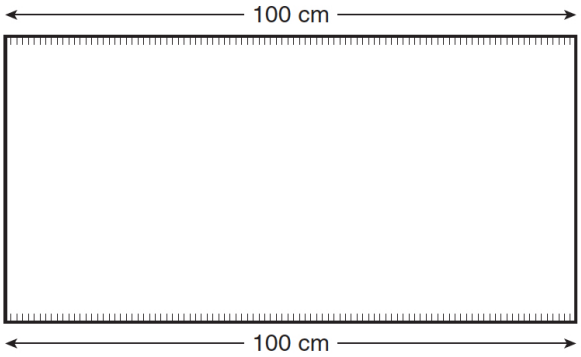
MATERIALS

- Activity 1: Money Creation Worksheet, one copy per student and a visual
- Activity 1: Money Creation Worksheet (KEY), one copy for the teacher.
- Name tags for bankers and borrowers
- A roll of bulletin board paper (optional)
- Chalk, dry erase marker, or poster marker
- Masking tape (optional)
- Meter stick
- Overhead projector or other means to display the visual
- Overhead projector pen (optional)
- Scissors

PROCEDURES

1. Cut a piece of paper one meter by 50 centimeters. This piece of paper will be the gigantic $100,000 bill for the lesson. You can decorate the paper to look like an actual $100,000 gold certificate. An example of the $100,000 gold certificate can be found online at www.philadelphiafed.org/education/money-in-motion/treasure-trove/americas-ever-changing-money/trove_changing-money-25c

2. On the front of the $100,000 bill you just created, using a meter stick, mark off each centimeter along the top and bottom of the bill as shown in the illustration below:



3. If your chalkboard or whiteboard is not at least five meters long, affix bulletin board paper five meters long along one wall in your classroom. This space on your chalkboard, whiteboard, or wall will be where you and your students will trace the gigantic $100,000 at the beginning of each round of the money creation activity.

4. Produce name tags for Bankers A–E (five students) and Borrowers 1–4 (four students).

5. Establish a place where you can show the visual of Activity 1 without interfering with the space where you and your students will trace the gigantic $100,000 bill at the beginning of each round.

6. Start the lesson by asking the students: Who do you think creates money? (*Answers will vary, but some students are likely to say that the government creates money.*) Tell the students that they are going to explore the process by which depository institutions create money. (To further introduce the lesson, if you have access to the Internet in your classroom, you may want to show your students the "Who Creates Money?" video available on YouTube at https://youtu.be/krHeFg4bOIQ)

7. Show students the gigantic $100,000 bill you prepared before class. Explain that the highest denomination note printed in the United States today is the $100 Federal Reserve note, but in the first half of the twentieth century there were larger denomination notes issued. The largest denomination note ever printed by the Bureau of Engraving and Printing was the $100,000 Series 1934 Gold Certificate. These $100,000 bills were issued only to Federal Reserve Banks and were used only for official transactions between Federal Reserve Banks. (Note: If you have access to the Internet in your classroom, you may want to show your students the $100,000 gold certificate shown at the web page address given in procedure step 1.)

8. Explain that the **money supply** is the total amount of money available in the economy

to purchase goods and services. The simplest measure of the U.S. money supply, called **M1**, includes coins and paper currency, all deposits in banks and savings institutions on which checks can be written (checkable), and traveler's checks. In this activity, we will assume that the money supply is limited to total checkable deposits at depository institutions and all currency in circulation.

9. Remind students that when people deposit money in a bank, savings institution, or credit union, the depository institution holds some of the deposited money as reserves and lends the rest of it. Depository institutions earn revenue by charging a higher rate of interest on the loans they make than the rate they pay to customers on deposited money.

10. Explain to students that in the United States, there are reserve requirements set by the Federal Reserve that require banks to hold a percentage of their transaction account balances as reserves—not loan them out. While banks do not hold reserves simply because they are required to and they may choose to hold more reserves than required, in this activity students should assume that banks hold only the reserves they are required to and lend the rest of the money they have on deposit.

11. Explain that **required reserves** are that portion of a bank's reserves retained to meet Federal Reserve requirements and **excess reserves** are that portion of a bank's reserves in excess of that amount. The amount of excess reserves can be found by subtracting an institution's required reserves from its total reserves, which in this simulation are equal to the bank's new deposits.

12. Point out that the highest reserve requirement in the United States is 10 percent, and some banks with net transactions account balances less than about $90 million are subject to lower reserve requirements. In this lesson, though, students will have a 20 percent required reserve ratio.

13. Ask for five volunteers to serve as Bankers. Give each Banker a name tag to put on and ask them to stand in the front of the room facing the class. Ask for four volunteers to serve as Borrowers. Give each Borrower a name tag to put on and ask them to stand in one corner of the classroom and wait to take out a loan from one of the banks.

14. Distribute one copy of Activity 1 to each student. Explain to students that they will record the deposits, required reserves, and excess reserves for each bank during each round of the activity. They will also record the amount of money created in each round on the right side of the activity sheet.

15. Explain to students that while $100,000 gold certificates never circulated publicly in the United States, we are going to assume that gigantic $100,000 bills are in circulation.

16. Explain that you found this gigantic $100,000 bill under the floorboards in your house. Ask: Is this $100,000 bill already counted as part of M1? (*Yes*) Why? (*M1 includes all currency in the hands of the public, so the gigantic $100,000 would already have been counted as part of the money supply.*)

17. Explain that you will use the space you prepared to keep track of the expansion of M1 by tracing the outline of the paper currency during each round of the activity.

18. With the help of a student, trace around the gigantic $100,000 bill on the prepared board or wall. The tracing should start in the leftmost part of the space so that successive expansions of the money supply can be traced to its right.

19. Project the visual of Activity 1.

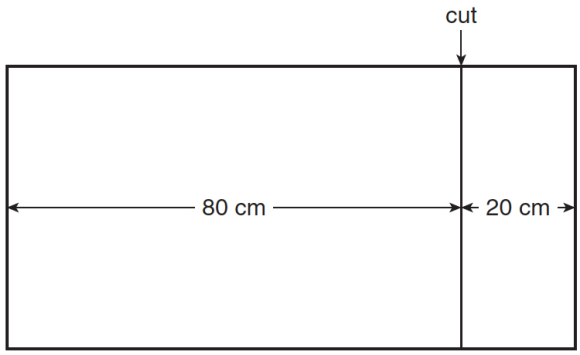
20. Deposit the gigantic $100,000 bill into Bank A. Instruct Banker A to take the $100,000 bill. Record the $100,000 deposit on the visual of Activity 1 in the ledger section for Bank A.

21. Discuss the following:
    a. Now that the $100,000 has been deposited into your checking account at Bank A, has M1 changed? (*No.*) Why? (*Before the $100,000 was deposited into the bank it was currency. Now the $100,000 is in a checking account. Both currency and checkable deposits are part of M1, so there has been no change in the money supply.*)
    b. Given that $100,000 has just been deposited into Bank A, by how much have Bank A's required reserves increased? (*$100,000 × 20% = $20,000*)
    c. By how much have Bank A's excess reserves increased? (*$100,000 – $20,000 = $80,000*)

22. Record Bank A's required and excess reserves in the appropriate blanks on the visual of Activity 1. Instruct the students to update their entries for Bank A on their copies of Activity 1.

23. Explain that each centimeter on the gigantic $100,000 bill represents $1,000. Show students that centimeters are marked along the top and bottom edges of the bill. Ask: How much of the $100,000 bill should be cut off the $100,000 bill to be kept at Bank A as required reserves? (*20 centimeters, equivalent to $20,000*)

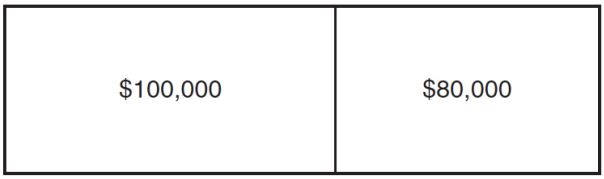
24. Direct Banker A, using scissors, to cut the required reserves off the gigantic $100,000 bill. The bill should be cut into two pieces along the line delineated in the picture at the top of the next column.



25. Begin Round 1. Ask: What will Bank A do now? (*Lend $80,000.*) Instruct Borrower 1 to come forward and request an $80,000 loan from Banker A. Instruct Banker A to give Borrower 1 the larger portion of the bill and retain the smaller portion as reserves.

26. Discuss the following:
    a. Ask Banker A: How much money do I have in my checking account? (*$100,000*)
    b. Ask Borrower 1: How much money do you have in paper currency, which you just borrowed from Bank A? (*$80,000*)
    c. By how much has the money supply increased? (*$80,000*)

27. Record the money created in Round 1 ($80,000) in the appropriate space on the visual of Activity 1. Direct Borrower 1 to help you trace the newly created $80,000 adjacent to the tracing of the original $100,000. Direct students to record this $80,000 increase in the money supply in the space provided in Activity 1 and then record it on the visual. The tracings should now look like this:



28. Explain that Borrower 1 borrowed the money to buy something big. Ask Borrower 1: Why did you borrow $80,000? (*Answers will vary.*) Explain that Borrower 1 is requested to deposit the $80,000 in the bank account of the business or person he or she bought from.

29. Direct Banker B to come forward. Direct Borrower 1 to deposit the $80,000 into Bank B on behalf of the person or business that he or she purchased from. Instruct Banker B to take the $80,000 from Borrower 1. Record the $80,000 deposit on the visual of Activity 1 under the section for Bank B.

30. Discuss the following:
    a. Given that $80,000 has just been deposited into Bank B, by how much have Bank B's required reserves increased? (*$80,000 × 20% = $16,000*)
    b. By how much have Bank B's excess reserves increased? (*$80,000 – $16,000 = $64,000*)

31. Record Bank B's required and excess reserves in the appropriate blanks on the visual of Activity 1. Instruct students to update their entries for Bank B on their copies of Activity 1.

32. Ask: How much of the $80,000 should be cut off the bill to be kept at Bank B as required reserves? (*16 centimeters, equivalent to $16,000*)

33. Direct Banker B, using scissors, to cut the required reserves off the $80,000. The original bill has now been cut into three pieces—one 20 cm wide (retained by Banker A as Bank A's required reserves), one 16 cm wide (to be retained by Banker B as Bank B's required reserves), and one 64 cm wide.

34. Begin Round 2. Ask: What will Bank B do now? (*Lend $64,000.*) Instruct Borrower 2 to come forward and request a $64,000 loan from Banker B. Ask Borrower 2: Why are you borrowing $64,000? (*Answers will vary.*)

35. Instruct Banker B to give Borrower 2 the larger portion of the bill and retain the 16 cm wide portion as Bank B's required reserves. Ask: What just happened? (*Money was created.*) By how much has the money supply increased? (*$64,000*)

36. Record the money created in Round 1 ($64,000) in the appropriate space on the visual of Activity 1. Direct Borrower 2 to help you trace the newly created $64,000 directly adjacent to the tracing of the previous $80,000. Direct students to record this $64,000 increase in the money supply in the space provided in Activity 1 and then record it on the visual.

37. Explain that, as before, Borrower 2 will make his or her purchase using the $64,000 he or she just borrowed. Direct Banker C to come forward and Borrower 2 to deposit the $64,000 into Bank C on behalf of the person or business that he or she purchased from. Instruct Banker C to take the $64,000 from Borrower 2. Record the $64,000 deposit on the visual of Activity 1 under the section for Bank C.

38. Discuss the following:
    a. Given that $64,000 has just been deposited into Bank C, by how much have Bank C's required reserves increased? (*$64,000 × 20% = $12,800*)
    b. By how much have Bank B's excess reserves increased? (*$64,000 – $12,800 = $51,200*)

39. Record Bank C's required and excess reserves in the appropriate blanks on the visual of Activity 1. Instruct students to update their entries for Bank C on their copies of Activity 1.

40. Ask: How much of the $64,000 should be cut off the bill to be kept at Bank C as required reserves? (*12.8 centimeters, equivalent to $12,800*)

41. Direct Banker C, using scissors, to cut the required reserves off the $64,000.

42. Repeat the process of making loans and deposits, tracing the expansions of the money supply, calculating and cutting reserves, and completing Activity 1 through two additional rounds. The money supply expansions are $51,200, in Round 3 and $40,960 in Round 4. Use Activity 1: Money Creation Worksheet (KEY) to check student work.

43. Discuss the following:
    - Although the U.S. Mint produces coins, the Bureau of Engraving and Printing prints paper currency notes, and the Federal Reserve Banks issues Federal Reserve notes, money is created when banks make loans.
    - The process of successive loans and deposits is called the **money creation** process.
    - The money creation process is limited by the amount banks choose to hold as reserves and can be affected by the amount actually deposited in depository institutions. Reserve requirements, though, delineate an upper bound on the amount of money that can be created from any one deposit into the banking system.
    - The simple **money multiplier** is the amount that an initial $1 increase in excess reserves will eventually add to the money supply if banks lend all their excess reserves and all the borrowed money is subsequently deposited back into a depository institution or institutions. The simple money multiplier can be found by dividing the required reserve ratio into one.
    - We can use the simple money multiplier to find the maximum amount of money that can be created as a result of a deposit into a checking account. To do this, we multiply the initial amount of excess reserves by the simple money multiplier.

44. Write the following equation on the board:

$$\text{money multiplier} = \frac{1}{\text{required reserve ratio}}$$

45. Discuss the following:
    a. What is the money multiplier for our example with a required reserve ratio of 20 percent? (*1 ÷ 0.20 = 5*)
    b. With the $100,000 initial deposit, the initial excess reserves were $80,000. What is the maximum amount the money supply could expand as a result of this initial deposit and the money creation process? (*$80,000 × 5 = $400,000*) Enter $400,000 in the blank at the bottom of the Money Supply Expansion column on the visual of Activity 1 and instruct students to do the same on their copies of Activity 1.
    c. If we continued tracing and cutting the gigantic bill from the activity until the money creation process was finished, how much total space would we need for the completed tracings? (*5 meters*)
    d. If the Federal Reserve raised the required reserve ratio from 20 percent to 25 percent, how would the activity have been different? (*The money multiplier would have been 1 ÷ 0.25 = 4. Only $300,000 could have been created (excess reserves times money multiplier, $75,000 × 4 = $300,000). Only four meters would have been required to trace the initial deposit and all of the money supply expansions.*) Explain that the Federal Reserve changes the required reserve ratios infrequently and last changed them in 1992.
    e. If we had used a required reserve ratio of 10 percent, how would the activity have been different? (*The money multiplier would have been 1 ÷ 0.10 = 10. $900,000 could have been created (excess reserves times money multiplier, $90,000 × 10 = $900,000). Ten meters would have been required to trace the initial deposit and all of the money supply expansions.*)

f. If money is created when banks make loans, how is money destroyed? (*Answers will vary.*) Explain that money is destroyed when loans are repaid. However, the depository institution is likely to make another loan with the proceeds from the repaid loan. Therefore, money is likely to be created to replace the money destroyed when the loan was repaid.

CLOSURE

46. Review important content from the lesson by discussing the following:
    a. How is money created? (*By banks making loans*)
    b. How is money destroyed? (*By loans being repaid*)
    c. What is the relationship between the money multiplier and the required reserve ratio? (*The money multiplier is one divided by the required reserve ratio.*)
    d. Given an initial deposit into a bank, what is the maximum money supply expansion that can result from that deposit? (*The amount of the excess reserves created by that deposit multiplied by the money multiplier.*)

ASSESSMENT

Multiple Choice

1. The 1st Bank of Kenville already has excess reserves of $800 and the reserve ratio is 20 percent. If Maria deposits $1,000 of cash into her checking account and the bank lends $600 to Javier, the 1st Bank of Kenville can lend an additional _____.
    a. $200
    b. $400
    c. $800
    d. $1,000

2. If banks lend all of their excess reserves and the required reserve ratio is 15 per- cent, an increase in deposits of $300,000 would result in initial excess reserves of _____.
    a. $15,000
    b. $45,000
    c. $255,000
    d. $300,000

3. If a bank has $75 of excess reserves that, if lent, could add $300 to the money supply, then the required reserve ratio must be _____.
    a. 100 percent
    b. 40 percent
    c. 25 percent
    d. 2.5 percent

Constructed Response

1. You were recently walking by the U.S. Mint in Philadelphia and heard one tourist say to another tourist, "All of the money in the United States is created in this mint and the U.S. Mint in Denver, Colorado. It's amazing to think that every dollar you have ever saved or spent was created right here or in Denver!" Write a one-page essay evaluating the tourist's statement. (*The statement made by this tourist is incorrect because although the U.S. Mint produces coins, the Bureau of Engraving and Printing prints paper currency notes, and Federal Reserve Banks issue Federal Reserve notes, money is created when banks make loans. Money, as measured by M1, consists of both currency in circulation and checkable deposits at banks.*)

Activity 1: Money Creation Worksheet

Ledger Entries

Money Supply Expansions

Depository Institution A

Deposit $_____

Required reserves (20% reserve requirement) $_____

Excess reserves $_____

Depository Institution B

Deposit $_____

Required reserves (20% reserve requirement) $_____

Excess reserves $_____

Money created in Round 1

Expansion = $_____

Depository Institution C

Deposit $_____

Required reserves (20% reserve requirement) $_____

Excess reserves $_____

Money created in Round 2

Expansion = $_____

Depository Institution D

Deposit $_____

Required reserves (20% reserve requirement) $_____

Excess reserves $_____

Money created in Round 3

Expansion = $_____

Depository Institution E

Deposit $_____

Required reserves (20% reserve requirement) $_____

Excess reserves $_____

Money created in Round 4

Expansion = $_____

The money creation process continues until a total of $_____ has been created.

Activity 1: Money Creation Worksheet (KEY)

Ledger Entries **Money Supply Expansions**

Depository Institution A	
Deposit	$100,000
Required reserves (20% reserve requirement)	$20,000
Excess reserves	$80,000

Depository Institution B	
Deposit	$80,000
Required reserves (20% reserve requirement)	$16,000
Excess reserves	$64,000

Money created in Round 1

Expansion = $80,000

Depository Institution C	
Deposit	$64,000
Required reserves (20% reserve requirement)	$12,800
Excess reserves	$51,200

Money created in Round 2

Expansion = $64,000

Depository Institution D	
Deposit	$51,200
Required reserves (20% reserve requirement)	$10,240
Excess reserves	$40,960

Money created in Round 3

Expansion = $51,200

Depository Institution E	
Deposit	$40,960
Required reserves (20% reserve requirement)	$8,192
Excess reserves	$32,768

Money created in Round 4

Expansion = $40,960

The money creation process continues until a total of $400,000 has been created.