

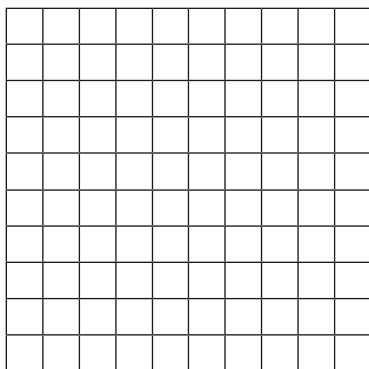
Name \_\_\_\_\_

## BALDO by Hector D. Cantu and Carlos Castellanos



### PERCENTAGE RIGHT; PERCENTAGE WRONG

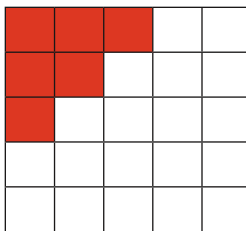
1. a. Shade 75% of the large square below.



- b. What percentage of the large square is not shaded?

2. a. What is Baldo's mathematical error in the cartoon? Explain why this may be humorous.
- b. Suppose that there were 20 problems on Baldo's math test. How many problems did he answer correctly? How many did he answer incorrectly?

3. Suppose that Baldo took a science test and answered 12 problems correctly. This number represented 40% of the total problems on the test. How many problems were on the test?
4. What percentage of the large square is shaded? Explain your reasoning.



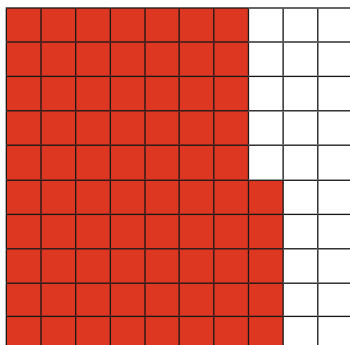
5. On a 25 problem multiple-choice test, Baldo answered 80% of the problems correctly. Of those he answered correctly, he guessed at 20% of them. How many problems did he guess correctly?

### CHALLENGE

6. A store discounts an item by 60%. Then it discounts the discounted price by another 40%. What is the total percentage discount?
7. A store marks up an item from \$50 to \$100.
- a. What is the percentage increase?
- b. \$100 is what percentage of \$50?

## SOLUTIONS

1. a. Sample shading:



- b. 25 percent

2. a. If Baldo got 75 percent correct, then he got 25 percent wrong (not 35 percent, as he stated). The cartoon may be humorous because he makes a mathematical error while talking about the math problems he missed.

- b. *Sample solution:* Baldo answered  $0.75 \times 20$ , or 15, problems correctly, meaning that he answered  $20 - 15$ , or 5 problems incorrectly.

*Sample solution:* If he answered 75 percent correctly, then he answered 25 percent incorrectly, meaning that he answered  $0.25 \times 20$ , or 5, problems incorrectly.

*Sample solution:* Solving this proportion, where  $x$  = number of problems answered incorrectly,

shows that 5 questions were answered incorrectly.

$$\begin{aligned}\frac{25}{100} &= \frac{x}{20} \\ 500 &= 100x \\ x &= 5\end{aligned}$$

3. *Sample solution:* Solving this equation, where  $x$  = the total number of problems on the science test, shows that the total number of problems is 30.

$$\begin{aligned}0.40x &= 12 \\ x &= 30\end{aligned}$$

*Sample solution:* Solving this proportion, where  $x$  = the total number of problems on the science test, shows that the total number of problems is 30.

$$\begin{aligned}\frac{40}{100} &= \frac{12}{x} \\ 40x &= 1200 \\ x &= 30\end{aligned}$$

4. *Sample solution:* Solving this proportion, where  $x$  = the percentage of the large square that is shaded, shows that the percentage shaded is 24 percent.

$$\begin{aligned}\frac{6}{25} &= \frac{x}{100} \\ 600 &= 25x \\ x &= 24\end{aligned}$$

*Sample solution:* Each small square represents  $1/25$ , or 4 percent, of the large square. Because 6 small squares are shaded,  $6 \times 4\%$ , or 24 percent, of the large square is shaded.

5. Baldo guessed 4 problems correctly. This problem involves finding a percentage of a percentage. *Sample solution:* The percentage that Baldo guessed correctly is  $0.8 \times 0.2 = 0.16$ , or 16 percent. The number of problems he guessed correctly is  $0.16 \times 25$ , or 4.

## CHALLENGE

6. 76 percent. *Sample solution:* After the 60 percent markdown, the item costs only 40 percent of the original price. A 40 percent reduction on that 40 percent amount reduces the price by  $0.40 \times 0.40$ , or another 16 percent off the original price. This means the price of the item will be  $40\% - 16\%$ , or 24 percent, of the original price. Thus, the total percentage discount is 76 percent. (This is true regardless of the original price of the item.)

7. a. 100 percent. An increase from \$50 to \$100 represents a  $50/50 = 1$ , or 100 percent, increase.

- b. 200 percent. The new price of \$100 is  $100/50 = 2$ , or 200 percent, of the original price.

## FIELD-TEST COMMENTS

I used this cartoon with seventh-grade students after working on a unit with percentages, so this was a good review. Students worked individually and did not have access to calculators. After reading the cartoon, several students

immediately raised their hands to ask if the “35 percent wrong” in the cartoon was a typo. They did not understand at first that the error was part of the point of the cartoon. All students correctly answered questions 1–4, and all but one answered ques-

tion 5 correctly. Some converted the percentages to decimals and multiplied; others set up ratios.

All students attempted the challenge problems. Although every student answered question 7 correctly, they all missed question 6. Most

added the 60 percent and 40 percent. We focused on this question the next day. I asked if a 100 percent discount was reasonable and explained that it would be the same as getting the item for free. Together we put in a value for a price and calculated the cost with a 60 percent discount, and then 40 percent off that price. Once they used numerical values, they understood how the math worked. Several found this very interesting since they like to shop.

**Carol Fears**

*Landstuhl Elementary/Middle School  
Armed Forces Post Office, Area Europe*

My sixth-grade prealgebra students enjoyed Baldo's humorous application of percentages so much that they jokingly stated that he must have missed 7 problems to achieve 35 percent incorrect. This provided an interesting discussion since  $7/22$  is about 32 percent. Students creatively analyzed the problem, stating that the two extra problems that Baldo seemed to believe he had missed were extra credit. Since the whole test was based on 20 problems, the extra-credit problems were also worth 5 percent each. Some of the methods used to correctly solve the problem included calculating 75 percent of 20;  $3/4$  of 20; and  $20/4$  to find one-fourth of the problems.

Our favorite problem was number 6. Some students calculated the fractional discount  $6/10 \times 4/10 = 24/100$  and then subtracted the 24 percent from 100 percent to arrive at the 76 percent discount. One student made a flow chart using \$100 as a starting point.

\$100 → 60 percent is \$60, so the item now costs \$40.

\$40 → 40 percent is \$16, so the item now costs \$24.

A price of \$24 is 76 percent off \$100.

**Judy Kraus**

*Hyde Park Middle School  
Las Vegas, Nevada*

My seventh-grade prealgebra class was studying percentage applications when this activity was assigned. The students were able to easily complete questions 1–5, but they had trouble doing questions 6 and 7 because they had not seen this type of question. It was interesting to see their misconceptions. For example, many said that the discount would be 100 percent for question 6; for question 7a, many said the markup would be 50 percent.

I think it would be good to ask students to continue to represent the answers visually, as they were asked to do in questions 1b and 4. Perhaps question 2b could have a rectangle with 20 squares, and students could be asked to shade 75 percent to show 15 questions correct. Question 3 was

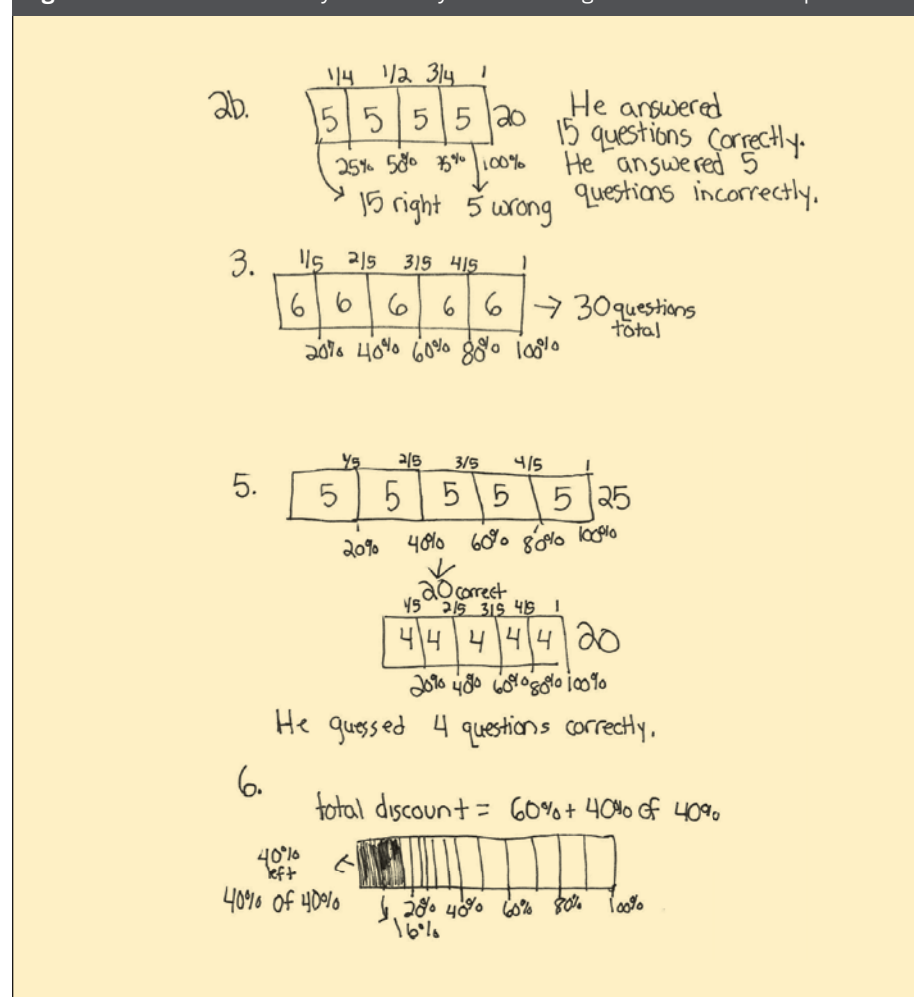
a little harder. I showed my students a rectangle of 10 blocks and had them shade 4 to represent 40 percent. Then I increased the size of the rectangle to 20 blocks with 8 shaded, which again represented 40 percent, and then finally to 30 blocks with 12 shaded.

**Machele Lynch**

*St. Patrick School  
Carlisle, Pennsylvania*

I gave this cartoon activity to my sixth-grade and seventh-grade classes. The sixth grade had just finished learning percentages, and the seventh grade was continuing to focus on applications of percentage, such as percentage increase and decrease. Both classes did well on most of the questions and used a variety of

**Fig. 1** Students from St. Mary's Academy used bar diagrams to answer the questions.



solution methods, such as proportions, ratio tables, and bar diagrams. Question 5's answer from students contained the most errors because many students simply did not read the question fully to understand that there was more than one part to consider.

I encouraged my students to use bar (tape) diagrams, as shown in **figure 1**.

**Margaret Merwin**  
*St. Mary's Academy*  
*Hoosick, New York*

My eighth-grade algebra 1 part 1 class completed this activity on the first day of school following spring break. Students had previously worked with percentages as part of their writing and solving equations chapter. I had heard from one of their teachers that they often asked questions about calculating grades based on a point system. This activity provided an opportunity to address their questions while reviewing topics they would see on their exam.

We started by reading and discussing the humor of the cartoon. Everyone understood the joke, and some found it funny. For question 3, one pair of students described a mental math procedure:

If 12 questions are 40 percent of the test, then doubling that gives 24 questions, or 80 percent. The remaining 20 percent gives half of 12, or 6 questions, for a total of 30 questions on the test.

To help students with question 4, I referenced question 1. The students quickly realized that they were looking at one-fourth of 100, so they simply multiplied 6 by 4. In modeling the different strategies for question 5, I mentioned that they would be working with composite functions in high school.

**Pamela Haner**  
*St. Catherine's School*  
*Richmond, Virginia*

## OTHER IDEAS

Extend this month's Cartoon Corner task with these ideas:

- Have students solve problems 2b, 3, and 4 using another method that is different from what they initially used.
- Have students explore the NCTM Illumination's activity, "Grid and Percent It" (<http://illuminations.nctm.org/Lesson.aspx?id=960>).
- Have students determine if a 60 percent markdown followed by a 40 percent markdown results in the same price as a 40 percent markdown followed by a 60 percent markdown.
- For an error analysis activity dealing with real-world examples of the misuse of percentages, see "Mathematics Detective: Ads That Are Baa-Ad!" by David B. Spangler (*MTMS*, December 1999, pp. 242–44).

## WE NEED YOU TO TEST DRIVE **CARTOON CORNER**

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1. Volunteer by sending an email to Cartoon Corner at [mtms@nctm.org](mailto:mtms@nctm.org).
2. Use the Cartoon Corner activity in your classroom.
3. Within about three or four weeks of receipt of the activity, write a two- to three-paragraph description about what worked, what did not work, and what your students learned. Any descriptions of *aha!* moments experienced, surprises found, or ideas for further exploration are especially welcome.

You will be helping the larger community of math teachers with not only your expertise but also your students' problem-solving acumen. Your name and school affiliation will be listed in the journal, as well.

