Decimals and Percentages

Compiled by Karl Schaffer

De Anza College

Math 46

Place Value

When asked to write *one thousand thirty four* as a number, many of Mrs. Carrera's students gave wrong answers. Of the following, which one are students least likely to write?

a) 134

b) 100034

c) 10304

d) 1000304

***Using Math to Teach Math,* Mark Hoover Thames, MSRI, 2007.**

Decimal Comparisons

Mr. Fitzgerald has been teaching his class to compare decimals. He wants to pose a question that will show him whether his students understand how to put a series of decimals n order. Which of the following sets of decimal numbers will help him assess whether his pupils understand how to order decimals? Choose each that you think will be useful for his purpose and explain why.

a) **.7** **5** **.09** **3.2**

b) **.60** **2.53** **3.14** **.45**

c) **.6 4** **.25** **.565** **2.5**

d) **These work equally well for this purpose. They all require students to read and interpret decimals.**

Using Math to Teach Math, **Mark Hoover Thames, MSRI, 2007.**

Repeated percentages

If a store offers a 25 percent off sale, with an additional 25 percent off for a certain product, which of the following is true?

(a) The total discount is 50%
(b) The total discount is less than 50%
(c) The total discount is more than 50%

Source: "When Two and Two is Not Equal to Four: Errors in Processing Multiple Percentage Changes," Akshay Rao and Haipeng Chen, 2007, Journal of Consumer Research.

Repeated percentages

Your stock portfolio went up 40 percent last period, and down 30 percent this period. Its value is now

(a) Better off by 10 percent.
(b) About the same
(c) Lower by 2 percent
(d) Not enough information

Source: "When Two and Two is Not Equal to Four: Errors in Processing Multiple Percentage Changes," Akshay Rao and Haipeng Chen, 2007, Journal of Consumer Research.

Repeated percentages

Which is better?

(a) A 25% discount followed by a 20% discount
(b) A 40% discount
(c) They are the same
(d) Not enough information

Source: "When Two and Two is Not Equal to Four: Errors in Processing Multiple Percentage Changes," Akshay Rao and Haipeng Chen, 2007, Journal of Consumer Research.

Repeated percentages

“Consumers treat percentages like whole numbers, and this results in systematic errors in calculation.”

Source: "When Two and Two is Not Equal to Four: Errors in Processing Multiple Percentage Changes," Akshay Rao and Haipeng Chen, 2007, Journal of Consumer Research.

Dollars and Cents

George Vaccaro reported the following on his blog, Dec. 6, 2006:

"I have a Verizon unlimited data plan in the U.S. and recently crossed the border into Canada. Prior to crossing the border I called customer service to find out what rates I'd be paying for voice and data. The data rate I was quoted was '.002 cents per kilobyte.'"

Vaccaro was charged $71.79 for his usage of 35,893 kilobytes. Which of the following are true?

(a) This was the correct bill.

(b) The phone company calculation was really based on .2 cents per kilobyte.

(c) The phone company calculation was based on .002 dollars per kilobyte.

(d) A better price quote by the phone company would have been $2 per megabyte.

c. 3500 - 2500 BC Elamites of Iran possibly use early forms of decimal system.

c. 2900 BC Egyptian hieroglyphs show counting in powers of 10 (1 million + 400,000 goats, *etc.*)

c. 2600 BC Indus Valley Civilization, earliest known physical use of decimal fractions in ancient weight system: 1/20, 1/10, 1/5, 1/2.

c. 1400 BC Chinese writers show familiarity with the concept: for example, 547 is written 'Five hundred plus four decades plus seven of days' in some manuscripts.

c. 1200 BC In ancient India, the Vedic text *Yajur-Veda* states the powers of 10, upto 10^{55}

c. 450 BC Panini ≷ uses the null operator in his grammar of Sanskrit

c. 400 BC Pingala ≷ develops the binary number system for Sanskrit prosody, with a clear mapping to the base-10 decimal system

c. 100≷200 The *Satkhandagama* written in India ≷ earliest use of decimal logarithms.

c. 476≷550 Aryabhata ≷ uses an alphabetic cipher system for numbers that used zero.

c. 598≷670 Brahmagupta ≷ explains the Hindu-Arabic numerals (modern number system) which uses decimal integers, negative integers, and zero.

c. 780≷850 Muḥammad ibn Mūsā al-Ḵwārizmī ≷ first to expound on algorism outside India.

c. 920≷980 Abu'l Hasan Ahmad ibn Ibrahim Al-Uqlidisi ≷ earliest known direct mathematical treatment of decimal fractions.

c. 1300≷1500 The Kerala School in South India ≷ decimal floating point numbers.

1548/49≷1620 Simon Stevin ≷ author of *De Thiende* ('the tenth').

1561≷1613 Bartholemaeus Pitiscus≷ (possibly) decimal point notation.·1550≷1617 John Napier≷ use of decimal logarithms as a computational tool