Next, subtract the 10-complement of one number from the other number: 8 – 3 or 7 – 2. This results in 5, the digit for the 10s place. Multiplying the complements gives 6, the value in the ones column.

8	2

7	3
5	6

When you use your fingers, you are acting out this method.

There is little resistance to using beans, beads, blocks, or bingo chips to teach basic calculation and reinforce computational skills and strategies, yet whether or not reliance on finger-based representations is beneficial or detrimental remains the subject of an ongoing debate between researchers in neurocognition and mathematics education.

From the neurocognitive perspective, finger counting provides multi-sensory input, which conveys both cardinal and ordinal aspects of numbers. Recent data indicate that children with good "finger sense," have enhanced mathematical skills. Conversely, research in mathematics education recommends first using finger counting, then concrete structured representations and, finally, mental representations of numbers to perform numerical operations.

I opened this article with the quotation from Evans that underscores the uniqueness of every child's learning trajectory. I close by saying that it is unlikely that a single system can offer everything to everyone, fingers included. And while I welcome debate on the topic, I am prepared to take my stand: I believe that fingers count.

▲

▲ Celebrate The International Year of Statistics With *Census At School*!

ALISON L. GIBBS, UNIVERSITY OF TORONTO
E-MAIL: alison.gibbs@utoronto.ca

Alison Gibbs is a faculty member in the Department of Statistical Sciences at the University of Toronto. She is interested in the promotion and teaching of statistical thinking at all levels. At the moment, she is developing an introductory statistics Massive Open Online Course (MOOC), a free, open-access, online course designed for large-scale global participation. She currently leads the Census at School Canada project team for the Statistical Society of Canada.

As you may have read in the September issue of the *Gazette*, Statistics Canada discontinued its Education Outreach program in June 2012, including their operation of *Census at School Canada*. We are grateful to the folks at Statistics Canada for their development and stewardship of the *Census at School* program in Canada. In the summer of 2012, the Statistical Society of Canada officially took over its operation.

The Statistical Society of Canada (SSC) is a community of statisticians from academia, government, and industry, run by volunteers. The society's mission is to encourage the development and use of statistics and probability, including the development of public awareness of the value of statistical thinking and the importance of statistics and statisticians in Canadian society and promoting the highest possible standards for statistical education and practice in Canada. See **www.ssc.ca** to learn more about the SSC. Enthusiasm about statistics education and outreach to schools has been growing recently in the SSC. Tangible evidence of this is the formation of a new section in Statistics Education through which we hope to grow our connections with Canadian teachers and students. It is also reflected in our commitment to maintain and continue to build *Census at School Canada*.

Census at School is an international classroom project designed to engage students aged 8 to 18 in statistical reasoning, using data collected about themselves and about participating students from around the world. The *Census at School* website contains detailed instructions on how to get your students involved and lesson plans and ideas for students of all ages. Your students can examine the data they collect about themselves and their classmates and see how they compare to other students from across Canada and other participating countries. You can find the Canadian component of the project at **www.censusatschool.ca**.

What's New at *Census at School Canada*?

New look, same great project.

If you've participated in *Census at School Canada* in previous years, you'll notice a new look. Otherwise, the project runs the same as previously. If you haven't yet used *Census at School* with your classes, you'll find excellent training resources that were developed at Statistics Canada to lead you through.

We're celebrating the International Year of Statistics!

The International Year of Statistics is a worldwide event, supported by more than 1400 organizations, to recognize and celebrate the importance of statistics in virtually every aspect of everyone's life, including the food they eat, the games they play, the technology they use, and the information they receive. For more about the International Year of Statistics and to keep up-to-date on planned activities for schools, see **www.statistics 2013.org**.

The 2011–2012 Canadian summary data have been posted.

How does your class compare to the latest cohort of Canadian students? What's been happening in Canada over time?

One of the measurements students collect in *Census at School* is their reaction times on a simple task. At the time of writing this column, I was entering the 2011–2012 summary data on the website. One thing that struck me immediately was an apparent trend with age in the reaction time data. See Table 1 for some of the summary data.

Average reaction time in seconds				
Age (years)	All boys	Right-handed	Left-handed	Ambidextrous
8	0.55	0.54	0.75	0.51
9	0.51	0.51	0.46	0.51
10	0.49	0.49	0.48	0.51
11	0.46	0.46	0.48	0.46
12	0.43	0.43	0.44	0.42
13	0.41	0.40	0.42	0.42
14	0.42	0.42	0.43	0.40
15	0.40	0.41	0.41	0.36
16	0.40	0.40	0.37	0.38
17	0.39	0.38	0.39	0.42
18	0.39	0.38	0.43	0.47
19	0.39	0.39	0.39	Not available

Table 1: *Average reaction time, by age and dominant hand, for boys participating in* Census at School Canada *in 2011–2012. From* ***www.censusatschool.ca/data-results/2011-2012/average-reaction-time****.*

Figure 1 shows how the average reaction time for boys changes with age. Reaction times appear to decrease with age, with the rate of decrease levelling off in the teenage years (Figure 1(A)). (What function might be a useful model to describe the relationship for all the boys?)

The relationship for right-handed boys (Figure 1(B)) is very similar to that for all boys. Of course, this is not surprising, since the right-handed boys comprise more than 80 percent of all boys. (See **www.censusatschool .ca/data-results/2011-2012/handed**.) But what happened to the left-handed and ambidextrous boys (Figures 1(C) and 1(D))? Does the age–reaction time relationship differ, depending on handedness?

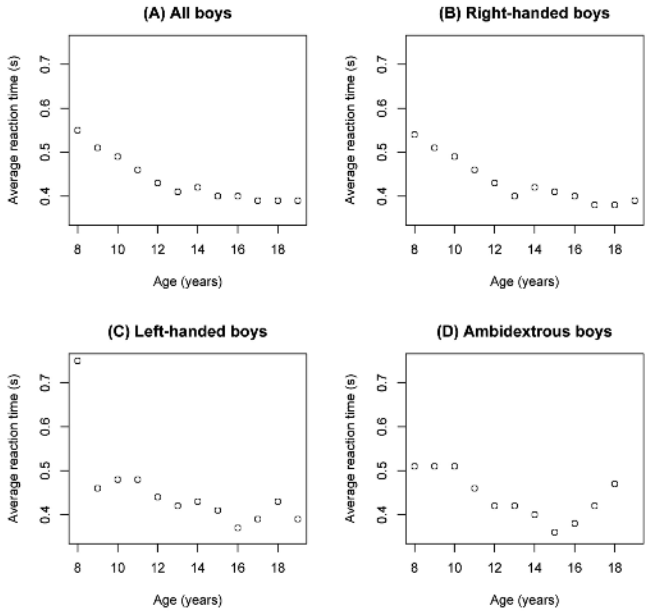

Figure 1: *Plots of average reaction times (in seconds) versus age (in years) for (A) all boys, (B) right-handed boys, (C) left-handed boys, and (D) ambidextrous boys participating in* Census at School Canada *in 2011–2012.*

A more plausible explanation for the apparent differing relationships in the left-handed and ambidextrous boys is sample size. In Canada in 2011–2012, only 52 8-year-old boys participated in *Census at School*. (See **www.censusatschool.ca/data-results/2012-2012/participation-by-age**.) Of all participating boys in elementary schools, 10.4 percent were left-handed and 8.9 percent were ambidextrous. (See **www.censusatschool.ca/data-results/2011-2012/handed**.) For secondary students, 10.7 percent and 7.1 percent of boys were left-handed and ambidextrous, respectively. Moreover, times until an event happens, such as reaction times, typically have right-skewed distributions. For an illustration of the distribution of reaction times, see Figure 2 for histograms of reaction times for random samples of 50 elementary and 50 secondary students. With a right-skewed distribution, the average of a small sample can be unusually large, such as in the case of the 8-year-old left-handed boys. For these boys, a large value from the right tail of the reaction- time distribution was observed, artificially inflating the average. Something similar happened for the 18-year-old ambidextrous boys, resulting in a larger than expected average reaction time. However, the average of a small sample from a right-skewed distribution can also be unusually small, as happened for the 8-year-old ambidextrous boys. For this group of participating boys, by chance, we missed getting any observations in the right tail of the distribution, resulting in a smaller average.

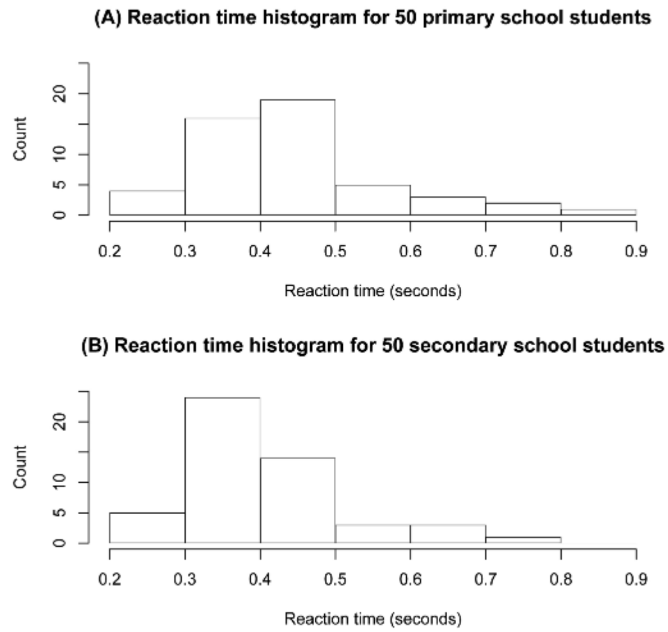

Figure 2: *Histograms of reaction times (in seconds) for random samples of 50 of (A) elementary students and (B) secondary students participating in* Census at School Canada *in 2011–2012. The data were obtained from the* Census at School *random data sampler at* **rds.censusatschool.org.uk**.

When learning about the mean and other measures of centre, students typically investigate the influence of outlying values on the mean. Here we have an illustration of the importance of that concept. When working with means, the possibility for outlying values, as we expect might be observed with data from right-skewed distributions, can distort relationships.

For some related ideas for using *Census at School* data with your class, see the following lesson plans with teacher notes at **www.censusatschool.ca/learning-activities**:

- *How weird is our class?* is designed for students in Grades 4 to 8 to compare class data with the rest of Canada, including guided discussion about why they might differ.
- *Relationships between variables* is designed to guide secondary students in investigating relationships between quantitative variables and the role of controlling for other variables.

What interesting relationships can you find in the 2011–2012 data? What trends can you find over the years? Let us know at **censusatschool@ssc.ca**. ▲