In this lesson, students are asked to create and solve some puzzles involving decimal calculations where the decimal points have been omitted. The task is to work out where the calculations are missing.

Q Where does the decimal point need to go to make the calculations correct?

**MAIN ACTIVITY**

Q Here is a puzzle. Can you work out what is missing from this calculation?

\[234 + 173 + 658 + 907 = 1000\]

There are many possible responses to this question. For example, a student might suggest replacing 100 by 1072, or replacing the \(=\) sign with \(+\). Other students have given some ideas, close the question down by asking:

Q Can you correct this statement by just adding decimal points? You can put as many as you need, wherever you need them.

You’re not allowed to change the numbers (other than putting in zeroes)!

There are many possible solutions, but perhaps the simplest (using 4 decimal points and no extra zeros) is

\[234.0 + 173.7 + 658.0 + 907.0 = 1000.0\]

Others would be:

\[23.4 + 17.3 + 65.8 + 90.7 = 100\]

\[2340 + 1730 + 6580 + 9070 = 10000\]

Students will need to look at the final digits of each number, and realise that the 3 and the 7 are a natural choice for being in the same column as each other, so as to add to make a 10.

Q Now I want you to invent a sum of 4 decimal numbers that makes 100. Then take out the decimal points and see if your neighbour can work out where they must have been. Can you invent an easy one and a difficult one?

There is much potential for students to invent and solve problems for each other. Confident pairs of students could try a more difficult total on the right-hand side, a subtraction or even a multiplication. The trial and error involved should give students extensive practice at handling decimals and thinking about their size.

**DISCUSSION**

Q What calculations did you invent? Which ones were easy to solve? Why? Which ones were harder? Why? How did you decide where the decimal points had to go? What clues were there in the calculations?

A good strategy is to estimate the size of each number in the calculation to 1 significant figure. One way to discuss students’ work is to project the Gattegno Chart shown below (a PDF of this chart can be downloaded at teachwire.net/gattegno).

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Q Which number on the chart is closest to each number in your calculation? How do you know?

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Q Which number on the chart is closest to each number in your calculation? How do you know?

Which number is closest to your answer? Why?

**ADDITIONAL RESOURCE**

A task on ordering decimals is available at nrich.maths.org/10326. Confident students could create more complicated calculations including multiplication and even division. These can get very difficult!

**GOING DEEPER**

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**ABOUT OUR EXPERT**

Colin Foster is a Reader in the Mathematics Education Centre at Loughborough University. He has written many books and articles for mathematics teachers (see www.foster77.co.uk).