

## Exploration: Multiplication Shortcuts

Multiplying two digit numbers in your head can be a challenge at best. For some products, however, there is a nice shortcut. Try to find a pattern in the products below.

1. Use a calculator to help you fill in the blanks below.

$35 \times 35 = \underline{\hspace{2cm}} \qquad 65 \times 65 = \underline{\hspace{2cm}}$

$45 \times 45 = \underline{\hspace{2cm}} \qquad 75 \times 75 = \underline{\hspace{2cm}}$

$55 \times 55 = \underline{\hspace{2cm}} \qquad 85 \times 85 = \underline{\hspace{2cm}}$

(a) You should notice a pattern in the way the products end (the last two digits). What pattern do you notice?

Where do you think this pattern comes from?

(Hint: look at the ones digits of the numbers you're multiplying.)

(b) You should notice a pattern in the way the numbers begin also (the first two digits).  
Look at the tens digit of the number you're multiplying with and find a shortcut.

2. Let's see if we can extend the pattern you just found. Use a calculator to help you fill in the blanks below.

$23 \times 27 = \underline{\hspace{2cm}} \qquad 33 \times 37 = \underline{\hspace{2cm}} \qquad 63 \times 67 = \underline{\hspace{2cm}}$

$24 \times 26 = \underline{\hspace{2cm}} \qquad 34 \times 36 = \underline{\hspace{2cm}} \qquad 64 \times 66 = \underline{\hspace{2cm}}$

$22 \times 28 = \underline{\hspace{2cm}} \qquad 32 \times 38 = \underline{\hspace{2cm}} \qquad 62 \times 68 = \underline{\hspace{2cm}}$

$25 \times 25 = \underline{\hspace{2cm}} \qquad 35 \times 35 = \underline{\hspace{2cm}} \qquad 65 \times 65 = \underline{\hspace{2cm}}$

(a) What do you notice about the ones digits of the numbers you're multiplying?  
What do you notice about the tens digits?

(b) You should see a pattern in the way the products end (the last two digits) that is similar to what you saw in (1). Find a relationship between the ones digits in the numbers you're multiplying and the last two digits in their products

(c) You should notice a pattern in the way the numbers begin also (the first two digits).  
Look at the tens digit of the number you're multiplying with and find a shortcut.