Problem

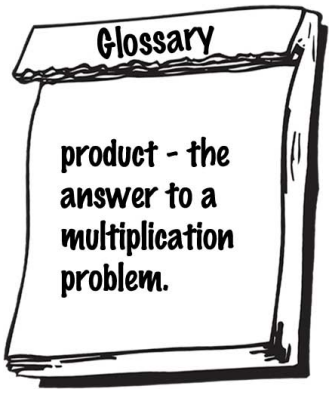
One day in class, instead of listening to your teacher, Mr.B.O.Ring, you are playing with your calculator when you notice that the number 9 key is not working. Use 'mental math' to describe how you could find the following products using the broken calculator, and state the answers.

a) 9×23

b) 6×99

c) 11×998

d) 9×750



***Extension* :**

1. Suppose the $\times$ sign was also not working. Describe how you could find the above products using mental math without the number 9 nor calculator multiplication.

Hints

Hint 1 - Is it possible to write 9 (or 99, or 998) as a sum or product of numbers other than 9?

Extension **:**

Hint 1 - If you cannot use multiplication, what other operation could substitute?

Hint 2 - By what number(s) can you multiply easily without a calculator?

Solution

The answers will vary a lot. Here are some simple possibilities.

a) $9 \times 23 = 3 \times 3 \times 23$, or $23 \times (2 + 7)$, or $23 \times (5 + 4)$

b) $6 \times 99 = 6 \times 3 \times 3 \times 11$, or $6 \times (88 + 11)$, or $2 \times 27 \times 11$

c) $11 \times 998 = 11 \times (610 + 388)$, or $11 \times (120 + 878)$, or $11 \times 2 \times (321 + 178)$

d) $9 \times 750 = 3 \times 3 \times 3 \times 250$, or 270×25, or $6 \times 3 \times 375$

Extension **:**

Without the $\times$ sign, we must use +, -, or $\div$. Here are some possible answers.

a) $9 \times 23 = 23 + (8 \times 23) = 23 + 4 \times (2 \times 23) = 23 + 46 + 46 + 46 + 46$,
or $(10 - 1) \times 23 = 230 - 23$ (assuming $\times 10$ and $\times 1$ can be done without a calculator)

b) $6 \times 99 = 6 \times (100 - 1) = 600 - 6$

c) $11 \times 998 = 11 \times (1000 - 2) = 11000 - 22$

d) $9 \times 750 = (10 - 1) \times 750 = 7500 - 750$