

**YOU & MATHS** Multiply and write scientific notation for the answer:

$$(2.4 \times 10^5)(5.4 \times 10^{-16}).$$

(USA Tacoma Community College, Review for Test, 2002)

First of all, we can get rid of the parentheses as the only operation involved here is multiplication:

$$(2.4 \times 10^5)(5.4 \times 10^{-16}) = 2.4 \times 10^5 \times 5.4 \times 10^{-16}.$$

Now let's apply the commutative property of multiplication to rearrange the terms in our expression:

$$2.4 \times 10^5 \times 5.4 \times 10^{-16} = 2.4 \times 5.4 \times 10^5 \times 10^{-16} = (2.4 \times 5.4)(10^5 \times 10^{-16}),$$

where we regrouped the terms again in the last passage. We can now calculate the two products separately:

$$2.4 \times 5.4 = 12.96,$$

$$10^5 \times 10^{-16} = 10^{5-16} = 10^{-11}, \text{ thanks to the product of powers property.}$$

We have thus shown that

$$(2.4 \times 5.4)(10^5 \times 10^{-16}) = 12.96 \times 10^{-11},$$

but this is not written in scientific notation yet, as the coefficient 12.96 is not a number at least 1 but less than 10. We have to move the decimal point in 12.96 **one** place to the left, to get a coefficient that respects our criteria. Consequently, we have to multiply our power of 10 by  $10^1$ , as follows:

$$12.96 \times 10^{-11} = 1.296 \times 10^1 \times 10^{-11} = 1.296 \times 10^{-11+1} = 1.296 \times 10^{-10}$$

and that will be our final answer.