

## Answer Key

---

### Challenge: Skills and Applications

1. 3   2. 3   3. -3   4. Let  $n = -k$ , where  $k$  is a positive integer.  $(a^m)^n = (a^m)^{-k} = \frac{1}{(a^m)^k} = \frac{1}{a^{mk}} = a^{-mk} = a^{m(-k)} = a^{mn}$

5. Let  $m = -j$  and  $n = -k$ , where  $j$  and  $k$  are positive integers.  $(a^m)^n = (a^{-j})^{-k} = \frac{1}{(a^{-j})^k} =$

$$\frac{1}{\left(\frac{1}{a^j}\right)^k} = \frac{1}{\left(\frac{1}{a^{jk}}\right)} = a^{jk} = a^{(-m)(-n)} = a^{mn}$$

6.  $(a^m)^n = (a^m)^0 = 1 = a^0 = a^{m \cdot 0} = a^{mn}$

7. The remainder is 1 each time.

8. The remainder is 1 each time.   9. If  $p$  is a prime number and  $a$  is not divisible by  $p$ , then  $a^{p-1}$  leaves a remainder of 1 when divided by  $p$ .