



**Age 14+ Level ★★★**  
**Worksheet 1**

**1. Know your Powers**

Given that  $4^x = 9$  and  $9^y = 64$ , what is the value of  $xy$ ?

**2. Self-power Squares**

How many integers  $n$ , between 1 and 100 inclusive, have the property that  $n^n$  is a square number?

**3. Power of 3**

What number needs to replace the ★ as the power of 27, so that

$$3^{2016} + 9^{1008} + 27^{\star} = 3^{2017}?$$

**4. Powered Up**

Given that  $5^p = 9$ ,  $9^q = 12$ ,  $12^r = 16$ ,  $16^s = 20$  and  $20^t = 25$ , what is the value of  $pqrst$ ?

**5. Power of Five**

Find the value of  $x$  so that:

$$5(5^x + 5^x + 5^x + 5^x + 5^x)^2 = 5^9$$

**6. Powerful 9**

What is the last digit of  $9^{9^9}$ ?

**7. Great Power**

Which is greater:  $10^{250}$  or  $6^{300}$ ?

*These problems are adapted from UKMT ([ukmt.org.uk](http://ukmt.org.uk)) and WMC ([competition.ac](http://competition.ac)) problems.*