

## Even and Odd Algebra Problems

### Solutions

1. An even number squared will be even

$$(2n)^2 = 4n^2 = 2(2n^2)$$

2. An odd number squared will be odd

$$(2n + 1)^2 = 4n^2 + 4n + 1 = 2(2n^2 + 2n) + 1$$

3. The sum of two even numbers is even

$$2n + 2k = 2(n + k)$$

4. The sum of two odd numbers is even

$$(2n + 1) + (2k + 1) = 2n + 2k + 2 = 2(n + k + 1)$$

5. The sum of three odd numbers is odd

$$(2n + 1) + (2k + 1) + (2a + 1)$$

$$= 2n + 2k + 2a + 2 + 1$$

$$= 2(n + k + a + 1) + 1$$

6. The difference between two odd numbers is even

$$\begin{aligned}(2n + 1) - (2k + 1) \\ &= 2n - 2k \\ &= 2(n - k)\end{aligned}$$

7. The difference between an even number and an odd number is odd

$$\begin{aligned}2n - (2k + 1) \\ &= 2n - 2k - 1 \\ &= 2(n - k) - 1\end{aligned}$$

8. Any multiple of 14 is even

$$14k = 2(7k)$$

9. A square with an odd integer as a side length will have an odd area

$$\begin{aligned}s &= 2k + 1 \\ A &= (2k + 1)^2 \\ &= 4k^2 + 4k + 1 \\ &= 2(2k^2 + 2k) + 1\end{aligned}$$