

Problem of the Week: Week 6 (Sum2): Year 9: Number: Inters, powers and roots

- Use integer powers and roots to solve problems

Power Mad

Powers of numbers behave in surprising ways. Take a look at the following and try to explain what's going on:



Work out $2^1, 2^2, 2^3, 2^4, 2^5, 2^6 \dots$

For which values of n will 2^n be a multiple of 10?

For which values of n is $1^n + 2^n + 3^n$ even?

Work out $1^n + 2^n + 3^n + 4^n$ for some different values of n .

What do you notice?

What about $1^n + 2^n + 3^n + 4^n + 5^n$?

What other surprising results can you find?

Here are some suggestions to start you off:

$$4^n + 5^n + 6^n$$

$$2^n + 3^n \text{ for odd values of } n$$

$$3^n + 8^n$$

$$2^n + 4^n + 6^n$$

$$3^n + 5^n + 7^n$$

$$3^n - 2^n$$

$$7^n + 5^n - 3^n$$

Can you justify your findings?

<https://nrich.maths.org/6401>

Powerful order

List the following three numbers in increasing order:

$$2^{25} \quad 8^8 \quad 3^{11}$$

<https://nrich.maths.org/7153>

Roots near 9

Given that n is an integer, and the difference between \sqrt{n} and 9 is less than 1, how many different possibilities are there for n ?

<https://nrich.maths.org/13713>