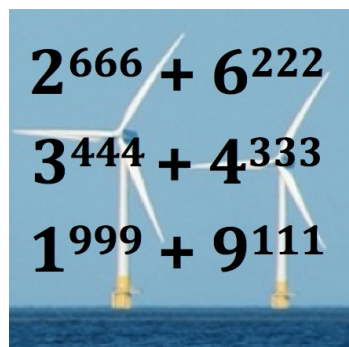# POWERFUL THINKING 4

Is this number $3^{444} + 4^{333}$ divisible by 5?

Investigate other big powers?

Make up some similar numerical expressions involving powers that have interesting properties.

What about
$2^{666} + 6^{222}$?
$1^{999} + 9^{111}$?
$7^{444} + 4^{777}$?

Create some patterns of your own involving the sum of two (or perhaps three) big powers, and describe their special properties.

HELP

What pattern can you see in the last digits of the powers of 2? What pattern can you see in the last digits of the powers of 6? Now add $2^2 + 6^2, 2^3 + 6^3, 2^4 + 6^4$,… but just focus on the last digits. Make a list of the last digits that you get. Try to spot a pattern and how the pattern keeps repeating itself. Where does 222 occur in that pattern?

For the second part of this question, what pattern can you see in the last digits of the powers of 3? Where does 444 occur in that pattern?

What pattern can you see in the last digits of the powers of 4? Where does 333 occur in that pattern?

Now add $3^4 + 4^3$, $3^8 + 4^6, 3^{12} + 4^9$,… but just focus on the last digits. Make a list of the last digits that you get. Try to spot a pattern and how the pattern keeps repeating itself.

NEXT

Make up a similar expression involving sums or products of powers of whole numbers. You might include sums of powers of three numbers. Write down a list of the properties that you see.

Exchange with another learner list the properties of the expressions that your partner has created. Then discuss the properties and between you find the best way to describe and explain the properties.