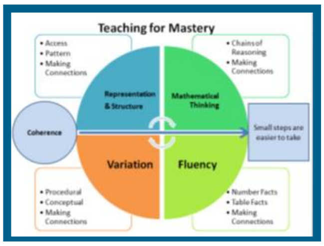


Big Ideas in Mastery: Variation

Messages

1. The central idea of teaching with variation is to highlight the essential features of a concept or idea through varying the non-essential features.
2. When giving examples of a mathematical concept, it is useful to add variation to emphasise:
   a. What it is (as varied as possible);
   b. What it is not.
3. When constructing a set of activities / questions it is important to consider what connects the examples; what mathematical structures are being highlighted?
4. Variation is not the same as variety – careful attention needs to be paid to what aspects are being varied (and what is not being varied) and for what purpose.

For example:

Key Teaching Point: if the base is the same, when you multiply expressions you add the powers

2×2	$= 2^2$
$2 \times 2^2 = 2 \times (2 \times 2)$	$= 2^3$
$2^2 \times 2^2 = (2 \times 2) \times (2 \times 2)$	$= 2^4$
$2^2 \times 2^3 = (2 \times 2) \times (2 \times 2 \times 2)$	$= 2^5$

Notice the changes from using bases with indices to single bases to help students to formulate their ideas

$5^3 \times 5^5 = (5 \times 5 \times 5) \times (5 \times 5 \times 5 \times 5 \times 5) \qquad = 5^8$

$10^2 \times 10^7 = 10^9$

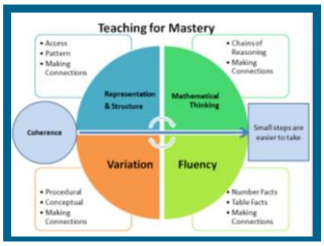
$6^6 \times 6^5 = 6^{11}$

$a^2 \times a^3 = a^5$

$(-8)^{12} \times (-8)^5$

$(-183)^7 \times (-183)^5 = (-183)^{12}$

The questions develop to use different bases including algebraic expressions and negative values



$x^5 . x^4$

$x . x^2 . x^5$

$a^{3m} . a^{2m-1}$

$(x-y)^3 . (x-y)^4 . (x-y)^2$

The questions now develop to no longer use the multiplication sign but still emphasise the use of the same bases

What it is not?

True or False?

1) $a^2 + a^3 = 2a^5$

2) $a^2 . a^3 = a^5$

3) $a^2 . a^3 = a^6$

4) $a^2 + a^3 = a^5$

5) $x^m + x^m = 2x^m$

1) $(-3)^3 \times 3^6$

2) $9^3 . (-9)^4$

3) $(a-b)^2 . (b-a)^3$

4) $a. a^4 . a^3$

5) $(a-2b)^5 . (2b-a)^7$

The questions have changed with the bases no longer being identical but show the negative of one of the bases These can be used for students to develop their own strategies and to emphasise that where n is even, $(-1)^n = 1$ and when n is odd $(-1)^n = -1$