

Algebraic Binomial on the Algebraic Peg Board

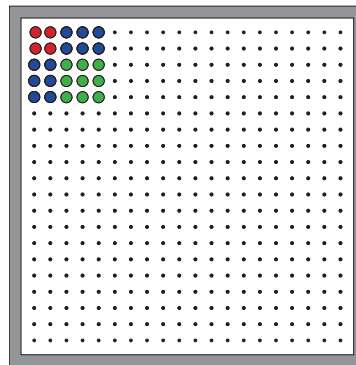
Materials:

- Algebraic Peg Board, pegs, and cups
- Patterns for Square Root (Binomial Square Guide)
- labels, black pen
- pencil, colored pencils
- graph paper from lesson: *Square of Binomials with the Algebraic Peg Board*
- graph paper

Aim: To move from numerals to letters, a move to abstraction.

Presentation:

1. Use the completed binomial square from lesson: *Square of Binomials with the Algebraic Peg Board* 23^2
2. Make labels of 20 and 3 and place them on the proper position along the top and the side of the Peg Board.

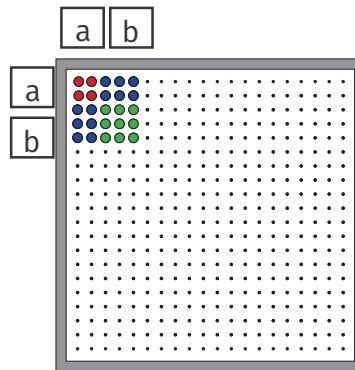


3. Turn the labels over and write the letters:

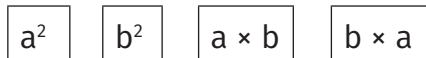
$$20 = \boxed{a}$$

$$3 = \boxed{b}$$

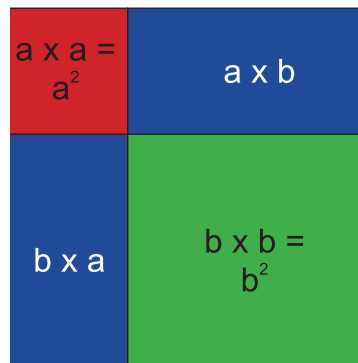
4. Place these letters and the duplicate set in their proper position along the top and the side of the Peg Board.



5. Write labels for the two squares and two rectangles:



6. Place these labels on the Binomial Square Guide.



7. The solution to this binomial is:

$$\begin{aligned}
 (a + b)^2 &= a^2 + 2(a \times b) + b^2 \\
 &= a^2 + 2ab + b^2
 \end{aligned}$$

The diagram illustrates the expansion of the binomial square $(20+3)^2$ on a wooden pegboard. The top part shows a grid of colored dots forming a large square, with labels for the terms: a (20), b (3), a^2 , $a \times b$, $b \times a$, and b^2 . Below this, a larger square is formed by colored blocks: a red block for $a \times a = a^2$, a blue block for $a \times b$, a blue block for $b \times a$, and a green block for $b \times b = b^2$. To the right, a blue box contains the following text:

Algebraic Binomial on the Peg Board

$$(23^2) = (20+3)^2$$

$$= 20^2 + (20 \times 3) + (3 \times 20) + 3^2$$

$$(t \times t) = 20^2 = (20 \times 20) = 400$$

$$(t \times u) = (20 \times 3) = 60$$

$$(u \times t) = (3 \times 20) = 60$$

$$(u \times u) = 3^2 = (3 \times 3) = 9$$

$$23^2 = (20+3)^2$$

$$= (20+3) \times (20+3)$$

$$20 = a$$

$$3 = b$$

$$(a+b)^2 = a^2 + 2(a \times b) + b^2$$

$$= a^2 + 2ab + b^2$$

8. Create the rule with the student:

RULE:

The square of a binomial equals the square of the first term plus the double product of the first term and the second term, plus the square of the second term.

Practice problems:

- | | | |
|-----------|-----------|------------|
| 1. 25^2 | 5. 21^2 | 9. 24^2 |
| 2. 31^2 | 6. 34^2 | 10. 36^2 |
| 3. 27^2 | 7. 28^2 | 11. 41^2 |
| 4. 43^2 | 8. 28^2 | 12. 47^2 |