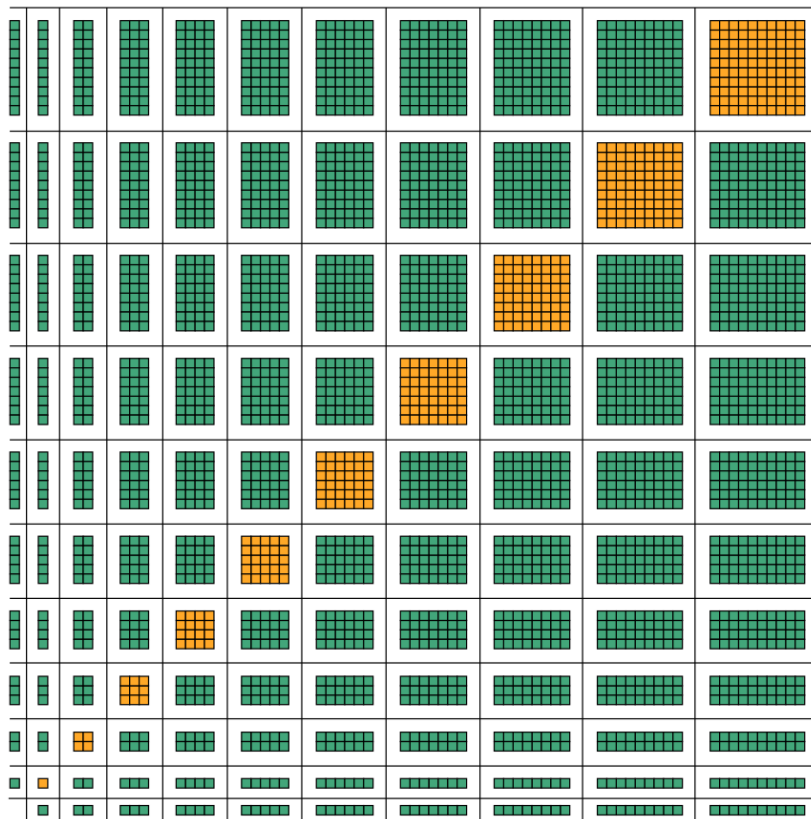


Expanding



Did you know?

This illustration shows a visual times-table or multiplication square.



- What do you notice?
- Can you see square numbers?
- Can you see prime numbers?

As you progress through this topic try to think about how this diagram might relate to what you are doing..



Expanding 1



1. Which of the following are the same as:

$$3(4 + 10)$$

$$3 \times 4 + 10$$

$$(3 \times 4) + (3 \times 10)$$

$$3 \times 14$$

$$3 + 14$$

2. Which of these are the same calculation?

$$24 \times 14$$

$$12 \times 2 \times 14$$

$$6 \times 4 \times 2 \times 14$$

$$3 \times 7 \times 8 \times 2$$

$$2 \times 7 \times 6 \times 4$$

3. Expand $4(x + 5)$

4. Calculate $\frac{5}{6} \left(2 + \frac{3}{5} \right)$

5. Which expression is the odd one out?

$$(20 \times 8) + (4 \times 8)$$

$$2 \times 4 \times 2 \times 6$$

$$(12 \times 8) + (12 \times 8)$$

$$8(20 + 4)$$

$$24 \times 8$$

6. Which of these expressions are the same?

$$12(x + 1)$$

$$4(3x + 2)$$

$$2(6x + 3)$$

$$6(2x + 1)$$

7. Expand $-3(2y + x)$

8. 4 people have $(x+3)$ apples each and 5 people have $(x-4)$ apples each.

Write an expression, in its simplest form for the total number of apples.



A multiplicative string



Have a go at doing the following sum in your head:

$$3 \times 7 \times 2 \times 4 \times 5$$

Did you multiply from left to right?

Here is an alternative suggestion:

$$\begin{aligned} &3 \times 7 \times 2 \times 4 \times 5 \\ &(2 \times 5) \times ((3 \times 7) \times 4) \\ &(10) \times (21 \times 4) \\ &10 \times 84 \\ &840 \end{aligned}$$

- Why has it been done this way?
- What do the brackets represent?



Multiplication matching

Which of the following multiplicative strings are the same...can you match them into sets?

$$9 \times 8 \times 6$$

$$2 \times 3 \times 2 \times 4 \times 5$$

$$20 \times 4 \times 7$$

$$15 \times 4 \times 6 \times 5 \times 7$$

$$4 \times 6 \times 5 \times 7 \times 3$$

$$3 \times 4 \times 6 \times 3 \times 2$$

$$10 \times 21 \times 6$$

$$2 \times 5 \times 7 \times 3 \times 6$$

$$12 \times 4 \times 5$$

$$10 \times 6 \times 4$$

$$2 \times 2 \times 5 \times 7 \times 4$$

$$35 \times 3 \times 4 \times 6$$

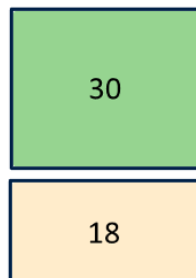
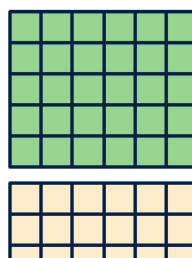
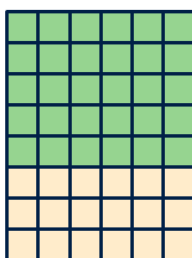
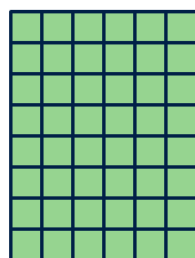
$$6 \times 35 \times 6$$

$$12 \times 6 \times 6$$

$$10 \times 7 \times 8$$

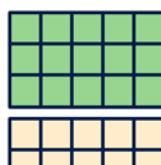
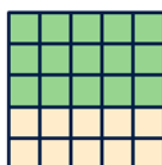
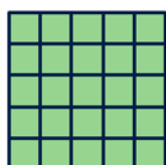


Geometric Interpretations



$$48 = 6 \times 8 = 6(3 + 5) = (6 \times 3) + (6 \times 5) = 18 + 30 = 48$$

■ Use the example above to complete the one below



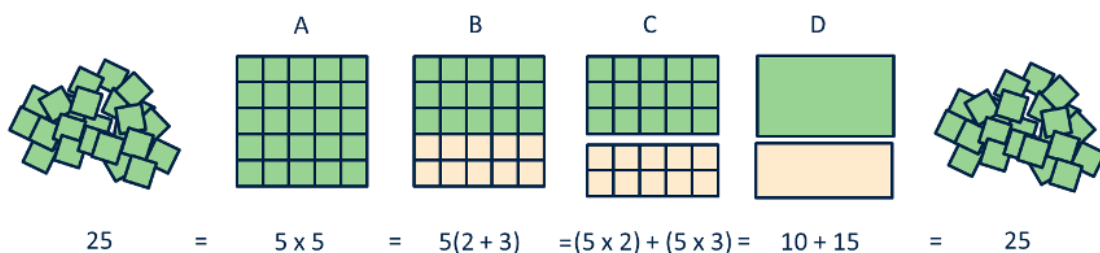
$$25 = \quad = \quad = \quad = \quad = 25$$

■ Complete the table below in a similar manner:

Total	A	B	C	D	Total
81	9×9	$9(3 + 6)$			
	5×12		$(5 \times 4) + (5 \times 8)$		
	$\dots \times 8$			$27 + 45$	72
	$15 \times \dots$			$\dots + 30$	90
144			$(\dots \times 7) + (\dots \times 5)$		
		$3(\dots + 4)$			36



Algebraic Applications



How does what you have been doing relate to the equations below?

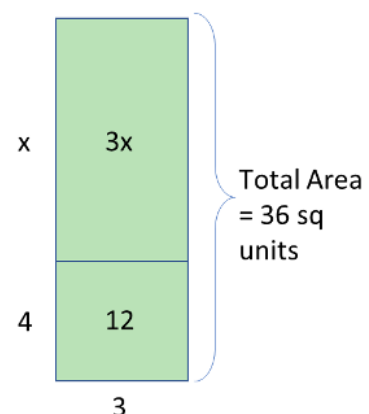
Try drawing diagrams to illustrate your explanations

1. $3(x + 4) = 36$ \longrightarrow e.g.

2. $5(x + 3) = 35$

3. $x(x + 7) = 44$

4. $5(x + y + 4) = 45$





Match it Up!

Square x , then
multiply by three

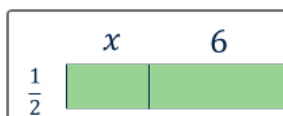
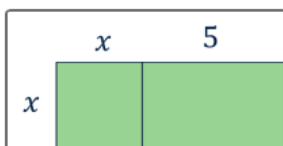
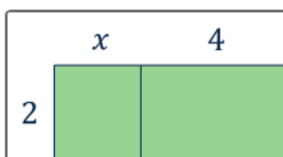
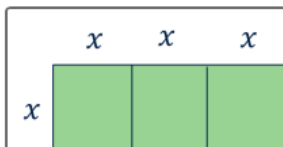
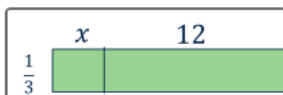
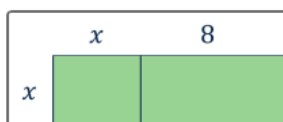
Add twelve to x ,
then
divide by three

Add eight to x , then
multiply by x

Half x , then
add three

Add five to x , then
multiply by x

Add four to x , then
multiply by two



$$\frac{x+6}{2}$$

$$2x+8$$

$$x(x+5)$$

$$3x^2$$

$$x(x+8)$$

$$\frac{1}{3}(x+12)$$



Odd One Out

In each group of four expressions, one of them is not the same as the rest. Can you find it?

- $(3x+4y)+2(x+2y)$
- $4(2x+5y)-3(x+4y)$
- $3(2x+3y)-(x-y)$
- $3(x+3y)+(2x-y)$

- $(x+3)(x+7)$
- $x(x+3)+7(x+3)$
- $x(x+2)+7(x+2)+x+7$
- $x(x+4)+6(x+3)$

- $x(x+3)+3(x+5)$
- $2(x+4)+x(x+4)$
- $(x+3)^2+6$
- $x(x+3)+4(x+3)+(x+3)$

- $x(x-6)-(-2x)-2(x-6)$
- $x(x-6)+2(x-6)$
- $x(x-2)-2(x-2)-2(x-4)$
- $(x-3)^2+3$



Expanding 2



1. Expand $y(2y - 3)$

2. Expand $2x^2(3xy - 2x^3)$

3. Expand and simplify

a. $5(x - 4) + 3(2x + 5)$

4. Expand and simplify

a. $4(\sqrt{2} - 3) + 2(\sqrt{2} + 2)$

5. Multiply the expressions y and $y + 4$

Which of these expressions show the result?

$5y$

$y(y + 4)$

$y^2 + 4y$

$4y + 4$

6. A rectangle of width 3cm and width $x + 4$ cm is made larger by doubling its side lengths. What is the area, in cm^2 of the larger rectangle?

7. Expand and simplify $4 - 3(2 - a + t) - t$

8. Expand and simplify

$$\frac{a}{2} \left(3 + \frac{a}{4} \right) + \frac{a}{3} \left(2 + \frac{a}{2} \right)$$