Understanding Multiplication

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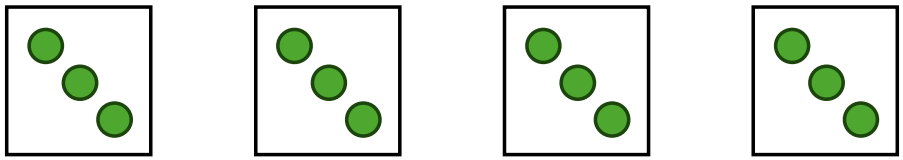
Multiplication is Repeated Addition

Multiplication is adding the same number again and again.

Example: 3 x 4

Means add 3 to itself 4 times.

3 + 3 + 3 + 3



It takes a long time to repeatedly add the same number.

Multiplication is a **shortcut** for repeated addition.

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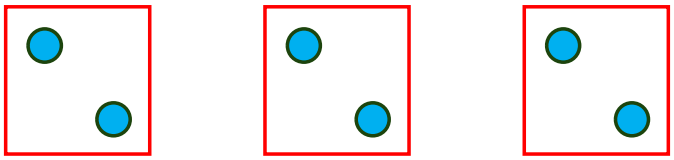
The Language of Multiplication

Size of equal groups

Number of equal groups → **3 x 2 = 6** ← Total amount



I have **three groups** of **2 counters**, I have **6 counters** in total

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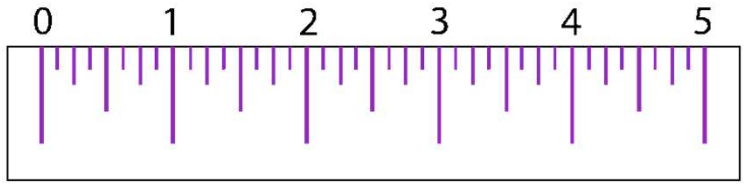
Times Tables You Must Know

The 1, 2, 5 and 10 times tables are the foundation facts. You must know them off by heart. You can learn them using dot patterns, Cuisenaire rods and number lines. All other times-table facts can be worked out from these facts and from understanding that multiplication is commutative (you can swap the order of the numbers).



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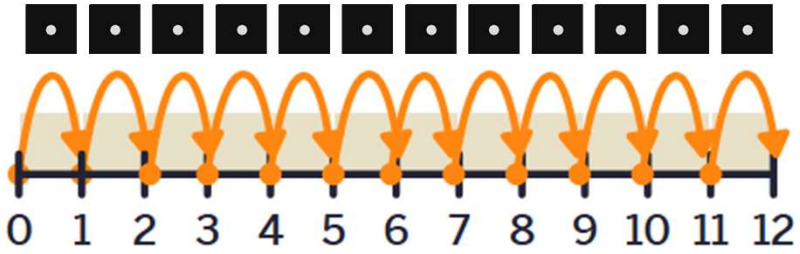
Times Tables You Must Know: One Times Tables



1 x 1= 1
2 x 1= 2
3 x 1= 3
4 x 1= 4
5 x 1= 5
6 x 1= 6
7 x 1= 7
8 x 1= 8
9 x 1= 9
10 x 1= 10
11 x 1= 11
12 x 1= 12

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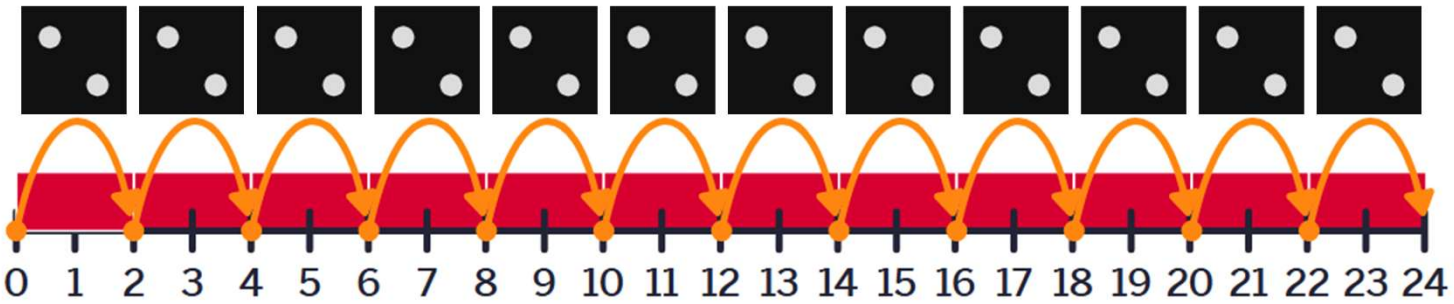
Times Tables You Must Know: Two Times Tables

Two Times Tables



1 x 2 = 2
2 x 2 = 4
3 x 2 = 6
4 x 2 = 8
5 x 2 = 10
6 x 2 = 12
7 x 2 = 14
8 x 2 = 16
9 x 2 = 18
10 x 2 = 20
11 x 2 = 22
12 x 2 = 24

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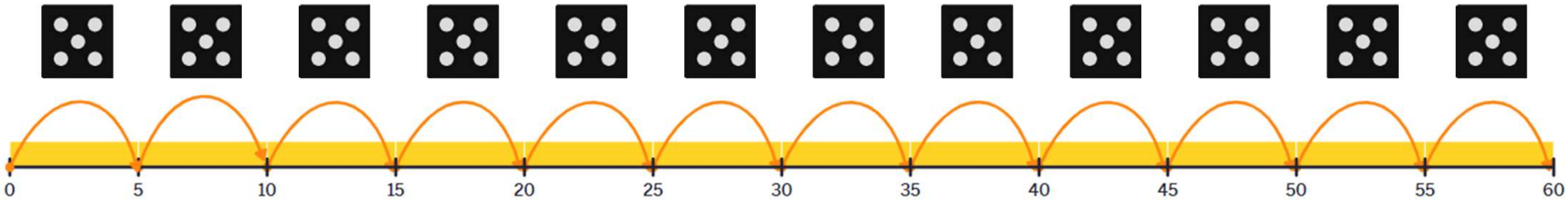
Times Tables You Must Know: Five Times Tables

Five Times Tables



1 x 5 = 5
2 x 5 = 10
3 x 5 = 15
4 x 5 = 20
5 x 5 = 25
6 x 5 = 30
7 x 5 = 35
8 x 5 = 40
9 x 5 = 45
10 x 5 = 50
11 x 5 = 55
12 x 5 = 60

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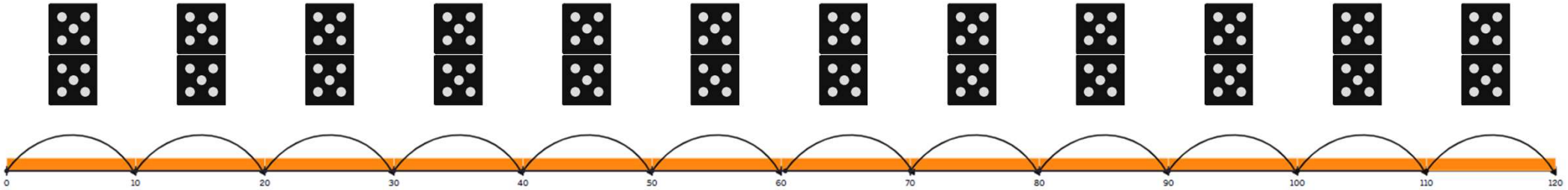
Times Tables You Must Know: Ten Times Tables

Ten Times Tables



1 x 10 = 10
2 x 10 = 10
3 x 10 = 15
4 x 10 = 20
5 x 10 = 25
6 x 10 = 30
7 x 10 = 35
8 x 10 = 40
9 x 10 = 45
10 x 10 = 50
11 x 10 = 55
12 x 10 = 60

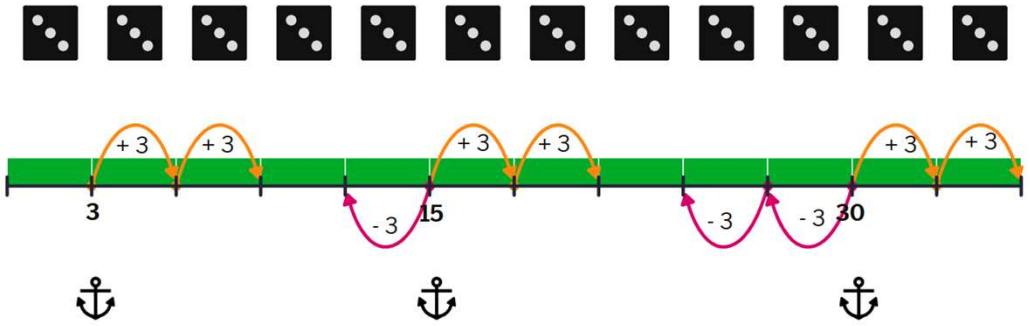
Working Out the Other Times Tables

All other multiplication facts can be reasoned from 1 x n, 5 x n, and 10 x n by adding or subtracting in small steps. Use flashcards to practice finding the closest anchor and reasoning forwards and backwards from there.

Reasoning patterns that derive all other tables

- 2 x n = (1 x n) + (1 x n)
- 3 x n = (2 x n) + (1 x n)
- 4 x n = (5 x n) - (1 x n)
- 6 x n = (5 x n) + (1 x n)
- 7 x n = (5 x n) + (2 x n)
- 8 x n = (10 x n) - (2 x n)
- 9 x n = (10 x n) - (1 x n)
- 11 x n = (10 x n) + (1 x n)
- 12 x n = (10 x n) + (2 x n)

Example: Three Times Tables



1 x 3 = 3
2 x 3 = 3 + 3 = 6
3 x 3 = 6 + 3 = 9
4 x 3 = 15 - 3 = 12
5 x 3 = 15
6 x 3 = 15 + 3 = 18
7 x 3 = 15 + 6 = 21
8 x 3 = 30 - 6 = 24
9 x 3 = 30 - 3 = 27
10 x 3 = 30
11 x 3 = 30 + 3 = 33
12 x 3 = 30 + 6 = 26

Drawing A Multiplication Square

Make good use of extra time in your maths exams by drawing a multiplication square. You can use it to solve multiplication and division problems and to identify square numbers and equivalent fractions.

To draw a multiplication square:

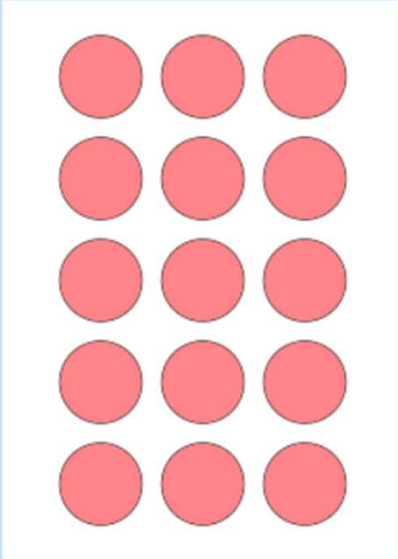
- Draw the grid and label the rows and columns.
- Fill in the parts you already know.
- Begin with the multiplication tables you are most confident with, such as the 1s, 2s, 5s and 10s.
- Then move on to the 9s, 11s and 12s, using the patterns in these tables to help you complete more of the grid.
- After that, work through the 3s, 4s and 6s.
- Leave the 7s and 8s until last, as these are often the trickiest.
- Highlight the square numbers once the grid is complete.
- Practise regularly until you can fill in the whole grid quickly and accurately.

x	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

a x b = b x a

The commutative property of multiplication states that changing the order of the factors does not change the product. In other words: a × b = b × a. Whether you multiply 5 × 3 or 3 × 5, the result is still 15.

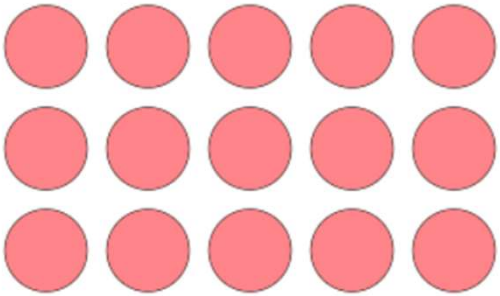
5 x 3 = 15



5 rows of 3 equals 15

5 x 3 = 15

3 x 5 = 15



3 rows of 5 equals 15

3 x 5 = 15

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Long Multiplication: Grid Method

The grid method is a way of multiplying large numbers by breaking them down into smaller, easier-to-manage chunks. It uses a grid to organise the calculation.

How to use the grid method

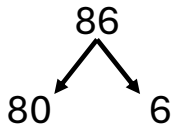
- **Estimate.** Rounding each number to 1 significant figure and estimate the answer.
- **Partition.** Split each number into its place value parts.
- **Draw a grid.** Label the columns with one number's place value parts and the rows with the other number's place value parts.
- **Multiply.** Multiply the value at the start of each row by the value at the top of each column. Write each product in the correct box.
- **Add.** Add all the products to find the total.
- **Check.** Compare your answer with your estimate to check that it's reasonable.
- **State.** Clearly write the final answer.

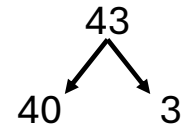
Example: $86 \times 43 =$

$86 \rightarrow 90$

$43 \rightarrow 40$

$9 \times 4 = 36$, therefore $90 \times 40 = 3600$





×	80	6
40	**3200**	**240**
3	**240**	**18**

3200
240
240
\+ 18
3698 Estimate✓

$86 \times 43 = 3698$

Acknowledgements

- Images were created using free virtual manipulatives by Amplify available at Polypad.com.

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