



Guess your number

1	3	5	7
9	11	13	15

2	3	6	7
10	11	14	15

4	5	6	7
12	13	14	15

8	9	10	11
12	13	14	15

Very Long Multiplication

I. Addition	II. Powers of 10	III. Number structure
$\begin{array}{r} 124 \\ 124 \\ \hline +124 \\ \hline 372 \end{array}$	$123 \times 100 = 12300$	$235 = 200 + 30 + 5$ $= 2 \times 100 + 3 \times 10 + 5 \times 1$ $= 2 \times 10^2 + 3 \times 10^1 + 5 \times 10^0$ $235235 = 235 \times 10^3 + 235$

IV. Distributive

$$\begin{aligned} (2+3) \times 7 &= 5 \times 7 = 7+7+7+7+7 = (7+7) + (7+7+7) \\ &= 2 \times 7 + 3 \times 7 \\ 35 &= 14 + 21 \end{aligned}$$

Commutative and Associative Properties

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	1	2	3	4	5
2	0	2	4	6	8	10
3	0	3	6	9	12	15
4	0	4	8	12	16	20
5	0	5	10	15	20	25

$$2 \times 10 = 10 + 10 = 20$$

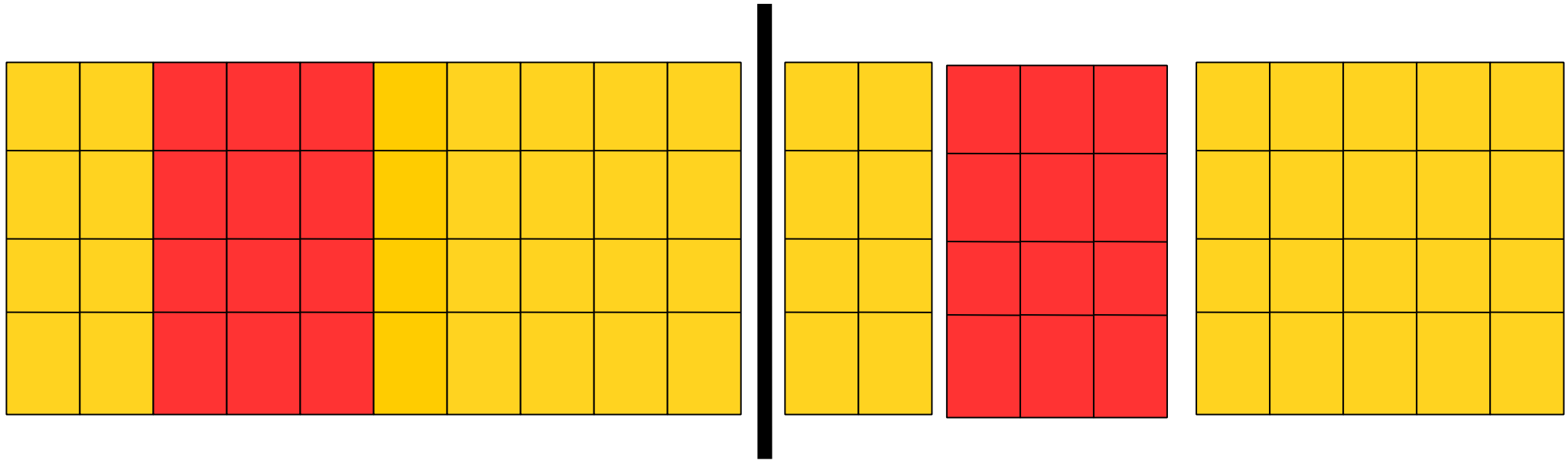
$$10 \times 2 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 =$$

$$(1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1)$$

$$+ (1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1) = 10 + 10 = 20$$

$$250 \times 350 = (25 \times 10) \times (35 \times 10) = 25 \times 35 \times 10 \times 10 = (25 \times 35) (10 \times 10)$$

Distributive Property



10X4

=

(2 + 3 + 5)x4

$$\begin{array}{r} 110 \\ 123 \\ \times 5 \\ \hline 615 \end{array}$$

$$\begin{array}{r} = 100 + 20 + 3 \\ \times \quad \quad \quad 5 \\ \hline \quad \quad \quad 15 \\ \quad 100 \\ \quad 500 \\ \hline 615 \end{array}$$

$$\begin{aligned} (30+2) \times (60+7) &= 32 \times (60+7) \\ &= 32 \times 60 + 32 \times 7 \\ &= (30+2) \times 60 + (30+2) \times 7 \end{aligned}$$

$$\begin{array}{r} 32 = 30+2 \\ \underline{\times 67} = \underline{\times 60+7} \end{array}$$

Associative Property:

No matter how you **group** your numbers, in addition or multiplication, The answer is the same.

$$\begin{aligned} 9+1+4 &= (9+1)+4 \\ &= 9+(1+4) \end{aligned}$$

$$\begin{aligned} 4 \times 2 \times 5 &= 4 \times (2 \times 5) \\ &= (4 \times 2) \times 5 \end{aligned}$$

Commutative Property:

No matter how you **order** your numbers, in addition or multiplication, The answer is the same.

$$50 \times 70 = (5 \times 10) \times (7 \times 10) = (5 \times 7) \times (10 \times 10)$$

Distributive Property:

The product of a number times a sum is equal to the sum of the products of that number with each number in the sum.

$$8 \times 6 = 8 \times (5 + 1) = 8 \times 5 + 8 \times 1$$

Distributive Property applied

$$\begin{array}{r} 12345 \\ \times \quad 5 \\ \hline 61725 \end{array}$$

$$\begin{array}{r} 12345 \\ \times \quad 40 \\ \hline 493800 \end{array}$$

$$\begin{array}{r} 12345 \\ \times \quad 300 \\ \hline 3703500 \end{array}$$

$$\begin{array}{r} 12345 \\ \times \quad 345 \\ \hline 61725 \\ 493800 \\ \hline 3703500 \\ \hline 4259025 \end{array}$$

$$\begin{array}{r} 12345 \\ \times \quad 345 \\ \hline 61725 \\ 49380 \\ \hline 37035 \\ \hline 4259025 \end{array}$$

$$\begin{array}{r} 12345 \\ \times 12345 \\ \hline 61725 \\ 49380 \\ 37035 \\ 24690 \\ \hline 12345 \\ \hline 152399025 \end{array}$$

$$\begin{array}{r} 12345 \\ \times 50050 \\ \hline 617250 \\ \hline 61725 \\ \hline 617867250 \end{array}$$

$$\begin{array}{r} 12345 \\ \times 12345 \\ \hline 12345 \\ 24690 \\ 37035 \\ 49380 \\ \hline 61725 \\ \hline 152399025 \end{array}$$

Blatantly Applying the Distributive Property

$$\begin{array}{r}
 120+3 \\
 \times 120 \\
 \hline
 14400 \\
 +360 \\
 \hline
 \end{array}$$

Distributive

$$\begin{array}{r}
 120+3 \\
 \times 3 \\
 \hline
 360 \\
 +9 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 120+3 \\
 \times 120+3 \\
 \hline
 14400 \\
 360 \\
 360 \\
 9 \\
 \hline
 15129
 \end{array}$$

commutative

Double distributive

$$\begin{array}{r}
 1230+4 \\
 \times 1230+4 \\
 \hline
 1512900 \\
 4920 \\
 4920 \\
 16 \\
 \hline
 1522756
 \end{array}$$

$$\begin{array}{r}
 12340+5 \\
 \times 12340+5 \\
 \hline
 152275600 \\
 61700 \\
 61700 \\
 25 \\
 \hline
 152399025
 \end{array}$$

$$\begin{array}{r}
 12345 \\
 \times 12345 \\
 \hline
 61725 \\
 49380 \\
 37035 \\
 24690 \\
 12345 \\
 \hline
 152399025
 \end{array}$$

Validation

Example

$$\begin{array}{r} 123 \\ \times 35 \\ \hline 615 \\ 369 \\ \hline 4305 \end{array}$$

$$\begin{array}{r} 123123123 \\ \times \quad 353535 \\ \hline 4305 \\ 4305 \\ +4305 \\ \hline 4309309305 \\ 4309309305 \\ \hline 4309309305 \\ \hline 43527330289805 \end{array}$$

$$\begin{aligned} &= 123 \times 10^6 + 123 \times 10^3 + 123 \\ &= 35 \times 10^4 + 35 \times 10^2 + 35 \\ &= 35 \times 123 \\ &= 35 \times 123000 \\ &= 35 \times 123000000 \\ &= 35 \times 123123123 \\ &= 3500 \times 123123123 \\ &= 350000 \times 123123123 \end{aligned}$$

$$123123123 \times 35 = (123000000 + 123000 + 123) \times 35$$

$$123123123 \times 353535 = 123123123 \times (350000 + 3500 + 35)$$

Very Long Multiplication

Notes:

$$\begin{array}{r} 123412341234 \\ \times 123123123123 \\ \hline \end{array}$$

$$\begin{aligned} &= 1234 + 1234 \times 10^4 + 1234 \times 10^8 \\ &= 123 + 123 \times 10^3 + 123 \times 10^6 + 123 \times 10^9 \end{aligned}$$

3702

2468

1234

151782

$$= 1234 \times 123$$

151782

$$= 12340000 \times 123$$

+151782

$$= 123400000000 \times 123$$

15179717971782

$$= 123412341234 \times 123$$

15179717971782

$$= 123412341234 \times 123000$$

15179717971782

$$= 123412341234 \times 123000000$$

15179717971782

$$= 123412341234 \times 123000000000$$

15194912884651471753782

$$\begin{array}{r}
 123450+6 \\
 \times 123450+6 \\
 \hline
 15239902500 \\
 740700 \\
 740700 \\
 \quad 36 \\
 \hline
 15241383936
 \end{array}$$

$$\begin{array}{r}
 123456123456123456 \\
 \times 123456123456123456 \\
 \hline
 15241383936 \\
 15241383936 \\
 \hline
 15241399177399177383936 \\
 15241399177399177383936 \\
 \hline
 15241399177399177383936 \\
 \hline
 15241414418813596182290783113383936
 \end{array}$$

$$123456 = 123450 + 6$$

$$123450 \times 123450 = (12345 \times 12345) \times (10 \times 10)$$

Area Method

123456123456123456
x123456123456123456
15241383936
15241383936
15241383936
15241383936
15241383936
15241383936
15241383936
15241383936
15241383936
15241414418813596182290783113383936

Area Method

$$\begin{array}{r} 123456123456123456 \\ \mathbf{x123456123456123456} \\ \hline 15241383936 \\ 15241383936 \\ 15241383936 \\ 15241383936 \\ 15241383936 \\ 15241383936 \\ 15241383936 \\ 15241383936 \\ \hline 15241414418813596182290783113383936 \end{array}$$

123456123456123456
x123456123456123456
740736740736740736
617280617280617280
493824493824493824
370368370368370368
246912246912246912
123456123456123456
740736740736740736
617280617280617280
493824493824493824
370368370368370368
246912246912246912
123456123456123456
740736740736740736
617280617280617280
493824493824493824
370368370368370368
246912246912246912
123456123456123456
15241414418813596182290783113383936

324 digits

142857
x142857
999999
714285
1142856
285714
571428
142857
20408122449

142857142857142857142857**142857**142857**142857**142857142857
x**142857**142857142857142857**142857**142857**142857**142857142857142857
20408122449
20408122449
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20408142857122449
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71428571428571428571428551020408163265306122449
91836734693877551020408122448979591836734693877551020408163265306122449

204081632653061224489795

142857
x142857
999999
714285
1142856
285714
571428
142857
20408122449

142857142857142857142857**142857**142857142857**142857**142857
x142857142857142857142857142857142857142857142857
20408122449
20408122449
20408142857122449
20408142857122449
20408163265265306122449
20408163265265306122449
20408163265285714285714265306122449
20408163265285714285714265306122449
20408163265306122448979551020408163265306122449
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20408163265306122448979571428571428571428571428551020408163265306122449
71428571428571428571428551020408163265306122449
91836734693877551020408122448979591836734693877551020408163265306122449

204081632653061224489795 42 digits counting 0

Precision 6 12 24 48

02040816326530612244897959183673469387755102
7)142857142857142857142857142857142857142857142857142857

