

MULTIPLICATION/DIVISION

* Multiplication Tables

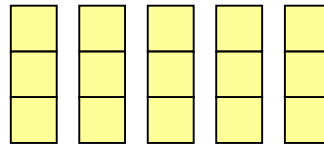
Doubling and halving can be used to help students to learn some of the tables from previously learnt tables.

* Multiplication as repeated addition

* Division as repeated subtraction

* Relationship between multiplication and division

e.g. 1 $5 \times 3 =$ **5 lots of 3** = 15



e.g. 2 $15 \div 3 =$ **Fifteen divided by three**
How many threes make 15?

(Transforming the division into a multiplication)

$15 \div 3 = 5$ **Five threes make 15**

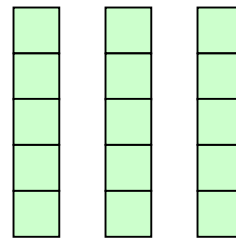
N.B. Each array leads to **two** multiplications and **two** divisions:

$5 \times 3 = 15$

$3 \times 5 = 15$

$15 \div 3 = 5$

$15 \div 5 = 3$



* Multiplying by 10 and by 100 using a place-value grid

e.g. 1 $4 \times 10 = 40$
 $4 \times 100 = 400$

H	T	U	
		4	4×1
	4	0	4×10
4	0	0	4×100

e.g. 2 $84 \times 10 = 840$
 $84 \times 100 = 8400$

Th	H	T	U	
		8	4	84×1
	8	4	0	84×10
8	4	0	0	84×100

N.B. When we **multiply** a number by 10 we slide the digit(s) one place to the **left**.

When we **multiply** a number by 100 we slide the digit(s) two places to the **left**.

*** Dividing by 10 and by 100 using a place-value grid**

e.g. $2300 \div 10 = 230$
 $2300 \div 100 = 23$

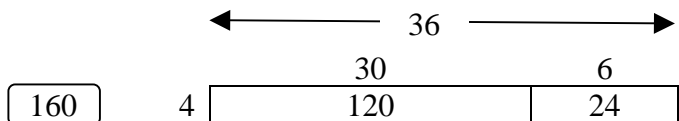
Th	H	T	U	
2	3	0	0	
	2	3	0	$2300 \div 10$
		2	3	$2300 \div 100$

N.B. When we **divide** a number by 10 we slide the digit(s) one place to the **right**.

When we **divide** a number by 100 we slide the digit(s) two places to the **right**.

*** Multiplying by partitioning into hundreds, tens and units (informal horizontal method)**

e.g. 1
 $36 \times 4 = 4 \times 36$
 $= 4 \times (30 + 6)$
 $= (4 \times 30) + (4 \times 6)$
 $= 120 + 24$
 $= 144$



e.g. 2

$$\begin{aligned}
523 \times 8 &= 8 \times 523 \\
&= 8 \times (500 + 20 + 3) \\
&= (8 \times 500) + (8 \times 20) + (8 \times 3) \\
&= 4000 + 160 + 24 \\
&= 4184
\end{aligned}$$

(The **commutative** law for multiplication)

(The **distributive** law for multiplication)

estimate 4000

$$8 \begin{array}{|c|c|c|} \hline 500 & 20 & 3 \\ \hline 4000 & 160 & 24 \\ \hline \end{array} = 4184$$

*** Multiplying (HTU × U) using a standard written method (vertical method)**

e.g. 1 523 × 8

$$\begin{array}{r}
\boxed{4000} \\
523 \\
\times \quad 8 \\
\hline
24 \\
160 \\
4000 \\
\hline
4184
\end{array}$$

Estimate (500 × 8)

8 × 3

Multiply the units (3) by 8

8 × 20

Multiply the tens (2) by 8

8 × 500

Multiply the hundreds (5) by 8

Add the three results

∴ 8 × 523 = 4184

e.g. 2 523 × 8

$$\begin{array}{r}
\boxed{4000} \text{ Estimate } (500 \times 8) \\
523 \\
\times \quad 8 \\
\hline
4184 \\
\text{1 2}
\end{array}$$

1. Eight threes are 24. That's **2** tens and 4 units. Write four in the units column. Carry the two tens over into the tens column. Write the **2** carried over, below the line in the tens column.
2. Eight twenties are 160. That's 16 tens. Add the **2** tens carried over to make 18 tens. This is **1** hundred and 8 tens. Write the 8 in the tens column. Carry the **1** hundred over into the hundreds column. Write the **1** carried over, below the line in the hundreds column.
3. Continue, to complete the multiplication.

∴ 523 × 8 = 4184

This is a shorter way of writing the multiplication.

*** Multiplying (TU × TU) using informal written method**

e.g. 54×26

estimate 1500

20	50	4	= 1404
6	1000	80	
	300	24	

$\therefore 54 \times 26 = 1404$

*** Multiplying (TU × TU) using standard written method**

e.g. 1 54×26

1 5 0 0	
5 4	
× 2 6	
2 4	
3 0 0	
8 0	
1 0 0 0	
1 4 0 4	
1	

Estimate (50×30)

- 6×4 Multiply the units (6) by units (4)
 - 6×50 Multiply the units (6) by tens (5)
 - 20×4 Multiply the tens (2) by units (4)
 - 20×50 Multiply the tens (2) by tens (5)
- Add the four results

2 tens × 5 tens = 2 tens × 50 = 100 tens = 1000

$\therefore 54 \times 26 = 1404$

*** Multiplying (U·t × U) using standard written method**

e.g. 9×4.7

45

9×4.7	=	9×4.0	=	36.0
		9×0.7	=	<u>6.3</u>
				<u>42.3</u>

- Split 4.7 into units and tenths
- Multiply the units by 9 (9 lots of 4 units).
- Multiply the tenths by 9 (9 lots of 7 tenths)
- Add the results

63 tenths = 6 units and 3 tenths = 6.3

$\therefore 9 \times 4.7 = 42.3$

*** Dividing using a standard written method (repeated subtraction)**

e.g. 1 $84 \div 6$

12	
14	
6) 84
	-60
	24
	-24
	0

10×6 Are there ten sixes in 84? Yes

4×6 How many sixes in 24?

14×6

$\therefore 84 \div 6 = 14$

e.g. 2 $680 \div 3$

200	
226 r 2	
3) 680
	-600
	80
	-60
	20
	-18
	2

200×3 Do we have a hundred threes in 680? Yes.
Do we have two hundred threes in 680? Yes.

20×3 Do we have ten threes in 80? Yes. Are there twenty threes? Yes.

6×3 How many threes in 20?

226×3

$\therefore 680 \div 3 = 226 \text{ r } 2$

e.g. 3 $956 \div 32$

30	
29 r 28	
32) 956
	-640
	316
	-288
	28

20×32 Are there ten thirty-twos in 956? Yes.
Are there twenty thirty-twos in 956? Yes.

9×32 How many thirty-twos in 316?

$\therefore 956 \div 32 = 29 \text{ r } 28$

e.g. 4 $123.41 \div 7$

2 0

	1 7 . 6 3		
7)	1 2 3 . 4 1	10 · 0	× 7 Start by subtracting tens of seven.
	– 7 0 . 0 0		
	5 3 . 4 1	7 · 0	× 7 Then subtracting units of seven.
	– 4 9 . 0 0		
	4 . 4 1	0 · 6	× 7 Next subtracting tenths of seven.
	– 4 . 2 0		
	0 . 2 1	0 · 03	× 7 Finally subtracting hundredths of seven.
	– 0 . 2 1		
	0 . 0 0	17 · 63	× 7

$$123.41 \div 7 = \mathbf{17.63}$$