



## Ancient Indian Maths

### Example 16 (demonstrations)

#### METHOD 1

The following scheme of the process of multiplication is exhibited in GANESA'S commentary

Statement: 135, 12; Product: ?

X		1	3	5
1		1	3	5
2		2	6	0
	1	6	2	0

135 x 12 = 1620

X		2	7	6
3		6	1	8
8		1	5	4
	10	4	8	8

276 x 38 = 10488

Multiply the digits of 135 by 12 from right to left.

$$\begin{array}{r}
 \text{Multiply 5 by 12} \quad 60 \\
 \text{Multiply 3 by 12} \quad 36 \\
 \text{Multiply 1 by 12} \quad 12 \\
 \hline
 1620
 \end{array}$$

Multiply the digits of 135 by 12 from right to left.

$$\begin{array}{r}
 \text{Multiply 1 by 12} \quad 12 \\
 \text{Multiply 3 by 12} \quad 36 \\
 \text{Multiply 5 by 12} \quad 60 \\
 \hline
 1620
 \end{array}$$

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## Ganitham - (*Bhascara's Lilavaty*)

Example 16 (demonstrations - continued)

### METHOD 2

Statement: 135, 12; Product: ?

#### Multiply by Integral Parts

Multiply 135 by 4 and 8 and add the results.

(as  $12 = 4 + 8$ )

$$12 = 8 + 4$$

|       |     |
|-------|-----|
| 135   | 135 |
| 8     | 4   |
| <hr/> |     |
| 540   |     |
| 1080  |     |
| <hr/> |     |
| 1620  |     |

### METHOD 3

Statement: 135, 12; Product: ?

#### Multiply by Aliquot Parts successively

Multiply 135 by 2; and the result by 6.

(as  $12 = 2 \times 6$ )

$$12 = 6 \times 2$$

|       |
|-------|
| 135   |
| 2     |
| <hr/> |
| 270   |
| 6     |
| <hr/> |
| 1620  |

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Example 16 (demonstrations - continued)

METHOD 4 (Digits of Multiplier Separated)

Statement: 135, 12; Product: ?

Multiply multiplicand by Separate Digits of the Multiplier

Multiply 135 by 2 and 1 and add the results as per place-values.

135	135
1	2
270	
135	
1620	

METHOD 5 (Digits of Multiplicand Separated)

Statement: 135, 12; Product: ?

Multiply Separate Digits of the Multiplicand by Multiplier

Multiply 1, 3, 5 by 12 and add the results as per place-values.

1	3	5
12 12 12		
60		
36		
12		
1620		

12	12	12
1	3	5
12		60
36		
1620		



## Ganitham - (*Bhascara's Lilavaty*)

Example 16 (demonstrations - continued)

### METHOD 6

Statement: 135, 12; Product: ?

#### Increase the Multiplier

Increase 12 by 8 to 20 (say).

Multiply 135 by 20 and 8 and subtract the results as per place-values.

$$\begin{array}{r} \text{subtract} \\ 135 \quad 135 \\ 20 \quad 8 \\ \hline 2700 \\ 1080 \\ \hline 1620 \end{array}$$

### METHOD 7

Statement: 135, 12; Product: ?

#### Decrease the Multiplier

Decrease 12 by 2 (say) to 10.

Multiply 135 by 10 and 2 and add the results as per place-values.

$$\begin{array}{r} \text{add} \\ 135 \quad 135 \\ 10 \quad 2 \\ \hline 270 \\ 1350 \\ \hline 1620 \end{array}$$



