

3.4 Notes

3.4: Algorithms for Multiplication and Division

Example: (The Standard Algorithm - Single Digit)

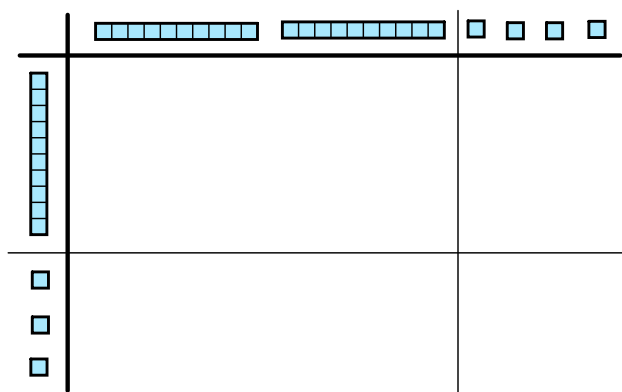
Multiply 3037 and 4.

$$\begin{array}{r} 3037 \\ 3037 \\ 3037 \\ + 3037 \\ \hline \end{array}$$

$$\begin{array}{r} 3037 \\ \times \quad 4 \\ \hline \end{array}$$

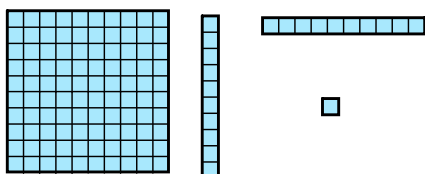
Example: (The Standard Algorithm - Multiple Digit)

Multiply 24 and 13.



Standard
Algorithm:

$$\begin{array}{r} 24 \\ \times 13 \\ \hline \end{array}$$



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Example: (Lattice Multiplication)

(a) Multiply 23 and 14.

Why does this work?

Example: (Lattice Multiplication)

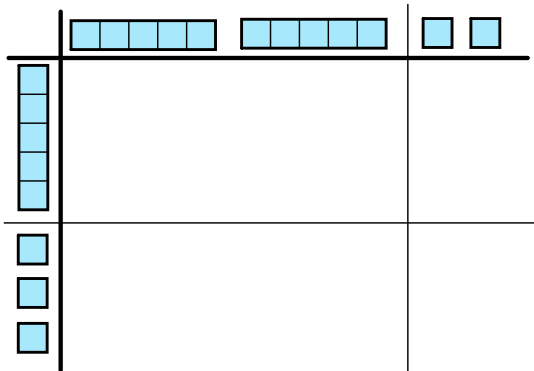
(b) Multiply 75 and 20.

(c) Multiply 273 and 54.

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Base 5 Multiplication: We can use both of the previous algorithms with base 5 numbers using this table.

Example: Multiply 14_{five} and 22_{five} .



Standard
Algorithm:

$$\begin{array}{r} 14 \\ \times 22 \\ \hline \end{array}$$

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Example: All numbers are base 5.

Standard:

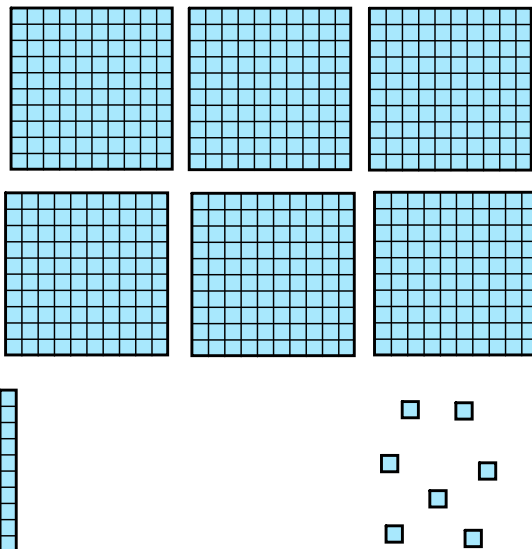
$$\begin{array}{r} 14 \\ \times 23 \\ \hline \end{array}$$

$$\begin{array}{r} 33 \\ \times 32 \\ \hline \end{array}$$

Lattice:

The Long Division Algorithm:

Example: Calculate $617 \div 5$



$$5 \overline{) 617}$$

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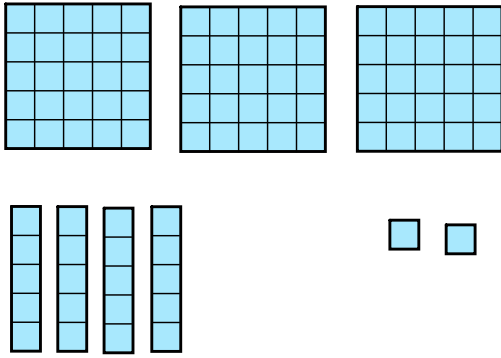
Example: Carefully explain why this works:

$$23 \overline{) 1986}$$

Example: Calculate $342_{\text{five}} \div 2_{\text{five}}$.

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Let's try $342_{\text{five}} \div 2_{\text{five}}$ with Base 5 blocks.



Example: Calculate $213_{\text{five}} \div 3_{\text{five}}$.

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Example: Calculate $1322_{\text{five}} \div 32_{\text{five}}$.

Example: Calculate $2002_{\text{five}} \div 21_{\text{five}}$.