

WORKING WITH BASE NUMBERS

Example 2304₍₅₎

Converting base 5 to decimal numbers

- "Given a base, assign its place"
- Meaning: if you have a subscript by your number, it means you are not in base 10. You are reading numbers with place values of 5⁰, 5¹, 5², 5³, etc. instead of the usual base 10 system of 1s, 10s, 100s, 1000s, etc.; therefore, you must assign each digit its place

2304₅ ← given a base, assign a place

$$\begin{array}{cccc} \frac{2}{5^3} & \frac{3}{5^2} & \frac{0}{5^1} & \frac{4}{5^0} \\ 125 & 25 & 5 & 1 \end{array} \Rightarrow \begin{array}{cccc} 125 & 25 & 0 & 4 \\ \times 2 & \times 3 & \times 5 & \times 1 \\ \hline 250 & 75 & 0 & 4 \end{array} = \textcircled{329}$$

Example 329 to Base 5

Converting decimal numbers to a base 5
Remove groups of ...625, 125, 25, 5, 1

$$\begin{array}{r} 329 \\ -250 \quad (2 \text{ groups of } 125) \\ \hline 79 \\ -75 \quad (3 \text{ groups of } 25) \\ \hline 4 \\ -0 \quad (0 \text{ groups of } 5) \\ \hline 4 \end{array} \quad 2304_5$$

Shortcut:

- "Given a decimal number...divide"
- Meaning: if you want to convert a decimal number to base 5, divide by 5. The quotient will come down and the remainder recorded off to the side
- Keep repeating the process
- The final quotient and all the remainders in reverse order become your base number.

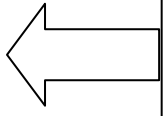
5 divides into 329
65 = 4 (etc.)

$$\begin{array}{r} 5 \overline{)329} \\ 5 \overline{)65} \\ 5 \overline{)13} \\ \quad 2 \end{array} \quad \begin{array}{c} \text{remainders} \\ 4 \\ 0 \\ 3 \end{array} \quad 2304_5$$

* (arrow pointing from 3 to 0)

Adding Base 5 numbers

$$\begin{array}{r} 1 \quad 1 \\ \mathbf{232}_5 \\ + \mathbf{304}_5 \\ \hline 546 \\ \hline \mathbf{1041}_5 \end{array}$$



Add the one's column, then **Look...**

- If sum ≥ 5 , carry a group of 5 to the next column, bring down what's left
- If sum < 5 , bring down

Go to the next column, add, the look...
(repeat)

To check convert back to base 10 and add

Ex. 2

$$\begin{array}{r} 1 \quad 1 \quad 1 \\ \mathbf{2314}_5 \\ + \mathbf{2422}_5 \\ \hline 5746 \\ \hline \mathbf{10241}_5 \end{array}$$