

Problems

$$Q \quad (43)_x = (y3)_8$$

How many possible combinations for x & y
(solutions)

$(43)_x \rightarrow$ Here $x > 4$ (minimum requirement)

$$(y3)_8 \rightarrow$$

$\rightarrow (0, 1, 2, 3, 4, 5, 6, 7)$

$$\underline{y < 8}$$

Step 1:- Convert into decimal

$$(43)_x = (y3)_8$$

$$4 \times x^1 + 3 \times x^0 = y \times 8^1 + 3 \times 8^0$$

$$4x + 3 = 8y + 3$$

$$\boxed{x = 2y}$$

\rightarrow

x	y
14	7
12	6
10	5
8	4
6	3
4	2

not possible \leftarrow

$x > 4$

$y < 8$

Q

$$(123)_5 = (x8)_y$$

$$\frac{x < y}{y > 8}$$

$$(0, \dots, \underline{r-1})_{\textcircled{r}}$$

Step 1:- Decimal used for Comparison

$$(123)_5 = (x8)_y$$

$$1 \times 5^2 + 2 \times 5^1 + 3 \times 5^0 = x \times y^1 + 8 \times y^0$$

$$25 + 10 + 3 = xy + 8$$

$$38 = xy + 8$$

$$xy = 30$$

$$x < y$$

x	y
1	30
2	15
3	10

$$y > 8$$

5	6
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$$x < y$$

$$y < 8$$

3 possible combinations

$$9 \quad \frac{312}{20} = 13.1$$

Find the base.

$$\frac{(312)_x}{(20)_x} = (13.1)_x$$

$$\frac{3x^2 + 1x^1 + 2x^0}{2x^1 + 0x^0} = 1x^1 + 3x^0 + 1x^{-1}$$

$$\frac{3x^2 + x + 2}{2x} = x + 3 + \frac{1}{x}$$

$$\frac{3x^2 + x + 2}{2x} = \frac{x^2 + 3x + 1}{x}$$

$$3x^2 + x + 2 = 2x^2 + 6x + 2$$

$$x^2 - 5x = 0$$

$$x(x-5) = 0$$

$$x \neq \boxed{x = 5}$$

Addition and Subtraction of any base

1) Addition

Decimal

$$\begin{array}{r} \overset{1}{7} \overset{1}{8} 6 \\ + (687)_{10} \\ \hline 1473 \end{array}$$

$$\begin{array}{r} 13 \\ \hline \downarrow \\ \text{decimal} \\ (0, \dots, 9) \end{array}$$

$$\begin{array}{r} 13 \\ - 10 \leftarrow \text{Subtract from base} \\ \hline 3 \end{array} \leftarrow \text{How many times subtracted}$$

Ans (1) \leftarrow Carry

$$\begin{array}{r} 1 \\ + 8 \\ + 8 \\ \hline 17 \end{array}$$

$$\begin{array}{r} 17 \\ - 10 \\ \hline 7 \end{array} \rightarrow \text{Ans} \quad 1 \leftarrow \text{Carry}$$

2) Binary

1) Convert to decimal & then binary

2) Direct

$$\begin{array}{r} \begin{array}{cccc} 1 & 1 & 1 & 1 \end{array} \\ + \left\{ \begin{array}{ccccc} 1 & 1 & 0 & 0 & 1_2 \\ 1 & 0 & 1 & 1 & 1_2 \end{array} \right. \\ \hline 110000 \end{array}$$

$$\begin{array}{r} 2 \\ - 2 \\ \hline 0 \end{array} \text{ (How many times)}$$

$$\begin{array}{r} 3 \\ - 2 \\ \hline 1 \end{array}$$

3) Base 6

$$\begin{array}{r} (524)_6 \\ + (321)_6 \\ \hline 1245 \end{array}$$

$$\begin{array}{r} 8 \\ -6 \\ \hline 2 \end{array}$$

①
+ once subtracted

$$\begin{array}{r} 12 \\ -8 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 4) \begin{array}{r} (1) \rightarrow 9 \\ (741)_8 \\ + (456)_8 \\ \hline 1417 \end{array} \end{array}$$

$$\begin{array}{r} 5) \begin{array}{r} (5A7D)_{16} \\ + (F43B)_{16} \\ \hline 14EB8 \end{array} \end{array}$$

$$\begin{array}{r} 15 \\ + 5 \\ \hline 20 \\ - 16 \\ \hline 4 \end{array}$$

$$\begin{array}{r} D \rightarrow 13 \\ + B \\ \hline 11 \\ 24 \\ - 16 \\ \hline ① 8 \end{array}$$

Q i) $(566)_7 + (345)_7 = \underline{\hspace{2cm}}$

2) $(312)_4 + (123)_4 = \underline{\hspace{2cm}}$

Subtraction

1) Decimal

$$\begin{array}{r} \overset{6}{(786)}_{10} \\ - \overset{7}{(687)}_{10} \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ + 6 \\ - 7 \\ \hline 9 \end{array}$$

$$\begin{array}{r} 099 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ + 7 \\ - 8 \\ \hline \end{array}$$

2)

$$\begin{array}{r} \overset{1}{0} \overset{1}{2} \overset{1}{2} \overset{1}{2} \overset{0}{0} \\ (100010)_2 \\ - (010111)_2 \\ \hline \end{array} \rightarrow \text{Borrow}$$

$$\begin{array}{r} 2 \\ + 0 \\ - 1 \\ \hline 1 \end{array}$$

3)

$$\begin{array}{r} \overset{4}{(524)}_6 \\ - \overset{5}{(355)}_6 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ + 4 \\ - 5 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 6 \\ + 1 \\ - 5 \\ \hline \end{array}$$

$$\begin{array}{r} \overset{8}{(503)}_8 \\ - \overset{4}{(245)}_8 \\ \hline \end{array} \rightarrow \begin{array}{r} 8 \\ - 4 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 16 \\ + 3 \\ - 10 \\ \hline 9 \end{array}$$

$$\begin{array}{r} \overset{E}{(F43B)}_{16} \\ - \overset{3}{(5A7D)}_{16} \\ \hline \end{array}$$

$$\begin{array}{r} 16 \\ + 2 \\ - 7 \\ \hline 11 \rightarrow B \end{array}$$

$$\begin{array}{r} 16 \\ + 11 \\ - 13 \\ \hline 14 \rightarrow E \end{array}$$

$$\begin{array}{r} 99B E \\ \hline \end{array}$$