

1. Count to our usual 10 (10_{10}) in **base 5**

Digits you have: 0, 1, 2, 3, 4.

base 10	0	1	2	3	4	5	6	7	8	9	10
base 5	0	1	2	3	4	10	11	12	—	—	—

2. Count to our usual 10 (10_{10}) in **base 2**

Digits you have: 0, 1.

base 10	0	1	2	3	4	5	6	7	8	9	10
base 2	0	1	10	11	100	—	110	—	—	1001	1010

3. Next numbers in **base 5**

The counter working in **base 5** shows 22_{10} .

With every click it goes 1 up. What will it show after 1, 2, and 3 clicks?

Answer:

--	--	--

4. Calculate in **base 5**

Digits you have: 0, 1, 2, 3, 4.

$$14 + 1 = \underline{\quad}$$

$$14 + 3 = \underline{\quad}$$

5. Calculate in **base 2**

$$100 + 1 = \underline{\hspace{2cm}}$$

$$101 + 1 = \underline{\hspace{2cm}}$$

6. Find the base

This is how you count in a mystery base:

0, 1, 2, 10, 11, 12, 20, ...

What is this base?

Answer:

7. What is 10 in different bases?

$$10_2 = \underline{\hspace{2cm}}_{10}$$

$$10_5 = \underline{\hspace{2cm}}_{10}$$

$$10_3 = \underline{\hspace{2cm}}_{10}$$

8. What is 10?

Based on the previous challenge (#7), answer without calculating:

$$10_4 = \underline{\hspace{2cm}}_{10}$$

$$10_{16} = \underline{\hspace{2cm}}_{10}$$

$$10_{88} = \underline{\hspace{2cm}}_{10}$$

9. Calculate in base 2

$$1010_2 + 10_2 = \underline{\hspace{2cm}}_2$$

10. Calculate in base 2 using column method

$$\begin{array}{r} 10100 \\ + \quad 101 \\ \hline \end{array}$$

=

11. Base 16

In programming, base 16 is frequently used.

Since we have only 10 'usual' digits, letters a–f are used for the additional base-16 digits:

base 10	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
base 16	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f

Find 18_{10} in base 16.

Answer:

12. What is 100 in different bases?

$$100_2 = \underline{\hspace{2cm}}_{10}$$

$$100_5 = \underline{\hspace{2cm}}_{10}$$

$$100_3 = \underline{\hspace{2cm}}_{10}$$

13. Convert from base 5

The counter shows **23** in base 5. How many is that in base 10?

Answer:

14. Colour this picture

Each number should be converted into base 2, and then squares corresponding to '1's should be shaded.

For example, $6_{10} = 110_2 = 0110_2$, so we shade like this:

0	1	1	0
---	---	---	---

Hint: start with the smaller numbers and grow your own base-2 ‘dictionary’ from 1_{10} to 15_{10} .

[illegible]