

Ghumu has a container which could measure 1 unit of magic sand. When Mr Rabbit comes to her and asks for 125 units of magic sand, she is annoyed as she has to take out 1 unit of magic sand 125 times from her big basket. She lying on her bed thinks about an idea which could make her task easy. Next day when she wakes up, she combines 10 units of small containers by removing their internal walls and make a big container out of it which could measure 10 units at one time.

Now when Mr Rabbit asks her to give 125 units of magic sand, she uses her big container only for 12 times( $12 * 10 = 120$ ) and her small container 5 times ie. total of 17 times, earlier she used to do it 125 times.

Everything was going well but Ghumu became more lazy, she decides that she will make much bigger container so that she could work less and get more time for watching TV. So she combines 100 small containers and make 1 very big container.

Now for giving 125 units of magic sand to Mr Rabbit, she just picks her very big container and gives 100 units of magic sand at a time, then two times from not so big container and then five times from small container. She just have to do 8 transfers and she has enough time for watching her favourite cartoon.

This is how number system works.

### **Decimal**

Units, Tens, Hundreds, Thousands ...

### **Octal**

Units, Eights, Sixty Fours, ...

Every number system follows a convention for making their containers. Like decimal will have container sizes which are power of 10. Similarly, Octal will have containers whose size are power of 8. Ghumu and her customers should both sync to a common number system before she could sell her magic sand.

A customer comes to Ghumu and asks for 125 units of magic sand in decimal number system. What does that mean?

It simply means Ghumu will pick her Very Big Container(100 units) and fill that 1 time, Not Very Big Container(10 units) 2 times and Small Container 5 times.

If the customer would have asked 125 units of magic sand in octal number system. Then what?

Ghumu will fill the customer bag with Small Container 5 times, Not Very Big Container(8 units) 2 times and Very Big Container(64 units) 1 time.

Is 125 in decimal number system equal to 125 in octal number system.

No. Right?

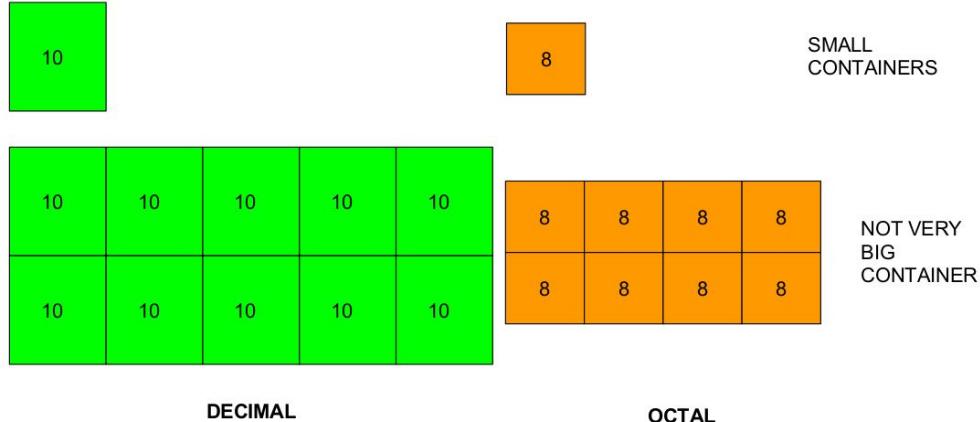
If you will sum up total number of small units in decimal number system we have

$$1 * 100 + 2 * 10 + 5 * 1 = 125 \text{ small units of magic sand}$$

Whereas in octal it comes to be

$$1 * 64 + 2 * 8 + 5 * 1 = 85 \text{ small units of magic sand}$$

Convention followed is **Number of container \* Size of container**



Ghumu brings magic sand from the man in the old mountains in Decimal Number System sells in Octal Number System and saves lot of money for her chocolates. You could figure it out why?

One another thing to note is that whatever system you chose the digits in that number system are limited.

Decimal - Has 10 digits (0-9)

Octal - Has 8 digits (0-7)

What that means is you could use any container maximum that many times for doing the measurements. Because more than that you could use bigger container and reduce your effort. For example in decimal number system: You could do a measurement with small containers for maximum of 9 times, for more than that could use bigger container of size 10 units 1 time.

Ghumu has a very old computer and you could talk to it only using binary numbers. So to keep records about magic sand sold she uses Binary Numbers.

It has only 2 digits 0 and 1. And to convert numbers to binary Ghumu uses Binary containers.

01111101 is the sand which she sold to Mr Rabbit earlier.

1 Small Container(Size 1 unit)( $2^0$ )

0 Container size 2 unit ( $2^1$ )

1 Container size 4 unit ( $2^2$ )

1 Container size 8 unit ( $2^3$ )

1 Container size 16 unit ( $2^4$ )

1 Container size 32 unit ( $2^5$ )

1 Container size 64 unit ( $2^6$ ) ... and the total is 125 units.