Examples 9 in The Radix

Click this to start.

Examples 9 in The Radix

Using the base specified, do the divisions in each of the problems.

Suppose we do 16 / 3 on the base 9. Then, 16 and 3 are on the base 9, and we get the result on the base 9, too.

$16 = 10 + 6 \Rightarrow 16/3 = (10 + 6)/3 = 10/3 + 6/3 = \mathbf{9}/3 + 6/3$
$= 3 + 2 = 5$

Therefore, 16/3 on the base 9 is 5 on the base 9.

0. $(6/2)_8$ **1**. $(12/2)_7$ **2**. $(24/2)_8$

3. $(24/4)_8$ **4.** $(2/3)_8$ **5.** $(1/10)_8$

6. $(2/10)_8$ **7.** $(12/10)_8$ **8.** $(120/10)_8$

9. $(12/3)_8$ **10.** $(46/12)_8$

Suggestions or Solutions

To the Problem 0

$(6/2)_8$

$6/2 = 3$

Suggestions or Solutions

To the Problem 1

$(12/2)_8$

(10 + 2)/2

= 10/2 + 2/2

= **8**/2 + 2/2

= 4 + 1

= 5

Suggestions or Solutions

To the Problem 2

$(24/2)_8$

20/2 + 4/2

= 10 + 2

= 12

Suggestions or Solutions
To the Problem 3

$(24/4)_8$

Note that 0, 1, 2, 3, 4, 5, 6, and 7 in octal are the same as 0, 1, 2, 3, 4, 5, 6, and 7 in decimal. And of course, 10 in octal is not the same as 10 in decimal, but is equal to 8 in decimal.

So we get this:

24/4

= 20/4 + 4/4

= 10/2 + 1

= **8**/2 + 1

= 4 + 1

= 5

Suggestions or Solutions
To the Problem 4

$(2/3)_8$

2/3 on the base 8 is 2/3 on the base 10.
That is, we have $(2/3)_8 = (2/3)_{10}$.

We know 2/3 < 1, whether 2/3 is in octal or in decimal.

So assuming 2/3 is in octal, and a, b, c, d, etc. are single digit numbers, we can put 2/3 the way as follows.

$2/3 = 0.abcd\ldots = a/8 + b/8^2 + c/8^3 + d/8^4 + \ldots$

It's because assuming 2/3 is in decimal, and a, b, c, d, etc. are single digit numbers, we can put 2/3 the way as follows.

$2/3 = 0.abcd\ldots = a/10 + b/10^2 + c/10^3 + d/10^4 + \ldots$

So setting $2/3 = a/8 + b/8^2 + c/8^3 + d/8^4 + \ldots$, and multiplying both sides by 8, we can find a. Then, we get

$8 \times 2/3 = 16/3 = 5 + 1/3$
$= 8 \times (a/8 + b/8^2 + c/8^3 + d/8^4 + \ldots)$
$= a + b/8 + c/8^2 + d/8^3 + \ldots$

Thus, we get a = 5. So we can take 5 for the first digit below the dot, which can be called the radix dot.

We can extract the next lower digit below the dot by taking the product of 8 and the part less than 1, which is 1/3 in this case.
So setting $1/3 = b/8 + c/8^2 + d/8^3 + e/8^4 + \ldots$, and multiplying both sides by 8, we can find b. Then, we get

$8 \times 1/3 = 8/3 = 2 + 2/3$
$= 8 \times (b/8 + c/8^2 + d/8^3 + e/8^4 + \ldots)$
$= b + c/8 + d/8^2 + e/8^3 + \ldots$

Thus, we get b = 2.

So repeating the same process with the part less than 1, we can get the subsequent digits, c, d, e, etc.

Thus, we can now set $2/3 = c/8 + d/8^2 + e/8^3 + \ldots$ and multiply both sides by 8. Then, we can get c.
We know however, 2/3 has showed up already. So we can see that the value of c is 5 with no calculation, because we got a = 5, after doing the multiplications after setting at the beginning, $2/3 = a/8 + b/8^2 + c/8^3 + d/8^4 + \ldots$

Therefore, we can see that the two digits 5 and 2 repeat indefinitely.

So we get $(2/3)_8 = (0.525252...)_8$.

Suggestions or Solutions
To the Problem 5

$(1/10)_8$

We have these:

$10_8 = 8_{10}$,

$(1/10)_8 = 1 \div 10_8 = 1 \div 8_{10} = (1/8)_{10}$,

$(1/8)_{10} = (0.1)_8$.

So we get $(1/10)_8 = (0.1)_8$.

Suggestions or Solutions
To the Problem 6

$(2/10)_8$

$(2/10)_8 = (0.2)_8$, because $(2/10)_8 = (2/8)_{10}$,
and $(2/8)_{10} = (0.2)_8$, since $(1/8)_{10} = (0.1)_8$.

$(0.2)_8 = (0.2)_{10} = (0.2)_7$, etc. Of course, $(0.2)_8 \neq (0.2)_2$,
because there is no 0.2 in the binary number system.

And we can get this, too: $(2/10)_8 = (2/8)_{10} = (1/4)_{10}$.

And as in the case of the problem 4 above, setting
$(1/4)_{10} = (0.abc\ldots)_8 = (a/8 + b/8^2 + c/8^3 + \ldots)_{10}$, and
multiplying both sides by 8, we can get a, the first digit
below the dot.
Then, we get this:
8 x 1/4 = 8/4 = 2. So the first digit below the dot is 2, and all
the other digits, b, c, etc. are all 0s.
Thus, $(1/4)_{10} = (0.2)_8$.

Suggestions or Solutions
To the Problem 7

$(12/10)_8$

$(12/10)_8 = (1.2)_8$.

$\{12/10 = (10 + 2)/10 = 10/10 + 2/10 = 1 + 0.2 = 1.2 = 5/4\}_8$.

$(12/10 = 10/10 + 2/10)_8 = (1 + 2/8 = 1 + 1/4 = 5/4)_{10}$.

$(1 + 1/4 = 5/4)_{10} = (1 + 1/4 = 5/4)_8$.

$5/4 = 1 + 1/4 = 1 + 2/8 = (1 + 0.2 = 1.2)_8$.

Suggestions or Solutions
To the Problem 8

$(120/10)_8$

120/10 = 12

120/10
= (1 x 10 x 10 + 2 x 10)/10
= (10 x 10)/10 + (2 x 10)/10
= 10 + 2
= 12

Suggestions or Solutions
To the Problem 9

$(12/3)_8$

$12/3 = 10/3 + 2/3 = (8/3 + 2/3 = 10/3 = 3 + 1/3)_{10}$.

$8 \times 1/3 = 8/3 = 2 + 2/3 \Rightarrow$ 2 is the first digit below the dot.

$8 \times 2/3 = 16/3 = 5 + 1/3 \Rightarrow$ 5 is the second digit below the dot.

$8 \times 1/3 = 8/3 = 2 + 2/3 \Rightarrow$ 2 is the third digit below the dot.

At the beginning, 1/3 showed up. So 2 and 5 repeat.

So we get 1/3 = 0.25252525... on the base 8.

Thus, we get $(3 + 1/3)_8 = (3.25252525...)_8$.

Suggestions or Solutions
To the Problem A

$(46/12)_8$

$\{46/12 = (12 \times 3 + 10)/12 = 3 + 10/12\}_8$

$= (3 + 8/10 = 3 + 4/5)_{10}$, because $8_{10} = 10_8$, and $10_{10} = 12_8$.

$8 \times \underline{4/5} = 32/5 = 6 + 2/5 \Rightarrow$ 6 is the first digit below the dot.

$8 \times 2/5 = 16/5 = 3 + 1/5 \Rightarrow$ 3 is the second digit below the dot.

$8 \times 1/5 = 8/5 = 1 + 3/5 \Rightarrow$ 1 is the third digit below the dot.

$8 \times 3/5 = 24/5 = 4 + \underline{4/5} \Rightarrow$ 4 is the fourth digit below the dot.

4/5 shows up again.

So the four digits 6314 repeat in a group.

Thus, we get 4/5 = 0.631463146314…

So we get $(46/12)_8 = (3.631463146314\ldots)_8$.