#### COMMON NUMBER SYSTEMS

# BINARY | BASE-2 | RADIX-2 (0,1)<sub>2</sub>

1 0 1 0 1 1 0 1

27	26	2 <sup>5</sup>	24	23	22	21	20
1	0	1	0	1	1	0	1

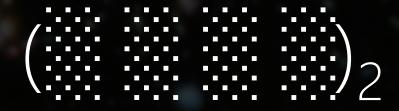
27	26	25	24	23	2 <sup>2</sup>	21	20	X
1	0	1	0	1	1	0	1	
$1\times2^7$	0×2 <sup>6</sup>	1×2 <sup>5</sup>	0×2 <sup>4</sup>	$1\times2^3$	$1\times2^2$	$0 \times 2^{1}$	1×2 <sup>0</sup>	

27	26	2 <sup>5</sup>	24	23	22	21	20	X
1	0	1	0	1	1	0	1	
$1\times2^7$	0×2 <sup>6</sup>	1×2 <sup>5</sup>	0×2 <sup>4</sup>	$1\times2^3$	1×2 <sup>2</sup>	$0 \times 2^1$	1×2 <sup>0</sup>	$\sum$

27	26	2 <sup>5</sup>	24	23	22	21	20	X
3	0	3	0	2	1	3	1	
								$\sum$

27	26	25	24	23	22	21	20	X
3	0	3	0	2	1	3	1	
$3\times2^7$	0×2 <sup>6</sup>	$3\times2^5$	0×2 <sup>4</sup>	$2\times2^3$	$1\times2^2$	3×2 <sup>1</sup>	1×2 <sup>0</sup>	$\sum$

#### LET'S COUNT IN BINARY



## OCTAL | BASE-8 | RADIX-8 (0,1,2,3,4,5,6,7)<sub>8</sub>

3	0	3	0	2	1	3	1	

87	86	<b>8</b> <sup>5</sup>	84	83	82	81	80
3	0	3	0	2	1	3	1

87	86	<b>8</b> <sup>5</sup>	84	83	82	81	80	X
3	0	3	0	2	1	3	1	
$3\times8^7$	0×8 <sup>6</sup>	$3\times8^5$	0×8 <sup>4</sup>	2×8 <sup>3</sup>	1×8 <sup>2</sup>	$3 \times 8^{1}$	1×8 <sup>0</sup>	

87	86	<b>8</b> <sup>5</sup>	84	83	82	81	80	X
$\odot$	0	3	0	2	1	3	1	
$3\times8^7$	0×8 <sup>6</sup>	$3\times8^5$	0×8 <sup>4</sup>	$2\times8^3$	1×8 <sup>2</sup>	$3 \times 8^{1}$	1×8 <sup>0</sup>	$\sum$

6,390,873

87	86	<b>8</b> <sup>5</sup>	84	<b>8</b> <sup>3</sup>	82	81	80	X
3	0	Α	0	9	1	3	1	
								$\sum$

87	86	85	84	<b>8</b> <sup>3</sup>	82	81	80	X
3	0	А	0	8	1	3	1	
$3\times8^7$	0×8 <sup>6</sup>	$A \times 8^5$	0×8 <sup>4</sup>	$8\times8^3$	1×8 <sup>2</sup>	$3 \times 8^{1}$	1×8 <sup>0</sup>	$\sum$

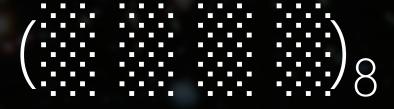
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87	86	<b>8</b> <sup>5</sup>	84	83	82	81	80	X
1	0	1	0	1	1	0	1	
1×8 <sup>7</sup>	0×8 <sup>6</sup>	1×8 <sup>5</sup>	0×8 <sup>4</sup>	1×8 <sup>3</sup>	1×8 <sup>2</sup>	$0 \times 8^{1}$	1×8 <sup>0</sup>	$\sum$

2,130,497

87	86	85	84	83	82	81	80	
1	0	1	0	1	1	0	1	
$1\times8^7$	$0 \times 8^6$	1×8 <sup>5</sup>	0×8 <sup>4</sup>	$1\times8^3$	1×8 <sup>2</sup>	0×8 <sup>1</sup>	1×8 <sup>0</sup>	
		2,130,497						
27	26	2 <sup>5</sup>	24	23	22	21	20	
1	0	1	0	1	1	0	1	
1×2 <sup>7</sup>	0×2 <sup>6</sup>	1×2 <sup>5</sup>	0×2 <sup>4</sup>	1×2 <sup>3</sup>	1×2 <sup>2</sup>	0×2 <sup>1</sup>	1×2 <sup>0</sup>	
								173

#### LET'S COUNT IN OCTAL



## DECIMAL | BASE-10 | RADIX-10 (0,1,3,4,5,6,7,9)<sub>10</sub>

0123456789 ΡΛΥΓΟ3Ψ7Ι• I II III IV V VI VII VIII IX X 0520866965 o ൧൨൩൪൫൬൭൮൯ Oopene & pulca 一二三四五六七八九 3 0 3 0 2 1 3 1

107	106	10 <sup>5</sup>	104	10 <sup>3</sup>	10 <sup>2</sup>	10 <sup>1</sup>	10 <sup>0</sup>
3	0	3	0	2	1	3	1

107	106	10 <sup>5</sup>	104	<b>10</b> <sup>3</sup>	102	101	100	X
3	0	3	O	2	1	3	1	
$3 \times 10^{7}$	0×10 <sup>6</sup>	$3 \times 10^{5}$	0×10 <sup>4</sup>	2×10 <sup>3</sup>	1×10 <sup>2</sup>	$3\times10^{1}$	1×10 <sup>0</sup>	

107	106	105	104	10 <sup>3</sup>	10 <sup>2</sup>	101	10 <sup>0</sup>	X
3	0	3	0	2	1	$\mathbb{C}$	1	
$3 \times 10^7$	0×10 <sup>6</sup>	$3 \times 10^{5}$	0×10 <sup>4</sup>	2×10 <sup>3</sup>	$1 \times 10^{2}$	$3 \times 10^{1}$	1×10 <sup>0</sup>	$\sum$

30,302,131

107	106	105	104	10 <sup>3</sup>	10 <sup>2</sup>	10 <sup>1</sup>	10 <sup>0</sup>	×
3	0	3	0	2	1	3	1	
3×10 <sup>7</sup>	0×10 <sup>6</sup>	$3 \times 10^{5}$	0×10 <sup>4</sup>	2×10 <sup>3</sup>	$1\times10^2$	$3 \times 10^{1}$	1×10 <sup>0</sup>	$\sum$

30,302,131

X	100	101	102	10 <sup>3</sup>	104	10 <sup>5</sup>	106	107		
	1	0	1	1	0	1	0	1		
$\sum$	1×10 <sup>0</sup>	0×10 <sup>1</sup>	1×10 <sup>2</sup>	1×10 <sup>3</sup>	0×10 <sup>4</sup>	1×10 <sup>5</sup>	0×10 <sup>6</sup>	1×10 <sup>7</sup>		

10,101,101

	100	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	104	10 <sup>5</sup>	106	10 <sup>7</sup>
	1	0	1	1	0	1	0	1
	1×10 <sup>0</sup>	0×10 <sup>1</sup>	1×10 <sup>2</sup>	1×10 <sup>3</sup>	0×10 <sup>4</sup>	$1 \times 10^{5}$	0×10 <sup>6</sup>	1×10 <sup>7</sup>
10,101,101								
	80	8 <sup>1</sup>	82	83	84	8 <sup>5</sup>	86	87
	1	0	1	1	0	1	0	1
	1×8 <sup>0</sup>	0×8 <sup>1</sup>	1×8 <sup>2</sup>	1×8 <sup>3</sup>	0×8 <sup>4</sup>	1×8 <sup>5</sup>	0×8 <sup>6</sup>	1×8 <sup>7</sup>
2,130,497								
	20	2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	24	2 <sup>5</sup>	26	27
	1	0	1	1	0	1	0	1
	1×2 <sup>0</sup>	0×2 <sup>1</sup>	1×2 <sup>2</sup>	1×2 <sup>3</sup>	0×2 <sup>4</sup>	1×2 <sup>5</sup>	0×2 <sup>6</sup>	1×2 <sup>7</sup>
173	•	•						

107	106	105	104	103	102	101	100	X
3	0	A	0	8	1	3	1	
								$\sum$

107	106	10 <sup>5</sup>	104	103	102	101	10 <sup>0</sup>	X
3	0	А	0	8	1	3	1	
3×10 <sup>7</sup>	0×10 <sup>6</sup>	$A \times 10^5$	0×10 <sup>4</sup>	8×10 <sup>3</sup>	1×10 <sup>2</sup>	$3\times10^{1}$	1×10 <sup>0</sup>	$\sum$

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# HEXADECIMAL | BASE-16 | RADIX-16 (0,1,3,4,5,6,7,9,A,B,C,D,E,F)<sub>16</sub>

16 <sup>7</sup>	16 <sup>6</sup>	16 <sup>5</sup>	164	16 <sup>3</sup>	16 <sup>2</sup>	16 <sup>1</sup>	16 <sup>0</sup>	X
3	0	A	0	9	1	3	1	
								$\sum$

167	166	16 <sup>5</sup>	164	16 <sup>3</sup>	16 <sup>2</sup>	16 <sup>1</sup>	16 <sup>0</sup>	X
3	0	Α	0	9	1	3	1	
3×16 <sup>7</sup>	0×16 <sup>6</sup>	A×16 <sup>5</sup>	0×16 <sup>4</sup>	9×16 <sup>3</sup>	1×16 <sup>2</sup>	3×16 <sup>1</sup>	1×16 <sup>0</sup>	$\sum$

167	16 <sup>6</sup>	16 <sup>5</sup>	164	16 <sup>3</sup>	16 <sup>2</sup>	16 <sup>1</sup>	16 <sup>0</sup>	X
3	0	A	0	9	1	3	1	
$3 \times 16^7$	0×16 <sup>6</sup>	A×16 <sup>5</sup>	0×16 <sup>4</sup>	9×16 <sup>3</sup>	1×16 <sup>2</sup>	3×16 <sup>1</sup>	1×16 <sup>0</sup>	$\sum$

$$A = (9 + 1) = (10)_{10}$$

X	160	16 <sup>1</sup>	16 <sup>2</sup>	16 <sup>3</sup>	164	16 <sup>5</sup>	166	167
	1	3	1	9	0	Α	0	3
$\sum$	1×16 <sup>0</sup>	3×16 <sup>1</sup>	1×16 <sup>2</sup>	9×16 <sup>3</sup>	0×16 <sup>4</sup>	A×16 <sup>5</sup>	0×16 <sup>6</sup>	$3\times16^7$
		-	-	-	-			

815,829,297

$$A = (9 + 1) = (10)_{10}$$

$$1,2,3,4,5,6,7,8,9,A = 9 + 1 = (10)_{10}$$

$$B = A + 1 = (11)_{10}$$

$$C = B + 1 = (12)_{10}$$

$$D = C + 1 = (13)_{10}$$

$$E = D + 1 = (14)_{10}$$

$$F = E + 1 = (15)_{10}$$

16 <sup>7</sup>	16 <sup>6</sup>	16 <sup>5</sup>	164	16 <sup>3</sup>	16 <sup>2</sup>	16 <sup>1</sup>	16 <sup>0</sup>	X
1	0	1	0	1	1	0	1	
1×16 <sup>7</sup>	0×16 <sup>6</sup>	1×16 <sup>5</sup>	0×16 <sup>4</sup>	1×16 <sup>3</sup>	1×16 <sup>2</sup>	0×16 <sup>1</sup>	1×16 <sup>0</sup>	$\sum$

269,488,385

16 <sup>7</sup>	16 <sup>6</sup>	16 <sup>5</sup>	16 <sup>4</sup>	16 <sup>3</sup>	16 <sup>2</sup>	16 <sup>1</sup>	16 <sup>0</sup>	
1	0	1	0	1	1	0	1	
1×16 <sup>7</sup>	0×16 <sup>6</sup>	1×16 <sup>5</sup>	0×16 <sup>4</sup>	1×16 <sup>3</sup>	1×16 <sup>2</sup>	0×16 <sup>1</sup>	1×16 <sup>0</sup>	
								269,488,385
10 <sup>7</sup>	10 <sup>6</sup>	10 <sup>5</sup>	104	10 <sup>3</sup>	10 <sup>2</sup>	10 <sup>1</sup>	10 <sup>0</sup>	
1	0	1	0	1	1	0	1	
1×10 <sup>7</sup>	0×10 <sup>6</sup>	1×10 <sup>5</sup>	0×10 <sup>4</sup>	1×10 <sup>3</sup>	1×10 <sup>2</sup>	0×10 <sup>1</sup>	1×10 <sup>0</sup>	
								10,101,101
87	86	8 <sup>5</sup>	84	8 <sup>3</sup>	82	8 <sup>1</sup>	80	
1	0	1	0	1	1	0	1	
1×8 <sup>7</sup>	0×8 <sup>6</sup>	1×8 <sup>5</sup>	0×8 <sup>4</sup>	1×8 <sup>3</sup>	1×8 <sup>2</sup>	0×8 <sup>1</sup>	1×8 <sup>0</sup>	
								2,130,497
2 <sup>7</sup>	2 <sup>6</sup>	2 <sup>5</sup>	24	23	22	2 <sup>1</sup>	20	
1	0	1	0	1	1	0	1	
1×2 <sup>7</sup>	0×2 <sup>6</sup>	1×2 <sup>5</sup>	0×2 <sup>4</sup>	1×2 <sup>3</sup>	1×2 <sup>2</sup>	0×2 <sup>1</sup>	1×2 <sup>0</sup>	
					•	•	•	173

# LET'S COUNT IN BASE-16

# BASE-64 | RADIX-64 (A,B,C, ...,Z, a,b,c,...,z,0,1,2,...,9,+,/)<sub>64</sub>

# BASE-64 | RADIX-64 (A,B,C, ...,Z, a,b,c,...,z,0,1,2,...,9,+,/)<sub>64</sub>

1992: RFC 1341

MIME (MULTIPURPOSE INTERNET MAIL EXTENSIONS)

Mechanisms For Specifying And Describing The Format Of Internet Message Bodies

Digit	Value		Digit	Value		Digit	Value		Digit	Value
А	0		Q	16		g	32		W	48
В	1		R	17		h	33		Х	49
С	2		S	18		i	34		У	50
D	3		Т	19		j	35		Z	51
Е	4		U	20		k	36		0	52
F	5		V	21			37		1	53
G	6		W	22		m	38		2	54
Н	7	<b>→</b>	Χ	23	<b>→</b>	n	39	$\rightarrow$	3	55
I	8		Υ	24		0	40		4	56
J	9		Z	25		р	41		5	57
K	10		а	26		q	42		6	58
L	11		b	27		r	43		7	59
М	12		С	28		S	44		8	60
Ν	13		d	29		t	45		9	61
0	14		е	30		U	46		+	62
Р	15		f	31		V	47		/	63

3	a A		d 1	Н	+	
---	-----	--	-----	---	---	--

647	64 <sup>6</sup>	64 <sup>5</sup>	64 <sup>4</sup>	64 <sup>3</sup>	64 <sup>2</sup>	64 <sup>1</sup>	640	X
3	а	А	/	d	1	Н	+	
								$\sum$

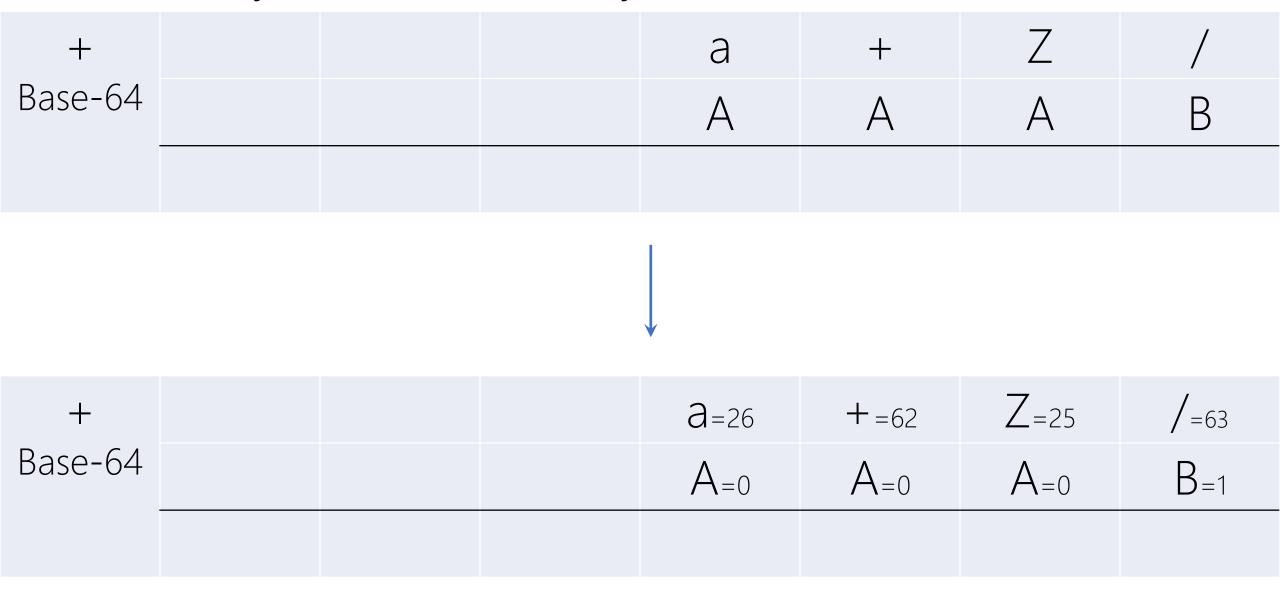
Digit	Value		Digit	Value		Digit	Value		Digit	Value
А	0		Q	16		g	32		W	48
В	1		R	17		h	33		Х	49
С	2		S	18		i	34		У	50
D	3		Т	19		j	35		Z	51
Е	4		U	20		k	36		0	52
F	5		V	21			37		1	53
G	6		W	22		m	38		2	54
Н	7	<b>→</b>	Χ	23	<b>→</b>	n	39	$\rightarrow$	3	55
I	8		Υ	24		0	40		4	56
J	9		Z	25		р	41		5	57
K	10		а	26		q	42		6	58
L	11		b	27		r	43		7	59
М	12		С	28		S	44		8	60
Ν	13		d	29		t	45		9	61
0	14		е	30		U	46		+	62
Р	15		f	31		V	47		/	63

647	64 <sup>6</sup>	64 <sup>5</sup>	644	64 <sup>3</sup>	64 <sup>2</sup>	64 <sup>1</sup>	64 <sup>0</sup>	X
3	а	A	/	d	1	Н	+	
55	26			29	53	7	62	$\sum$
$\times 64^{7}$	×64 <sup>6</sup>	$\times 64^{5}$	×64 <sup>4</sup>	$\times 64^{3}$	$\times 64^2$	×64 <sup>1</sup>	×64 <sup>0</sup>	

647	64 <sup>6</sup>	64 <sup>5</sup>	644	64 <sup>3</sup>	64 <sup>2</sup>	64 <sup>1</sup>	64 <sup>0</sup>	X
3	а	A	/	d	1	Н	+	
55	26			29	53	7	62	$\sum$
$\times 64^{7}$	×64 <sup>6</sup>	$\times 64^{5}$	×64 <sup>4</sup>	$\times 64^{3}$	$\times 64^2$	×64 <sup>1</sup>	×64 <sup>0</sup>	

243,680,329, 290,238

### Increment by $1 \rightarrow$ Increment by AAAB



				B=1	
+		<b>a</b> =26	+=62	<b>Z</b> =25	/=63
Base-64		A=0	<b>A</b> =0	A=0	B=1
					<b>A</b> =0
					$\frac{64}{64} = 1 r 0$ $= B r A$
				B=1	
+		<b>a</b> =26	+=62	<b>Z</b> =25	/=63
Base-64		<b>A</b> =0	<b>A</b> =0	<b>A</b> =0	B=1
		а	+	<b>a</b> =26	<b>A</b> =0

# RADIX-R NUMBER SYSTEM aka. Base-r Number System

Hossein's number system is not a Radix-r number system!

Let  $(N)_r$  be a radix-r (base-r) number in a positional weighting number system, then

$$(N)_r = (d_{n-1}r^{n-1} + d_{n-2}r^{n-2} + \dots + d_ir^i + \dots + d_2r^2 + d_1r^1 + d_0r^0)_{10}$$

### where:

```
f(x) = radix (base)

f(x) = radix (base)
```

Let  $(N)_r$  be a radix-r (base-r) number in a positional weighting number system, then

$$(N)_{r} = (d_{n-1}^{n-1} r^{n-1} + d_{n-2} r^{n-2} + \dots + d_{i} r^{i} + \dots + d_{2} r^{2} + d_{1} r^{1} + d_{0} r^{0})_{10}^{10}$$

### where:

```
r = radix (base)

d_i = digit at position i, 0 \le d_i \le r - 1

r^i = weight (significance) of position i

n = number of digits in N
```

Let  $(N)_r$  be a radix-r (base-r) number in a positional weighting number system, then

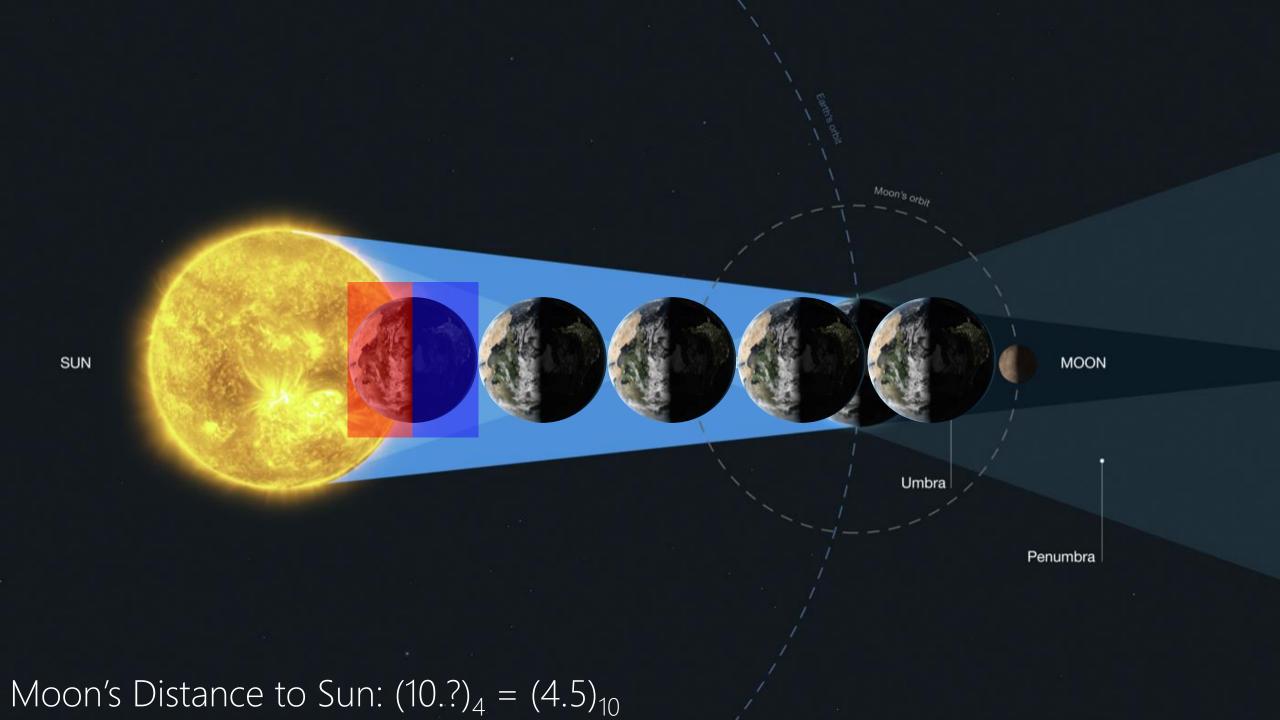
```
Min  = (0_{n-1}0_{n-2} \cdots 0_10_0)_r = (0)_{10} 
 = ((r-1)_{n-1}(r-1)_{n-2} \cdots (r-1)_1(r-1)_0)_r = (r^n-1)_{10} 
 = (0_{n-1}0_{n-2} \cdots 0_1\frac{1_0}{1_0})_r = (1)_{10}
```

### where:

```
r = radix (base)

r<sup>i</sup> = weight of position i

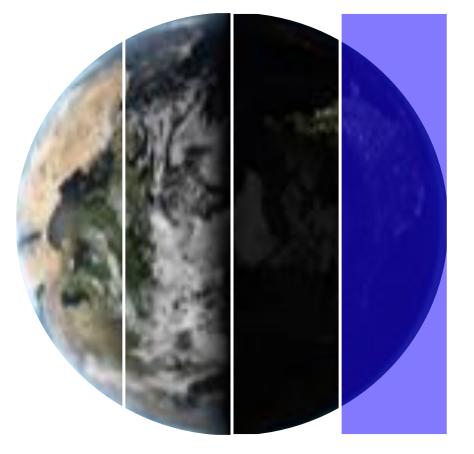
n = number of digits in N
```



# FRACTION

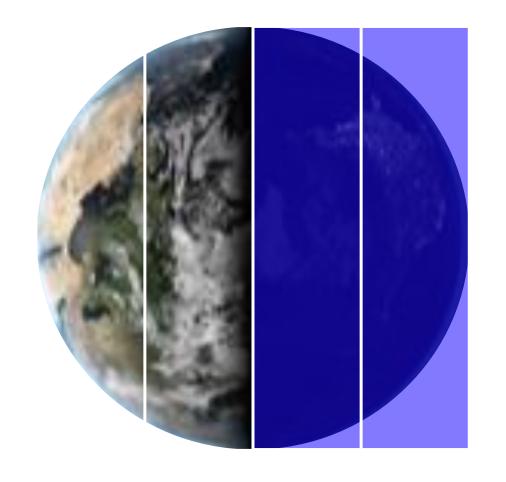


1 Earth

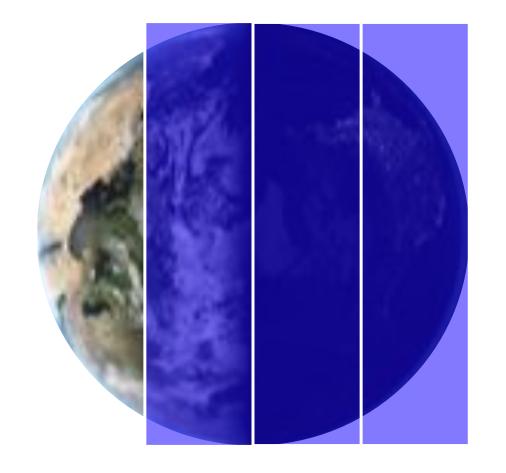


Fraction Point

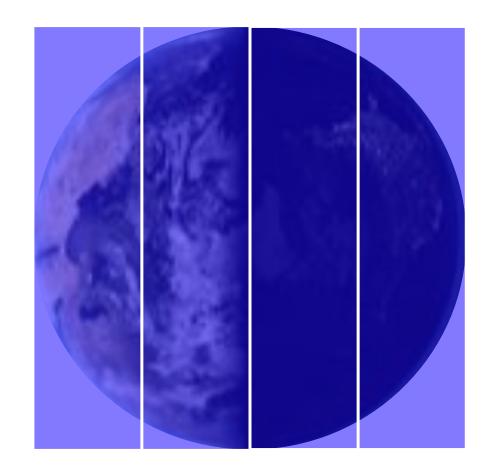
Radix-4 (Base-4) = 1/4 Earth =  $4^{-1}$  Earth =  $(.1)_4$ 



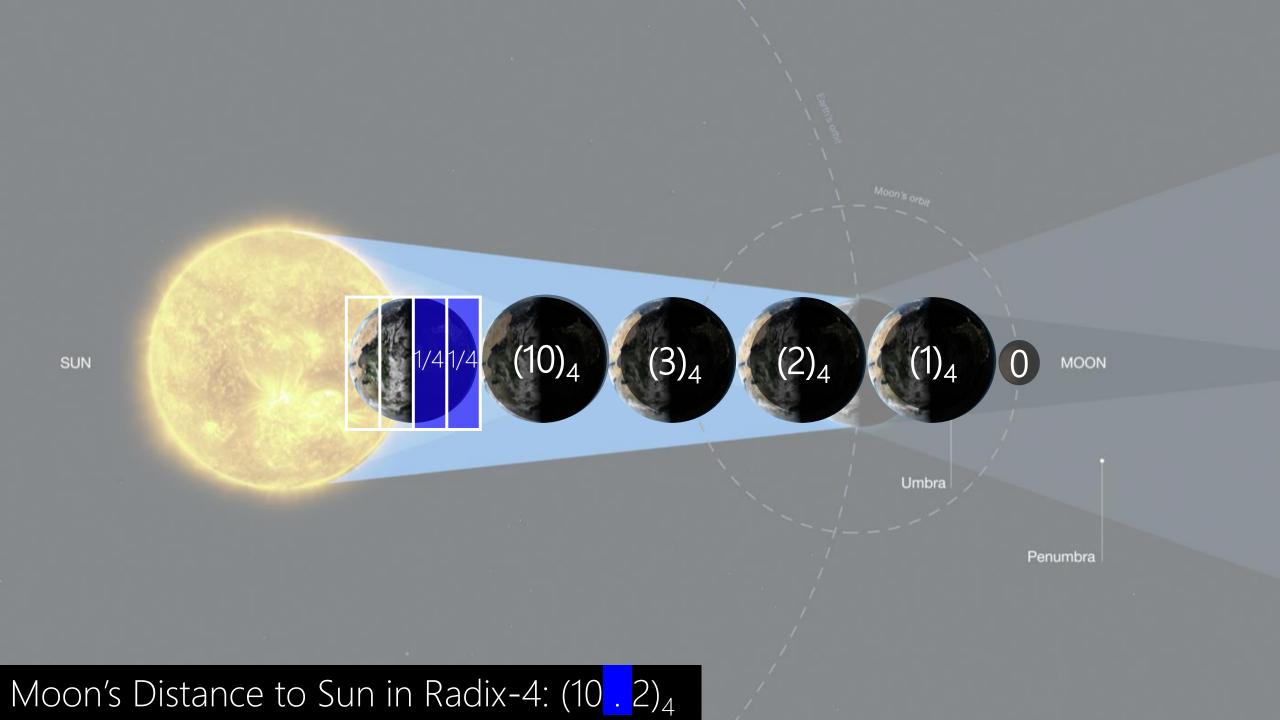
Radix-4 (Base-4) =  $2 \times 1/4$  Earth =  $2 \times 4^{-1}$  Earth=(.2)<sub>4</sub>



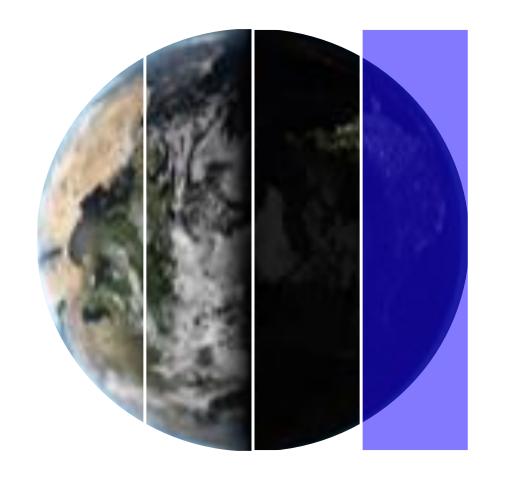
Radix-4 (Base-4) =  $3 \times 1/4$  Earth =  $3 \times 4^{-1}$  Earth=(.3)<sub>4</sub>



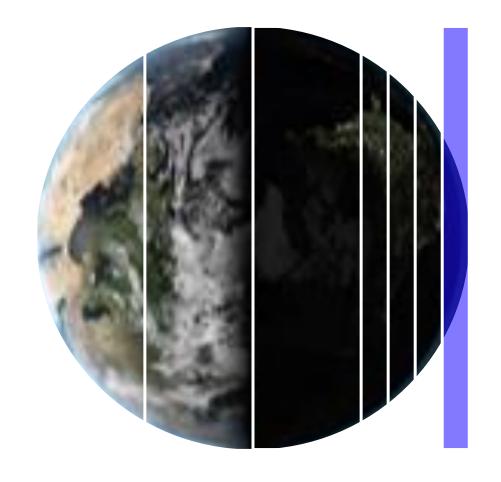
Radix-4 (Base-4) =  $4 \times 1/4$  Earth =  $4 \times 4^{-1}$  Earth= $(1)_4$ 



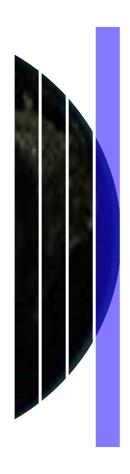
## MORE PRECISION



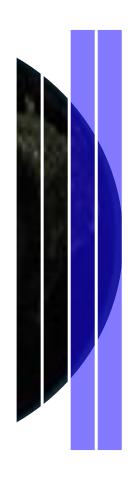
Radix-4 (Base-4) = 1/4 Earth =  $4^{-1}$  Earth =  $(.1)_4$ 



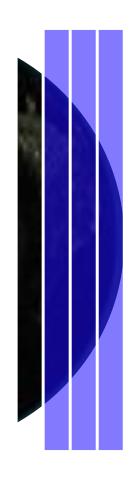
Radix-4 (Base-4) = (1/4)/4) Earth = 1/16 Earth =  $4^{-2}$  Earth



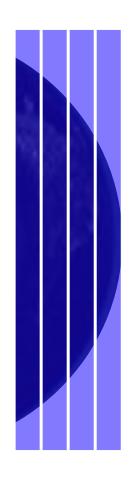
Radix-4 (Base-4) =  $1/16 = 4^{-2}$  Earth =  $(.01)_4$ 



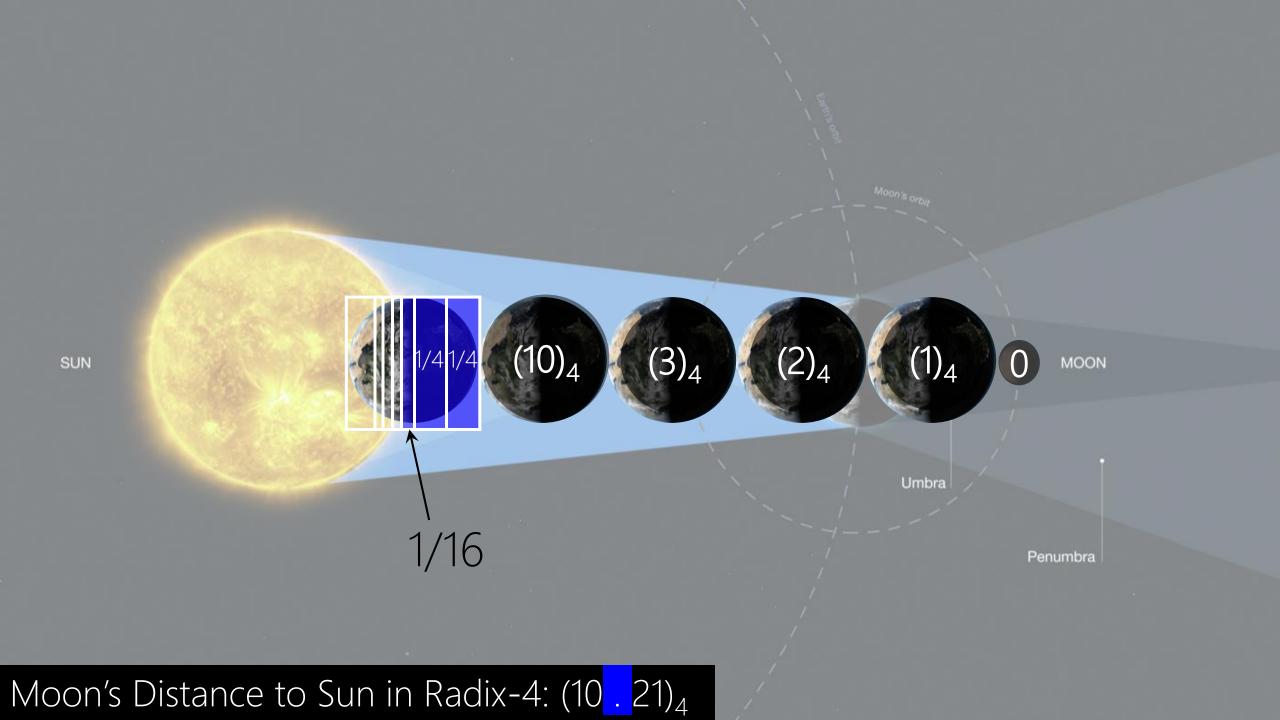
Radix-4 (Base-4) =  $2 \times 1/16 = 2 \times 4^{-2}$  Earth =  $(.02)_4$ 

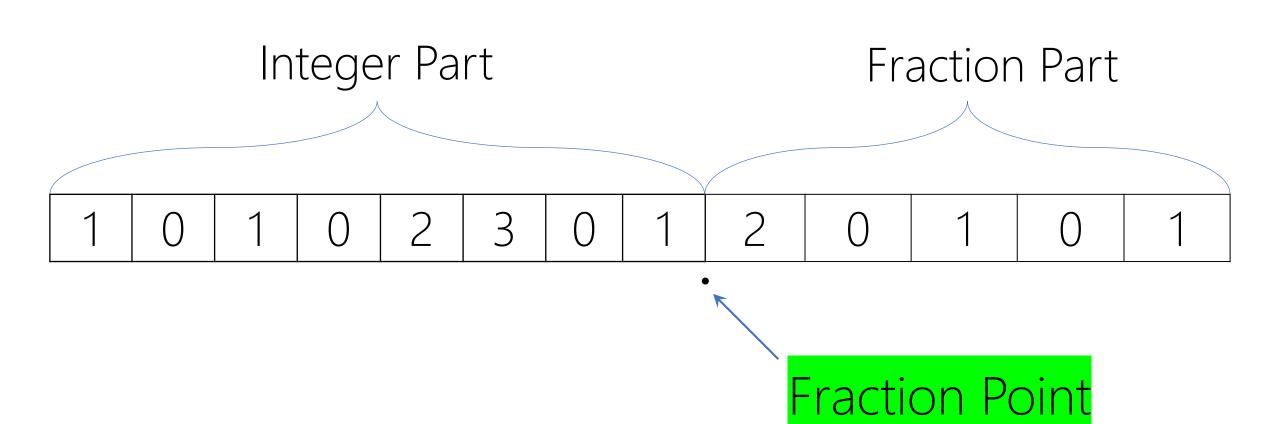


Radix-4 (Base-4) =  $3 \times 1/16 = 3 \times 4^{-2}$  Earth =  $(.03)_4$ 



Radix-4 (Base-4) =  $4 \times 1/16 = 4 \times 4^{-2}$  Earth =  $(.1)_4$ 





Integer Part

Fraction Part

47	46	45	44	43	42	41	40		4-1	4-2	4-3	4-4	4-5
1	0	1	O	2	3	0	1	•	2	0	1	0	1

## Integer Part

#### Fraction Part

47	46	45	44	43	42	41	40	1	4-1	4-2	4-3	4-4	4-5
1	0	1	0	2	$\omega$	0	1	)×(	2	0	1	0	1
1 ×16,384	0	1 ×1,024	0	2 ×64	3 ×16	0	1	$\sum$	$\frac{2}{4}$	0	$\frac{1}{64}$	0	1 1,024

## Integer Part

#### Fraction Part

47	46	45	44	43	42	41	40		4-1	4-2	4-3	4-4	4-5
1	0	1	0	2	3	0	1	)×(	2	0	1	0	1
1 ×16,384	0	1 ×1,024	0	2 ×64	3 ×16	0	1	$\sum$	$\frac{2}{4}$	0	$\frac{1}{64}$	0	$\frac{1}{1,024}$
						17,	584						

## Integer Part

#### Fraction Part

47	46	45	44	43	42	41	40	1	4-1	4-2	4-3	4-4	4-5
1	0	1	0	2	3	0	1	)×(	2	0	1	0	1
1 ×16,384	0	1 ×1,024	0	2 ×64	3 ×16	0	1	$\sum$	$\frac{2}{4}$	0	$\frac{1}{64}$	0	1/024
						17,	584	•	516	6015	625		

Let  $(N)_r$  be a radix-r (base-r) number in a positional weighting number system, then

$$(N)_r = (d_{n-1}r^{n-1} + \cdots + d_0r^0 \cdot d_{-1}r^{-1} + d_{-2}r^{-2} + \cdots + d_{-m}r^{-m})_{10}$$

where:

Fraction Point

```
r = radix (base)
```

 $d_i = digit at position i, 0 \le d_i \le r - 1$ 

r<sup>i</sup> = weight of position i

n = number of digits in integer part of N

m = number of digits in fraction part of N

Let  $(N)_r$  be a radix-r (base-r) number in a positional weighting number system, then

Min = 
$$(0_{n-1} \cdots 0_1 0_0 \cdot 0_{-1} 0_{-2} \cdots 0_{-m-1} 0_{-m})_r$$
 =  $(0 \cdot 0)_{10}$   
Max =  $((r-1)_{n-1} \cdots (r-1)_0 \cdot (r-1)_{-1} (r-1)_{-2} \cdots (r-1)_{-m-1} (r-1)_{-m})_r = (r^n-1 \cdot ?)_{10}$   
Unit =  $(0_{n-1} \cdots 0_1 0_0 \cdot 0_{-1} 0_{-2} \cdots 0_{-m-1} 1_{-m})_r = (r^{-m})_{10}$   
where:

r = radix (base)

Lecture Assignment

r<sup>i</sup> = weight of position i

n = number of digits in integer part of N

m = number of digits in fraction part of N

# PRACTICE RADIX-2

			Rad	ix-2				
Int	eger	n=4	)		Fract	ion (m	า=3)	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0	•	0	0	0	0
0	0	0	0		0	0	1	$1*2^{-3} = 1/8 = 0.125$
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1	•	0	0	1	1.125
0	0	0	1	•	0	1	0	1.25
0	0	0	1	•	0	1	1	1.375
0	0	0	1	•	1	0	0	1.5
0	0	0	1	•	1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1	•	1	1	1	1.875
0	0	1	0	•	0	0	0	2

Int	eger	(n=4	)		Fract	ion (m	า=3)	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0	•	0	0	0	0
0	0	0	0		0	0	1	$1*2^{-3} = 1/8 = 0.125$
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0		0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0		1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0		1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0		1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1		0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1		0	0	1	1.125
0	0	0	1		0	1	0	1.25
0	0	0	1		0	1	1	1.375
0	0	0	1		1	0	0	1.5
0	0	0	1		1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1		1	1	1	1.875
0	0	1	0	•	0	0	0	2

What is the max in this system with these spaces?

Int	eger	n=4	)	Fraction (n		ion (m	n=3)	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0		0	0	0	0
0	0	0	0		0	0	1	1*2 <sup>-3</sup> = 1/8 = 0.125
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0		1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1		0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1	•	0	0	1	1.125
0	0	0	1	•	0	1	0	1.25
0	0	0	1		0	1	1	1.375
0	0	0	1	•	1	0	0	1.5
0	0	0	1		1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1	•	1	1	1	1.875
0	0	1	0	•	0	0	0	2

What is the  $\frac{\text{max}}{\text{max}}$  in this system with these spaces?  $(1111.111)_2 = (15.875)_{10}$ 

Int	eger	(n=4	)		Fract	ion (m	n=3) 	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0		0	0	0	0
0	0	0	0	•	0	0	1	1*2 <sup>-3</sup> = 1/8 = 0.125
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1	•	0	0	1	1.125
0	0	0	1	•	0	1	0	1.25
0	0	0	1	•	0	1	1	1.375
0	0	0	1	•	1	0	0	1.5
0	0	0	1	•	1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1	•	1	1	1	1.875
0	0	1	0	•	0	0	0	2

Is it possible to show the number  $(1.02)_{10}$  in this system with these spaces?

Int	eger	(n=4			Fract	ion (m	า=3)	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0		0	0	0	0
0	0	0	0		0	0	1	$1*2^{-3} = 1/8 = 0.125$
0	0	0	0		0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0		0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0		1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0		1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0		1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0		1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1		0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1		0	0	1	1.125
0	0	0	1		0	1	0	1.25
0	0	0	1		0	1	1	1.375
0	0	0	1		1	0	0	1.5
0	0	0	1		1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1		1	1	1	1.875
0	0	1	0	•	0	0	0	2

Is it possible to show the number  $(1.02)_{10}$  in this system with these spaces?

No! The numbers in this system increments by 0.125 unit.

			каа	IX-∠				
Int	eger	n=4			Fract	ion (m	า=3)	Radix-10
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3	
0	0	0	0		0	0	0	0
0	0	0	0	•	0	0	1	1*2 <sup>-3</sup> = 1/8 = 0.125
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$
0	0	0	1	•	0	0	1	1.125
0	0	0	1	•	0	1	0	1.25
0	0	0	1	•	0	1	1	1.375
0	0	0	1	•	1	0	0	1.5
0	0	0	1	•	1	0	1	1.625
0	0	0	1	•	1	1	0	1.75
0	0	0	1	•	1	1	1	1.875
0	0	1	0	•	0	0	0	2

Is it possible to show the number  $(1.02)_{10}$  in this system with these spaces?

No! The numbers in this system increments by 0.125 unit.

Solution?

ls					IX-Z	Kau			
ر ا	Radix-10	n=3)	ion (m	Fract		)	(n=4)	eger	Int
n		2-3	2-2	2-1		2 <sup>0</sup>	21	2 <sup>2</sup>	2 <sup>3</sup>
C١	0	0	0	0		0	0	0	0
S	$1*2^{-3} = 1/8 = 0.125$	1	0	0		0	0	0	0
	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	0	1	0		0	0	0	0
	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	1	1	0		0	0	0	0
\	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	0	0	1		0	0	0	0
S١	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	1	0	1		0	0	0	0
	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	0	1	1		0	0	0	0
$\cup$	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	1	1	1	•	0	0	0	0
	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	0	0	0	•	1	0	0	0
	1.125	1	0	0	•	1	0	0	0
5	1.25	0	1	0	•	1	0	0	0
^	1.375	1	1	0	•	1	0	0	0
А	1.5	0	0	1	•	1	0	0	0
	1.625	1	0	1	•	1	0	0	0
	1.75	0	1	1	•	1	0	0	0
	1.875	1	1	1	•	1	0	0	0
	2	0	0	0	•	0	1	0	0

s it possible to show the number (1.02)<sub>10</sub> in this system with these spaces?

No! The numbers in this system increments by 0.125 unit.

Solution?

A. More precision.

			Rad	lix-2					Is it possible to s
Inte	eger (	n=4			Fract	ion (m	n=3)	Radix-10	· ·
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2 <sup>-2</sup>	2-3		number (1.02) <sub>10</sub> i
0	0	0	0		0	0	0	0	system with thes
0	0	0	0	•	0	0	1	$1*2^{-3} = 1/8 = 0.125$	System with thes
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	Nal Tha busha
0	0	0	0	٠	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	No! The number
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	system incremer
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125 unit.
0	0	0	1	٠	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	
0	0	0	1	٠	0	0	1	1.125	
0	0	0	1	•	0	1	0	1.25	Solution?
0	0	0	1	٠	0	1	1	1.375	
0	0	0	1	٠	1	0	0	1.5	A. More precisio A. More fraction
0	0	0	1	٠	1	0	1	1.625	Λ More fraction
0	0	0	1	٠	1	1	0	1.75	A. MOLE HACHOH
0	0	0	1	•	1	1	1	1.875	
0	0	1	0	•	0	0	0	2	

show the in this se spaces?

ers in this ents by

on.

n positions.

			Rac	lix-2					Is it possible to show the
Int	eger (	(n=4			Fract	ion (m	า=3)	Radix-10	'
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	20		2-1	2-2	2-3		number (1.02) <sub>10</sub> in this
0	0	0	0	•	0	0	0	0	system with these spaces?
0	0	0	0	•	0	0	1	$1*2^{-3} = 1/8 = 0.125$	system with these spaces.
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	Nol The numbers in this
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	No! The numbers in this
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	system increments by
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125 unit.
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	
0	0	0	1	•	0	0	1	1.125	
0	0	0	1	•	0	1	0	1.25	Solution?
0	0	0	1	•	0	1	1	1.375	
0	0	0	1	•	1	0	0	1.5	A. More precision.
0	0	0	1	•	1	0	1	1.625	A. More fraction positions.
0	0	0	1	•	1	1	0	1.75	The state of the s
0	0	0	1	•	1	1	1	1.875	A. More in m!
0	0	1	0	•	0	0	0	2	

Radix-2									Is it possible to show the
Int	eger	(n=4			Fract	ion (n	า=3)	Radix-10	· · · · · · · · · · · · · · · · · · ·
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3		number (1.02) <sub>10</sub> in this
0	0	0	0	•	0	0	0	0	system with these spaces?
0	0	0	0	•	0	0	1	$1*2^{-3} = 1/8 = 0.125$	system with these spaces.
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	Nal The pumbars in this
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	No! The numbers in this
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	system increments by
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125 unit.
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	
0	0	0	1	•	0	0	1	1.125	
0	0	0	1	•	0	1	0	1.25	Solution?
0	0	0	1	•	0	1	1	1.375	
0	0	0	1	•	1	0	0	1.5	A. More precision.
0	0	0	1	•	1	0	1	1.625	A. More fraction positions.
0	0	0	1	•	1	1	0	1.75	the state of the s
0	0	0	1	•	1	1	1	1.875	A. More in m! How much?
0	0	1	0	•	0	0	0	2	

			Rad	lix-2					Is it p
Int	eger	(n=4			Fract	ion (m	n=3)	Radix-10	13 16
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3		num
0	0	0	0	•	0	0	0	0	syste
0	0	0	0	•	0	0	1	$1*2^{-3} = 1/8 = 0.125$	Syste
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	NIGI
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	No!
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	syste
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	syste
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125
0	0	0	1	•	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	
0	0	0	1	•	0	0	1	1.125	
0	0	0	1	•	0	1	0	1.25	Solu
0	0	0	1	•	0	1	1	1.375	
0	0	0	1	•	1	0	0	1.5	B. Fii
0	0	0	1	•	1	0	1	1.625	
0	0	0	1	•	1	1	0	1.75	
0	0	0	1	•	1	1	1	1.875	
0	0	1	0	•	0	0	0	2	

Is it possible to show the number (1.02)<sub>10</sub> in this system with these spaces?

No! The numbers in this system increments by 0.125 unit.

Solution?

B. Find the closest number

			Rac	lix-2					Is it possible to show the
Int	eger	(n=4			Fract	ion (m	า=3)	Radix-10	'
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>		2-1	2-2	2-3		number (1.02) <sub>10</sub> in this
0	0	0	0	•	0	0	0	0	system with these spaces?
0	0	0	0	•	0	0	1	$1*2^{-3} = 1/8 = 0.125$	system with these spaces:
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$	
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	Nal The pumbars in this
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	No! The numbers in this
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	system increments by
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$	
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125 unit.
0	0	0	1	٠	0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$	
0	0	0	1		0	0	1	1.125	
0	0	0	1	•	0	1	0	1.25	Solution?
0	0	0	1	•	0	1	1	1.375	
0	0	0	1	•	1	0	0	1.5	B. Find the closest number
0	0	0	1	•	1	0	1	1.625	$(1.000)_2 = (1)_{10} = $ Error = 0.02
0	0	0	1	•	1	1	0	1.75	$(1.001)_2 = (1.125)_{10} = > Error = 0.105$
0	0	0	1	•	1	1	1	1.875	$(1.001)_2 - (1.123)_{10} - 21101 - 0.103$
0	0	1	0	•	0	0	0	2	

Radix-2									Is it possible to show the	
Int	eger	(n=4	.)		Fract	tion (m	า=3)	Radix-10	'	
2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	20	•	2-1	2-2	2-3		number (1.02) <sub>10</sub> in this	
0	0	0	0	•	0	0	0	0	system with these spaces?	
0	0	0	0	٠	0	0	1	1*2 <sup>-3</sup> = 1/8 = 0.125	System with these spaces.	
0	0	0	0	•	0	1	0	$1*2^{-2} + 0*2^{-3} = 1/4 = 0.25$		
0	0	0	0	•	0	1	1	$1*2^{-2} + 1*2^{-3} = 1/4 + 1/8 = 3/8 = 0.375$	No! The numbers in this	
0	0	0	0	•	1	0	0	$1*2^{-1} + 0*2^{-2} + 0*2^{-3} = \frac{1}{2} = 0.5$	INO: THE HUITIDETS III UIIS	
0	0	0	0	•	1	0	1	$1*2^{-1} + 0*2^{-2} + 1*2^{-3} = 1/2 + 1/8 = 5/8 = 0.625$	system increments by	
0	0	0	0	•	1	1	0	$1*2^{-1} + 1*2^{-2} + 0*2^{-3} = 1/2 + 1/4 = 3/4 = 0.75$		
0	0	0	0	•	1	1	1	$1*2^{-1} + 1*2^{-2} + 1*2^{-3} = 1/2 + 1/4 + 1/8 = 0.875$	0.125 unit.	
0	0	0	1		0	0	0	$1*2^{0} + 0*2^{-1} + 0*2^{-2} + 0*2^{-3} = 1$		
0	0	0	1	•	0	0	1	1.125	_	
0	0	0	1	•	0	1	0	1.25	Solution?	
0	0	0	1	•	0	1	1	1.375		
0	0	0	1	•	1	0	0	1.5	B. Find the closest number	
0	0	0	1	•	1	0	1	1.625	$(1.000)_2 = (1)_{10} = $ > Error = 0.02	
0	0	0	1	•	1	1	0	1.75	$(1.001)_2 = (1.125)_{10} = > Error = 0.105$	
0	0	0	1	•	1	1	1	1.875	$\frac{1.001}{2} - \frac{1.123}{10} - \frac{1.01}{100} - \frac{1.00}{100}$	
0	0	1	0	•	0	0	0	2		

# PRACTICE RADIX-4

			Rad	ix-4				
Integer (n=4) Fraction (m=3)						ion (m	1=3)	Radix-10
43	42	41	40		4 <sup>-1</sup>	4-2	4-3	
0	0	0	0		0	0	0	0
0	0	0	0		0	0	1	$1*4^{-3} = 1/64 = 0.015625$
0	0	0	0	•	0	0	2	$2*4^{-3} = 2/64 = 0.03125$
0	0	0	0		0	0	3	3*4 <sup>-3</sup> = 3/64 = 0.046875
0	0	0	0		0	1	0	1*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 1/16 = 0.0625
0	0	0	0	•	0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125
0	0	0	0	•	0	1	2	1*4 <sup>-2</sup> + 2*4 <sup>-2</sup> = 1/16 + 2/64 = 0.09375
0	0	0	0		0	1	3	1*4 <sup>-2</sup> + 3*4 <sup>-2</sup> = 1/16 + 3/64 = 0.109375
0	0	0	0	•	0	2	0	$2*4^{-2} + 0*4^{-2} = 2/16 = 0.125$
0	0	0	0	•	3	3	3	$3*4^{-1} + 3*4^{-2} + 3*4^{-3} = 0.984375$
0	0	0	1		0	0	0	1
3	3	3	3		3	3	0	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 0*4^{-3} = ?$
3	3	3	3	•	3	3	1	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 1*4^{-3} = ?$
3	3	3	3		3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$
3	3	3	3		3	3	3	255.984375

Int	eger	(n=4	)		Fract	ion (m	n=3)	Radix-10
43	42	41	40		4-1	4-2	4-3	
0	0	0	0		0	0	0	0
0	0	0	0		0	0	1	1*4 <sup>-3</sup> = 1/64 = 0.015625
0	0	0	0	•	0	0	2	$2*4^{-3} = 2/64 = 0.03125$
0	0	0	0		0	0	3	3*4 <sup>-3</sup> = 3/64 = 0.046875
0	0	0	0		0	1	0	1*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 1/16 = 0.0625
0	0	0	0		0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125
0	0	0	0		0	1	2	1*4 <sup>-2</sup> + 2*4 <sup>-2</sup> = 1/16 + 2/64 = 0.09375
0	0	0	0	•	0	1	3	1*4 <sup>-2</sup> + 3*4 <sup>-2</sup> = 1/16 + 3/64 = 0.109375
0	0	0	0	•	0	2	0	$2*4^{-2} + 0*4^{-2} = 2/16 = 0.125$
0	0	0	0	•	3	3	3	3*4 <sup>-1</sup> + 3*4 <sup>-2</sup> + 3*4 <sup>-3</sup> = 0.984375
0	0	0	1		0	0	0	1
3	3	3	3	•	3	3	0	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 0*4^{-3} = ?$
3	3	3	3	•	3	3	1	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 1*4^{-3} = ?$
3	3	3	3		3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$
3	3	3	3	•	3	3	3	255.984375

Is it possible to show the number (1.02)<sub>10</sub> in this system with these spaces?

Int	Integer (n=4)				Fract	ion (m	n=3)	Radix-10
43	4 <sup>2</sup>	41	40		4-1	4-2	4-3	
0	0	0	0	•	0	0	0	0
0	0	0	0	•	0	0	1	1*4 <sup>-3</sup> = 1/64 = 0.015625
0	0	0	0	•	0	0	2	$2*4^{-3} = 2/64 = 0.03125$
0	0	0	0	•	0	0	3	3*4 <sup>-3</sup> = 3/64 = 0.046875
0	0	0	0	•	0	1	0	1*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 1/16 = 0.0625
0	0	0	0	•	0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125
0	0	0	0	•	0	1	2	1*4-2 + 2*4-2 = 1/16 + 2/64 = 0.09375
0	0	0	0	•	0	1	3	1*4-2 + 3*4-2 = 1/16 + 3/64 = 0.109375
0	0	0	0	•	0	2	0	2*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 2/16 = 0.125
0	0	0	0	•	3	3	3	$3*4^{-1} + 3*4^{-2} + 3*4^{-3} = 0.984375$
0	0	0	1	•	0	0	0	1
3	3	3	3	•	3	3	0	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 0*4^{-3} = ?$
3	3	3	3	•	3	3	1	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 1*4^{-3} = ?$
3	3	3	3	•	3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$
3	3	3	3	•	3	3	3	255.984375

Is it possible to show the number  $(1.02)_{10}$  in this system with these spaces?

No! Why?

			rtaa						
Int	Integer (n=4) Fraction (m=3)					ion (m	1=3)	Radix-10	.   .
4 <sup>3</sup>	4 <sup>2</sup>	41	40		4-1	4-2	4-3		It
0	0	0	0		0	0	0	0	t
0	0	0	0	•	0	0	1	$1*4^{-3} = 1/64 = 0.015625$	L
0	0	0	0	•	0	0	2	$2*4^{-3} = 2/64 = 0.03125$	S
0	0	0	0	•	0	0	3	3*4 <sup>-3</sup> = 3/64 = 0.046875	
0	0	0	0	•	0	1	0	1*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 1/16 = 0.0625	
0	0	0	0	•	0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125	
0	0	0	0	•	0	1	2	1*4 <sup>-2</sup> + 2*4 <sup>-2</sup> = 1/16 + 2/64 = 0.09375	<b>'</b>
0	0	0	0	•	0	1	3	1*4 <sup>-2</sup> + 3*4 <sup>-2</sup> = 1/16 + 3/64 = 0.109375	
0	0	0	0	•	0	2	0	2*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 2/16 = 0.125	
								•••	
0	0	0	0	•	3	3	3	$3*4^{-1} + 3*4^{-2} + 3*4^{-3} = 0.984375$	<i>\</i>
0	0	0	1	•	0	0	0	1	F
								•••	
3	3	3	3	•	3	3	0	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 0*4^{-3} = ?$	
3	3	3	3	•	3	3	1	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 1*4^{-3} = ?$	
3	3	3	3	•	3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$	
3	3	3	3	•	3	3	3	255.984375	

Is it possible to show the number (1.02)<sub>10</sub> in this system with these spaces?

No! Why?

Solution:

A. More in m

B. Find the closest number

Int	eger	(n=4	-)		Fract	ion (n	n=3)	Radix-10	13 11 POSSIDIC 10 3110 W			
43	4 <sup>2</sup>	4 <sup>1</sup>	40		4-1	4-2	4-3		the number $(1.02)_{10}$ in			
0	0	0	0	•	0	0	0	0	this system with these			
0	0	0	0	•	0	0	1	1*4 <sup>-3</sup> = 1/64 = 0.015625				
0	0	0	0	•	0	0	2	$2*4^{-3} = 2/64 = 0.03125$	spaces?			
0	0	0	0	•	0	0	3	$3*4^{-3} = 3/64 = 0.046875$				
0	0	0	0	•	0	1	0	$1*4^{-2} + 0*4^{-2} = 1/16 = 0.0625$				
0	0	0	0	•	0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125	No! Why?			
0	0	0	0	•	0	1	2	1*4 <sup>-2</sup> + 2*4 <sup>-2</sup> = 1/16 + 2/64 = 0.09375	T (O. VVII)			
0	0	0	0	•	0	1	3	1*4 <sup>-2</sup> + 3*4 <sup>-2</sup> = 1/16 + 3/64 = 0.109375				
0	0	0	0	•	0	2	0	$2*4^{-2} + 0*4^{-2} = 2/16 = 0.125$	Solution:			
0	0	0	0	•	3	3	3	$3*4^{-1} + 3*4^{-2} + 3*4^{-3} = 0.984375$	A. More in m			
0	0	0	1	•	0	0	0	1	B. Find the closest number			
0	0	0	1	٠	0	0	1	1.015625				
0	0	0	1		0	0	2	1.03125	$(1.001)_4 = (1.015625)_{10} => Error = 0.004375$ $(1.002)_4 = (1.03125)_{10} => Error = 0.01125$			
									$(1.002)_4 - (1.05123)_{10} - > EITOI - 0.01123$			
3	3	3	3	•	3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$				
3	3	3	3	•	3	3	3	255.984375				

Is it possible to show

Radix-4

			Rac	lix-4					Is it possible to show	
Int	eger	(n=4	.)		Fract	ion (m	n=3)	Radix-10	·	
43	4 <sup>2</sup>	41	40		4-1	4-2	4-3		the number $(1.02)_{10}$ in	
0	0	0	0	•	0	0	0	0	this system with these	
0	0	0	0	•	0	0	1	1*4 <sup>-3</sup> = 1/64 = 0.015625		
0	0	0	0	•	0	0	2	2*4 <sup>-3</sup> = 2/64 = 0.03125	spaces?	
0	0	0	0	•	0	0	3	3*4 <sup>-3</sup> = 3/64 = 0.046875	<b>'</b>	
0	0	0	0	•	0	1	0	1*4 <sup>-2</sup> + 0*4 <sup>-2</sup> = 1/16 = 0.0625		
0	0	0	0	•	0	1	1	1*4 <sup>-2</sup> + 1*4 <sup>-2</sup> = 1/16 + 1/64 = 0.078125	No! Why?	
0	0	0	0	•	0	1	2	1*4 <sup>-2</sup> + 2*4 <sup>-2</sup> = 1/16 + 2/64 = 0.09375	T VO. VVIIY.	
0	0	0	0	•	0	1	3	1*4 <sup>-2</sup> + 3*4 <sup>-2</sup> = 1/16 + 3/64 = 0.109375		
0	0	0	0	•	0	2	0	$2*4^{-2} + 0*4^{-2} = 2/16 = 0.125$	Solution:	
								•••	Solution.	
0	0	0	0	•	3	3	3	$3*4^{-1} + 3*4^{-2} + 3*4^{-3} = 0.984375$	A. More in m	
0	0	0	1		0	0	0	1	B. Find the closest number	
0	0	0	1		0	0	1	1.015625		
0	0	0	1	•	0	0	2	1.03125	$(1.001)_4 = (1.015625)_{10} = > Error = 0.004375$	
									$(1.002)_4 = (1.03125)_{10} = $ Error = 0.01125	
3	3	3	3	•	3	3	2	$3*4^3 + 3*4^2 + 3*4^1 + 3*4^0 + 3*4^{-1} + 3*4^{-2} + 2*4^{-3} = ?$		
3	3	3	3	•	3	3	3	255.984375		

# PRACTICE RADIX-[8,10,16] At Home