CISP 440

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Homework 0 -

Positional Number Systems

COMMON BASES

1. 1234 decimal to binary: 0100 1101 0010	
1234 % 2 = **0**	1234 / 2 = 617
617 % 2 = **1**	617 / 2 = 308
308 % 2 = **0**	308 / 2 = 154
154 % 2 = **0**	154 / 2 = 77
77 % 2 = **1**	77 / 2 = 38
38 / 2 = **0**	38 / 2 = 19
19 % 2 = **1**	19 / 2 = 9
9 % 2 = **1**	9 / 2 = 4
4% 2 = **0**	4 / 2 = 2
2% 2 = **0**	2 / 2 = 1
1 % 2 = **1**	1 / 2 = 0

2. ABBA base 16 to decimal: 43,962	
A = 10	B = 11
$A * 16^3 + B * 16^2 + B * 16^1 + A * 16^0$	
$10 * 4096 + 11 * 256 + 11 * 16 + 10$	
43962	

3. 1234 base 10 to hex: 4D2	
1234 % 16 = **2**	1234 / 16 = 77
77 % 16 = **13**	77 / 16 = 4
4 % 16 = **4**	4 / 16 = 0

4. 1100 0001 binary to octal : 301	
$1 * 2^7 + 1 * 2^6 + 1 * 2^0$	
$1 * 128 + 1 * 64 + 1$	
193 in decimal	
193 % 8 = **1**	193 / 8 = 24
24 % 8 = **0**	24 / 8 = 3
3 % 8 = **3**	3 / 8 = 0

5. 011 000 001 decimal to octal: 51 754 301	
11,000,001 % 8 = **1**	11,000,001 / 8 = 1375000
1,375,000 % 8 = **0**	1,357,000 / 8 = 171875
171,875 % 8 = **3**	171,875 / 8 = 21484
21,484 % 8 = **4**	21,484 / 8 = 2685
2,685 % 8 = **5**	2,685 / 8 = 335
335 % 8 = **7**	335 / 8 = 41
41 % 8 = **1**	41 / 8 = 5
5 % 8 = **5**	5 / 8 = 0

6. 1234 octal to decimal: 668
$1 * 8^3 + 2 * 8^2 + 3 * 8^1 + 4 * 8^0$
$1 * 512 + 2 * 64 + 3 * 8 + 4 * 1$
668

7. 1234 octal to hex: 29C	
1234 octal is 668 decimal from problem 5	
668 % 16 = **12**	668 / 16 = 41
41 % 16 = **9**	41 / 16 = 2
2 % 16 = **2**	2 / 16 = 0

8. 1234 octal to binary: 10 1001 1100	
1234 octal is 668 decimal from problem 5	
668 % 2 = **0**	668 / 2 = 334
334 % 2 = **0**	334 / 2 = 167
167 % 2 = **1**	167 / 2 = 83
83 % 2 = **1**	83 / 2 = 41
41 % 2 = **1**	41 / 2 = 20
20 % 2 = **0**	20 / 2 = 10
10 % 2 = **0**	10 / 2 = 5
5 % 2 = **1**	5 / 2 = 2
2 % 2 = **0**	2 / 2 = 1
1 % 2 = **1**	1 / 2 = 0

OTHER BASES

9. 1234 base 10 to base 16: 4D2	
1234 % 16 = **2**	1234 / 16 = 77
77 % 16 = **13**	77 / 16 = 4
4 % 16 = **4**	4 / 16 = 0
13 maps to D	

10. 1234 base 16 to base 10: 4,660
$1 * 16^3 + 2 * 16^2 + 3 * 16^1 + 4 * 16^0$
$1 * 4096 + 2 * 256 + 3 * 16 + 4 * 1$
4660

11. 4567 base 10 to base 5: 121232	
4567 % 5 = **2**	4567 / 5 = 913
913 % 5 = **3**	913 / 5 = 182
182 % 5 = **2**	182 / 5 = 36
36 % 5 = **1**	36 / 5 = 7
7 % 5 = **2**	7 / 5 = 1
1 % 5 = **1**	1 / 5 = 0

12. 1234 base 5 to base 10: 194
$1 * 5^3 + 2 * 5^2 + 3 * 5^1 + 4 * 5^0$
$1 * 125 + 2 * 25 + 3 * 5 + 4 * 1$
194

13. 1234 base 7 to base 9: 567	
$1 * 7^3 + 2 * 7^2 + 3 * 7^1 + 4 * 7^0$	
$1 * 343 + 2 * 49 + 3 * 7 + 4 * 1$	
466 in base 10	
466 % 9 = **7**	466 / 9 = 51
51 % 9 = **6**	51 / 9 = 5
5 % 9 = **5**	5 / 9 = 0

14. 4567 base 10 to base 24 : 7L7	
4567 % 24 = **7**	4537 / 24 = 189
189 % 24 = **21**	189 / 24 = 7
7 % 24 = **7**	7 / 24 = 0
21 maps to L	

15. 4567 base 24 to base 2: 0110 1011 1101 0111

$4 * 24^3 + 5 * 24^2 + 6 * 24^1 + 7 * 24^0$

$4 * 13824 + 5 * 576 + 6 * 24 + 7 * 1$

58327 in decimal

58327 % 2 = **1**	58327 / 2 = 29163
29163 % 2 = **1**	29163 / 2 = 14581
14581 % 2 = **1**	14581 / 2 = 7290
7290 % 2 = **0**	7290 / 2 = 3645
3545 % 2 = **1**	3545 / 2 = 1822
1822 % 2 = **0**	1822 / 2 = 911
911 % 2 = **1**	911 / 2 = 455
455 % 2 = **1**	455 / 2 = 227
227 % 2 = **1**	227 / 2 = 113
113 % 2 = **1**	113 / 2 = 26
26 % 2 = **0**	26 / 2 = 13
13 % 2 = **1**	13 / 2 = 6
6 % 2 = **0**	6 / 2 = 3
3 % 2 = **1**	3 / 2 = 1
1 % 2 = **1**	1 / 2 = 0

16. FIVE base 36 to base 19: 58D8G

F = 15 I = 18 V = 31 E = 14

$F * 36^3 + I * 36^2 + V * 36^1 + E * 36^0$

$15 * 46656 + 18 * 576 + 31 * 36 + 14 * 1$

711338 in decimal

711338 % 19 = **16**	711338 / 19 = 37438
37438 % 19 = **8**	37438 / 19 = 1970
1970 % 19 = **13**	1970 / 19 = 103
103 % 19 = **8**	103 / 19 = 5
5 % 19 = **5**	5 / 19 = 0

16 = G 13 = D

17. THREE base 28 to base 10

T would map to 29, which is out of bounds for base 28

18. 1234 base 10 to base 36: YA

1234 % 36 = **10**	1234 / 36 = 34
34 % 36 = **34**	34 / 36 = 0

34 = Y 10 = A

ADDITION IN OTHER BASES

19. Add 1234_5 plus 4321_5= 11110_5

1	1	1	1	0
	1	2	3	4
+	4	3	2	1
1	**1**	**1**	**1**	**0**

20. Add $KETCHUP_{30}$ plus $FRIES_{30}$= $KFFA6FN_{30}$

K	E	T	C	H	U	P
20	14	29	12	17	30	25
		F	R	I	E	S
		15	27	18	14	28
0	1	1	1	1	1	
20	14	29	12	17	30	25
+		15	27	18	14	28
20	15	15	10	6	15	23
K	**F**	**F**	**A**	**6**	**F**	**N**

21. Add $FOUR_{36}$ plus TWO_{36} = $GIRF_{36}$

F	O	U	R
15	24	30	27
	T	W	O
	29	32	24
1	1	1	
15	24	30	27
+	29	32	24
16	18	27	15
G	**I**	**R**	**F**

DNA

22. ACT to base 10: 33
A = 2 C = 0 T = 1
$A * 4^2 + C * 4^1 + T * 4^0$
$2 * 16 + 0 * 4 + 1 * 1$
33

23. ATTGCA to base 10: 2418
A = 2 T = 1 G = 3 C = 0
$A * 4^5 + T * 4^4 + T * 4^3 + G * 4^2 + C * 4^1 + A * 4^0$
$2 * 1024 + 1 * 256 + 1 * 64 + 3 * 16 + 0 * 4 + 2 * 1$
2418

24. TTAA to base 10: 90
T = 1 A = 2
$T * 4^3 + T * 4^2 + A * 4^1 + A * 4^0$
$1 * 64 + 1 * 16 + 2 * 4 + 2 * 1$
90

25. 1234 base 10 to DNA format: TCGTCA	
1234 % 4 = **2**	1234 / 4 = 308
308 % 4 = **0**	308 / 4 = 77
77 % 4 = **1**	77 / 4 = 19
19 % 4 = **3**	19 / 4 = 4
4 % 4 = **0**	4 / 4 = 1
1 % 4 = **1**	1 / 4 = 0
1 = T 0 = C 3 = G 1 = T 0 = C 2 =A	

26. 20 base ten to DNA format: TTC	
20 % 4 = **0**	20 / 4 = 5
5 % 4 = **1**	5 / 4 = 1
1 % 4 = **1**	1 / 4 = 0

27. Alanine = GCC convert to base 10: 48
G = 3 C = 0
$G * 4^2 + C * 4^1 + C * 4^0$
$3 * 16 + 0 * 4 + 0 * 1$
48

28. Explain how to group a binary string (1's and 0's) so that it can more easily be converted to DNA format. Give an example.

Groups of two would be best. C = 0 = 00 T = 1 = 01 A = 2 = 10 G = 3 = 11

ACT = 10 00 01

COLORS

29. 1234 decimal to color code: TACCACT	
1234 % 3 = **1**	1234 / 3 = 411
411 % 3 = **0**	411 / 3 = 137
137 % 3 = **2**	137 / 3 = 45
45 % 3 = **0**	45 / 3 = 15
15 % 3 = **0**	15 / 3 = 5
5 % 3 = **2**	5 / 3 = 1
1 % 3 = **1**	1 / 3 = 0
0 = C 1 = T 2 = A	

30. Figure out and explain some way that yellow could be represented in this color code?

Yellow could be represented by blue plus green, which sums to 10
Blue = 1 Green = 2

	1	0
		1
+		2
	1	**0**

31. What is your favorite color, in this color code? There are no wrong answers to this one!

My favorite color is blue, so the color code would be 1.