

Numeral System

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1) The symbol 25_b represents a two-digit number in base b . If the number 52_b is double the number 25_b , then b is: [Asked in "FMS".]

A) 7 B) 8 C) 9 D) 11

2) Convert the decimal number 22 to binary number.

3) Convert the decimal number 110 to octal number.

4) Convert the decimal number 733 to hexadecimal number.

5) Convert the decimal number 0.153 to binary number.

6) Convert the decimal number $\frac{5}{11}$ to binary number.

7) Convert the decimal number 0.153 to octal number.

8) Convert the decimal number 0.153 to hexadecimal number.

9) Convert the binary number 1111101000.10101 to octal number.

10) Convert the binary number 1111101000.10101 to hexadecimal number.

11) Convert the hexadecimal number 3E8.A8 to binary number.

12) Convert the octal number 1750.52 to binary number.

13) Convert the octal number 1750.52 to hexadecimal number.

14) Convert the hexadecimal number 3E8.A8 to octal number.

15) $111010_2 + 1110111_2 = ?$

16) $1010110001_2 - 11110111_2 = ?$

17) $110.11_2 \times 11.01_2 = ?$

18) $156_8 + 34_8 = ?$

19) $106_8 - 37_8 = ?$

20) $1011011_2 \div 111_2 = ?$

_____ ? _____

[Detailed solutions and some general tricks:](#)

1) 25 and 52 are two-digit numbers in base b. Therefore 2 and 5 are digits in the base b numeral system.

Also given that $25_b \times 2_b = 52_b$.

We have $2_b \times 2_b = 4_n$.

$\therefore 5_b \times 2_b = 12_b$

$\Rightarrow 5_b \times 2_b = 10_b + 2_b$.

Now $10_b = b_{10}$, $5_b = 5_{10}$ and $2_b = 2_{10}$.

$\therefore 5_{10} \times 2_{10} = b_{10} + 2_{10}$

$\Rightarrow 10_{10} = (b+2)_{10}$

$\Rightarrow b = 8_{10}$.

2)

Hence $22_{10} = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 10110_2$.

3)

Hence $110_{10} = 1 \times 8^2 + 5 \times 8^1 + 6 \times 8^0 = 156_8$.

4)

Hence $733_{10} = 2 \times 16^2 + D \times 16^1 + D \times 16^0 = 2DD_{16}$.

5)

Hence $0.153_{10} = 0 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 0 \times 2^{-4} + 0 \times 2^{-5} + 1 \times 2^{-6} + 1 \times 2^{-7} + 1 \times 2^{-8} + \dots = 0.00100111_2$. (After we round and cut the number.)

6)

Hence $\frac{5}{11} = 0.0111\text{...}_2$

7)

Hence $0.153_{10} = 1 \times 8^{-1} + 1 \times 8^{-2} + 6 \times 8^{-3} + 2 \times 8^{-4} + 5 \times 8^{-5} + 4 \times 8^{-6} + \dots = 0.116254_8$ (After we round and cut the number.)

8)

Hence $0.153_{10} = 2 \times 16^{-1} + 7 \times 16^{-2} + 2 \times 16^{-3} + 11 \times 16^{-4} + 0 \times 16^{-5} + 2 \times 16^{-6} + \dots = 0.272B02_{16}$ (After we round and cut the number.)

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9)

1111101000.10101

1 111 101 000 . 101 010

1 7 5 0 . 5 2

Hence $1111101000.10101_2 = 1750.52_8$

10)

1111101000.10101

11 1110 1000 . 1010 1000

3 14 8 . 10 8

3 E 8 . A 8

Hence $1111101000.10101_2 = 3E8.A8_{16}$.

11)

3E8.A8

3 E 8 . A 8

11 1110 1000 . 1010 1000

Hence $3E8.A8_{16} = 1111101000.10101_2$.

12)

1750.52

1 7 5 0 . 5 2

1 111 101 000 . 101 010

Hence $1750.52_8 = 1111101000.10101_2$.

13)

1750.52

1 7 5 0 . 5 2

1 111 101 000 . 101 010

1111101000.10101

11 1110 1000 . 1010 1000

3 14 8 . 10 8

3 E 8 . A 8

Hence $1750.52_8 = 3E8.A8_{16}$.

14)

3E8.A8

3 E 8 . A 8

11 1110 1000 . 1010 1000

1111101000.10101

1 111 101 000 . 101 010

1 7 5 0 . 5 2

Hence $3E8.A8_{16}=1750.52_8$

15)

16)

17)

Hence required value = 10101.1111

18)

19)

20)

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