1. $110111010_2 =$ _____$_{16}$

$$110111010 = 1 \quad 1011 \quad 1010$$

by definition,

$$1111{=}2^3 2^2 2^1 2^0$$

therefore,

$$1{=}0001{=}2^0{=}1, \quad 1011{=}2^3 + 2^1 + 2^0 = 11, \quad 1010 = 2^3 + 2^1 = 10$$
$$1{=}1, \quad 11{=}\text{B}, \quad 10{=}\text{A}$$
$$110111010_2 = 1BA_{16}$$

2. $100011111111_2 =$ _____$_8$

$$100011111111{=}100 \quad 011 \quad 111 \quad 111$$

by definition,

$$111{=}2^2 2^1 2^0$$

therefore,

$$100 = 4 \quad 011 = 3 \quad 111 = 7 \quad 111 = 7$$
$$100011111111_2 = 4377_8$$

3. $214_{10} =$ _____$_8$

Convert to binary first then convert to octal.

$$\tfrac{214}{2} = 107r0 \longrightarrow \tfrac{107}{2} = 53r1 \longrightarrow \tfrac{53}{2} = 26r1 \longrightarrow \tfrac{26}{2} = 13r0 \longrightarrow \tfrac{13}{2} = 6r1 \longrightarrow$$
$$\tfrac{6}{2} = 3r0 \longrightarrow \tfrac{3}{2} = 1r1 \longrightarrow \tfrac{1}{2} = 0r1,$$
$$214_{10} = 11010110_2,$$
$$11010110_2 = 11 \quad 010 \quad 110,$$
$$11 = 011 = 3 \quad 010 = 2 \quad 110 = 6,$$
$$11010110_2 = 326_8$$

therefore,

$$214_10 = 326_8$$

4. $175_{10} =$ _____$_2$

$$\tfrac{175}{2} = 87r1 \longrightarrow \tfrac{87}{2} = 43r1 \longrightarrow \tfrac{43}{2} = 21r1 \longrightarrow \tfrac{21}{2} = 10r1 \longrightarrow \tfrac{10}{2} = 5r0 \longrightarrow \tfrac{5}{2} =$$
$$2r1 \longrightarrow \tfrac{2}{2} = 1r0 \longrightarrow \tfrac{1}{2} = 0r1,$$

therefore,

$$175_{10} = 10101111_2$$

5. $10100011_2 =$ _____$_{10}$

$$1 \cdot 2^7 + 1 \cdot 2^5 + 1 \cdot 2^1 + 1 \cdot 2^0 = 163$$

therefore,

$$10100011_2 = 163_{10}$$

6. $240_{10} =$ _____$_{10}$

$$\frac{240}{10} = 120r0 \longrightarrow \frac{120}{2} = 60r0 \longrightarrow \frac{60}{2} = 30r0 \longrightarrow \frac{30}{2} = 15r0 \longrightarrow \frac{15}{2} = 7r1 \longrightarrow \frac{7}{2} = 3r1 \longrightarrow \frac{3}{2} = 1r1 \longrightarrow \frac{1}{2} = 0r1$$

therefore,

$$240_{10} = 11110000$$

7. $1245_{10} =$ _____$_{16}$

$$1245_{10} = 10011011101_2,$$
$$10011011101_2 = 100 \quad 1101 \quad 1101$$
$$100 = 0100 = 4 \quad 1101 = 13 \quad 1101 = 13$$
$$4 = 4 \quad 13 = D \quad 13 = D$$

therefore,

$$1245_{10} = 4DD_{16}$$

8. $256_8 =$ _____$_2$

$$2 = 010 \quad 5 = 101 \quad 6 = 110$$

therefore,

$$256_8 = 10101110_2$$

9. $7BC_{16} =$ _____$_2$

$$C = 1100 \quad B = 1011 \quad 7 = 0111$$

therefore,

$$7BC_{16} = 11110111100_2$$

10. $111101101111_2 =$ _____$_{16}$

$$1111 = 15 \quad 0110 = 6 \quad 1111 = 15$$
$$15 = F \quad 6 = 6 \quad 15 = F$$

therefore,

$$111101101111_2 = F6F_{16}$$