# Converting Between Decimal and Binary

| Convert $53_{10}$ to binary | | Convert $110101_2$ to decimal | |
|---|---|---|---|
| $53 \div 2 = 26.5$ | $Remainder = 1 = a_0$ | $1 \times 2^0 = 1$ | $1 = a_0$ |
| $26 \div 2 = 13.0$ | $Remainder = 0 = a_1$ | $0 \times 2^1 = 0$ | $0 = a_1$ |
| $13 \div 2 = 6.5$ | $Remainder = 1 = a_2$ | $1 \times 2^2 = 4$ | $4 = a_2$ |
| $6 \div 2 = 3.0$ | $Remainder = 0 = a_3$ | $0 \times 2^3 = 0$ | $0 = a_3$ |
| $3 \div 2 = 1.5$ | $Remainder = 1 = a_4$ | $1 \times 2^4 = 16$ | $16 = a_4$ |
| $1 \div 2 = 0.5$ | $Remainder = 1 = a_5$ | $1 \times 2^5 = 32$ | $32 = a_5$ |
| $53_{10} = a_5 a_4 \cdots a_0 = 110101_2$ | | $110101_2 = a_5 + a_4 + \cdots a_0 = 53_{10}$ | |