

$$\sum_{i=1}^n i \times 2^i$$

$$\text{Out}[1]= 2 (1 - 2^n + 2^n n)$$

$$\text{In}[2]:= \sum_{i=1}^{\text{Log2}[M]-1} i \times 2^i$$

$$\text{Out}[2]= (2 \text{Log}[2] - 2 M \text{Log}[2] + M \text{Log}[M]) / \text{Log}[2]$$

$$\text{In}[6]:= \sum_{i=1}^{\lfloor \text{Log2}[M] \rfloor - 1} i \times 2^i + \lfloor \text{Log2}[M] \rfloor \times (M - 2^{\lfloor \text{Log2}[M] \rfloor} + 1)$$

$$\text{Out}[6]= 2 - 2^{1+\text{Floor}\left[\frac{\text{Log}[M]}{\text{Log}[2]}\right]} + 2^{\text{Floor}\left[\frac{\text{Log}[M]}{\text{Log}[2]}\right]} \text{Floor}\left[\frac{\text{Log}[M]}{\text{Log}[2]}\right] + \left(1 - 2^{\text{Floor}\left[\frac{\text{Log}[M]}{\text{Log}[2]}\right]} + M\right) \text{Floor}\left[\frac{\text{Log}[M]}{\text{Log}[2]}\right]$$

$$\text{In}[9]:= 2 - 2^{1+\lfloor \text{Log2}[M] \rfloor} + 2^{\lfloor \text{Log2}[M] \rfloor} \lfloor \text{Log2}[M] \rfloor + (1 - 2^{\lfloor \text{Log2}[M] \rfloor} + M) \lfloor \text{Log2}[M] \rfloor$$

$$2 - 2^{1+\lfloor \text{Log2}[M] \rfloor} + 2^{\lfloor \text{Log2}[M] \rfloor} \lfloor \text{Log2}[M] \rfloor + 1 \lfloor \text{Log2}[M] \rfloor - 2^{\lfloor \text{Log2}[M] \rfloor} \lfloor \text{Log2}[M] \rfloor + M \lfloor \text{Log2}[M] \rfloor$$

$$2 - 2^{1+\lfloor \text{Log2}[M] \rfloor} + 2^{\lfloor \text{Log2}[M] \rfloor} \lfloor \text{Log2}[M] \rfloor + \lfloor \text{Log2}[M] \rfloor - 2^{\lfloor \text{Log2}[M] \rfloor} \lfloor \text{Log2}[M] \rfloor + M \lfloor \text{Log2}[M] \rfloor$$

$$2 - 2^{1+\lfloor \text{Log2}[M] \rfloor} + \lfloor \text{Log2}[M] \rfloor + M \lfloor \text{Log2}[M] \rfloor$$

$$2 - 2^{1+\lfloor \text{Log2}[M] \rfloor} + (M + 1) \lfloor \text{Log2}[M] \rfloor$$