

BFS → PQ

$$\begin{array}{r} 12 \rightarrow 0000 \ 1100 \\ 12 \rightarrow 1111 \ 0011 \\ -12 \rightarrow \underline{1111 \ 0100} \\ 1111 \ 0011 \\ 0000 \ 1100 \end{array}$$



$$\begin{array}{r} 100101 \\ 011010 \end{array}$$

$$-10 \quad -12 \quad -12 \quad -10 \quad -12 \quad -5 \quad -10$$

$$\begin{array}{r} 7 \ 2 \ 2 \ 2 \ 1 \ 6 \ 4 \ 1 \\ 3 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1 \ 0 \\ -2 \qquad \qquad +8 \qquad \qquad +2 \ +1 \end{array}$$

$$\begin{array}{l} 11110110 = -10 \\ -12 \rightarrow 11110100 \\ -5 \rightarrow 11111011 \end{array}$$

$$\begin{array}{r} 5 \rightarrow 0000 \ 101 \\ 1111 \ 110 \\ -5 \rightarrow \underline{1111 \ 011} \\ 1110 \ 100 \\ 1110 \ 011 \\ 0001 \ 100 \end{array}$$

$$\begin{array}{r} 111 \\ 1000 \\ \hline 111 \end{array} \quad \begin{array}{r} 10000 \\ \hline 1111 \end{array}$$

$$\begin{array}{c} 31 \quad \quad \quad 0 \\ | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \\ | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \end{array}$$

$$\begin{array}{r} 12 \quad 0000 \quad 1100 \\ 0 \quad 0 \quad 0 \quad 0 \quad 1000 \quad 0000 \quad 1010 \end{array}$$

$$\begin{array}{r} 0000 \ 0000 \ 1100 \\ 1111 \ 1111 \end{array}$$

$$\begin{array}{r} 1010 \\ 1111 \\ \hline 0101 \end{array}$$

$$[3, 4, 2, 5]$$

$$\begin{array}{r} 3 \quad 4 \quad 2 \quad 5 \\ 3 \times 4 = 12 \\ 4 \times 2 = 8 \\ 2 \times 5 = 10 \\ 3 \times 5 = 15 \end{array}$$

$$\begin{array}{r} 4 \times 0 = 0 \\ 5 \times 0 = 0 \\ 0 \times 6 = 0 \\ 6 \times 2 = 12 \end{array}$$

$$\begin{array}{r} 3 \quad 4 \quad 2 \quad 5 \\ 3 \times 4 = 12 \\ 4 \times 2 = 8 \\ 2 \times 5 = 10 \\ 3 \times 5 = 15 \end{array}$$

$$\begin{array}{r} 0000 \\ 0001 \\ 0010 \\ 0011 \\ 0100 \\ 0101 \\ 0110 \\ 0111 \end{array}$$

$$\begin{array}{r} 11 \\ 11 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 1111 \ 1111 \\ 1111 \ 1111 \\ \hline 1111 \ 1111 \end{array}$$

$$\begin{array}{r} 3 \quad 4 \quad 2 \quad 3 \quad 4 \quad 12 \quad 7 \\ 011 \ 100 \ 011 \ 011 \ 100 \ 100 \ 100 \\ 0011 \ 0100 \ 0011 \ 0100 \ 0100 \ 0100 \ 0100 \\ 0100 \ 0100 \ 0100 \ 0100 \ 0100 \ 0100 \ 0100 \\ 1010 \ 0100 \ 0100 \ 0100 \ 0100 \ 0100 \ 0100 \\ 1343 \ 1010 \end{array}$$

$$\begin{array}{r} 0 \quad \quad \quad 1 \\ -2^{21} \quad \quad \quad 2^{21}-1 \end{array}$$

$$13 \ 12 \ 11 \ 10 \ 9 \ 8 \ 7 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1 \ 0$$

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$$-12 \rightarrow 11110100$$