

# Subtraksjon og toerkomplement

Tuesday, September 21, 2021

1:23 PM

$$23 - 4 \rightarrow 23 + (-4)$$

$$0001\ 0111 + (-0000\ 0100)$$

↓

overflow

$$1111\ 1011 + 1 \rightarrow 1111\ 1100$$

$$\begin{array}{r} \text{overflow} \\ \downarrow \\ \textcolor{red}{1}\ \textcolor{red}{1}\ \textcolor{red}{1}\ \textcolor{red}{1}\ \textcolor{red}{1}\ \textcolor{red}{1} \\ 0001\ 0111 \\ + 1111\ 1100 \\ \hline \textcolor{teal}{\textcolor{teal}{0001\ 0011}} \end{array}$$

MSB er 0 så svaret blir positivt

$$\begin{array}{r} a) 16 - 8 = 0001\ 0000 - 0000\ 1000 = \begin{array}{r} \textcolor{teal}{0001\ 0000} \\ + 1111\ 1000 \\ \hline \textcolor{teal}{0000\ 1000} \end{array} \end{array}$$

$$\begin{array}{r} b) 24 - 9 = 0001\ 1000 - 0000\ 1001 = \begin{array}{r} \textcolor{teal}{0001\ 1000} \\ + 1111\ 0110 \\ \hline \textcolor{teal}{0000\ 1110} \end{array} \end{array}$$

$$\begin{array}{r} c) 127 - 128 = 0111\ 1111 - 1000\ 0000 = \begin{array}{r} 0111\ 1111 \\ + 1000\ 0000 \\ \hline \textcolor{teal}{1111\ 1111} \end{array} \end{array}$$

$$\begin{array}{r} d) 98 - 100 = 0110\ 0010 - 0110\ 0100 = \begin{array}{r} 0110\ 0010 \\ + 1001\ 1100 \\ \hline \textcolor{teal}{1111\ 1110} \end{array} \end{array}$$

$$\begin{array}{r}
 + 1001 \ 1100 \\
 = \underline{\underline{1111 \ 1110}}
 \end{array}$$

$$\begin{array}{r}
 e) \ 87 - 19 = 0101 \ 0111 - 0001 \ 0011 = \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \\
 + 1110 \ 1101 \\
 = \underline{\underline{0100 \ 0100}}
 \end{array}$$

$$\begin{array}{r}
 f) \ 78 - 12 = 0100 \ 1110 - 0000 \ 1100 = \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{1} \\
 + 1111 \ 0100 \\
 = \underline{\underline{0100 \ 0010}}
 \end{array}$$

$$\begin{array}{r}
 g) \ 82 - 69 = 0101 \ 0010 - 0100 \ 0101 = \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \\
 - 1011 \ 1011 \\
 = \underline{\underline{0000 \ 1101}}
 \end{array}$$

$$\begin{array}{r}
 h) \ 42 - 42 = 0010 \ 1010 - 0010 \ 1010 = \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \\
 + 1101 \ 0110 \\
 = \underline{\underline{0000 \ 0000}}
 \end{array}$$

$$\begin{array}{r}
 i) \ 12 - 20 = 0000 \ 1100 - 0001 \ 0100 = \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{0} \overset{\overset{1}{}}{1} \overset{\overset{1}{}}{0} \\
 + 1110 \ 1100 \\
 = \underline{\underline{1111 \ 1000}}
 \end{array}$$

$$\begin{array}{r}
 j) \ 15 - 24 = 0000 \ 1111 - 0001 \ 1000 = 0000 \ 1111 \\
 + 1110 \ 1000 \\
 = \underline{\underline{1110 \ 1111}}
 \end{array}$$

$$\begin{aligned}
 k) (10 - 5) - 9 &= (0000\ 1010 - 0000\ 0101) - 0000\ 1001 && \begin{array}{c} 111 \\ 111 \end{array} \\
 &= (0000\ 1010 + 1111\ 1011) + 1111\ 0111 = 0000\ 0101 \\
 & && + 1111\ 0111 \\
 & && = \underline{\underline{1111\ 1000}}
 \end{aligned}$$

$$\begin{aligned}
 l) (20 - 15) - 2 &= (0001\ 0100 - 0000\ 1111) - 0000\ 0010 && \begin{array}{c} 1111 \\ 1111 \end{array} \\
 &= (0001\ 0100 + 1111\ 0001) + 1111\ 1110 = 0000\ 0101 \\
 & && + 1111\ 1110 \\
 & && = \underline{\underline{0000\ 0011}}
 \end{aligned}$$

$$\begin{aligned}
 m) (10 - 12) - 2 &= (0000\ 1010 - 0000\ 1100) - 0000\ 0010 && \begin{array}{c} 1111 \\ 1111 \end{array} \\
 &= (0000\ 1010 + 1111\ 0100) + 1111\ 1101 = 1111\ 1110 \\
 & && + 1111\ 1101 \\
 & && = \underline{\underline{1111\ 1011}}
 \end{aligned}$$

$$\begin{aligned}
 n) 127 - 119 - 7 - 1 &= 0111\ 1111 - 0111\ 0111 - 0000\ 0111 - 0000\ 0001 && \begin{array}{c} 1111 \\ 1111 \\ 1111 \\ 1111 \end{array} \\
 &= 0111\ 1111 + 1000\ 1001 + 1111\ 1001 + 1111\ 1111 = 0111\ 1111 \\
 & && 1000\ 1001 \\
 & && 1111\ 1001 \\
 & && + 1111\ 1111 \\
 & && = \underline{\underline{0000\ 0000}}
 \end{aligned}$$

$$\begin{aligned}
 o) 50 - 10 &= 0011\ 0010 - 0000\ 1010 && \begin{array}{c} 1111 \\ 1111 \end{array} \\
 &= 0011\ 0010 + 1111\ 0110 = 0011\ 0010 \\
 & && + 1111\ 0110 \\
 & && = \underline{\underline{0010\ 1000}}
 \end{aligned}$$

$$\begin{aligned}
 p) 77 - 99 &= 0100\ 1101 - 0110\ 0011 && \begin{array}{c} 1111 \\ 1111 \end{array} \\
 &= 0100\ 1101 + 1001\ 1101 = 0100\ 1101 \\
 & && + 1001\ 1101
 \end{aligned}$$

$$\begin{array}{r} 0100\ 1101 + 1001\ 1101 = 0100\ 1101 \\ + 1001\ 1101 \\ = \underline{\underline{11\ 10\ 1010}} \end{array}$$