

Question 1

1. a) $+14_{10} = 8+4+2 = 01110_2$
b) $22_{16} = 2 \times 16^1 + 2 \times 16^0 = 32+2 = 34_{10}$
c) $01001111 = 0100111 = 117_8$
d) $0111.011 = 4+2+1 + 0.25+0.125 = 7.375_{10}$
e) $1011.100 = -8+2+1+0.5 = -4.5_{10}$

- 2 a) w:4 o:1
b) w:2 o:1
c) w:1 o:7
d) w:1 o:3
e) w:1 o:3

3 a) $110.01 + 1010.01$

$$\begin{array}{r} 1110.01 \quad (Q3.2) \\ + 1010.01 \quad (Q3.2) \\ \hline 1000.10 \quad (Q3.2 \text{ with carry; no overflow}) \end{array}$$

Check:
 -1.75
 $+ -5.75$
 $\hline -7.5 \quad \checkmark$

b) $000.11 + 1011.11$

$$\begin{array}{r} 0000.11 \quad (Q3.2) \\ + 1011.11 \quad (Q3.2) \\ \hline 1100.10 \quad (Q3.2 \text{ no carry; no overflow}) \end{array}$$

Check
 0.75
 $+ -4.25$
 $\hline -3.50$

c) $010110.01 - 0111.11$

$$\begin{array}{r} 010110.01 \quad (Q5.2) \\ - 000111.11 \quad (Q5.2) \\ \hline 001110.10 \quad (Q5.2) \end{array}$$

Check!
 22.25
 $- 7.75$
 $\hline 14.50 \quad \checkmark$

d) $01011.11 \times 11.1100 = -1 \times (010.11.11 \times 00.0100)$ unsigned
 $Q4.2 \times Q1.4 = Q5.6$

now multiply in unsigned space and re-sign result for final answer.

3d continued)

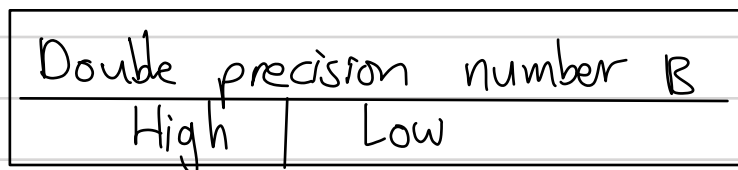
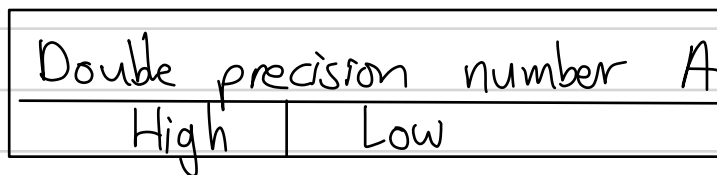
$$\begin{array}{r}
 0101111 \\
 \times 000100 \\
 \hline
 0000000 \\
 0000000 \\
 01011100 \\
 00000000 \\
 00000000 \\
 \hline
 00001011100 \quad Q.5.6
 \end{array}$$

Now re-sign:

$$\begin{array}{r}
 000010.111100 \\
 111101.000011 \quad (\text{invert}) \\
 \hline
 + 1 \quad (\text{add 1 to LSB}) \\
 111101.000100
 \end{array}$$

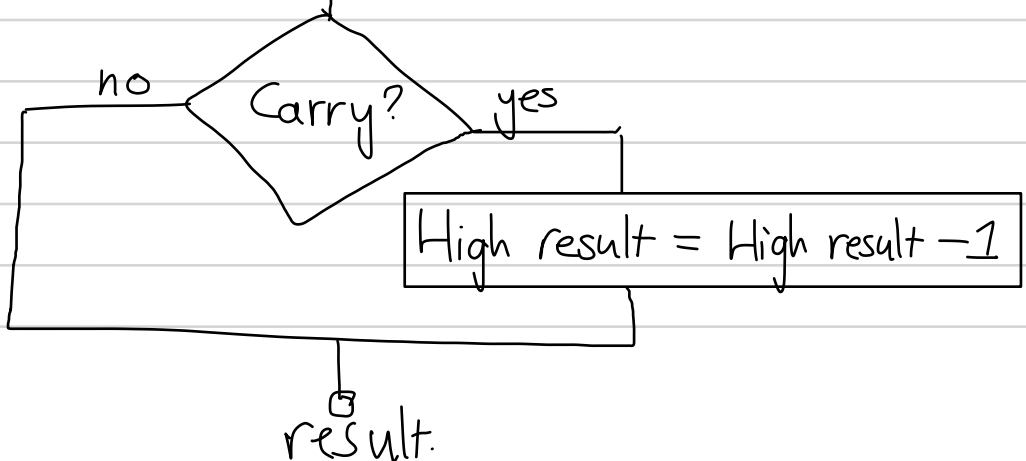
Question 2

A - B



High result = High A - High B

Low Result = Low A - Low B



High Test = High result + High B

Low Test = Low Result + Low B

