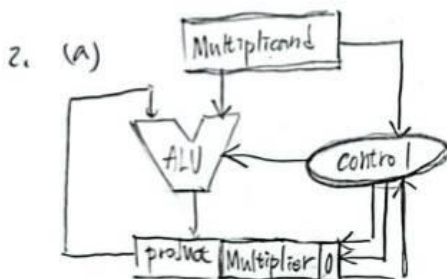


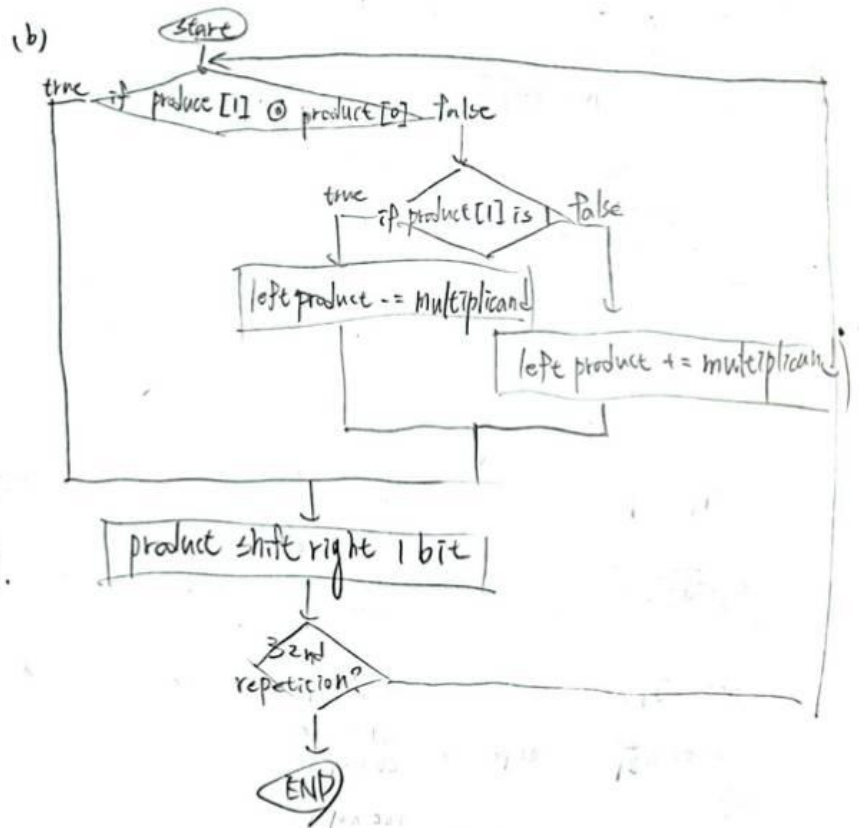
1. $149 = 10010011_{10}$ $28 = 00011100$

Iteration	step	Remainder	Divisor
0	shift left Remainder 1 bit	0000001 00100110	00011100
1	left Remainder \geq Divisor	11100101 00100110	00011100
2	if left Remainder ≤ 0		
3	left Remainder \neq Divisor	00000001 00100110	
4	shift left Remainder 1 bit	00000010 01001100	
5	if not repetition yet		
...			
19	shift left Remainder 1 bit	00100100 11000000	
20	if not repetition yet		
21	left Remainder \geq Divisor	00001000 11000000	
22	if left Remainder ≥ 0		
23	shift left Remainder 1 bit and set 1	00010001 10000001	
24	if not repetition yet		
25	left Remainder \geq Divisor	11101010 10000001	
26	if left Remainder ≤ 0		
27	left Remainder \neq Divisor	00010001 10000001	
28	shift left Remainder 1 bit	00100011 00000010	
29	if not repetition yet		
30	left Remainder \geq Divisor	00000111 00000010	
31	if left Remainder ≥ 0		
32	shift left Remainder 1 bit and set 1	00001110 00000011	
33	if repetition yet		
34	left Remainder shift left 1 bit	00000111 00000011	



(c) in some cases,

Booth's algorithm can achieve the goal with less computation than the original multiplication method.



8,

1) $23.25 = 10111.01_{(2)} = 1.011101 \times 2^4$

Exponent = 4 + bias = 4 + 127 = 131 = 10000011₍₂₎

Fraction = 011101₍₂₎

S = 1 (because -23.25 is negative number \Rightarrow (-1)')

$\frac{1}{3} \frac{10000011}{\text{Exponent}} \frac{011101000000000000000000}{\text{Fraction}}$

(b) $-127 = -1.01101_2 \times 2^6 = -1.40625 / 64 = -0.02197265625$
 Negative $0.25 = 0.125 + 0.03125 = 0.40625$

(c)

positive $\frac{0}{\text{sign}} \frac{11111110}{\text{Exponent}} \frac{111111111111111111111111}{\text{Fraction}}$
 MAX $127 + 127 = 254$

(d) $\frac{0}{\text{sign}} \frac{00000000}{\text{Exponent}} \frac{000000000000000000000000}{\text{Fraction}}$
 positive MIN $-127 + 127 = 0$

sign	Exponent	Fraction	object represented
0	1111111	000000000000000000000000	$+\infty$
1	1111111	000000000000000000000000	$-\infty$
1/0	1111111	$\neq 000000000000000000000000$	NaN

(f) Negative 130

$1 \frac{100.0001}{\text{sign}} \frac{0000}{\text{Exponent}} \frac{00101011000111110010}{\text{Fraction}}$

$-1.0... \times 2^{(130-127)} = 1.0210554599161963 \times 8 = 8.16844367980957$

4. (a) $0.3125 = 0.0101_{(2)} \Rightarrow 1.0101 \times 2^0$
 $1\ 0111\ 01010\ 00000$

(b) $10011000.01 + 0.0101010101$
 $= 1.00110000 \times 2^7 + 1.01010101 \times 2^{-2}$
 $= 1.00110000 \times 2^7 + 0.0000000101010101 \times 2^7$
 $= 1.00110001010101 \times 2^7$
 $0\ 0011\ 0011000101010101$ $\left\{ \begin{array}{l} \text{Guard} = 0 \\ \text{Round} = 1 \\ \text{Sticky} = 0(0\dots 0) \end{array} \right.$ 捨去

$\Rightarrow 0\ 0011\ 00110001010101$

(c) $110.0111001 \times 1000.01101$
 $= 1.100111001 \times 2^2 \times 1.00001101 \times 2^3$
 $= 110110.00101100101 \times 2^{(2+3)}$
 $= 1.1011000101100101 \times 2^{(5)}$
 $0\ 01010\ 10110001011001010$ $\left\{ \begin{array}{l} \text{Guard} = 0 \\ \text{Round} = 1 \\ \text{Sticky} = 0(0\dots 0) \end{array} \right.$ 捨去

$\Rightarrow 0\ 01010\ 10110001011001$