

First Name: _____ Last Name: _____

1) Integers can be represented as bits.

- True
 False

2) Instructions can be represented as bits.

- True
 False

Consider the subtraction of base ten numbers $5 - 4$ using 32-bit binary numbers, and achieved by adding 5 with the two's complement of 4:

$$\begin{array}{r}
 00 \dots 0101 \quad 00 \dots 0101 \\
 -00 \dots 0100 \quad + 11 \dots dcba \\
 \hline
 s00 \dots zyxw
 \end{array}$$

3) dcba

- 1011
 1100

4) zyxw

- 0000
 0001

5) If a 33rd sum bit, s, existed on the left, what value would that bit get?

- 0
 1

Indicate if the binary operation resulted in overflow.

6)

$$\begin{array}{r}
 0110 \dots \\
 +0111 \dots \\
 \hline

 \end{array}$$

1101 ...

- Overflow
 No overflow

7)

$$\begin{array}{r} 1100 \dots \\ + 1101 \dots \\ \hline 1001 \dots \end{array}$$
 Overflow
 No overflow

8)

$$\begin{array}{r} 0001 \dots \\ + 1001 \dots \\ \hline 1010 \dots \end{array}$$
 Overflow
 No overflow

Consider $13_{\text{ten}} \times 6_{\text{ten}}$, or $1101_{\text{two}} \times 0110_{\text{two}}$. Fill in the missing values.

$$\begin{array}{r} 1101 \text{ (Multiplicand)} \\ \times 0110 \text{ (Multiplier)} \\ \hline \quad ???? \text{ (Partial product 1)} \\ \quad ???? \text{ (Partial product 2)} \\ \quad ???? \text{ (Partial product 3)} \\ + ???? \text{ (Partial product 4)} \\ \hline \quad ???? \text{ (Product)} \end{array}$$

9) Partial product 1
 0000
 1101

10) Partial product 2
 0000
 1101

11) Partial product 3
 0000
 1101

12) Partial product 4
 0000
 1101

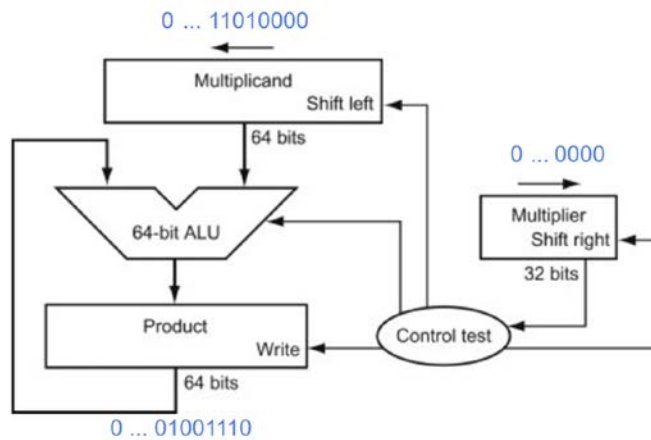
13) Product

- 11010
- 1001110

14) The largest product resulting from a multiplication of a 7-bit multiplicand and a 7-bit multiplier is _____ bits long.

- 14
- 35

For the first multiplication algorithm, as depicted the following diagram



15) Each step of the multiplication algorithm shifts the Multiplier register 1 bit to the _____.

- right
- left

16) The Multiplier register is _____-bits wide.

- 32
- 64

17) Each step of the multiplication algorithm shifts the Multiplicand register 1 bit to the _____.

- right
- left

18) The Multiplicand register is _____-bits wide.

- 32
- 64

19) The Product register is _____-bits wide.

- 32
- 64
- 128

20) Each iteration of the multiplication algorithm consists of _____ basic steps.

3

7

32