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Chapter 2 Participation 4

Due: Saturday, October 24, 2020, Midnight

This participation exercise should not take long to complete. I am giving you this assignment because you will see one of these on a quiz and/or the next exam.

Submission: Canvas. Please type your answers in red.

Based on the in-class example, you are to show the steps to multiply 15 \* 11, with 15 being the multiplicand and 11 being the multiplier. The **multiplicand** is also known as **M.** The **multiplier** is known as **Q**. The carry is represented by **C**. The accumulator register is represented by **ACC**.

Since this is a 4 bit by 4-bit multiplication this process will take place across 4 steps.

Step 0 Initialize the data M = 1111 C = 0 ACC = 0 Q = 1011

C ACC Q

STEP 1 0 0000 1011

+ 1111

lsb = 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

0 1111 1011

Check your answer here by converting the binary to decimal and then hexadecimal:

Shift >> 1

0 0111 1101

C ACC Q

STEP 2 0 0111 1101

1111

lsb = 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

0 0101 1101

Shift >> 1

0 0011 1110

C ACC Q

STEP 3 0 0011 1110

\_ \_ \_ \_

+ lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

0 \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

0 \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 4 0 \_ \_ \_ \_ \_ \_ \_ \_

\_ \_ \_ \_

+ lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

0 \_ \_ \_ \_ \_ \_ \_ \_

Now that you have completed the 4 bit number, try doing one with 8 bits x 8 bits (31 \* 22 with 32 being the multiplicand and 22 being the multiplier). Each are 8 bit numbers so the result will need to be 16 bits long and there will be 8 steps not 4.

Step 0 Initialize the data M = \_ \_ \_ \_ \_ \_ \_ \_ C = \_ ACC = \_ \_ \_ \_ \_ \_ \_ \_

Q = \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 1 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 2 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 3 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 4 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 5 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 6 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 7 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

C ACC Q

STEP 8 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

+ \_ \_ \_ \_ \_ \_ \_ \_

lsb = \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Shift >> 1

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Check your answer here by converting the binary to decimal and then hexadecimal: