C Math Worksheet

1. Divide the integer x by 4 without using “/” (the divide operator).

2. Determine the result of h/j if h = 20 and j = 7, assuming both h and j are integers.

3. Determine the result of p%q if p = 20 and q = 7, assuming both p and q are integers.

4. Determine results for:

```
     y = 0xf0 & 0x17;
     z = 0xf0 & 0x31;
     a = 0x3f & 0x81;
```

5. Determine results for:

```
     x = 0xf0 | 0x17;
     b = 0x3f | 0x81;
```

6. Determine results for:

```
     m = 0x11 ^ 0x0f;
     n = 0xfe ^ 0x10;
```

7. Given the unsigned chars d and e, what is the result of e given the following code?

```
d = 100;
d++;
e = d + 155;
```

8. Given integers j = 4, k = 5 and i = 0, determine the results of:

```
j && k
j && i
j || k
j || i
```

9. Explain && vs. & and || vs. |

C Math Worksheet Answers

1. Divide the integer x by 4 without using "/" (the divide operator).

```
x >> 2;    /* right shift twice */
```

2. Determine the result of h/j if h = 20 and j = 7, assuming both h and j are integers.

There is no remainder in integer division, so the answer is 2.

3. Determine the result of p%q if p = 20 and q = 7, assuming both p and q are integers.

% is the modulo operator which yields the remainder, or 6.

4. Determine results for:

Turn these into binary, AND them, and finally convert back to hex. to convert, just turn each hex digit into a nybble (4 bits).

```
      y = 0xf0 & 0x17;
      y = 11110000 & 00010111 = 00010000 = 0x10

      z = 0xf0 & 0x31;
      z = 11110000 & 00110001 = 00110000 = 0x30

      a = 0x3f & 0x81;
      a = 00111111 & 10000001 = 00000001 = 0x01
```

5. Determine results for:

Follow problem 4, but OR instead of AND.

```
      x = 0xf0 | 0x17;
      x = 11110000 | 00010111 = 11110111 = 0xf7

      b = 0x3f | 0x81;
      b = 00111111 | 10000001 = 10111111 = 0xbf
```

6. Determine results for:

Follow problem 4, but XOR instead of AND.

```
      m = 0x11 ^ 0x0f;
      m = 00010001 ^ 00001111 = 00011110 = 0x1e

      n = 0xfe ^ 0x10;
      n = 11111110 ^ 00010000 = 11101110 = 0xee
```

7. Given the unsigned chars d and e, what is the result of e given the following code?

```
d = 100;        /* sets d to 100 */
d++;            /* increments d, so d is 101 now */
e = d + 155;    /* add 101 to 155 */
```

The answer is 0, not 256. The reason is because an unsigned char is only 8 bits in length and only ranges from 0 through 255. The bit pattern for 256 is 100000000 (a 1 followed by 8 0's). Thus, the high ninth bit is ignored, leaving all 0's. This is important to remember! This is not some arcane academic trick question, but one that bites many a programmer in the real world (pun intended).

8. Given integers j = 4, k = 3 and i = 0, determine the results of:

These are the logical operators. The results are either TRUE (non-zero) or FALSE (zero).

```
j && k something and something is TRUE
j && i something and nothing is FALSE
j || k something or something is TRUE
j || i something or nothing is TRUE
```

9. Explain && vs. & and || vs. |

The single versions (& and |) are the bitwise AND and OR operators, respectively. The operations are followed bit by bit as shown in problems 4 and 5 above. The double versions (&& and ||) are the logical AND and OR operators. These do not work on individual bits, but rather on the variables as a whole as seen in problem 8. The logical and bitwise operators are not interchangeable. For example, in problem 8 j&&k yields TRUE (non zero), but j&k would yield 0 (FALSE).