8th Grade Assignment – Week #4

Individual Work:

- **Number Bases – Practice Sheet #5**: Do only Problems #6, 7
- **Number Bases – Practice Sheet #6**: Get as far as you can. Special bonus if anyone can do problem #16
- **Number Bases Test.** Things to keep in mind regarding the test:
  - The test is included with next week's assignment.
  - Prepare for the test by reviewing what we have done in this unit.
  - Calculators are not permitted when taking the test, but the **tables** (for number base multiplication) at the back of the workbook are permitted. (These tables were also included on the assignment page.)

Group Assignment for Tuesday and Thursday

- **Number Bases – Group Sheet #5:** Problems: #25, 27, 28, 29, 30
- **Number Bases – Group Sheet #7**: Problems: #1e, 2
- **Number Bases – Practice Sheet #7**: Problem #3

Important Notes:

- For our upcoming geometry work (starting in week #6), you will need the following materials: Clay (10 lbs or 4 kg), compass, scissors, glue (e.g., Elmer's), toothpick, pin, colored pencils.
- You also need good paper for making paper models. I find the best is "80-pound cover paper" which you should be able to find in an office supply store. Alternatively, you can use standard manila file folders. It is nice, if possible, to get around 5 sheets that are 23 by 35 inches.

Number Bases – Group Sheet #5

Divisibility Rules.

For each problem, try to determine what the divisibility rule is. You should look at the times tables. Skip the harder ones and come back to them later.

1) Octal, divisible by 8. (i.e., How can you tell if an octal number is evenly divisible by 8?)

2) Octal, divisible by 4.

3) Octal, divisible by 2.

4) Octal, divisible by 7.

5) Octal, divisible by 64.

6) Base-five, divisible by 5.

7) Base-five, divisible by 4.

8) Base-five, divisible by 2.

9) Base-five, divisible by 25.

10) Binary, divisible by 2.

11) Binary, divisible by 4.

12) Binary, divisible by 8.

13) Hex, ÷ by 16.

14) Hex, ÷ by 8.

15) Hex, ÷ by 4.

16) Hex, ÷ by 2.

17) Hex, ÷ by 15.

18) Hex, ÷ by 3.

19) Hex, ÷ by 5.

Arithmetic.

20) $17_{dec} + 12_{dec} = 29_{dec}$

Consider the above problem. Rewrite it in the following base.

a) octal.

b) base-five.

c) hexadecimal.

d) binary.

21) $456_{oct} + 67_{oct}$

22) $456_{oct} - 67_{oct}$

23) $456_{oct} \times 67_{oct}$

24) $413_{five} + 34_{five}$

25) $432_{five} - 24_{five}$

26) $33_{five} \times 42_{five}$

27) $456_{hex} + 67_{hex}$

28) $E5C_{hex} - A7_{hex}$

29) $A6_{hex} \times 37_{hex}$

30) $10011_{bin} + 10111_{bin}$

31) Rewrite the above problem in decimal.

32) $11010_{bin} - 10011_{bin}$

33) $10011_{bin} \times 1011_{bin}$

Math Tricks!

34) $65_{dec} \cdot 11_{dec} =$

35) $65_{oct} \cdot 11_{oct} =$

36) $65_{hex} \cdot 11_{hex} =$

37) $31_{five} \cdot 11_{five} =$

38) $43_{five} \cdot 11_{five} =$

Number Bases – Practice Sheet #5

1) Convert to decimal.

a) 507_{oct}

b) 10035_{oct}

c) 20443_{five}

d) AA_{hex}

e) $20B7_{hex}$

f) 101_{bin}

g) 1101_{bin}

h) 110100111_{bin}

2) Convert to octal.

a) 72_{dec}

b) 235_{dec}

3) Convert to base-five.

a) 44_{dec}

b) 313_{dec}

4) Convert to hex.

a) 28_{dec}

b) 163_{dec}

c) 65570_{dec}

5) Convert to binary.

a) 7_{dec}

b) 19_{dec}

c) 32_{dec}

d) 67_{dec}

e) 153_{dec}

6) Write down the three numbers that follow each given number.

a) 775_{oct}

b) 3243_{five}

c) 998_{hex}

d) $4FFD_{hex}$

e) 101_{bin}

f) 10110_{bin}

7) *Count backwards!* Write down the three numbers that precede each given number.

a) 7401_{oct}

b) 1000_{five}

c) $9A1_{hex}$

d) $B400_{hex}$

e) 101_{bin}

f) 11101_{bin}

8) *Challenge!*

The *place value table* (see earlier Group Sheet) is completely written in decimal. Rewrite it so that each row is written in its own base.

Number Bases – Practice Sheet #6

1) Convert to decimal.

a) 4032_{oct}

b) 4032_{hex}

c) 4032_{five}

d) 11011001_{bin}

2) Convert 229_{dec} into…

a) Octal.

b) Hexadecimal.

c) Base-five.

d) Binary.

3) $5637_{oct} + 4136_{oct}$

4) $5072_{oct} - 674_{oct}$

5) $526_{oct} \times 45_{oct}$

6) $33333_{five} + 44444_{five}$

7) $3333_{five} - 444_{five}$

8) $33_{five} \times 44_{five}$

9) $AAAA_{hex} + CCCC_{hex}$

10) $EB9_{hex} - 2A_{hex}$

11) $CD_{hex} \times 78_{hex}$

12) $10101_{bin} + 10111_{bin}$

13) $10110_{bin} - 1011_{bin}$

14) $11001_{bin} \times 101_{bin}$

15) *Challenge!*
$13632_{oct} \div 23_{oct}$

16) *Challenge!*
$DD25_{hex} \div A7_{hex}$

Number Bases – Group Sheet #7

1) Translate each string of ASCII code into characters using your ASCII table (at the back of this book).
Example: 01001011
Solution: The first four bits are 0100, which is 4 in hex, and the next four bits are 1011, which is B in hex. So we look up 4B from the ASCII table and get K.

a) 01011101

b) 01110000

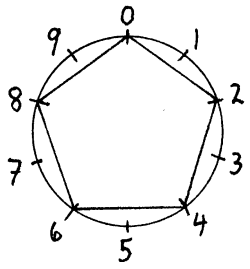
c) 00111000

d) 00100000

e) 01001001, 01110011, 00100000, 01110100, 01101000, 01101001, 01110011, 00100000, 01100110, 01110101, 01101110, 00111111.

2) Write the binary ASCII code for "Nancy".

3) If we look at the 2's times table (in decimal) we have 2,4,6,8,10,12,14,16,etc. We can see that there is a pattern with the last digit and represent this geometrically as:



State what each table, below, looks like geometrically.

a) The 4's table in decimal.

b) The 6's table in decimal.

c) The 8's table in decimal.

d) The 2's table in octal.

e) The 4's table in octal.

f) The 6's table in octal.

g) The 2's table in hex.

h) The 4's table in hex.

i) The 6's table in hex.

j) The 8's table in hex.

k) The A's table in hex.

l) The C's table in hex.

m) The E's table in hex.

4) Math tricks! Use a times table, when helpful.

a) $67.32_{dec} \cdot 1000_{dec}$

b) $6C.A7_{hex} \cdot 1000_{hex}$

c) $120000_{dec} \div 30_{dec}$

d) $C0000_{hex} \div 30_{hex}$

e) $103_{dec} \cdot 105_{dec}$

f) $103_{oct} \cdot 105_{oct}$

g) $56_{dec} \cdot 11_{dec}$

h) $56_{oct} \cdot 11_{oct}$

i) $56_{hex} \cdot 11_{hex}$

j) $5004_{dec} - 4997_{dec}$

k) $5004_{hex} - 4FF7_{hex}$

l) $4_{dec} \cdot 99999_{dec}$

m) $4_{hex} \cdot FFFFF_{hex}$

n) $51_{dec} \cdot 49_{dec}$

o) $51_{oct} \cdot 47_{oct}$

p) $(61_{dec})^2$

q) $(61_{hex})^2$

r) $43_{dec} \cdot 47_{dec}$

s) $43_{hex} \cdot 4D_{hex}$

Number Bases – Practice Sheet #7

1) Translate each string of ASCII code into characters using your ASCII table (at the back of this book).

a) 01101101

b) 01001101

c) 00111101

2) Write the binary ASCII code for "Mr. Sims".

3) Translate the following ASCII code and then solve the resulting riddle.

01010111, 01101000, 01100001,
01110100, 00100000, 01100010,
01100001, 01110011, 01100101,
00100000, 01101001, 01110011,
00100000, 01110100, 01101000,
01101001, 01110011, 00111010,
00100000, 00110011, 00110100,
00101011, 00110100, 00110100,
00111101, 00110001, 00110000,
00110000, 00111111

4) 100 gigabytes of computer memory is about how many bytes?

5) Write each decimal number in scientific notation.

a) 67,300,000,000

b) 70,000

c) 0.00000832

6) Write each number in standard decimal form.

a) $6.03 \cdot 10^{4}$

b) $6.03 \cdot 10^{-3}$

c) $6.03 \cdot 10^{0}$

7) Write down the three numbers that follow each given number.

a) 75_{oct}

b) $9D_{hex}$

c) 444_{five}

d) 11101_{bin}

8) Convert 145_{dec} to…

a) Octal

b) Base-five

c) Hexadecimal

d) Binary

9) Convert to decimal.

a) 10723_{oct}

b) $1A05E_{hex}$

c) 24302_{five}

d) 100101011_{bin}

10) $4641_{oct} - 2675_{oct}$

11) $37_{oct} \times 62_{oct}$

12) $4234_{five} + 2142_{five}$

13) $32_{five} \times 43_{five}$

14) $569_{hex} - 28A_{hex}$

15) $2D6_{hex} \times 53_{hex}$

16) $110110_{bin} + 101111_{bin}$

17) $10110_{bin} \times 101_{bin}$