LISP Programming Worksheet
Created by Christopher Cooper and Sam Craig for the West Lafayette High School ACSL Club of 2014–2015

You may not need to know all of this material for the next contest! Problems 1 and 2 are representative of problems you may see on contest #2. Problems 3 through 5 are representative of problems you may see on contest #4.

Questions

Evaluate the following LISP code.

1.
```
(DIV 24 (SUB 2 5))
```

2.
```
(ADD (MULT 48 40)
     (SUB (SQUARE 9) 1)
     (MULT 3 5))
```

3.
```
(SETQ a 'hello)
(ATOM a)
```

4.
```
(SETQ b '((what) is a list "?"))
(CONS (CAR b) (CDR b))
(SETQ (CAR b) (CAR (CAR b)))
```

5.
```
(SET 'c '(21 22 23 50))
(SETQ (CDR (CDR c)) (CONS 33 NIL))
(REVERSE c)
```

Answers

1. `(DIV 24 -3)`
   `-8`

2. `(ADD (MULT 48 40) (SUB 81 1) (MULT 3 5))`
   `(ADD 1920 80 15)`
   `2015`

3. | | |
   |---|---|
   | `(SETQ a 'hello)` | Set variable `a` to symbol `hello`. |
   | `(ATOM a)` | Returns true, since `a` is not a list. |

4. $$\begin{array}{r} 21\text{A}7 \\ -\ 11\,0 \\ \hline 209\,7 \end{array}$$

5. $$\begin{array}{r} {\scriptstyle 1} \\ 10531 \\ +12414 \\ \hline 23145 \end{array}$$

6. $$\begin{array}{r} {\scriptstyle 1\,0} \\ -\,1\,11011 \\ \hline 1\,10100 \end{array}$$

7. $$3\text{C}0_{16} = 0011\ 1100\ 0000_2$$

$$340_8 = 011\ 100\ 000_2$$

$$\begin{array}{r} {\scriptstyle 1\ 11\ 1\ \ \ \ \ \ \ \ \ \ } \\ 1111000000 \\ +\quad 11100000 \\ \hline 10010100000 \end{array}$$

$$\begin{aligned} 10010100000_2 &= 100\ 1010\ 0000_2 \\ &= 4\text{A}0_{16} \end{aligned}$$

8.

$$\begin{aligned} 6\text{FAC}_{16} &= 0110\ 1111\ 1010\ 1100_2 \\ &= 01101\ 111\ 101\ 01100 \end{aligned}$$

so

$$\begin{aligned} \text{Field A} &= \text{D}_{16} \\ \textbf{Field B} &= 7_{16} \\ \text{Field C} &= 5_{16} \\ \text{Field D} &= \text{C}_{16} \end{aligned}$$