

Junior Division

Solutions

1. This program finds the largest factor of X, less than X, by counting counting down from X until it finds a factor. The loop ends when C changes from zero.

1. 10

$$2. \quad \overline{X}(X + \overline{Y}) + \overline{Y}(\overline{Y} + \overline{Z}) + \overline{Y} = \overline{X}X + \overline{X}\overline{Y} + \overline{Y}\overline{Y} + \overline{Y}\overline{Z} + \overline{Y} = \\ 0 + \overline{X}\overline{Y} + \overline{Y} + \overline{Y}\overline{Z} + \overline{Y} = \overline{X}\overline{Y} + \overline{Y} + \overline{Y}\overline{Z} = \overline{Y}(\overline{X} + 1 + \overline{Z}) = \overline{Y}$$

2. \overline{Y}

3. $\overline{A} + AB + A\overline{B} = \overline{A} + A(B + \overline{B}) = \overline{A} + A = 1$. The 1 denotes that the expression is always TRUE. All 4 possible inputs must be listed.

3. (1,1), (1,0), (0,1),
(0,0)

4. Working from the inside out:
RSHIFT-1 10100 = 01010
LCIRC-2 01010 = 01001
LSHIFT-2 01001 = 00100

4. 00100

5. Let X=abcde. The equation becomes 00110 OR abcde = 10110.
Consider the equation bit by bit.
0 OR a = 1 implies a = 1
0 OR b = 0 implies b = 0
1 OR c = 1 implies c can be either a 1 or a 0
1 OR d = 1 implies c can be either a 1 or a 0
0 OR e = 0 implies e = 0
(1, 0, *, *, 0) gives 4 possible solutions

5. 4