American Computer Science League

2018-2019 **Contest #2**

INTERMEDIATE DIVISION

1. Pre/Post/Infix Notation Evaluate this prefix expression where the numbers are single digits: + − / + 2 4 3 / − 9 1 2 / / * 8 3 * 6 2 ↑ 1 − 4 1	**1.**
2. Pre/Post/Infix Notation Convert this infix expression to postfix. $\frac{A(B+C)}{2} - \frac{3A+4}{A-C}$	**2.**
3. Bit-String Flicking Evaluate the following: (RCIRC-2 (LSHIFT-1 (LCIRC-1 (RSHIFT-2 (NOT 10100)))))	**3.**
4. Bit-String Flicking Solve for X (5-bit string): (LCIRC-2 X) OR (RSHIFT-2 01010) = (NOT 00000) AND X	**4.**
5. LISP Evaluate the following expression: (ADD (SUB 4 1) (EXP 2 4) (MULT 3 5) (MULT (EXP 3 2) (SUB 2 4)))	**5.**

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INTERMEDIATE DIVISION SOLUTIONS

1. Pre/Post/Infix Notation

+ − / + 2 4 3 / − 9 1 2 / / * 8 3 * 6 2 ↑ 1 − 4 1
= + − / (+ 2 4) 3 / (− 9 1) 2 / / (* 8 3) (* 6 2) ↑ 1 (− 4 1)
= + − (/ 6 3) (/ 8 2) / (/ 24 12) (↑ 1 3)
= + (− 2 4) (/ 2 1) = + −2 2 = 0

1. 0

2. Pre/Post/Infix Notation:

$\frac{A(B+C)}{2} - \frac{3A+4}{A-C}$ = ((A * (B + C)) / 2 − (3 * A + 4) / (A − C)
= (A * (B C +)) / 2 − (3 A * 4 +) / (A C −)
= (A B C + *) / 2 − (3 A * 4 + A C − /)
= (A B C + * 2 /) − (3 A * 4 + A C − /)
= A B C + * 2 / 3 A * 4 + A C − / −

2. As shown

3. Bit-String Flicking

(RCIRC-2 (LSHIFT-1 (LCIRC-1 (RSHIFT-2 (NOT 10100)))))
= (RCIRC-2 (LSHIFT-1 (LCIRC-1 (RSHIFT-2 01011))))
= (RCIRC-2 (LSHIFT-1 (LCIRC-1 00010)))
= (RCIRC-2 (LSHIFT-1 00100))
= (RCIRC-2 01000)
= 00010

3. 00010

4. Bit-String Flicking

Let X = abcde
LHS = (LCIRC-2 abcde) OR (RSHIFT-2 01010)
= cdeab OR 00010 = cde1b
RHS = (NOT 00000) AND abcde
= 11111 AND abcde = abcde
LHS = RHS → cde1b = abcde
→ c = a, d = b, e = c, 1 = d, b = e
→ a = b = c = d = e = 1
→ 11111

4. 11111

INTERMEDIATE DIVISION SOLUTIONS

5. LISP

(ADD (SUB 4 1) (EXP 2 4) (MULT 3 5) (MULT (EXP 3 2) (SUB 2 4)))
= (ADD 3 16 15 (MULT 9 -2))
= (ADD 3 16 15 -18)
= 16

5. 16