ACSL

American Computer Science League

INTERMEDIATE DIVISION

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1. Computer Number Systems

Convert 2019_{10} to octal. Write the octal digits in ascending order. Convert this new octal to hex.

1.

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2. Computer Number Systems

Which of the following has the fewest number of 1's in its binary representation?

a) 4765_8 b) ABE_{16} c) 8271_{10} d) 1011111011_2

2.

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3. Recursive Functions

Find $f(f(f(f(-5))))$ given:

$$f(x)= \begin{cases} f(x + 3) - 2 & \text{if } x < 4 \\ f(2x - 1) + 1 & \text{if } 4 <= x <= 6 \\ x - 4 & \text{if } x > 6 \end{cases}$$

3.

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4. Recursive Functions

Given: $f(1) = 3$
     $f(2) = 5$
     $f(n) = 3 * f(n - 1) - f(n - 2)$
Find the smallest value of n such that $f(n) > 200$.

4.

5. What Does This Program Do?   5.

What is outputted when this program is executed?

```
a = 20: b = 4: c = 10: d = 2
if a < b then
    e = b - a
else
    f = a + b
end if
if b + c < a * a then
    b = b + c
else
    d = 2 * c
end if
if c > b && a < d then
    f = b + e
else
    e = f - c
end if
if a + d < b - c || f < d + c then
    a = e
else
    b = f
end if
if a * a < e * e || f > d then
    b = d * d
else
    d = a * a
end if
if b - a  > d - a then
    a = b
else
    b = f
end if
x =  (f / (a + d) - f / (b * d) + (e + d)/(a * b))^((f - e)/d)
print x
end
```