



American Computer Science League

2019-2020

Contest #1

INTERMEDIATE DIVISION

个人考号/Exam Code: _____ 姓名/Name: _____ 学校/School: _____

1. Computer Number Systems

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

1.

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.

3. Recursive Functions

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

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

3.

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.



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5. What Does This Program Do?

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
```

5.



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1. Computer Number Systems

将 2019_{10} 转化成八进制，将这个八进制数字按照升序重新排列后再转换成十六进制。

1.

2. Computer Number Systems

下列哪个数字转化成二进制后1的数量最少？

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

2.

3. Recursive Functions

求 $f(f(f(f(-5))))$ ，已知：

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

3.

4. Recursive Functions

已知：
 $f(1) = 3$
 $f(2) = 5$
 $f(n) = 3 * f(n-1) - f(n-2)$
求n的最小值，使得 $f(n) > 200$.

4.



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5. What Does This Program Do?

执行下列程序后，输出值是多少？

```
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
```

5.