



## American Computer Science League

2019-2020

Contest #1

### JUNIOR DIVISION

#### 1. Computer Number Systems

Convert the date of this year's All-Star Contest: 5/23/2020 to hex. Write in the form: M/DD/YYYY

1.

#### 2. Computer Number Systems

Which number has the most 2's when converted to octal?

$508_{16}$     $88A_{16}$     $195_{16}$     $348A_{16}$     $1050_{16}$

2.

#### 3. Recursive Functions

Find  $f(90)$  given:

$$f(x) = \begin{cases} 2 * f(x/3) - 1 & \text{if } x \text{ is a multiple of 3 and odd} \\ -1 * f(x/2) + 2 & \text{if } x \text{ is even} \\ x + 4 & \text{otherwise} \end{cases}$$

3.

#### 4. Recursive Functions

Find  $f(f(f(6)))$  given:

$$f(x) = \begin{cases} 2 * f(x-3) - 1 & \text{if } x > 10 \\ f(x-2) + 3 & \text{if } 2 \leq x \leq 10 \\ 3^x * x^3 & \text{if } x < 2 \end{cases}$$

4.



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#### 5. What Does This Program Do? - Branching

What is outputted when this program is executed?

```
a = 12 : b = 6 : c = 3 : d = 2
if a == b * d then
    e = a / b
end if
if b - d == a / c then
    e = e + a / c
end if
e = a / c - e
if b / c == a / e then
    a = 2 * d
else
    a = 2 * e
end if
if (a < b) || (c < d) then
    a = a + b
else
    c = c + d
end if
if (a < d) && (b + c > c * c) then
    d = a + c
else
    c = d - b
end if
x = b / a + c * e / (d + b) - (b + d) / a * a
print x
end
```

5.