

# American Computer Science League

2020-2021 • Contest 1: Shorts • Senior Division

## 1. Computer Number Systems

How many 6's are there in the octal representation of the decimal numbers from 675 to 700, inclusive?

- A. 9
- B. 10
- C. 11
- D. 12
- E. 13

## 2. Computer Number Systems

Evaluate and express in base 16 if both numbers are hexadecimal.

$$13 * 74F$$

- A.  $8BDD_{16}$
- B.  $8ADD_{16}$
- C.  $7BDE_{16}$
- D.  $8AEC_{16}$
- E.  $8ACD_{16}$

## 3. Recursive Functions

Find  $f(24)$ , given:

$$f(x) = \begin{cases} x + f(x - 5) & \text{if } x \geq 10 \\ f(x + 3) - 4 & \text{if } 5 < x < 10 \\ 2x - 1 & \text{if } x \leq 5 \end{cases}$$

- A. 9
- B. 49
- C. 56
- D. 76
- E. 80

## 4. Recursive Functions

Find  $f(3, 18)$ , given:

$$f(x, y) = \begin{cases} f(x - 2, y + 3) + 3 & \text{if } x > y \\ f(y - 1, x + 1) - 5 & \text{if } x < y \\ xy & \text{if } x = y \end{cases}$$

- A. 139
- B. 142
- C. 143
- D. 144
- E. 148

---

### 5. What Does This Program Do?

When this program is executed, what is the largest value of any variable?

```
a = 16; b = 4 : d = 12
c = a / b
if a / c > d / b then
    if a < 15 then
        d = b + c
    else
        c = a + b
    end if
else
    if b > 3 then
        a = a + d / b
    end if
end if
if c > a then
    t = a
    a = c
    c = t
end if
if a > b + c || a > d && a > b then
    d = d + (a - c) ^ 2
else
    a = a + b * d
end if
```

- A. 28
- B. 20
- C. 16
- D. 12
- E. 8



# American Computer Science League

2020-2021 • Contest 1: Shorts • Senior Division

## 1. Computer Number Systems

把十进制数 675 到 700（包含 675 和 700）用八进制表示，共会出现多少个数字 6？

- A. 9
- B. 10
- C. 11
- D. 12
- E. 13

## 2. Computer Number Systems

已知下方两个数字均为十六进制，计算并用十六进制表示结果。

$$13 * 74F$$

- A.  $8BDD_{16}$
- B.  $8ADD_{16}$
- C.  $7BDE_{16}$
- D.  $8AEC_{16}$
- E.  $8ACD_{16}$

## 3. Recursive Functions

根据以下条件，求  $f(24)$ ：

$$f(x) = \begin{cases} x + f(x - 5) & \text{当 } x \geq 10 \text{ 时} \\ f(x + 3) - 4 & \text{当 } 5 < x < 10 \text{ 时} \\ 2x - 1 & \text{当 } x \leq 5 \text{ 时} \end{cases}$$

- A. 9
- B. 49
- C. 56
- D. 76
- E. 80

## 4. Recursive Functions

根据以下条件，求  $f(3, 18)$ ：

$$f(x, y) = \begin{cases} f(x - 2, y + 3) + 3 & \text{当 } x > y \text{ 时} \\ f(y - 1, x + 1) - 5 & \text{当 } x < y \text{ 时} \\ xy & \text{当 } x = y \text{ 时} \end{cases}$$

- A. 139
- B. 142
- C. 143
- D. 144
- E. 148

### 5. What Does This Program Do?

执行以下程序后，在变量 a, b, c, d 中，最大的变量值是多少？

a = 16; b = 4 : d = 12

c = a / b

if a / c > d / b then

    if a < 15 then

        d = b + c

    else

        c = a + b

    end if

else

    if b > 3 then

        a = a + d / b

    end if

end if

if c > a then

    t = a

    a = c

    c = t

end if

if a > b + c || a > d && a > b then

    d = d + (a - c) ^ 2

else

    a = a + b \* d

end if

A. 28

B. 20

C. 16

D. 12

E. 8