Started on	Saturday, 24 September 2022, 4:16 PM
State	Finished
Completed on	Saturday, 24 September 2022, 4:17 PM
Time taken	1 min 19 secs
Marks	0.00/25.00
Grade	**0.00** out of 10.00 (**0%**)

Question **1**

Not answered

Marked out of 1.00

Find the "best" big-oh notation to describe the complexity of the algorithm.

An algorithm that prints all bit strings of length *n*.

- a. $O(2^n)$
- b. $O(n!)$
- c. None of these
- d. $O(n^2)$
- e. $O(n^n)$

Your answer is incorrect.

The correct answer is:
$O(2^n)$

Question **2**

Not answered

Marked out of 1.00

Given the Euclidean algorithm.

ALGORITHM 1 The Euclidean Algorithm.

procedure $gcd(a, b$: positive integers)
$x := a$
$y := b$
while $y \neq 0$
$\quad r := x \textbf{ mod } y$
$\quad x := y$
$\quad y := r$
return $x\{gcd(a, b)$ is $x\}$

Use the Euclidean algorithm to find gcd(-27, 12).

How many divisions are required?

- a. 4
- b. None of these
- c. 5
- d. 2
- e. 3

Your answer is incorrect.

The correct answer is:
3

Question **3**

Not answered

Marked out of 1.00

Encrypt the message NEED HELP using the function f(p) = (p + 7) mod 26

- ○ a. None of these
- ○ b. UKKL OLSW
- ○ c. ULKK OLSW
- ○ d. ULLK OLSV
- ○ e. ULLK OLSW

Your answer is incorrect.

The correct answer is:
ULLK OLSW

Question **4**

Not answered

Marked out of 1.00

Given the Euclidean algorithm.

ALGORITHM 1 The Euclidean Algorithm.

procedure $gcd(a, b:$ positive integers$)$
$x := a$
$y := b$
while $y \neq 0$
    $r := x \bmod y$
    $x := y$
    $y := r$
return $x\{gcd(a, b)$ is $x\}$

Use the Euclidean algorithm to find gcd(-28, 8).

How many **divisions** are required?

- a. None of these
- b. 4
- c. 5
- d. 3
- e. 2

Your answer is incorrect.

$$x \swarrow \qquad \swarrow y$$

$$\begin{array}{c|c} -28 & 8 \\ \hline r = \boxed{4} & -4 \end{array}$$

$$x := y \swarrow \qquad \swarrow y := r$$

$$\begin{array}{c|c} 8 & 4 \\ \hline r = \boxed{0} & 2 \end{array}$$

The correct answer is:
2

Question **5**

Not answered

Marked out of 1.00

Encrypt the message BUY using the function f(p) = (p + 14) mod 26

- ○ a. PIM
- ○ b. PJN
- ○ c. None of these
- ○ d. PHM
- ○ e. PIN

Your answer is incorrect.

The correct answer is:
PIM

Question **6**

Not answered

Marked out of 1.00

Determine whether the integers in the set {21, 34, 55} are pairwise relatively prime.

(That is, we need each pair of (21, 34), (34, 55), (21, 55) to be relatively prime)

- a. No, because $gcd(34, 55) \neq 1$
- b. No, because $gcd(21, 55) \neq 1$
- c. No, because $gcd(21, 34) \neq 1$
- d. Yes

Your answer is incorrect.

The correct answer is:
Yes

Question **7**

Not answered

Marked out of 1.00

Give the best big-oh estimate for the function

f(n) = 1 + 2 + 3 + ... + n

- a. None of these
- b. $O(n^3)$
- c. $O(n^4)$
- d. $O(n^2)$
- e. $O(n)$
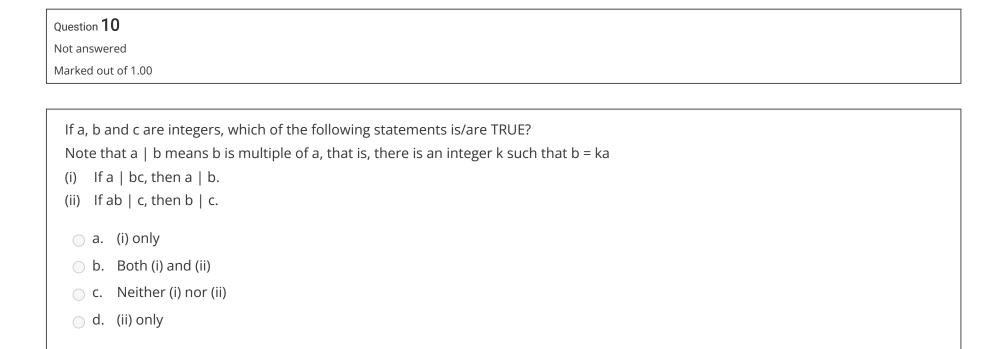
Your answer is incorrect.

$1 + 2 + 3 + ... + n = n(n + 1)/2 = O(n^2)$

The correct answer is:
$O(n^2)$

Question **8**

Not answered

Marked out of 1.00

A message has been encrypted to be LMV using the encryption function f(p) = (p + 8) mod 26.

Decrypt the message.

- ○ a.   END
- ○ b.   DEN
- ○ c.   None of these
- ○ d.   DEM
- ○ e.   DIE

Your answer is incorrect.

The correct answer is:
DEN

Question **9**

Not answered

Marked out of 1.00

Find the sum

$(112)_3$

+

$(210)_3$

Express your answers as a base 3 expansion.

- ○ a. $(322)_3$
- ○ b. $(1022)_3$
- ○ c. None of these
- ○ d. $(122)_3$
- ○ e. $(2022)_3$

Your answer is incorrect.

The correct answer is:
$(1022)_3$

Question **10**

Not answered

Marked out of 1.00

If a, b and c are integers, which of the following statements is/are TRUE?

Note that a | b means b is multiple of a, that is, there is an integer k such that b = ka

(i)   If a | bc, then a | b.

(ii) If ab | c, then b | c.

- a. (i) only
- b. Both (i) and (ii)
- c. Neither (i) nor (ii)
- d. (ii) only

The correct answer is: (ii) only

Question **11**

Not answered

Marked out of 1.00

A sequence of pseudorandom numbers is generated using the pure multiplicative generator $x_{n+1} = 3x_n \bmod 11$ with seed x_0
Given $x_2 = 7$, find x_1 and x_3.

○ a.   None of these

○ b.   10, 2

○ c.   6, 10

○ d.   2, 6

○ e.   7, 10

Your answer is incorrect.

The correct answer is:
6, 10

Question **12**

Not answered

Marked out of 1.00

Decide whether each of these integers is congruent to -15 modulo 9.

a) 15

b) -39

○ a. Yes, No

○ b. Yes, Yes

○ c. No, Yes

○ d. No, No

Your answer is incorrect.

The correct answer is:
No, No

Question **13**

Not answered

Marked out of 1.00

Which of the following integers are relatively prime to 15?

- ○ a. 3, 5
- ○ b. 2, 7
- ○ c. 5, 7
- ○ d. 2, 3
- ○ e. None of the others

Your answer is incorrect.

The correct answer is:
2, 7

Question **14**

Not answered

Marked out of 1.00

Find

$(64 \bmod 33)^{73} \bmod 15$

○ a.   1

○ b.   3

○ c.   5

○ d.   None of these

○ e.   13

Your answer is incorrect.

The correct answer is:
1

Question **15**

Not answered

Marked out of 1.00

Suppose $\varphi(n)$ counts the number of integers x such that $0 < x \leq n$ and gcd(x, n) = 1 (x is relatively prime to n)

Find $\varphi(4)$, $\varphi(5)$.

- a. 3, 4
- b. None of these
- c. 2, 4
- d. 2, 3
- e. 1, 4

Your answer is incorrect.

The correct answer is:
2, 4

Question **16**

Not answered

Marked out of 1.00

Find

2^{103} mod 15

- a. 1
- b. 4
- c. 2
- d. 8
- e. None of these

Your answer is incorrect.

The correct answer is:
8

Question **17**

Not answered

Marked out of 1.00

A message has been encrypted to be BXC using the encryption function $f(p) = (p + 15) \bmod 26$.

Decrypt the message.

- a.   MOM
- b.   MEN
- c.   MIN
- d.   None of these
- e.   MAI

Your answer is incorrect.

The correct answer is:
MIN

Question **18**

Not answered

Marked out of 1.00

Given that $x^k(\log x + 13)$ is $O(x^3)$.

Find the largest value of the integer k.

- a.   3
- b.   0
- c.   None of these
- d.   2
- e.   1

Your answer is incorrect.

The correct answer is:
2

Question **19**

Not answered

Marked out of 1.00

Find the least integer k such that f(x) is $O(x^k)$

if f(x) = $100x^2 + x^2\log x$

- a. 3
- b. 4
- c. 1
- d. 2

Your answer is incorrect.

The correct answer is:
3

Question **20**

Not answered

Marked out of 1.00

Give as good a big-oh estimate as possible for $(n\log n + n)(n^2 + 1)$.

- a. $O(n^2\log n)$
- b. None of these
- c. $O(n^3)$
- d. $o(n^2)$
- e. $O(n^3\log n)$

Your answer is incorrect.

The correct answer is:
$O(n^3\log n)$

Question 21

Not answered

Marked out of 1.00

Decide whether each of these integers is congruent to 23 modulo 11.

a) -32

b) -66

- ○ a. No, No
- ○ b. Yes, Yes
- ○ c. No, Yes
- ○ d. Yes, No

Your answer is incorrect.

The correct answer is:
Yes, No

Question **22**

Not answered

Marked out of 1.00

Convert the integer 38 to a base 3 expansion.

○ a. 2011

○ b. None of these

○ c. 1120

○ d. 1201

○ e. 1102

Your answer is incorrect.

The correct answer is:
1102

Question **23**

Not answered

Marked out of 1.00

Determine whether each of these functions is $\Omega(x^2)$.

- a. $f(x) = 23x + 1$
- b. $f(x) = 7x^2 + 15x$
- c. $f(x) = x\log x + 7x$
- d. $f(x) = 2^{2021}$
- e. None of these

Your answer is incorrect.

The correct answer is:
$f(x) = 7x^2 + 15x$

Question **24**

Not answered

Marked out of 1.00

Given the bubble sort algorithm.

ALGORITHM 4 The Bubble Sort.

procedure *bubblesort*$(a_1, \ldots, a_n$: real numbers with $n \geq 2)$
for $i := 1$ **to** $n - 1$
    for $j := 1$ **to** $n - i$
        if $a_j > a_{j+1}$ **then** interchange a_j and a_{j+1}
$\{a_1, \ldots, a_n$ is in increasing order$\}$

Use the bubble sort to sort 6, 2, 3, 1, 5.

Showing the lists obtained after the first pass (i = 1).

- a. 2, 3, 1, 5, 6
- b. 2, 3, 1, 6, 5
- c. 2, 1, 3, 5, 6
- d. None of these
- e. 1, 2, 3, 5, 6

Your answer is incorrect.

The correct answer is:
2, 3, 1, 5, 6

Question **25**

Not answered

Marked out of 1.00

Find a + b if

a = -37 mod 7

and b = 37 mod 7

- a. 10
- b. 7
- c. 0
- d. -1
- e. None of these

Your answer is incorrect.

The correct answer is:
7