Started on	Thursday, 19 October 2023, 7:14 AM
State	Finished
Completed on	Thursday, 19 October 2023, 7:44 AM
Time taken	30 mins
Marks	14.00/15.00
Grade	**9.33** out of 10.00 (**93**%)
Feedback	Congratulations on your performance!

Question **1**

Complete

Mark 1.00 out of 1.00

How many one-to-one functions from a set of 2 elements to a set of 5 elements?

Answer: 20

Question **2**

Complete

Mark 1.00 out of 1.00

How many positive integers not exceeding 100 and are divisible by neither 6 nor 9?

Select one:

- a. 88
- b. 78
- c. None of the other choice is correct.
- d. 68
- e. 58

Question **3**

Complete

Mark 1.00 out of 1.00

Suppose gcd(m, n) = $7^3\ 11^{12}$ and lcm(m, n) = $2^4\ 7^5\ 11^{13}\ 13^4$. Choose correct statements:

(i) m=$7^5\ 11^{12}13^4$ and n = $2^4\ 7^3\ 11^{13}$

(ii) m=$2^4\ 7^5\ 11^{13}\ 13^2$ and n = $7^3\ 11^{12}\ 13^2$

Select one:

- a. None of the other choices is correct
- b. (i)
- c. Both (i), (ii).
- d. (ii)

Question **4**

Complete

Mark 1.00 out of 1.00

Find the output of:

Greedy Change-Making Algorithm

Input: 1068 cents

Output: The number of coins of each type: Quarters (25 cents), Dimes (10 cents), Nickles (5 cents), Pennies (1 cent)

Select one:

- a. 42 , 1 , 1 , 3
- b. 42 , 1 , 0 , 8
- c. None of the other choices is correct
- d. 41 , 4 , 0 , 3
- e. 43 , 0 , 1 , 2

Question **5**

Complete

Mark 1.00 out of 1.00

How many solutions are there to the equation

$$x_1 + x_2 + x_3 = 12,$$

where x_1, x_2, x_3 are nonnegative integers such that $x_2 \leq 3$ and $x_3 \leq 3$?

Select one:

- a. None of the other choices is correct
- b. 16
- c. 24
- d. 20
- e. 12

Question **6**

Complete

Mark 1.00 out of 1.00

Find a recursive definition for

$$S(n) = n^2 - 1,\ n = 1, 2, 3, \ldots$$

Select one:

- a. $S(1) = 0$; $S(n+1) = S(n) + 2n + 1$ for $n \geq 1$
- b. $S(1) = 0$; $S(n+1) = S(n) + n^2 + 2n + 1$ for $n \geq 1$
- c. None of the other choices is correct
- d. $S(1) = 0$; $S(n+1) = S(n) + n^2$ for $n \geq 1$
- e. $S(1) = 0$; $S(n+1) = S(n) + 2$ for $n \geq 1$

Question **7**

Complete

Mark 1.00 out of 1.00

How many divisions are needed when using Euclidean algorithm to find the greatest common divisor of $a = 846$ and $b = 238$?

Answer: 5

Question **8**

Complete

Mark 1.00 out of 1.00

procedure **XYZ**($a_1, \ldots, a_n$: integers)

$k := 0$

for $i := 1$ to n do

    if $a_i \mod 2 = 0$ then $k := k + a_i$

Find output value of k if input is $1, 2, 3, 7, 8, 6, 9, 12, 11$.

Select one:

- a. 28
- b. None of the other choices is correct
- c. 30
- d. 32
- e. 26

Question **9**

Complete

Mark 1.00 out of 1.00

$21, 34, 55$ are pairwise relatively prime.

Select one:

- True
- False

Question **10**

Complete

Mark 1.00 out of 1.00

Which of the following algorithms are recursive?

(i) procedure **XYZ**(n, P: integers)

$s := 0$;

for $j := 1$ to n

$s := s + j^2$;

return n

(ii) procedure **ABC**(n, P: integer)

if $n = 1$ then $ABC(1) := 1$;

else $ABC(n) := ABC(n-1) + n^2$;

Select one:

- a. None of them
- b. Both of them
- c. (i)
- d. (ii)

Question **11**

Complete

Mark 1.00 out of 1.00

Rearrange the steps in the correct order of a proof by induction of the proposition

$$1 + 3 + 5 + \cdots + (2n - 1) = n^2,$$

foe n positive integer.

Assume that the proposition is true for $n = k$. — Step 2

Then the proposition is also true for $n = k + 1$ since
$1 + 3 + 5 + \cdots + (2(k+1) - 1) = 1 + 3 + 5 + \cdots + (2k - 1) + (2k + 1) = k^2 + 2k + 1 = (k+1)^2$. — Step 3

The proposition is true for $n = 1$ since $1 = 1^2$. — Step 1

By induction, the proposition is true for all n positive integer. — Step 4

Question **12**

Complete

Mark 1.00 out of 1.00

Find the smallest integer n such that $f(x) = O(x^n)$.

2^x	Does not exist
$2x^3 \ln(x)$	4
$(x^3 - x^2 + x - 1)^3$	9

Question **13**

Complete

Mark 0.00 out of 1.00

A young pair of rabbits (one of each sex) is placed on an island. A pair of rabbits does not breed until they are 2 month old. After they are 2 month old they will produce 3 pairs of rabbits each month. Find the number of pairs of rabbits after 5 months.

Answer: 55

Question **14**

Complete

Mark 1.00 out of 1.00

How many bit strings of length seven either begin with two 0s or end with three 1s?

Select one:

- a. 44
- b. 48
- c. 52
- d. 40
- e. None of the other choices is correct

Question **15**

Complete

Mark 1.00 out of 1.00

Given

$$f(n) = 2.f(\sqrt{n})^2 + 1, f(2) = 1.$$

Find $f(16)$**.**

Answer: 19