Started on	Saturday, 24 September 2022, 8:45 AM
State	Finished
Completed on	Saturday, 24 September 2022, 9:10 AM
Time taken	24 mins 14 secs
Marks	12.00/18.00
Grade	**6.67** out of 10.00 (**67**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Find the sum 1 - 1/2 + 1/4 - 1/8 + 1/16 - 1/32 + ...

- a. 1
- b. 2/3 ✔
- c. 4/5
- d. None of the other choices is correct
- e. 3/4

Your answer is correct.

geometric progression with common ratio $r = -1/2$

$1, -1/2, 1/4, -1/8, 1/16, -1/32, \dots$

Use the formula:

$$S_n = a_1 + a_2 + a_3 + \dots + a_n = a_1 \cdot \frac{1 - r^n}{1 - r}$$

$$S_\infty = \lim_{n \to \infty} S_n = \lim_{n \to \infty} \left(a_1 \frac{1 - r^n}{1 - r} \right) = \frac{a_1}{1 - r}, \quad (\text{if } |r| < 1)$$

The correct answer is:

2/3

Question 2

Correct

Mark 1.00 out of 1.00

What are the values of these sums, where $S = \{1, 3, 5, 7\}$?

$$M = \sum_{j \in S} j \qquad N = \sum_{j \in S} 1$$

a. None of these

b. M = 16, N = 7

c. M = 16, N = 4

d. M = 16, N = 1

Your answer is correct.

The correct answer is:
M = 16, N = 4

Question 3

Incorrect

Mark 0.00 out of 1.00

Mark each statement TRUE or FALSE. Assume that the statement applies to all sets.

a) If A ∪ B = A ∪ C, then B = C

b) If A - B = A, then B is empty

a. True, True

b. True, False

c. False, False

d. False, True ✖

The correct answer is: False, False

Question **4**

Correct

Mark 1.00 out of 1.00

In the questions below assume that the universe for x is all people and the universe for y is the set of all movies. Write the English statement using the following predicates and any needed quantifiers:

$S(x, y)$: x saw y $L(x, y)$: x liked y

"No one liked every movie he/she has seen."

(i) $\exists x \exists y \, (S(x,y) \wedge \neg L(x,y))$

(ii) $\forall x \exists y \, (S(x,y) \wedge \neg L(x,y))$

(iii) $\exists x \exists y \, (S(x,y) \rightarrow \neg L(x,y))$

a. (i)

b. None of these

c. (iii)

d. (ii)

The correct answer is: (ii)

Question 5

Correct

Mark 1.00 out of 1.00

The proposition $p \rightarrow q$ is equivalent to _____.

(i) $q \rightarrow p$
(ii) $\neg p \rightarrow \neg q$
(iii) $\neg q \rightarrow \neg p$
(iv) $p \vee q$

a. (ii)
b. (iv)
c. (iii)
d. (i)

The correct answer is: (iii)

Question **6**

Correct

Mark 1.00 out of 1.00

Given $f(x)=3-x,\ g(x)=3x$. Then $(f\circ g)(x)=$ ___.

a. 3x(3-x)

b. None of these

c. 3 - 3x ✔

d. 9-3x

The correct answer is: 3 - 3x

Question 7

Correct

Mark 1.00 out of 1.00

Let $Q(x, y)$ be the statement "$2x - y = xy$", where the domain of x and y consists of all **integers**.
Which of the following statements is/are **true**?

(i) $Q(2, -1)$

(ii) $\forall y Q(2, y)$

- a. true, false
- b. true, true
- c. false, false ✔
- d. false, true

The correct answer is: false, false

Question 8

Incorrect

Mark 0.00 out of 1.00

Suppose the truth value of $p \vee q \vee r$ is false.
Find the truth values of $p \rightarrow q$ and $q \oplus r$.

- a. false, false
- b. false, true ✖
- c. true, true
- d. true, false

The correct answer is: true, false

Question 9

Correct

Mark 1.00 out of 1.00

The **power set** of the set {1, 3, 5} has ____ elements.

- a. 8
- b. 9
- c. 6
- d. 3

The correct answer is: 8

Question **10**

Correct

Mark 1.00 out of 1.00

Consider the sets Z = {..., -2, -1, 0, 1, 2, ...}, N = {0, 1, 2, ...} and the function

$$f:\mathbb{Z}\to\mathbb{N},$$

$$f(n)=\begin{cases}2n+1, & \text{if } n\geq 0\\ -2n, & \text{if } n<0\end{cases}$$

Which statement is true?

(i) f is **one-to-one**

(ii) f is **onto**

- a. Both
- b. Neither
- c. Only (i)
- d. Only (ii)

Your answer is correct.

(ii) No n such that f(n) = 0.

The correct answer is:
Only (i)

Question 11

Correct

Mark 1.00 out of 1.00

"proof" of $2 = 1$

(1) $a = b \neq 0$

(2) $ab = b^2$

(3) $ab - a^2 = b^2 - a^2$

(4) $a(b-a) = (b-a)(b+a)$

(5) $a = b + a$

(6) $a = 2a$

(7) $1 = 2$ (!)

Given a = b, which step is the first false statement?

a. (4)

b. (7)

c. (6)

d. (5)

The correct answer is: (5)

Question 12

Incorrect

Mark 0.00 out of 1.00

Find the **negation** of the statement “Bob knows Python or Java”.

a. Bob doesn’t know Python and Java.

b. Bob knows Python and Java.

c. Bob doesn’t know Python or Java. ✖

d. None of the others

The correct answer is: Bob doesn’t know Python and Java.

Question 13

Correct

Mark 1.00 out of 1.00

Rewrite $\sum_{i=-3}^{4}(i^2+1)$ so that the index of summation has lower limit 0.

Select one.

(i) $\sum_{i=0}^{7}(i-3)^2+1).$

(ii) $\sum_{i=0}^{6}\left(i^2+1\right)$

(iii) $\sum_{i=0}^{6}\left((i-3)^2+1\right)$

(iv) $\sum_{i=0}^{7}\left(i^2+1\right)$

a. (ii)

b. (i)

c. (iv)

d. (iii)

e. None of the other choices is correct

Your answer is correct.

The correct answer is:
(i)

Question **14**

Not answered

Marked out of 1.00

Suppose $g: A \to B$ and $f: B \to C$ where $A = B = C = \{1,2,3,4\}$, $g = \{(1,4),(2,1),(3,1),(4,2)\}$ and $f = \{(1,3),(2,2),(3,4),(4,2)\}$.

Find $f \circ g$.

a. {(1,2), (2,3), (3,3), (4,2)}

b. {(1,1), (2,1), (3,2), (4,1)}

c. {(1,1), (2,2), (3,3), (4,4)}

d. None of the other choices is correct

e. {(1,2), (2,4), (3,4), (4,1)}

Your answer is incorrect.

$(f \circ g)(1) = f(g(1)) = f(4) = 2 \Rightarrow (f \circ g)(1) = 2$ or $(1,2) \in f \circ g$

$1 \xrightarrow{g} 4 \xrightarrow{f} 2 \Rightarrow (1,2) \in f \circ g$

$2 \xrightarrow{g} 1 \xrightarrow{f} 3 \Rightarrow (2,3) \in f \circ g$

$3 \xrightarrow{g} 1 \xrightarrow{f} 3 \Rightarrow (3,3) \in f \circ g$

$4 \xrightarrow{g} 2 \xrightarrow{f} 2 \Rightarrow (4,2) \in f \circ g$

The correct answer is:
{(1,2), (2,3), (3,3), (4,2)}

Question **15**

Not answered

Marked out of 1.00

The set $\{1, 2\}\times\{3\}$ has ___ subsets.

a. 3

b. 2

c. 8

d. 4

The correct answer is: 4

Question 16

Correct

Mark 1.00 out of 1.00

Let *F*(*A*) be the predicate "*A* is a finite set" and *S*(*A*,*B*) be the predicate "*A* is contained in *B*".
Suppose the universe of discourse consists of all sets. Translate the statement into symbols.
"The empty set is a subset of every finite set."

Select one.

$(i)\ \forall \mathrm{B}\left(F(B) \rightarrow S(\varnothing, B)\right)$

$(ii)\ \forall \mathrm{B}\left(F(B) \wedge S(\varnothing, B)\right)$

$(iii)\ \forall \mathrm{B}\left(\varnothing \rightarrow S(\varnothing, B)\right)$

$(iv)\ \forall \mathrm{B} S\left(\varnothing, \mathrm{F}(B)\right)$

a. (iii)
b. (iv)
c. (ii)
d. None of the other choices is correct
e. (i)

Your answer is correct.

"The empty set is a subset of every finite set."

$\emptyset$ $S(\cdot,\cdot)$ $\forall B$ $F(B)$

$\forall B\,(F(B) \rightarrow S(\emptyset, B))$

The correct answer is:
(i)

Question 17

Incorrect

Mark 0.00 out of 1.00

Which rules are functions?

$$(i)\ f:\mathbb{R}\to\mathbb{Z};f(x)=\frac{1}{x^2+3}$$

$$(ii)\ f:\mathbb{R}\to\mathbb{R};f(x)=\frac{1}{x^2-3}$$

a. Both

b. (ii)

c. (i)

d. Neither

The correct answer is: Neither

Question 18

Correct

Mark 1.00 out of 1.00

Suppose $A = \{x, y\}$ and $B = \{x, \{x\}\}$.

Which one is true?

(i) $\{x\} \subseteq B - A$.

(ii) $x \in A \oplus B$

a. Both

b. Only (i)

c. Only (ii)

d. Neither ✔

Your answer is correct.

(i) $B - A = \{\{x\}\}$

and $x \notin \{\{x\}\}$

(ii) $A \oplus B = \{y, \{x\}\}$

and $x \notin \{y, \{x\}\}$

The correct answer is:
Neither