Part 1 of 10 - Section 1: Sets and Relations

Question 1 of 10

2.0 Points

Let set P = {a, b, {b}, {{a}, 3}}. Which one of the following is NOT a valid relation on P?

- ◯ **A.** {(b, {b})}
- ◯ **B.** {({a}, 3), (a, b), ({b}, {b})}
- ◯ **C.** {(a, a), (a, b), ({{a}, 3}, {b})}
- ◯ **D.** {({{a}, 3}, {{a}, 3})}

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2.0 Points

We want to prove that for all A, B, C $\subseteq$ U,

$$(A \cup C) - (C \cap B) = (A - C) \cup [(A - B) \cup (C - B)] \text{ is an identity.}$$

Consider the following incomplete proof:

$z \in (A \cup C) - (C \cap B)$

iff $(z \in A \text{ or } z \in C) \text{ and } (z \notin (C \cap B))$

iff $(z \in A \text{ or } z \in C) \text{ and } (z \notin C \text{ or } z \notin B)$

Step 4

iff $[(z \in A \text{ or } z \in C) \text{ and } (z \in C')] \text{ or } [(z \in A \text{ or } z \in C) \text{ and } (z \in B')]$

Step 6

iff $[(z \in A \text{ and } z \in C')] \text{ or } [(z \in A \text{ and } z \in B') \text{ or } (z \in C \text{ and } z \in B')]$

iff $[(z \in A - C)] \text{ or } [(z \in (A - B) \text{ or } (z \in C - B)]$

iff $z \in (A - C) \cup [(A - B) \cup (C - B)]$

Which one of the following alternatives contain the correct Step 4 and Step 6 to complete the proof correctly?

- A. **Step 4**: iff $(z \in A \text{ or } z \in C) \text{ and } (z \in C' \text{ or } z \in B')$
  Step 6: iff $[(z \in A \text{ and } z \in C') \text{ or } (z \in C \text{ and } z \in C')] \text{ or }$
  $[(z \in A \text{ and } z \in B') \text{ or } (z \in C \text{ and } z \in B')]$

- B. **Step 4**: iff $(z \in A \text{ or } z \in C) \text{ and } (z \in C' \text{ and } z \in B')$
  Step 6: iff $[(z \in A \text{ or } z \in C') \text{ and } (z \in C \text{ or } z \in C')] \text{ and }$
  $[(z \in A \text{ or } z \in B') \text{ and } (z \in C \text{ or } z \in B')]$

- C. **Step 4**: iff $(z \in A \text{ or } z \in C) \text{ and } z \in (z \in C' \text{ and } z \in B')$
  Step 6: iff $[(z \in A \text{ and } z \in C') \text{ or } (z \in C \text{ and } z \in C')] \text{ or }$
  $[(z \in A \text{ and } z \in B') \text{ or } (z \in C \text{ and } z \in B')]$

- D. **Step 4**: iff $(z \in A \text{ or } z \in C) \text{ and } (z \in C' \text{ or } z \in B')$
  Step 6: iff $[(z \in A \text{ or } z \in C') \text{ and } (z \in C \text{ or } z \in C')] \text{ and }$
  $[(z \in A \text{ or } z \in B') \text{ and } (z \in C \text{ or } z \in B')]$

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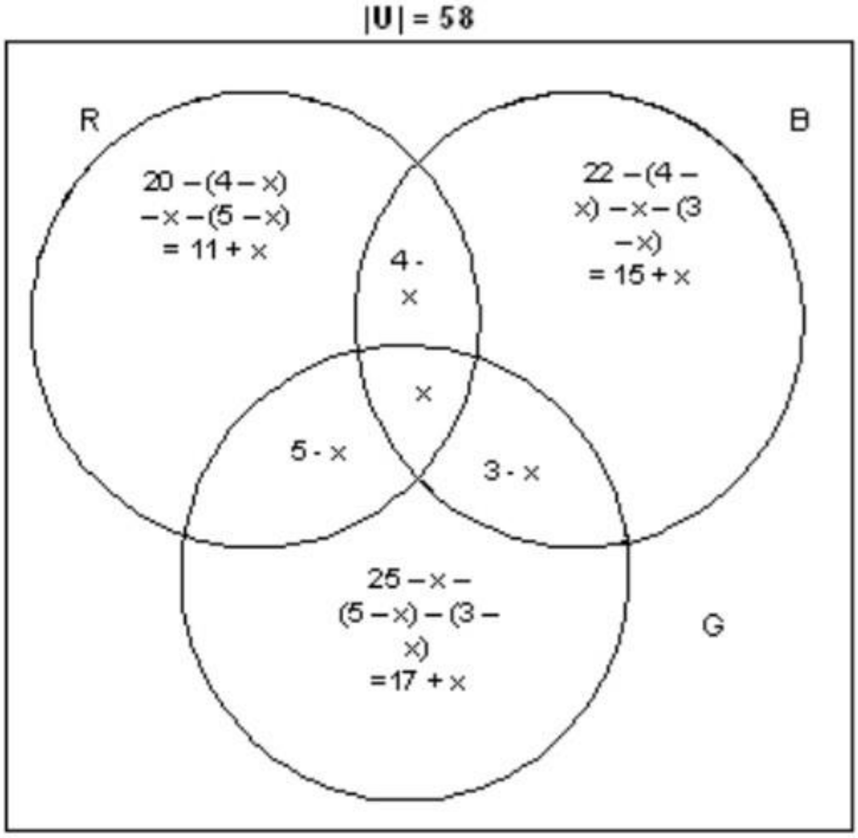
Part 3 of 10 - Section 2: Venn diagrams

Question 3 of 10

2.0 Points

The Venn diagram below represents coloured blocks in a nursery school. There are 58 blocks. Some are painted in one colour (red, blue or green), some in two, and some in three colours. Which one of the alternatives is true? (Hint: calculate the value of x first)



▲ Question Progress ▲

- **A.** 3 blocks are painted in green and blue only.
  20 blocks are painted in green only.

  2 blocks contain red and green paint, but no blue paint.
- **B.** 0 blocks are painted in green and blue only.
  20 blocks are painted in green only.

  2 blocks contain red and green paint, but no blue paint.
- **C.** 3 blocks are painted in green and blue only.
  17 blocks are painted in green only.

  2 blocks contain red and green paint, but no blue paint.
- **D.** 0 blocks are painted in green and blue only.
  22 blocks are painted in green only.

  5 blocks contain red and green paint, but no blue paint.

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Part 4 of 10 - Relations and functions (1)

Question 4 of 10

2.0 Points

Let U = {1, {2}, 3, {1, 2}, 4}.

Let A = {1, {2}, 3}, B = {{2}, 3, {1, 2}, 4} and C = {{2}, 1, 4}.

Which one of the following relations is not a function from C to U?

- ◯ **A.** {(4, {2}), (1, {1, 2}), ({2}, 3)}
- ◯ **B.** {({2}, {2}), (1, 1), (4, 4)}
- ◯ **C.** {({1, 2}, {2}), (1, 4), (3, 1)}
- ◯ **D.** {({2}, {2}), (1, {2}), (4, {2})}

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Part 5 of 10 - Section 3: relations and Functions (2)

Question 5 of 10

2.0 Points

Let f and g be functions on Z defined by:

$(x, y) \in g$ **iff** $y = -x^2 + 3$ and $(x, y) \in f$ **iff** $y = 5 - 3x$.

Which one of the following alternatives represents an ordered pair that does NOT belong to f?

- **A.** (-3, 13)
- **B.** (0, 5)
- **C.** (-2, 11)
- **D.** (1, 2)

Reset Selection

▲ Question Progress ▲

Part 6 of 10 - Section 3: Relations and Functions (3)

Question 6 of 10

2.0 Points

Let f and g be functions on Z defined by:

$(x, y) \in g$ iff $y = 2x^2 - 5$ and **$(x, y) \in f$ iff $y = -3x + 7$.**

Which one of the following alternatives represents $g \circ f(x)$ (ie $g(f(x))$?

- ◯ **A.** $18x^2 + 42x + 49$
- ◯ **B.** $18x^2 - 84x + 93$
- ◯ **C.** $-6x^2 + 22$
- ◯ **D.** $18x^2 + 2$

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2.0 Points

Consider the following matrices:

Let $A = \begin{bmatrix} 0 & 1 & 0 & 2 \\ 3 & 0 & 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 2 & 0 \\ 0 & 3 \\ 4 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$

Which one of the following alternatives regarding operations on the given matrices is FALSE?

- **A.** It is impossible to perform the operation A · C.
- **B.** The result of B · A will result in a 4 x 4 matrix.
- **C.** The result of A · B is equal to matrix C.
- **D.** The result of B · C is the matrix
$$\begin{bmatrix} 0 & 10 \\ 20 & 0 \\ 0 & 30 \\ 40 & 0 \end{bmatrix}$$

▲ Question Progress ▲

Part 8 of 10 - Section 4: Operations

Question 8 of 10

2.0 Points

Consider the following representation for the binary operation ☼ :

¤	a	b
a	a	a
b	b	a

Which one of the following alternatives gives the correct list notation for the operation?

- ◯ **A.** {((a, a), a), ((a, b), a), ((b, a), b), ((b, b), a)}
- ◯ **B.** {({a, a}, a), ({a, b}, a), ({b, a}, b), ({b, b}, a)}
- ◯ **C.** (((a, a), a), ((a, b), a), ((b, a), b), ((b, b), a))
- ◯ **D.** {{(a, a), a}, {(a, b), a}, {(b, a), b}, {(b, b), a}}

▲ Question Progress ▲

Part 9 of 10 - Section 5: Logic

Question 9 of 10

2.0 Points

Which one of the following alternatives provides a statement that is FALSE?

- A.
  $\exists x \in \mathbb{Z}^+, [(2x - 3 \leq 1) \wedge (2x^2 - 3 < 0)]$
- B.
  $\forall x \in \mathbb{Z}, [(x - 1 > 0) \vee (x - 1 < 1)]$
- C.
  $\forall x \in \mathbb{Z}, [(3x^2 + 2 \geq 5) \wedge (1 - x \leq 0)]$
- D.
  $\forall x \in \mathbb{Z}^+, [(2x - 3 > 0) \vee (x^2 + 1 \geq 10)]$

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▲ Question Progress ▲

2.0 Points

Consider the statement

If n is a multiple of 3, then $3n^2 + 6n + 9$ is even.

Which one of the following statements provides the contrapositive of the given statement?

- **A.**
  If n is a multiple of 3, then $3n^2 + 6n + 9$ is even.
- **B.**
  If n is not a multiple of 3, then $3n^2 + 6n + 9$ is odd.
- **C.**
  If $3n^2 + 6n + 9$ is even, then n is a multiple of 3.
- **D.**
  If $3n^2 + 6n + 9$ is odd, then n is not a multiple of 3.

Reset Selection