Part 1 of 10 - Section 1: Sets and Relations

Question 1 of 10

2.0 Points

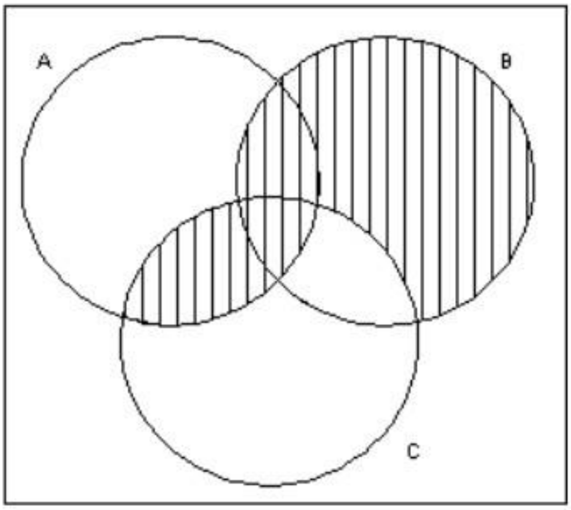
Suppose U = {b, {c, 3}, 3, 4, {4, 5}, 5} is a universal set with the following subsets: A = {{c, 3}, 3, {4, 5}}, B = {b, {c, 3}, 4, 5} and C = {b, 3, 4, 5}. Which one of the following sets represents C − A?

- **A.** {b, {c, 3}, 4, 5, {4, 5}}
- **B.** {3, 4, 5}
- **C.** { }
- **D.** {b, 4, 5}

Reset Selection

2.0 Points

Consider the following Venn diagram with A, B and C sets from the universal set U:



Which one of the following alternatives describes the set represented by the Venn diagram correctly? (Hint: Draw the Venn-diagrams in the alternatives on rough to find a match.)

- **A.** (B − C) U (A n C)
- **B.** [(A n C) − B] U (B − A)
- **C.** [(A U B) − C] + A
- **D.** (B − A) U (A n B n C)

Part 3 of 10 - Section 3: RElations and functions

Question 3 of 10

2.0 Points

Let C = {1, 3, d, e}.

Let R = {(1, 1), (1, 3), (1, e), (3, 3), (3, d), (e, 3) be a relation on C.

Which one of the following alternatives is needed to make R transitive and irreflexive?

- ◯ **A.** Add the ordered pairs (1, d) and (e, d), and remove ordered pairs (1, 1) and (3, 3).
- ◯ **B.** Add the ordered pair (d, 1) and remove ordered pairs (1, 1) and (3, 3).
- ◯ **C.** Add the ordered pair (1, d), (d, d) and (e, e).
- ◯ **D.** Add the ordered pair (d, d) and (e, e).

Reset Selection

Question Progress ▲

Part 4 of 10 - Section 3: Relations and functions (2)

Question 4 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 5 of 10 - Section 3: Relations and functions (3)

Question 5 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 $f \circ f(x)$ (ie $f(f(x))$?

- A. $9x^2 - 42x + 49$
- B. $-9x^2 + 42x + 49$
- C. $9x - 21$
- D. $9x - 14$

Reset Selection

▲ Question Progress ▲

Question 6 of 10

2.0 Points

What is the result of the operation $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \bullet \begin{bmatrix} 4 & 5 \end{bmatrix}$?

- ◯ **A.** It is not possible to do the multiplication on these two matrices.
- ◯ **B.** $\begin{bmatrix} 9 \\ 18 \\ 27 \end{bmatrix}$
- ◯ **C.** $\begin{bmatrix} 4 & 5 \\ 8 & 10 \\ 12 & 15 \end{bmatrix}$
- ◯ **D.** $\begin{bmatrix} 21 & 30 \end{bmatrix}$

Reset Selection

◀ Question Progress ◀

Part 7 of 10 - Section 4: Operations

Question 7 of 10

2.0 Points

Consider the following binary operation * :

*	a	b	c
a	b	c	a
b	c	b	a
c	c	a	b

Which one of the following statements regarding the binary operation * is TRUE?

- ◯ **A.** b((a * b) * c) = (c * a) * (b * b)
- ◯ **B.** (b * c) * a = a * (b * c) proves that the binary operation * is associative.
- ◯ **C.** The binary operation * is NOT commutative.
- ◯ **D.** The identity element of the binary operation * is b.

Reset Selection

▲ Question Progress ▲

Part 8 of 10 - Section 5: Logic

Question 8 of 10

2.0 Points

Which one of the statements in the following alternatives is NOT equivalent to $p \wedge q$? (Hint: simplify the statement in each alternative using de Morgan's rules or a truth table to find the statement that is NOT equivalent to $p \wedge q$.)

- A. $p \wedge (\neg(p \rightarrow \neg q))$
- B. $p \wedge (\neg(\neg p \rightarrow \neg q))$
- C. $\neg(\neg p \vee (p \rightarrow \neg q))$
- D. $p \wedge (\neg(\neg(p \wedge q)))$

Reset Selection

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Part 9 of 10 - Section 5: Truth tables

Question 9 of 10

2.0 Points

Consider the incomplete truth table below.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	
T	F	F	T	
F	T	T	F	
F	F	T	T	

Which one of the following alternatives provides the correct completed truth table?

- A.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	T
T	F	F	T	F
F	T	T	F	T
F	F	T	T	T

- B.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	F
T	F	F	T	T
F	T	T	F	F
F	F	T	T	F

▲ Question Progress ▲

- A.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	T
T	F	F	T	F
F	T	T	F	T
F	F	T	T	T

- B.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	F
T	F	F	T	T
F	T	T	F	F
F	F	T	T	F

- C.

p	q	¬p	¬q	¬(¬q ∧ p)
T	T	F	F	T
T	F	F	T	T
F	T	T	F	T
F	F	T	T	F

- D.

p	q	¬p	¬q	¬q → ¬p
T	T	F	F	F
T	F	F	T	F
F	T	T	F	T
F	F	T	T	F

Part 10 of 10 - Section 6: Proofs

Question 10 of 10

2.0 Points

Which of the following alternatives provides a **direct** proof to show that for all $n \in Z$,

if $n - 1$ is odd, then $2n^2 - 2n + 1$ is odd.

- ◯ **A.**
  Let n be an odd number, ie $n = 3$, $3 \in \mathbb{Z}$,
  Then $2n^2 - 2n + 1 = 2(3)^2 - 2(3) + 1$,
  ie $2(9) - 6 + 1$,
  ie $18 - 6 + 1 = 13$, which is odd.

- ◯ **B.**
  Let $n - 1$ be odd, then n is even (odd + even = odd),
  Then $n = 2k$ for some $k \in \mathbb{Z}$,
  ie $2n^2 - 2n + 1 = 2(2k)^2 - 2(2k) + 1$
  ie $8k^2 - 4k + 1$,
  ie $2(4k^2 - 2k) + 1$, which is odd. (even + odd = odd).

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- C.

  Let n be odd, then n = 2k + 1 for some $k \in \mathbb{Z}$,

  ie $2n^2 - 2n + 1 = 2(2k + 1)^2 - 2(2k + 1) + 1$

  ie $2(4k^2 + 4k + 1) - 4k - 2 + 1$,

  ie $8k^2 + 8k + 2 - 4k - 2 + 1$,

  ie $8k^2 + 4k + 1$,

  ie $2(4k^2 + 2k) + 1$ which is odd. (even + odd = odd).

- D.

  Let k - 1 be odd, for some $k \in \mathbb{Z}$,

  Then $2k^2 - 2k + 1 = 2(k - 1)^2 - 2(k - 1) + 1$

  ie $2(k^2 - 2k + 1) - 2k + 2 + 1$,

  ie $2k^2 - 4k + 2 - 2k + 3$,

  ie $2k^2 - 6k + 5$,

  ie $2(k^2 - 3k + 2) + 1$ which is odd. (even + odd = odd).

Reset Selection

▲ Question Progress ▲