- 1. **Multiple Choice: Which First-Order Logic (FOL) formula...**

Points: 2

Question

Which First-Order Logic (FOL) formula expresses the following English sentence?

Virginia and **Colorado** are both in the **United States (US)**.

Answer

In (Virginia ∧ Colorado, US)

✓ *In (Virginia, US) ∧ In (Colorado, US)*

In (Virginia, US) ∨ In (Colorado, US)

2. **Multiple Choice: Which First-Order Logic (FOL) formula...**

Points: 2

Question

Which First-Order Logic (FOL) formula expresses the following English sentence?

There is a country that borders both **Canada** and **Mexico**.

Answer

✓ *∃ c Country(c) ∧ Border (c, Canada) ∧ Border (c, Mexico).*

∃ c Country(c) ⇒ [Border (c, Canada) ∧ Border (c, Mexico)].

[∃ c Country(c)] ⇒ [Border (c, Canada) ∧ Border (c, Mexico)].

∃ c Border (Country(c), Canada ∧ Mexico).

3. **Multiple Choice: Which First-Order Logic (FOL) fo...**

Points: 2

Question

Which First-Order Logic (FOL) formula correctly expresses the following English sentence?

All countries that border the **United States (US)** are in **North America**.

Answer

Any of these two ✓
∀c Country(c) ∧ Border (c, US) ⇒ In(c, NorthAmerica).

Any of these two ✓
∀ c Country(c) ⇒ [Border (c, US) ⇒ In(c, NorthAmerica)].

∀ c [Country(c) ⇒ Border (c, US)] ⇒ In(c, NorthAmerica).

∀c Country(c) ∧ Border (c, US) ∧ In(c, NorthAmerica).

4. **Multiple Choice: Which First-Order Logic (FOL) formula...**

Points: 2

Question

Which First-Order Logic (FOL) formula correctly expresses the following English sentence?

No region in **South America** borders any region in **Europe**.

Answer

Any of the three ✓

$\neg[\exists c, d\ In(c, SouthAmerica) \wedge In(d, Europe) \wedge Borders(c, d)]$.

Any of the three ✓

$\forall c, d\ [In(c, SouthAmerica) \wedge In(d, Europe)] \Rightarrow \neg Borders(c, d)]$.

$\neg \forall c\ In(c, SouthAmerica) \Rightarrow \exists d\ In(d, Europe) \wedge \neg Borders(c, d)$.

Any of the three ✓

$\forall c\ In(c, SouthAmerica) \Rightarrow \forall d\ In(d, Europe) \Rightarrow \neg Borders(c, d)$.

5. **Multiple Choice: Which First-Order Logic (FOL) formula...**

Points: 2

Question

Which First-Order Logic (FOL) formula correctly expresses the following English sentence?

No two adjacent countries have the same map color.

Answer

Any of these two ✓

$\forall x, y\ \neg Country(x) \vee \neg Country(y) \vee \neg Borders(x, y) \vee \neg(MapColor\ (x) = MapColor\ (y))$.

Any of these two ✓

$\forall x, y\ (Country(x) \wedge Country(y) \wedge Borders(x, y) \wedge \neg(x = y)) \Rightarrow \neg(MapColor\ (x) = MapColor\ (y))$.

$\forall x, y\ Country(x) \wedge Country(y) \wedge Borders(x, y) \wedge \neg(MapColor\ (x) = MapColor\ (y))$.

$\forall x, y\ (Country(x) \wedge Country(y) \wedge Borders(x, y)) \Rightarrow MapColor(\neg(x = y))$.