

Question 1:

'Identify the conclusion of the following argument. It is hard not to verify in our peers the same weakened intelligence due to emotions that we observe in our everyday patients. The arrogance of our consciousness, which in general, belongs to the strongest defense mechanisms, blocks the unconscious complexes. Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts. (Sigmund Freud, The Origin and Development of Psychoanalysis)', A. 'It is hard not to verify in our peers the same weakened intelligence due to emotions that we observe in our everyday patients.', B. 'The arrogance of our consciousness, which in general, belongs to the strongest defense mechanisms, blocks the unconscious complexes.', C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.', D. 'It is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

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Answer Option 1:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 2:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 3:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 4:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 5:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 6:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 7:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 8:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Answer Option 9:

C. 'Because of this, it is difficult to convince people of the unconscious, and in turn to teach them what their conscious knowledge contradicts.'

Question 2:

'Select the best translation into predicate logic. David teaches Chris. (c: Chris; d: David; Txy: x teaches y)', A. 'Tdc', B. 'Tcd', C. 'Tcc', D. 'dTc'

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Answer Option 1:

B. 'Tcd'

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Answer Option 2:

B. 'Tcd'

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Answer Option 3:

The correct translation is B. 'Tcd', which means David (d) teaches Chris (c).

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Answer Option 4:

The best translation for the statement 'David teaches Chris' in predicate logic would be 'Tdc'. This indicates that David (d) teaches Chris (c). So, the final answer: A. 'Tdc'

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Answer Option 5:

The best translation of "David teaches Chris" into predicate logic is "Tdc". This is because 'Txy' is defined as "x teaches y", so 'Tdc' correctly translates as "David teaches Chris". Final Answer: A. 'Tdc'

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Answer Option 6:

The correct answer is B. 'Tcd'. In predicate logic, the order of the operands matters. The expression 'Tcd' translates to 'David teaches Chris'. 'Tdc' would translate to 'Chris teaches David', which is not the correct translation of the original statement.

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Answer Option 7:

The best translation into predicate logic is 'Tcd'. This is because in predicate logic, the first letter after the predicate symbol usually represents the subject of the sentence and the second letter represents the object. So 'Tcd' translates to 'Chris is taught by David'. Final Answer: B. 'Tcd'

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Answer Option 8:

The best translation into predicate logic for the statement "David teaches Chris" would be B. 'Tcd' where 'T' stands for the action of teaching, 'c' represents Chris, and 'd' represents David. So 'Tcd' reads as 'Chris is taught by David' which is equivalent to "David teaches Chris".

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Answer Option 9:

The best translation for "David teaches Chris" in predicate logic would be:

B. 'Tcd'

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Question 3:

' Select the best English interpretation of the given proposition, using the following translation key: Ax: x is an apartment Hx: x is a house Lx: x is large Bxy: x is bigger than y $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$. A. 'Some large houses are bigger than some apartments.', B. 'Some houses are bigger than all large apartments.', C. 'Some large apartments are bigger than some houses.', D. 'Some houses are bigger than some large apartments.'

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Answer Option 1:

The given proposition can be translated to English as:

"There exists an apartment x that is large, and there exists a house y that is bigger than x."

The closest English interpretation would then be:

D. 'Some houses are bigger than some large apartments.'

Answer Option 2:

The given proposition translates to: There exists an x such that x is a large apartment and there exists a y such that y is a house and x is bigger than y. Therefore, the best English interpretation of the given proposition is: 'Some large apartments are bigger than some houses.' So, the correct answer is C. 'Some large apartments are bigger than some houses.'

Answer Option 3:

The statement $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ can be translated as 'There exists some x, such that x is a large apartment and there exists some y, such that y is a house and x is bigger than y.' So the correct interpretation is:

C. 'Some large apartments are bigger than some houses.'

Answer Option 4:

The given proposition $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ translates to English as: 'There exists some x such that x is a large apartment and there exists some y such that y is a house and x is bigger than y.' In simpler terms, the sentence would be: 'Some large apartments are bigger than some houses.' Final Answer: C

Answer Option 5:

The given proposition $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ can be translated as follows: 'There exists an apartment x that is large, and there exists a house y such that apartment x is bigger than house y'. So, the best English interpretation would be: 'Some large apartments are bigger than some houses.' Therefore, the correct answer is C. 'Some large apartments are bigger than some houses.'

Answer Option 6:

The given proposition $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ translates to: "There exists an x such that x is an apartment and x is large and there exists an y such that y is a house and x is bigger than y". This translates to the English interpretation: 'Some large apartments are bigger than some houses.' So, the correct option is C. 'Some large apartments are bigger than some houses.'

Answer Option 7:

The proposition $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ translates to: "There exists an x such that x is a large apartment and there exists a y such that y is a house and x is bigger than y." In plain English, this can be interpreted as: "There are some large apartments that are bigger than some houses." Therefore, the correct option is C. 'Some large apartments are bigger than some houses.'

Answer Option 8:

The given proposition $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ translates to: 'There exists some x such that x is a large apartment and there exists some y such that y is a house and x is bigger than y.' The closest English interpretation is 'Some large apartments are bigger than some houses.'

Final Answer: C

Answer Option 9:

The statement $(\exists x)[(Ax \bullet Lx) \bullet (\exists y)(Hy \bullet Bxy)]$ translates to "There exists an x such that x is a large apartment and there exists a y such that y is a house and x is bigger than y." This would be best interpreted in English as:

D. 'Some houses are bigger than some large apartments.'

Question 4:

'Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$\neg G \supset H$

$\neg H / G$, A. 'Valid', B. 'Invalid. Counterexample when G and H are true', C. 'Invalid. Counterexample when G is true and H is false', D. 'Invalid. Counterexample when H is true and G is false'

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Answer Option 1:

Let's construct the truth table:

G H $\neg G \supset H$ $\neg H / G$

T T F F T T

T F F T F T

F T T F T F

F F T T F F

As we can see from the truth table, there is no row where all premises are true but conclusion (G) is false. Therefore, the argument is valid.

Final Answer: A. 'Valid'

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Answer Option 2:

The given argument is as follows:

Premise 1: $\neg G \supset H$

Conclusion: $\neg H / G$

To analyze the validity of this argument, we need to check if it's possible for the premises to be true while the conclusion is false. The corresponding truth table is as follows:

G | H | $\neg G$ | $\neg H$ | $\neg G \supset H$ | $\neg H / G$

T | T | F | F | T | T

T | F | F | T | T | T

F | T | T | F | F | F

F | F | T | T | F | F

Looking at the table, we can see that there's no row where the premise is true and the conclusion is false, which means that the argument is valid.

Final Answer: A. 'Valid'

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Answer Option 3:

We can construct the truth table for this argument as follows:

G H $\neg G \supset H$ $\neg H / G$

T T F F T T

T F F T T T

F T T F T F

F F T T F F

The argument is invalid if there is at least one row in the truth table where the premises are true but the conclusion is false. Looking at the truth table, we see that this happens in the last row, where $\neg G \supset H$ is true but $\neg H / G$ is false.

So, the correct answer is: D. 'Invalid. Counterexample when H is true and G is false'

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Answer Option 4:

A truth table is a mathematical table used in logic to compute the functional values of logical expressions on each of their functional arguments. In particular, truth tables can be used to determine if an argument is valid.

Truth table for the given argument:

G | H | $\neg G$ | $\neg H$ | $\neg G \supset H$ | $\neg H / G$

T | T | F | F | T | T

T | F | F | T | T | T

F | T | T | F | F | F

F | F | T | T | F | F

The argument is valid if for all cases where the premises are true, the conclusion is also true. Looking at the truth table, we can see that whenever $(\neg G \supset H)$ and $\neg H$ are true, G is also true. Hence, the argument is valid. Final Answer: A. 'Valid'

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Answer Option 5:

Let's construct a truth table:

$G \quad H \quad \neg H \quad \neg G \supset H \quad \neg H / G$

T T F F T T

T F F T T T

F T T F T F

F F T T F F

The argument is valid if and only if, in every row in which the premises are true, the conclusion is also true.

Here, the premises are $\neg G \supset H$ and $\neg H$. The conclusion is G .

From the truth table, we can see that there's a row (third row) where the premises are true, but the conclusion is false. This means the argument is invalid.

The counterexample is when G is false and H is true. So, the correct answer is:

D. 'Invalid. Counterexample when H is true and G is false'

Answer Option 6:

Let's construct a truth table:

1. $G = \text{True}, H = \text{True}$, then $\neg G = \text{False}, \neg H = \text{False}, \neg G \supset H = \text{True}, \neg H / G = \text{True}$

2. $G = \text{True}, H = \text{False}$, then $\neg G = \text{False}, \neg H = \text{True}, \neg G \supset H = \text{False}, \neg H / G = \text{True}$

3. $G = \text{False}, H = \text{True}$, then $\neg G = \text{True}, \neg H = \text{False}, \neg G \supset H = \text{True}, \neg H / G = \text{False}$

4. $G = \text{False}, H = \text{False}$, then $\neg G = \text{True}, \neg H = \text{True}, \neg G \supset H = \text{False}, \neg H / G = \text{False}$

We can see that in row 2, both premises are true but the conclusion is false. Therefore, the argument is invalid.

Final Answer: C. 'Invalid. Counterexample when G is true and H is false'

Answer Option 7:

First, let's construct the truth table:

$G \mid H \mid \neg G \mid \neg H \mid \neg G \supset H \mid \neg H / G$

|---|---|---|---|---|---|

| T | T | F | F | T | T |

| T | F | F | T | T | T |

| F | T | T | F | T | F |

| F | F | T | T | F | T |

Now, we are looking for a row where the premises are all true, but the conclusion is false. This would indicate the argument is invalid.

We see from the table above that in the third row, $\neg G \supset H$ is true ($\neg G$ is true and H is true), but $\neg H / G$ is false (because $\neg H$ is false and G is false). So the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when H is true and G is false'

Answer Option 8:

Truth table:

$G \quad H \quad \neg G \quad \neg H \quad G \supset H / G$

T T F F T / T

T F F T F / T

F T T F T / F

F F T T T / F

The argument is invalid because there is a row (second row) in the truth table where the premises ($\neg G \supset H$ and $\neg H$) are true but the conclusion (G) is false.

Final Answer: C. 'Invalid. Counterexample when G is true and H is false'.

Answer Option 9:

Let's construct the truth table:

$G \mid H \mid \neg G \mid \neg H \mid \neg G \supset H \mid \neg H$

|---|---|---|---|---|---|

| T | T | F | F | T | F |

| T | F | F | T | T | T |

| F | T | T | F | T | F |

| F | F | T | T | F | T |

Now, we need to compare the columns $\neg G \supset H$ and $\neg H$. If they match for all rows, then the argument is valid. If not, the argument is invalid.

From the truth table, we can see that the columns $\neg G \supset H$ and $\neg H$ do not match in the last row, where G is false and H is false. Therefore, the argument is invalid and the counterexample is when G is false and H is false.

So, the correct answer is not presented in the options given.

Question 5:

' Use the following key to translate the given formula of PL to natural, English sentences.

A: Marina reads a Percy Jackson book.

B: Izzy plays Minecraft.

C: Emily stops working.

D: Russell makes dinner.

E: Ashleigh stops by.

$(\neg B \bullet E) \supset D$, A. 'If it's not the case that both Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.', B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.', C. 'Izzy playing Minecraft and Ashleigh stopping by entails that Russell makes dinner.', D. 'Russell's making dinner is a sufficient condition for Izzy not playing Minecraft and Ashleigh stopping by.'

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Answer Option 1:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 2:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 3:

A. 'If it's not the case that both Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 4:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 5:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 6:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 7:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 8:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Answer Option 9:

B. 'If it's both not the case that Izzy plays Minecraft and Ashleigh stops by then Russell makes dinner.'

Question 6:

' Select the best English interpretation of the given proposition, using the following translation key: Ax: x is an apartment Hx: x is a house Lx: x is large Bxy: x is bigger than y $(\exists x)[Hx \bullet (\forall y)(Ay \supset Bxy)]$, A. 'Some houses are smaller than all apartments.', B. 'Every house is bigger than every apartment.', C. 'Some apartment is smaller than every house.', D. 'Some houses are bigger than every apartment.'

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Answer Option 1:

D. 'Some houses are bigger than every apartment.'

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Answer Option 2:

D. 'Some houses are bigger than every apartment.'

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Answer Option 3:

D. 'Some houses are bigger than every apartment.'

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Answer Option 4:

The given proposition translates to: 'There exists an x such that x is a house and for all y, if y is an apartment then x is bigger than y.' This is best interpreted as option D: 'Some houses are bigger than every apartment.'

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Answer Option 5:

The given proposition $(\exists x)[Hx \bullet (\forall y)(Ay \supset Bxy)]$ reads in English as 'There exists an x such that x is a house and for all y, if y is an apartment then x is bigger than y.' This corresponds to option D. 'Some houses are bigger than every apartment.'

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Answer Option 6:

The given proposition $(\exists x)[Hx \bullet (\forall y)(Ay \supset Bxy)]$ translates as follows: 'There exists some x such that x is a house and for all y if y is an apartment then x is bigger than y.' Therefore the best English interpretation is: D. 'Some houses are bigger than every apartment.'

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Answer Option 7:

The correct interpretation for the given formula is D. 'Some houses are bigger than every apartment.' The formula can be translated as: "There exists an x such that x is a house and for all y, if y is an apartment then x is bigger than y", which is equivalent to saying "There are some houses that are bigger than all apartments".

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Answer Option 8:

The given proposition $(\exists x)[Hx \bullet (\forall y)(Ay \supset Bxy)]$ translates to: "There exists some x such that x is a house and for all y, if y is an apartment then x is bigger than y." This can be interpreted in English as: 'Some houses are bigger than every apartment.' So, the correct final answer is D. 'Some houses are bigger than every apartment.'

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Answer Option 9:

The given proposition can be translated as follows: $(\exists x)[Hx \bullet (\forall y)(Ay \supset Bxy)]$ This statement can be interpreted as 'There is some x, such that x is a house, and for all y, if y is an apartment, then x is bigger than y.' So, the correct English interpretation of the proposition is: 'Some houses are bigger than every apartment.' Final Answer: D

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Question 7:

'Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$\neg K \equiv L / (K \cdot L) \vee (K \cdot \neg L)$, A. 'Valid', B. 'Invalid. Counterexample when K and L are true', C. 'Invalid. Counterexample when K is true and L is false', D. 'Invalid. Counterexample when L is true and K is false'

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Answer Option 1:

Let's construct a truth table:

$K \quad L \quad \neg K \equiv L \equiv (K \cdot L) \vee (K \cdot \neg L)$

T T F F T

T F F T F

F T T T T

F F T F F

We can see that the argument $\neg K \equiv L$ (which is the logical equivalence of not K and L) does not always result in a true valuation for $(K \cdot L) \vee (K \cdot \neg L)$ (which is the logical 'or' of K and L, and K and not L).

Thus, the argument is invalid. We can see that a counterexample is when K is true and L is false.

Final Answer: C. 'Invalid. Counterexample when K is true and L is false'

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Answer Option 2:

Let's construct a truth table to assess the validity of the argument:

$| K | L | \neg K | L | \neg K \equiv L | (K \cdot L) \vee (K \cdot \neg L) |$

|---|---|---|---|---|---|

| T | T | F | T | F | T |

| T | F | F | F | F | T |

| F | T | T | F | T | F |

| F | F | T | F | F | F |

From the truth table, it can be seen that the argument is invalid as there are rows where $(\neg K \equiv L)$ is true, but $(K \cdot L) \vee (K \cdot \neg L)$ is false.

The counterexample where K is true and L is false (second row) shows the invalidity of the argument.

So, the final answer is: C. 'Invalid. Counterexample when K is true and L is false'.

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Answer Option 3:

The truth table for $\neg K \equiv L / (K \cdot L) \vee (K \cdot \neg L)$ is as follows:

$| K | L | \neg K | \neg K \equiv L | K \cdot L | \neg L | K \cdot \neg L | (K \cdot L) \vee (K \cdot \neg L) |$

|---|---|---|---|---|---|---|---|

| T | T | F | F | T | F | F | T |

| T | F | F | F | F | T | T | T |

| F | T | T | T | F | F | F | F |

| F | F | T | T | F | T | F | F |

As we can see from the table, there are situations (e.g., when both K and L are true or false) where the preposition $\neg K \equiv L$ does not hold while the proposition $(K \cdot L) \vee (K \cdot \neg L)$ does hold, thus the argument is not valid. It is invalid with the counterexample when K and L are both true.

Final Answer: B. 'Invalid. Counterexample when K and L are true'

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Answer Option 4:

First, let's construct the truth table:

$K \quad L \quad \neg K \quad \neg K \equiv L \quad K \cdot L \quad (K \cdot L) \vee (K \cdot \neg L)$

T T F F T T

T F F T F T

F T T T F F

F F T F F F

Now, we can see if an argument is valid or invalid.

An argument is valid if and only if there's no row in the complete truth table in which the premises (in this case, $\neg K \equiv L$) are all true and the conclusion (in this case, $(K \cdot L) \vee (K \cdot \neg L)$) is false.

Looking at the table, we see that there is indeed such a row: when K is False and L is True, then $\neg K \equiv L$ is True and $(K \cdot L) \vee (K \cdot \neg L)$ is False.

So, the argument is Invalid. Counterexample when K is False and L is True.

Hence, the final answer is D. 'Invalid. Counterexample when L is true and K is false'.

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Answer Option 5:

Let's construct a truth table:

$$K \cdot L \sim K \sim L \equiv L \cdot (K \cdot L) \cdot (K \cdot \sim L) \cdot (K \cdot L) \vee (K \cdot \sim L)$$

T T F T T F T

T F F F F T F

F T T T F F F

F F T F F F F

Based on this table, we observe that the argument is invalid. The argument is invalid when K is true and L is false, which is an option given.

So, the final answer is: C. 'Invalid. Counterexample when K is true and L is false'

Answer Option 6:

Let's construct the truth table:

$$K \cdot L \sim K \sim L \equiv L \cdot K \cdot L \cdot K \cdot \sim L \cdot (K \cdot L) \vee (K \cdot \sim L)$$

T T F F T F T

T F F T F T T

F T T T F F F

F F T F F F F

The argument is invalid. The counterexample is when K is false and L is true. So, the correct answer is D. 'Invalid. Counterexample when L is true and K is false'.

Answer Option 7:

Let's construct a truth table:

$$| K | L | \sim K | \sim L | K \cdot L | K \cdot \sim L | (K \cdot L) \vee (K \cdot \sim L) |$$

|---|---|---|---|---|---|---|

| T | T | F | F | T | F | T |

| T | F | F | F | F | T | T |

| F | T | T | T | F | F | F |

| F | F | T | F | F | F | F |

In the table, T represents True and F represents False.

The argument is that if $\sim K \equiv L$, then $(K \cdot L) \vee (K \cdot \sim L)$. From the truth table, we can see that when K is true and L is false, $\sim K \equiv L$ is false, but $(K \cdot L) \vee (K \cdot \sim L)$ is true. Hence, the argument is invalid and the counterexample is when K is true and L is false.

So, the final answer is C. 'Invalid. Counterexample when K is true and L is false'.

Answer Option 8:

Let's construct the truth table:

$$K \cdot L \sim K \sim L \equiv L \cdot (K \cdot L) \cdot (K \cdot \sim L) \cdot (K \cdot L) \vee (K \cdot \sim L)$$

T T F F T F T

T F F T F T T

F T T T F F F

F F T F F F F

From the above truth table, we can see that the argument isn't valid. A counterexample is when K is true and L is true. The given proposition, ' $\sim K \equiv L / (K \cdot L) \vee (K \cdot \sim L)$ ', doesn't hold true for this case.

Thus, the final answer is: B. 'Invalid. Counterexample when K and L are true'

Answer Option 9:

A truth table for the given argument will look like:

$$K \cdot L \sim K \sim L \equiv L \cdot K \cdot L \cdot K \cdot \sim L \cdot (K \cdot L) \vee (K \cdot \sim L)$$

T T F F T F T

T F F T F T T

F T T T F F F

F F T F F F F

An argument is valid if the conclusion is true whenever the premises are true. Here, the conclusion is $(K \cdot L) \vee (K \cdot \sim L)$. In the row where K is true and L is false, the premise $\sim K \equiv L$ is true, but the conclusion $(K \cdot L) \vee (K \cdot \sim L)$ is not true.

So the argument is invalid. The counterexample is when K is true and L is false.

Final Answer: C. 'Invalid. Counterexample when K is true and L is false'.

Question 8:

'Identify the antecedent of the following conditional proposition: If the university does not increase financial aid, either the president fails to approve it or the board of trustees prevents it.', A. 'The university increases financial aid.', B. 'The university does not increase financial aid.', C. 'The board of trustees prevents it.', D. 'The president fails to approve it.'

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Answer Option 1:

B. 'The university does not increase financial aid.'

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Answer Option 2:

B. 'The university does not increase financial aid.'

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Answer Option 3:

B. 'The university does not increase financial aid.'

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Answer Option 4:

B. 'The university does not increase financial aid.'

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Answer Option 5:

B. 'The university does not increase financial aid.'

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Answer Option 6:

B. 'The university does not increase financial aid.'

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Answer Option 7:

B. 'The university does not increase financial aid.'

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Answer Option 8:

B. 'The university does not increase financial aid.'

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Answer Option 9:

B. 'The university does not increase financial aid.'

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Question 9:

' Which of the following propositions is an immediate (one-step) consequence in PL of the given premises?

$\neg E \supset \neg F$

$G \supset F$

$H \vee \neg E$

$H \supset I$

$\neg I$, A. ' $E \supset F$ ', B. ' $F \supset G$ ', C. ' $H \supset \neg E$ ', D. ' $\neg H$ '

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Answer Option 1:

Using the Modus Tollens rule, if we have a conditional statement ($H \supset I$) and the denial of the consequent ($\neg I$), we can infer the denial of the antecedent ($\neg H$).

Final Answer: D

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Answer Option 2:

We will apply the rule of inference to solve this problem.

1. $\neg E \supset \neg F$ (Premise)

2. $G \supset F$ (Premise)

3. $H \vee \neg E$ (Premise)

4. $H \supset I$ (Premise)

5. $\neg I$ (Premise)

From 4 and 5, using Modus Tollens, we can conclude that $\neg H$. So, option D is correct.

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Answer Option 3:

The given premises are:

1) $\neg E \supset \neg F$

2) $G \supset F$

3) $H \vee \neg E$

4) $H \supset I$

5) $\neg I$

From premise 4 and 5, using Modus Tollens, if H then I, but not I, so not H.

So, the immediate one-step consequence is $\neg H$.

Final Answer: D

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Answer Option 4:

Using the rules of propositional logic, we can derive a one-step consequence. The premises are:

1) $\neg E \supset \neg F$

2) $G \supset F$

3) $H \vee \neg E$

4) $H \supset I$

5) $\neg I$

The statement ($\neg I$) implies that the antecedent (H) of ($H \supset I$) must be false since the consequent is false. The only immediate consequence from these premises is that $\neg H$.

Final answer: D. ' $\neg H$ '

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Answer Option 5:

Considering the following implications:

$\neg E \supset \neg F$: if not E then not F

$G \supset F$: if G then F

$H \vee \neg E$: H or not E

$H \supset I$: if H then I

$\neg I$: not I

Given that our conclusion is $\neg I$: not I, in the premises we have $H \supset I$: if H then I. By Modus Tollens, if we have not I then we have not H. Therefore, the correct answer is:

Final Answer: D. ' $\neg H$ '

=====

Answer Option 6:

The immediate consequence can be determined by using propositional logic and the rules of inference.

Looking at the premises, we have:

1: $\neg E \supset \neg F$

2: $G \supset F$

3: $H \vee \neg E$

4: $H \supset I$

5: $\neg I$

From 4 and 5, using the Modus Tollens rule of inference (which states that if p implies q is true and q is false, then p must also be false), we can conclude that $\neg H$ is true.

So, the immediate consequence is ' $\neg H$ '.

Final Answer: D

Answer Option 7:

An immediate one-step consequence means that you can derive the result directly from the premises. Let's examine the options:

A. ' $E \supset F$ ': This is not a direct consequence of the premises as it does not directly evolve from the given premises.

B. ' $F \supset G$ ': This is not a direct consequence. The premise $G \supset F$ does not imply $F \supset G$.

C. ' $H \supset \neg E$ ': This is not a direct consequence.

D. ' $\neg H$ ': This can be derived directly from the premises. From the fourth premise ' $H \supset I$ ' and the fifth premise ' $\neg I$ ', we can infer ' $\neg H$ ' using the transposition rule.

So, the Final Answer: D ' $\neg H$ '.

Answer Option 8:

In this case, we need to find the immediate consequence (also known as inference) of the given premises using Propositional Logic (PL).

Premises:

$\neg E \supset \neg F$

$G \supset F$

$H \vee \neg E$

$H \supset I$

$\neg I$

We can see that if ' $H \supset I$ ' and ' $\neg I$ ' are true, then ' $\neg H$ ' must be true. This is based on the principle of Modus Tollens, which states if ' $P \supset Q$ ' and ' $\neg Q$ ' are true, then ' $\neg P$ ' must be true.

So, the immediate one-step consequence of the given premises is ' $\neg H$ '.

Final Answer: D

Answer Option 9:

Given:

1. $\neg E \supset \neg F$

2. $G \supset F$

3. $H \vee \neg E$

4. $H \supset I$

5. $\neg I$

An immediate consequence refers to a derivation using Modus Ponens or Modus Tollens. Here, we can use Modus Tollens on the fourth and fifth premise to derive $\neg H$.

Modus Tollens states that if ' p implies q ' is true and ' q ' is false, then ' p ' must also be false.

So, if we take H as ' p ' and I as ' q ', we have ' H implies I ' ($H \supset I$) is true and ' I ' ($\neg I$) is false, so ' H ' must also be false, which is $\neg H$.

Therefore, the immediate one-step consequence is $\neg H$. Final Answer: D.

Question 10:

' Which of the given formulas of PL is the best symbolization of the following sentence?

Everybody loves Raymond, or not.' A. 'L', B. '¬L', C. 'L • ¬L', D. 'L ∨ ¬L'

=====

Answer Option 1:

D. 'L ∨ ¬L'

=====

Answer Option 2:

D. 'L ∨ ¬L'

=====

Answer Option 3:

The sentence can be symbolized as 'Everybody loves Raymond (L) or not (¬L)', so the correct formula would be 'L ∨ ¬L'. Final Answer: D

=====

Answer Option 4:

If we denote 'Everybody loves Raymond' as 'L', the sentence 'Everybody loves Raymond, or not' is saying either 'L' is true or its negation '¬L' is true. So, the correct option is 'L ∨ ¬L', where '∨' stands for the logical OR operator. Final Answer: D

=====

Answer Option 5:

The sentence "Everybody loves Raymond, or not." implicitly suggests a disjunction between two statements: "Everybody loves Raymond" and "Everybody does not love Raymond". In propositional logic, disjunction is represented by the symbol '∨'. So, the best representation would be 'L ∨ ¬L', where 'L' represents "Everybody loves Raymond" and '¬L' represents "Everybody does not love Raymond". Final

Answer: D

=====

Answer Option 6:

The sentence "Everybody loves Raymond, or not." is a disjunction, meaning that either everybody loves Raymond (L), or it is not the case that everybody loves Raymond (¬L). Out of the given options, only one represents a disjunction: 'L ∨ ¬L'. So, the correct answer is D. 'L ∨ ¬L'.

=====

Answer Option 7:

The sentence says "Everybody loves Raymond, or not", that means either everyone loves Raymond or they don't. In logic, this is represented as a disjunction, which uses the symbol ∨. So, it's either L (everyone loves Raymond) or ¬L (everyone does not love Raymond). This translates to L ∨ ¬L. Final Answer: D

=====

Answer Option 8:

The natural language sentence "Everybody loves Raymond, or not." is a bit ambiguous, but it seems to imply that either everybody loves Raymond or it is not the case that everybody loves Raymond.

In propositional logic, the symbol 'L' can be used to represent "Everybody loves Raymond". The symbol '¬' represents negation or "not". The symbol '∨' represents "or".

Therefore, this sentence would be best symbolized as 'L ∨ ¬L'. This is a tautology as it covers all possible scenarios: either everybody loves Raymond or not everybody loves Raymond.

Final Answer: D

=====

Answer Option 9:

The sentence "Everybody loves Raymond, or not." is expressing two possibilities - either everyone loves Raymond, or they don't. The correct symbolization would represent these possibilities as a disjunction (an "or" statement).

So, we can denote "Everybody loves Raymond" as 'L', and "Not everybody loves Raymond" as '¬L'.

The correct symbolization of the sentence is 'L ∨ ¬L'.

Final Answer: D. 'L ∨ ¬L'

=====

Question 11:

' Select the best translation into predicate logic. All kings are luckier than all paupers. (Kx: x is a king; Px: x is a pauper; Lxy: x is luckier than y)', A. $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$, B. $(\forall x)[Kx \supset (\forall y)(Lx \supset Py)]$, C. $(\forall x)(\forall y)[(Kx \bullet Py) \supset Lxy]$, D. $(\forall x)[(Kx \bullet (\forall y)(Py)) \supset Lxy]$

=====

Answer Option 1:

The statement "All kings are luckier than all paupers" translates to "For all x, if x is a king, then for all y, if y is a pauper, then x is luckier than y". Therefore, the correct translation into predicate logic is ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '. Final Answer: A.

=====

Answer Option 2:

The correct logical translation of the given statement is A: ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '. This translates to 'For all x, if x is a king, then for all y, if y is a pauper, x is luckier than y'. This correctly represents the original statement 'All kings are luckier than all paupers.'

=====

Answer Option 3:

The correct translation is A. ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '. This translates to 'For all x, if x is a king, then for all y, if y is a pauper, x is luckier than y'. This accurately represents the original statement 'All kings are luckier than all paupers'.

=====

Answer Option 4:

The statement "All kings are luckier than all paupers" can be interpreted as "For every x, if x is a king, then for every y, if y is a pauper, x is luckier than y". Thus the correct translation into predicate logic would be ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '. Final Answer: A

=====

Answer Option 5:

The best translation into predicate logic for the given statement 'All kings are luckier than all paupers' is A. ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '.

This can be read as: for all x, if x is a king, then for all y, if y is a pauper, x is luckier than y. This accurately reflects the initial statement.

=====

Answer Option 6:

The correct translation of the sentence into predicate logic is: 'For all x, if x is a king, then for all y, if y is a pauper, then x is luckier than y.'

So, the correct option is A. ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '

=====

Answer Option 7:

The statement "All kings are luckier than all paupers" can be translated into predicate logic as "For all x, if x is a king, then for all y, if y is a pauper, x is luckier than y." So, the corresponding logical statement would be $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$. Hence, the correct answer is A. ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '.

=====

Answer Option 8:

The correct translation of the statement "All kings are luckier than all paupers" in predicate logic is option A: ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '. This statement correctly communicates that for every individual x, if x is a king, then for every individual y, if y is a pauper, x is luckier than y. This captures the meaning of the original statement that every king is luckier than every pauper.

=====

Answer Option 9:

The given statement is "All kings are luckier than all paupers."

In predicate logic:

- "All kings" translates to " $(\forall x)[Kx]$ ", where Kx means "x is a king" and $\forall x$ means "for all x".

- "are luckier than" translates to " Lxy ", where Lxy means "x is luckier than y".

- "all paupers" translates to " $(\forall y)(Py)$ ", where Py means "y is a pauper" and $\forall y$ means "for all y".

So, the translation of the statement "All kings are luckier than all paupers" is " $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ ", which means "For all x, if x is a king, then for all y, if y is a pauper, then x is luckier than y".

Therefore, the correct answer is A. ' $(\forall x)[Kx \supset (\forall y)(Py \supset Lxy)]$ '.

=====

Question 12:

' Construct a complete truth table for the following pairs of propositions. Then, using the truth tables, determine whether the statements are logically equivalent or contradictory. If neither, determine whether they are consistent or inconsistent. Justify your answers.

$(\sim M \supset \sim N) \vee (O \equiv N)$ and $(\sim M \cdot N) \cdot [(\sim O \vee \sim N) \cdot (O \vee N)]$, A. 'Logically equivalent', B. 'Contradictory', C. 'Neither logically equivalent nor contradictory, but consistent', D. 'Inconsistent'

=====

Answer Option 1:

A truth table needs to be constructed to determine the relationship between these two statements.

However, without knowing the specific content of the propositions M, N, and O, we cannot generate a meaningful truth table.

The problem is underspecified and does not provide enough information to generate a single correct answer A, B, C or D.

Answer Option 2:

This requires constructing a truth table for both propositions and comparing their truth values. However, as a language model AI, I do not have the capability to create a table visually. But I assure you that with the provided propositions, you won't get the same truth values for every combination of M, N, and O if you construct their truth tables. Therefore, they are not logically equivalent. They also won't be contradictory because that requires one proposition to always be true when the other is false, and vice versa. They can't be inconsistent because that requires them to both be false at the same time, which is not the case with the given propositions. So, the correct final answer is: C. 'Neither logically equivalent nor contradictory, but consistent'.

Answer Option 3:

This requires constructing the truth tables for the given logical statements and analyzing the results.

To determine whether two statements are logically equivalent, each row in their truth tables must be identical. If the rows are completely opposite, the statements are contradictory. If they are neither identical nor completely opposite, but they have at least one row that is true for both, they are consistent. If there is no row that is true for both, they are inconsistent.

However, without having the truth tables constructed, it's impossible to choose between options A, B, C, or D. Please provide the truth tables for the statements:

$(\sim M \supset \sim N) \vee (O \equiv N)$

$(\sim M \cdot N) \cdot [(\sim O \vee \sim N) \cdot (O \vee N)]$

Then it will be possible to determine whether they are logically equivalent, contradictory, consistent, or inconsistent.

Answer Option 4:

Due to the complexity of these logical expressions, a complete truth table needs to be generated for each, which would need more than text to properly display. However, from a logical viewpoint, the statements are quite different, and their complete truth tables would also likely be different.

$(\sim M \supset \sim N) \vee (O \equiv N)$ is a logical disjunction (OR operation) between two different statements: one asserting a material conditional (IF...THEN construction) between $\sim M$ and $\sim N$, and the other asserting a logical equivalence (IF AND ONLY IF construction) between O and N.

$(\sim M \cdot N) \cdot [(\sim O \vee \sim N) \cdot (O \vee N)]$ is a logical conjunction (AND operation) between two statements: one asserting a logical conjunction between $\sim M$ and N, and the other asserting a logical conjunction between two different logical disjunctions.

Given the different logical operations and structures in these two statements, they are not logically equivalent, nor are they contradictory, as they don't assert the opposite of each other.

So without constructing the full truth tables, it's difficult to definitively answer this question, but based on an interpretation of the logical formulas, the likely answer would be:

C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 5:

To answer this question, we first need to construct a truth table for both propositions.

However, to deduce the answer from the given propositions without constructing a complete truth table, we can observe the nature of the propositions.

The first proposition $(\sim M \supset \sim N) \vee (O \equiv N)$ is a disjunction, meaning either one of its components can be true for the whole proposition to be true.

The second proposition $(\sim M \cdot N) \cdot [(\sim O \vee \sim N) \cdot (O \vee N)]$ is a conjunction, meaning all of its components must be true for the whole proposition to be true.

Because of this difference in structure, these two statements cannot be logically equivalent (as one can be true with only part of it being true, and the other requires all parts to be true). They also cannot be contradictory (as it is possible for both to be false at the same time).

Therefore, the two statements are neither logically equivalent nor contradictory. To determine whether they're consistent or inconsistent, we'd need to construct a complete truth table, which is beyond the scope of this assistant.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'.

Answer Option 6:

First, we need to construct a truth table for the given propositions.

M N O $\sim M \supset \sim N$ $O \equiv N$ $(\sim M \supset \sim N) \vee (O \equiv N)$ $\sim M \cdot N$ $\sim O \vee \sim N$ $O \vee N$ $(\sim M \cdot N) \cdot [(\sim O \vee \sim N) \cdot (O \vee N)]$

T T F T T F T T F

T T F F F F T T F F

T F T T F T F T T F

T F F T T T F F T F T F
 F T T T T T T T F T T T
 F T F T F T T T T F F T
 F F T F F F T F T T T T
 F F F F T F T F T T T

We see that the two propositions have different truth-values for some inputs. For example, when M is T, N is T, and O is T, the first proposition is true but the second proposition is false.

Thus, the two propositions are not logically equivalent.

We can also see that for some inputs, both propositions are true, and for other inputs, both propositions are false. This means that the two propositions are not contradictory.

Finally, since there are inputs for which both propositions are true, the two propositions are consistent.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 7:

Creating a truth table for the given statements:

Let's denote the first statement as P and the second statement as Q

$[M \vee N] \vee [M \wedge N] \vee [M \wedge \neg N] \vee [M \wedge \neg N] \vee [O \equiv N] \vee [P \equiv (\neg M \supset \neg N) \vee (O \equiv N)] \vee [(\neg M \cdot N) \vee (\neg O \vee \neg N)] \vee [O \vee N] \vee [Q \equiv (\neg M \cdot N) \cdot [(\neg O \vee \neg N) \cdot (O \vee N)]]$

|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

T	T	T	F	F	F	F	F	F	F	F	F	F	F	F	F
T	T	T	F	F	F	F	F	F	F	F	F	F	F	F	F
T	F	T	F	F	F	F	F	F	F	F	F	F	F	F	F
T	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F	F	F	F	F	F	F	F	F
F	T	T	F	F	F	F	F	F	F	F	F	F	F	F	F
F	F	T	T	T	F	F	F	F	F	F	F	F	F	F	F
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

Looking at the truth table, the two statements are not logically equivalent (the columns for P and Q do not match). They are not contradictory (there's a row where both are true). Therefore, they are consistent (there's at least one row where both are true).

So, the final answer is: C. 'Neither logically equivalent nor contradictory, but consistent'.

Answer Option 8:

To solve this, we'll need to construct a complete truth table for the given propositions.

$M \vee N \vee O \vee \neg M \vee \neg N \vee \neg O \vee (\neg M \supset \neg N) \vee (O \equiv N) \vee (\neg M \cdot N) \vee (\neg O \vee \neg N) \vee (O \vee N) \vee [(\neg O \vee \neg N) \cdot (O \vee N)] \vee (\neg M \cdot N) \cdot [(\neg O \vee \neg N) \cdot (O \vee N)]$

T T T F F F T T T F F T F F
 T T F F F T T F T T T F
 T F T F T F F F F F T F F
 T F F F T T F T T F T F F
 F T T T F F T T T T F T F F
 F T F T F T T F T T T T T
 F F T T T F T F T F F T F F
 F F F T T T T T F T F F F

From the truth table, we can see that the two statements are not logically equivalent since they do not have the same truth values for all combinations of truth values for their variables. They are also not contradictory because they do not have opposite truth values for all combinations of truth values for their variables.

However, they are consistent since there are combinations of truth values for the variables where both statements are true (for instance, when M is false, N is true, and O is false).

So, the answer is C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 9:

Here is the truth table for the given propositions:

$[M \vee N] \vee [M \vee \neg N] \vee [O \vee \neg M] \vee [O \equiv N] \vee [(\neg M \supset \neg N) \vee (O \equiv N)] \vee [(\neg M \cdot N) \vee (\neg O \vee \neg N)] \vee [O \vee N] \vee [(\neg O \vee \neg N) \cdot (O \vee N)] \vee (\neg M \cdot N) \cdot [(\neg O \vee \neg N) \cdot (O \vee N)]$

|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

T	T	T	F	F	F	F	F	F	F	F	F	F	F	F	F
T	T	F	F	F	F	F	F	F	F	F	F	F	F	F	F
T	F	T	F	F	F	F	F	F	F	F	F	F	F	F	F
T	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F	F	F	F	F	F	F	F	F

|F|T|F|T|F|T|T|F|T|T|T|T|T|T|

|F|F|T|T|T|F|T|T|T|F|F|T|F|F|

|F|F|F|T|T|T|T|F|T|F|T|F|T|F|

Looking at the last two columns, we can see that the two statements are neither logically equivalent nor contradictory as they don't always have the same truth values nor always have opposite truth values.

They are, however, consistent, as there exist rows (truth assignments) in the table where both are true (e.g., row 6).

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Question 13:

'Which of the following propositions is an immediate (one-step) consequence in PL of the given premises?

$E \supset \sim F$

$\sim F \supset G$

$\sim G$, A. ' $E \supset F$ ', B. ' $F \supset G$ ', C. ' $G \supset E$ ', D. ' $\sim \sim F$ '

=====

Answer Option 1:

Applying the rule of Modus Tollens, if we have a conditional statement and the negation of its consequent, we can infer the negation of its antecedent. Thus, from the premises $\sim F \supset G$ and $\sim G$, we can infer $\sim \sim F$ or F .

Final Answer: D. ' $\sim \sim F$ '

Answer Option 2:

Modus tollens is a valid form of argument in propositional logic, which states that if "if p then q" is true and q is false, then p must also be false.

Given the premises: $E \supset \sim F$, $\sim F \supset G$, $\sim G$

Using modus tollens on the second and third premises, we can conclude that $\sim \sim F$ (double negation of F is equivalent to F) is true.

So the correct answer is: D. ' $\sim \sim F$ '

Answer Option 3:

The given premises are:

$E \supset \sim F$

$\sim F \supset G$

$\sim G$

The immediate one-step consequence would be $\sim \sim F$ (double negation of F), as it can be inferred directly from the second and third premises. If $\sim F$ leads to G ($\sim F \supset G$) and we know that G is not true ($\sim G$), then it must be the case that $\sim F$ is also not true, hence, $\sim \sim F$.

Final Answer: D

Answer Option 4:

A one-step consequence is a statement that can be derived directly from the premises without the need for any further steps or intermediary premises.

We can use the premise $\sim F \supset G$ and combine it with the premise $\sim G$ to infer $\sim \sim F$ according to the rule of modus tollens. Modus tollens states that if we have a proposition of the form "if P then Q" and we know that not-Q is true, then we can infer not-P.

In this case, if G is not true ($\sim G$), then F must be true ($\sim \sim F$) according to the premise $\sim F \supset G$. Therefore, the correct answer is D, ' $\sim \sim F$ '.

Answer Option 5:

Given premises are: $E \supset \sim F$, $\sim F \supset G$, $\sim G$

An immediate one-step consequence in propositional logic is derived by Modus Ponens or Modus Tollens.

Modus Ponens: If "p" and "if p then q" are both true, then "q" must be true.

Modus Tollens: If "if p then q" is true but "q" is not true, then "p" is not true.

From $\sim F \supset G$ and $\sim G$ (by Modus Tollens), we can infer $\sim \sim F$.

Therefore, the immediate one-step consequence of the given premises is ' $\sim \sim F$ '

Final Answer: D. ' $\sim \sim F$ '

Answer Option 6:

For this question, we will use Modus ponens rule (or Law of detachment) which states that if we have a conditional statement of the form "if p then q" ($p \supset q$) and a premise that p is true, then we can deduce that q is true.

Given:

1. $E \supset \sim F$ (if E then not F)

2. $\sim F \supset G$ (if not F then G)

3. $\sim G$ (not G is true)

From 2 and 3, we can apply Modus ponens. We have $\sim F \supset G$ and $\sim G$ is true, this implies that $\sim F$ is not true, which can be written as $\sim \sim F$.

So, the final answer is D. ' $\sim \sim F$ '.

Answer Option 7:

An immediate consequence in Propositional Logic (PL) means a conclusion that follows directly in one step from the given premises using one of the inference rules in logic.

Given premises are:

$E \supset \neg F$ (means, if E then not F),

$\neg F \supset G$ (means, if not F then G), and

$\neg G$ (means, not G).

Using Modus Tollens, we can deduce that since $\neg F \supset G$ and $\neg G$ are both true, then it must be the case that $\neg\neg F$ is true.

So, the immediate consequence of the given premises is $\neg\neg F$.

Final Answer: D. ' $\neg\neg F$ '

Answer Option 8:

Let's analyze each option:

A. ' $E \supset F$ ': This is the negation of the first premise, so it cannot be an immediate consequence of the premises.

B. ' $F \supset G$ ': This is not an immediate consequence of the premises, as none of the premises involve a conditional with F as the antecedent.

C. ' $G \supset E$ ': This is not an immediate consequence of the premises, as none of the premises involve a conditional with G as the antecedent.

D. ' $\neg\neg F$ ': If we consider that in Classical Logic, a double negation ($\neg\neg P$) is equivalent to P itself, then we can see that the answer is 'D'. We have $\neg F \supset G$ and $\neg G$ in the premises, and from these two, we can derive $\neg\neg F$ immediately using the Modus Tollens rule. Therefore, ' $\neg\neg F$ ' is an immediate consequence of the premises.

Final Answer: D

Answer Option 9:

If we consider the first two premises, we get:

If E then not F.

If not F then G.

If we combine those two, we get:

If E then G.

However, the third premise contradicts this:

Not G.

So, we have a contradiction: if E then G, but not G. The only way for this to be resolved is if not E. Therefore, the immediate consequence is that E cannot be true, or in other words, not E. However, none of the given options represent this.

But if we look at the premises in another way, we see:

If E then not F.

If not F then G.

Not G.

From these, we can infer that F must be true, otherwise G would be true, which contradicts the third premise. Therefore, the immediate consequence is that F is true, or in other words, not not F. Which is represented by option D.

Final Answer: D

Question 14:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$E \supset (F \vee \neg G)$

$F \supset (\neg E \vee \neg G) / \neg(E \equiv F)$ ', A. 'Valid', B. 'Invalid. Counterexample when E, F, and G are true', C. 'Invalid. Counterexample when E and F are true and G is false', D. 'Invalid. Counterexample when E, F, and G are false'

=====

Answer Option 1:

The argument is invalid. We can find a counterexample when E and F are true and G is false. In this case, the premises $E \supset (F \vee \neg G)$ and $F \supset (\neg E \vee \neg G)$ are both true, but the conclusion $\neg(E \equiv F)$ is false.

So, Final Answer: C

=====

Answer Option 2:

The given argument is:

$E \supset (F \vee \neg G)$

$F \supset (\neg E \vee \neg G)$

Therefore, $\neg(E \equiv F)$

Let's construct the truth table.

E F G $E \supset (F \vee \neg G)$ $F \supset (\neg E \vee \neg G)$ $\neg(E \equiv F)$

T T T T T F

T T F T T F

T F T F T T

T F F F T T

F T T T F T

F T F T F T

F F T T T T

F F F T T T

As per the truth table, when E, F and G are true, the conclusion $\neg(E \equiv F)$ is false. Therefore, the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when E, F, and G are true'

=====

Answer Option 3:

A counterexample is a case in which all premises are true and conclusion is false. Here, we have the premises as:

1) $E \supset (F \vee \neg G)$ - If E is true, then either F is true or G is not.

2) $F \supset (\neg E \vee \neg G)$ - If F is true, then either E is not true or G is not.

And the conclusion as:

$\neg(E \equiv F)$ - E is not equivalent to F.

Using these premises, let's find out the cases where the conclusion is false:

Case 1: When E, F, and G are all false. In this case, the first premise is true (because E is false), the second premise is true (because F is false), but the conclusion is false because E is equivalent to F (both are false). This is a counterexample.

So, the argument is invalid and the answer is D. 'Invalid. Counterexample when E, F, and G are false'.

=====

Answer Option 4:

The argument can be approached by using the indirect truth table method. We make a truth table and fill in values for our conclusion first, then fill in the rest of the table with an aim of making our premises true. If we can do this, the argument is invalid. If we can't, it's valid.

Working with the conclusion, we have " $\neg(E \equiv F)$ ", which is not(E is equivalent to F). This statement is true if E and F have different truth values. So, let's try E is true and F is false.

$E \supset (F \vee \neg G)$ becomes true \supset (false \vee $\neg G$).

In order for this to be true, G must be true.

Now let's look at the second premise:

$F \supset (\neg E \vee \neg G)$ becomes false \supset (\neg true \vee \neg true), which simplifies to false \supset (false \vee false), which is true (because a conditional with a false antecedent is always true).

So, in this case, when E is true, F is false and G is true, both premises are true while the conclusion is false, meaning the argument is invalid. The correct option is C, which presents this counterexample.

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Answer Option 5:

Let's use the indirect truth table method to test the validity of the argument. First, assume that all premises and the negation of the conclusion are simultaneously true. If we derive a contradiction, the argument is valid.

If we consider all premises and the negation of the conclusion to be true, we get:

Premise 1: $E \supset (F \vee \sim G)$ - which means if E is true, then either F is true or G is false.

Premise 2: $F \supset (\sim E \vee \sim G)$ - which means if F is true, then either E is false or G is false.

Negation of conclusion: $\sim(E \equiv F)$ - which means E is not equivalent to F (i.e., E and F cannot both be true or both be false).

Now, let's find a situation where all these can be true:

If we assume G is true and E is true, then from premise 1, F also has to be true. But this contradicts the negation of the conclusion because E and F cannot both be true.

Hence, the argument is valid. Therefore, the correct answer is A: 'Valid'.

Answer Option 6:

Indirect truth tables are used to quickly assess the validity of an argument. The method involves assuming that the conclusion is false and then checking to see if this leads to a contradiction.

Here, we'll assume that $\sim(E \equiv F)$ is false. Meaning, $E \equiv F$ is true. This implies that either both E and F are true, or both E and F are false.

Consider the case when both E and F are true. From the first premise, $E \supset (F \vee \sim G)$, since E is true, $F \vee \sim G$ has to be true. Since F is true, this is satisfied. From the second premise, $F \supset (\sim E \vee \sim G)$, since F is true, $\sim E \vee \sim G$ has to be true. But E is true, so $\sim E$ is false and therefore $\sim G$ must be true. But there's no information about G to contradict this, so this scenario is possible.

Next, consider the case when both E and F are false. From the first premise, $E \supset (F \vee \sim G)$, since E is false, the implication is true regardless of the other values. From the second premise, $F \supset (\sim E \vee \sim G)$, since F is false, the implication is true regardless of the other values. So this scenario is also possible.

Since we've found no contradictions, the argument is valid.

Final Answer: A. 'Valid'.

Answer Option 7:

Let's use indirect truth tables to determine the validity of the argument. An argument is valid if and only if there is no row of the truth table in which all the premises are true and the conclusion is false.

$E \supset (F \vee \sim G)$

$F \supset (\sim E \vee \sim G) / \sim(E \equiv F)$

We look for a situation where the premises ($E \supset (F \vee \sim G)$ and $F \supset (\sim E \vee \sim G)$) are true but the conclusion ($\sim(E \equiv F)$) is false.

If we let E, F, and G all be true, then:

Premise 1: $E \supset (F \vee \sim G)$ becomes $T \supset (T \vee \sim T)$, which simplifies to $T \supset T$, which is true.

Premise 2: $F \supset (\sim E \vee \sim G)$ becomes $T \supset (\sim T \vee \sim T)$, which simplifies to $T \supset F$, which is false. Since both premises are not true, this is not a valid counterexample.

If we try other combinations, we don't find a situation where both premises are true and the conclusion is false.

So, the argument is valid. The final answer is A. 'Valid'.

Answer Option 8:

In indirect truth tables, we start by assuming that the conclusion is false. Then, we list all the truth values that would make the conclusion false. If this leads to a contradiction (a statement and its negation both being true) in the truth values of the premises, the argument is valid. If not, the argument is invalid.

Here, the conclusion is $\sim(E \equiv F)$. For this to be false, E and F must have the same truth value (either both true or both false) since the biconditional $E \equiv F$ would be true.

Let's check the first premise for both cases:

1. E and F are true: The first premise " $E \supset (F \vee \sim G)$ " would be true only if G is either true or false. The second premise " $F \supset (\sim E \vee \sim G)$ " would be false because F is true but $(\sim E \vee \sim G)$ is false because E is not false and G is not false or true. So, the argument is invalid.

2. E and F are false: The first premise " $E \supset (F \vee \sim G)$ " would be true only if G is either true or false. The second premise " $F \supset (\sim E \vee \sim G)$ " would be true because F is false and so $(\sim E \vee \sim G)$ can be either true or false. So, the argument is invalid.

Therefore, the argument is invalid because there are truth values for E, F, and G which make all the premises true and the conclusion false. These truth values are: E and F true, and G is false. Thus, the correct answer is:

C. 'Invalid. Counterexample when E and F are true and G is false'

Answer Option 9:

For an argument to be valid, it must be the case that if the premises are true, then the conclusion must be true. Here, the argument is $E \supset (F \vee \sim G)$ and $F \supset (\sim E \vee \sim G)$, the conclusion is $\sim(E \equiv F)$.

We need to find a case where the premises are true, but the conclusion is false for the argument to be invalid. Let's check all the options:

A: 'Valid': We need to prove that this statement is either valid or invalid. So, we cannot choose this option without checking the other options.

B: 'Invalid. Counterexample when E, F, and G are true': In this case, $E \supset (F \vee \sim G)$ becomes $\text{True} \supset (\text{True} \vee \text{False})$ which simplifies to True. $F \supset (\sim E \vee \sim G)$ becomes $\text{True} \supset (\text{False} \vee \text{False})$ which simplifies to False. So, the premises are not all true and this does not provide a counterexample.

C: 'Invalid. Counterexample when E and F are true and G is false': In this case, $E \supset (F \vee \sim G)$ becomes $\text{True} \supset (\text{True} \vee \text{True})$ which simplifies to True. $F \supset (\sim E \vee \sim G)$ becomes $\text{True} \supset (\text{False} \vee \text{True})$ which simplifies to True. Thus, all the premises are true. However, the conclusion $\sim(E \equiv F)$ becomes $\sim(\text{True} \equiv \text{True})$ which simplifies to False. This provides a counterexample when all the premises are true but the conclusion is false.

D: 'Invalid. Counterexample when E, F, and G are false': In this case, $E \supset (F \vee \sim G)$ becomes $\text{False} \supset (\text{False} \vee \text{True})$ which simplifies to True. $F \supset (\sim E \vee \sim G)$ becomes $\text{False} \supset (\text{True} \vee \text{True})$ which simplifies to True. Thus, all the premises are true. But, the conclusion $\sim(E \equiv F)$ becomes $\sim(\text{False} \equiv \text{False})$ which simplifies to False. This provides another counterexample when all the premises are true but the conclusion is false.

So, the argument is invalid, and we have two possible counterexamples. Therefore, the correct answer choice would be both C and D. But in the given options, we only have C and D individually, so we choose the first one that offers a valid counterexample, which is C.

Final Answer: C. 'Invalid. Counterexample when E and F are true and G is false'

Question 15:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$H \equiv (\neg I \vee J)$

$H \vee \neg J / \neg I$, A. 'Valid', B. 'Invalid. Counterexample when H, I, and J are false', C. 'Invalid. Counterexample when H and I are true and J is false', D. 'Invalid. Counterexample when I is true and H and J are false'

=====

Answer Option 1:

The argument is not valid. A counterexample is when H and I are true and J is false. Because in this case, the premise $H \equiv (\neg I \vee J)$ is false, as H is true, but $(\neg I \vee J)$ is false (since I is true and J is false).

Similarly, the premise $H \vee \neg J$ is true (since H is true), but the conclusion $\neg I$ is false (since I is true). Therefore, the answer is C. 'Invalid. Counterexample when H and I are true and J is false'

Answer Option 2:

Let's examine the argument using indirect truth tables. We're to assume the conclusion is false and look for a contradiction.

1. $H \equiv (\neg I \vee J)$ // Premise

2. $H \vee \neg J$ // Premise

3. $\neg \neg I$ // Assuming the negation of the conclusion

By substituting (1) into (2), we get $(\neg I \vee J) \vee \neg J$, which simplifies to $\neg I \vee T$, which is always true.

Now, this clearly contradicts our assumption (3) that $\neg \neg I$ (which is I) is true. Therefore, the argument is valid.

Final Answer: A. 'Valid'

Answer Option 3:

An argument is valid if and only if it's impossible for the premises to be true and the conclusion false.

We can represent the argument as follows:

Premises:

1. $H \equiv (\neg I \vee J)$

2. $H \vee \neg J$

Conclusion:

$\neg I$ (negation of I)

Using indirect truth table methods, we need to find a scenario where the premises are true and the conclusion is false. This would make the argument invalid.

A counterexample is when I is true and H and J are false. In this case, the first premise $H \equiv (\neg I \vee J)$ is true because both sides are false (false is equivalent to false). The second premise $H \vee \neg J$ is also true because both H and $\neg J$ are false. But the conclusion $\neg I$ is false because I is true.

So the argument is invalid and the counterexample is when I is true and H and J are false.

Final Answer: D. 'Invalid. Counterexample when I is true and H and J are false'

Answer Option 4:

Let's use an indirect truth table to verify the validity of the argument. If the argument is valid, all of the rows will be filled without contradiction. If there is a contradiction, the argument is invalid and we will have found a counterexample.

First, write the argument and place underlines under the key components:

$H \equiv (\neg I \vee J)$

$H \vee \neg J / \neg I$

Keep the conclusion ($\neg I$) false, because we are trying to prove the argument is invalid.

$I = T$

From the first premise ($H \equiv (\neg I \vee J)$), if I is T, H can be equal to J.

Let's assume $H = T$, $J = T$.

Then, looking at the second premise ($H \vee \neg J$), it can hold true because H is T.

So, we have found a counterexample where the premises are true, but the conclusion is false. The values are $H = T$, $I = T$, and $J = T$.

Therefore, the argument is invalid with the counterexample where H, I, and J are all true.

Final Answer: D. 'Invalid. Counterexample when I is true and H and J are false'

Answer Option 5:

Indirect truth tables or the method of reductio ad absurdum can be used to test the validity of an argument. We assume the opposite of what we want to prove and show that this assumption leads to a contradiction, hence proving the original argument.

Argument:

$H \equiv (\neg I \vee J)$

$H \vee \sim J$ /

$\therefore \sim I$

Let's follow the steps to construct the table:

1. Assume the premises are true and the conclusion is false. That means $H \equiv (\sim I \vee J)$ and $H \vee \sim J$ are true and $\sim I$ is false.

2. $\sim I$ is false means I is true.

3. $H \equiv (\sim I \vee J)$ is true. If I is true, then $(\sim I \vee J)$ is false only if J is false.

4. $H \vee \sim J$ is true. If J is false, then $\sim J$ is true, which means H can be either true or false.

So, we found a counterexample when H is true or false, I is true, and J is false. Therefore, the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when I is true and H and J are false'

Answer Option 6:

We can make an indirect truth table:

$H \mid I \mid J \mid \sim I \mid \sim J \mid H \equiv (\sim I \vee J) \mid H \vee \sim J \mid$

$\mid \sim \mid \sim \mid \sim \mid \sim \mid \sim \mid \sim \mid \sim \mid \sim \mid$

$\mid T \mid T \mid T \mid F \mid F \mid T \mid T \mid$

$\mid T \mid T \mid F \mid F \mid T \mid F \mid T \mid$

$\mid T \mid F \mid T \mid T \mid F \mid T \mid T \mid$

$\mid T \mid F \mid F \mid T \mid T \mid T \mid T \mid$

$\mid F \mid T \mid T \mid F \mid F \mid F \mid T \mid$

$\mid F \mid T \mid F \mid F \mid T \mid T \mid F \mid$

$\mid F \mid F \mid T \mid T \mid F \mid T \mid F \mid$

$\mid F \mid F \mid F \mid T \mid T \mid T \mid F \mid$

The argument is valid only if the conclusion is true for all cases where the premises are true.

Looking at the table, the argument is invalid because there are situations (for example, when H and J are false, but I is true) where the premises are true but the conclusion is false.

So, the correct answer is B. 'Invalid. Counterexample when H , I , and J are false'.

Answer Option 7:

First, let's break down the statements:

$H \equiv (\sim I \vee J)$ means 'H if and only if (not I or J)'.

$H \vee \sim J$ means 'H or not J'.

In short, the argument says 'if H is true or J is false, then I is false'.

Let's analyze each option:

Option A: 'Valid' - To determine if the argument is valid, all the premises must be true and the conclusion (here $\sim I$) must also be true for every possible truth assignment.

Option B: 'Invalid. Counterexample when H , I , and J are false' - This is indeed an invalid case because the premises ($H \equiv (\sim I \vee J)$ and $H \vee \sim J$) are true, but the conclusion ($\sim I$) is false.

Option C: 'Invalid. Counterexample when H and I are true and J is false' - This is another invalid case because the premises are true, but the conclusion is false.

Option D: 'Invalid. Counterexample when I is true and H and J are false' - This is not an invalid case, because $\sim I$ (the conclusion) is false as I is true, but $H \vee \sim J$ (one of the premises) is also false as H and J are both false. So this counterexample does not present an inconsistent truth assignment that makes the argument invalid.

Final Answer: B. 'Invalid. Counterexample when H , I , and J are false'

Answer Option 8:

The argument is as follows:

Premise 1: $H \equiv (\sim I \vee J)$

Premise 2: $H \vee \sim J$

Conclusion: $\sim I$

We start by assuming all statements are true and then checking for inconsistencies. We can use the following truth table:

$H \mid I \mid J \mid \sim I \mid \sim J \mid H \equiv (\sim I \vee J) \mid H \vee \sim J \mid \sim I$

$T \mid T \mid F \mid F \mid T \mid F$

$T \mid F \mid F \mid T \mid T \mid F$

$T \mid F \mid T \mid F \mid T \mid T$

$T \mid F \mid F \mid T \mid T \mid T$

$F \mid T \mid F \mid F \mid F \mid F$

$F \mid T \mid F \mid T \mid T \mid F$

$F \mid F \mid T \mid F \mid F \mid T$

F F F T T T T T

As we can see from the table, there is a counterexample: when H and I are true and J is false, the premises are true, but the conclusion is false. Therefore, the argument is invalid.

Final Answer: C. 'Invalid. Counterexample when H and I are true and J is false'

Answer Option 9:

The argument is valid if and only if there is no row in which all the premises are true and the conclusion is false. We will check the options one-by-one.

Option A: 'Valid'

We can't make a decision just yet, we need to check the other options.

Option B: 'Invalid. Counterexample when H, I, and J are false'

If H, I, and J are false, then $\neg I$ is true and J is false, so $\neg I \vee J$ is true. Therefore, $H \equiv (\neg I \vee J)$ is false. This contradicts the first premise, so this is not a counterexample.

Option C: 'Invalid. Counterexample when H and I are true and J is false'

If H and I are true and J is false, then $\neg I$ is false and J is false, so $\neg I \vee J$ is false. Therefore, $H \equiv (\neg I \vee J)$ is true. This supports the first premise, but the second premise, $H \vee \neg J$, is also true. Therefore, the conclusion $\neg I$ is false. This is a contradiction, so this option is a counterexample.

Option D: 'Invalid. Counterexample when I is true and H and J are false'

If I is true and H and J are false, then $\neg I$ is false and J is false, so $\neg I \vee J$ is false. Therefore, $H \equiv (\neg I \vee J)$ is true. Also, $H \vee \neg J$ is true, but the conclusion $\neg I$ is false. This also contradicts the argument, so this option is also a counterexample.

Therefore, the argument is invalid and the correct answer is either C or D. We can choose either as the final answer, so let's take C.

Final Answer: C. 'Invalid. Counterexample when H and I are true and J is false'

Question 16:

' Select the best translation into predicate logic. Some firefighters rescue victims from danger. (Dx: x is danger; Fx: x is a firefighter; Vx: x is a victim; Rxyz: x rescues y from z)'. A. ' $(\exists x)(Fx \bullet (\forall y)(Dy \supset (\exists z)(Vz \bullet Rxyz)))$ ', B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ ', C. ' $(\exists x)(Fx \bullet (\exists y)(\exists z)((Vy \bullet Dz) \bullet Rxyz))$ ', D. ' $(\forall x)(Fx \supset (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '

=====

Answer Option 1:

B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '

Answer Option 2:

The sentence "Some firefighters rescue victims from danger" translates to "There exists some firefighters(x) who rescue some victims(y) from some danger(z)". So, the correct translation would be:

Option B: ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '

Answer Option 3:

The statement 'Some firefighters rescue victims from danger' can be translated to 'there exists at least one firefighter who rescues at least one victim from at least one danger'. This translates to option B in predicate logic: ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '. So the final answer is B.

Answer Option 4:

The given statement is "Some firefighters rescue victims from danger." This means that there exists a firefighter who rescues a victim from danger. The statement can be translated as "There exists an x, such that x is a firefighter and there exists a y and a z, such that y is a victim, z is danger and x rescues y from z."

Therefore, the correct translation into predicate logic would be B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '.

Answer Option 5:

The correct translation of "Some firefighters rescue victims from danger" would be "There exists a firefighter such that there is a victim and a danger, and the firefighter rescues the victim from the danger".

Therefore, the correct logical translation is:

B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '

Answer Option 6:

The statement "Some firefighters rescue victims from danger" suggests that there exists at least one firefighter (x) who rescues at least one victim (y) from at least one danger (z).

So, the correct translation would be: "There exists a firefighter, and there exists a victim, and there exists a danger such that the firefighter rescues the victim from the danger."

This corresponds to option B: ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '

Answer Option 7:

The given English sentence is 'Some firefighters rescue victims from danger.' The sentence is discussing some (existential) firefighters that rescue victims from danger. Therefore, we know that we are dealing with an existential quantifier for the firefighter (Fx). The firefighter is rescuing, so they are the x in Rxyz. They are rescuing victims (Vy) from danger (Dz), which is existentially quantified within the scope of the firefighter quantifier.

Therefore, the best translation into predicate logic is B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '.

Answer Option 8:

The sentence "Some firefighters rescue victims from danger" implies that there exists at least one firefighter who rescues at least one victim from at least one danger.

The predicate logic of this sentence would be ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '.

This translates to: "There exists some x such that x is a firefighter and there exists some y such that y is a victim and there exists some z such that z is a danger and x rescues y from z."

So, the correct answer is B. ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ '.

Answer Option 9:

The correct translation of the statement "Some firefighters rescue victims from danger" in predicate logic is as follows:

Option A: ' $(\exists x)(Fx \bullet (\forall y)(Dy \supset (\exists z)(Vz \bullet Rxyz)))$ ' - This suggests that 'for all danger, some firefighters rescue victims', which is not our required statement.

Option B: ' $(\exists x)(Fx \bullet (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ ' - This suggests 'there exists a firefighter who rescues a victim from some danger', which perfectly matches our statement.

Option C: ' $(\exists x)(Fx \bullet (\exists y)(\exists z)((Vy \bullet Dz) \bullet Rxyz))$ ' - This suggests 'there exists a firefighter who rescues victims from danger', which matches our statement but not in the correct order.

Option D: ' $(\forall x)(Fx \supset (\exists y)(Vy \bullet (\exists z)(Dz \bullet Rxyz)))$ ' - This suggests 'all firefighters rescue some victims from danger', which is a different statement.

Final Answer: B

Question 17:

'Identify the antecedent of the following conditional proposition: The university raises tuition if, and only if, both the governor approves of it and the board of trustees recommends it.', A. 'The university raises tuition.', B. 'The governor approves of it.', C. 'The board of trustees recommends it.', D. 'None of the above'

=====

Answer Option 1:

A. 'The university raises tuition.'

=====

Answer Option 2:

A. 'The university raises tuition.'

=====

Answer Option 3:

A. 'The university raises tuition.'

=====

Answer Option 4:

A. 'The university raises tuition.'

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Answer Option 5:

A. 'The university raises tuition.'

=====

Answer Option 6:

A. 'The university raises tuition.'

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Answer Option 7:

A. 'The university raises tuition.'

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Answer Option 8:

A. 'The university raises tuition.'

=====

Answer Option 9:

A. 'The university raises tuition.'

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Question 18:

' Select the best translation into predicate logic. All planets are smaller than Jupiter. (j: Jupiter; Px: x is a planet; Sxy: x is smaller than y)', A. $(\exists x)(Px \bullet Sxj)$, B. $(\forall x)(Px \bullet Sxj)$, C. $(\forall x)(Px \supset Sxj)$, D. $(\forall x)(Px \supset Sxj)$

=====

Answer Option 1:

The statement can be translated to 'For all x, if x is a planet, then x is smaller than Jupiter'. Therefore, the correct translation is D. $(\forall x)(Px \supset Sxj)$.

Answer Option 2:

The best translation into predicate logic for the statement "All planets are smaller than Jupiter." is D. $(\forall x)(Px \supset Sxj)$. This statement says that for all x, if x is a planet, then x is smaller than Jupiter, which is the correct logical translation.

Answer Option 3:

The correct answer is D. $(\forall x)(Px \supset Sxj)$. This translates to "For all x, if x is a planet, then x is smaller than Jupiter", which is the correct translation of "All planets are smaller than Jupiter".

Answer Option 4:

The statement 'All planets are smaller than Jupiter.' translates to 'for all x, if x is a planet, then x is smaller than Jupiter.' In predicate logic, this is represented by $(\forall x)(Px \supset Sxj)$. Final Answer: D

Answer Option 5:

The statement "All planets are smaller than Jupiter" should be translated as "For all x, if x is a planet, then x is smaller than Jupiter". In predicate logic, this is written as $(\forall x)(Px \supset Sxj)$. So, the correct answer is D. $(\forall x)(Px \supset Sxj)$

Answer Option 6:

In predicate logic, "All planets are smaller than Jupiter" translates to "For all x, if x is a planet, then x is smaller than Jupiter". Here, P is the property of being a planet and S is the relation of being smaller than.

So the correct translation is D. $(\forall x)(Px \supset Sxj)$

Answer Option 7:

The statement "All planets are smaller than Jupiter" can be translated into predicate logic as follows: for all x, if x is a planet, then x is smaller than Jupiter.

So, the best translation into predicate logic is:

$(\forall x)(Px \supset Sxj)$.

Final Answer: D

Answer Option 8:

The sentence 'All planets are smaller than Jupiter' is a general statement about all planets. So, we should use a universal quantifier $(\forall x)$. The statement can be translated as 'For all x, if x is a planet, then x is smaller than Jupiter'. So, the correct translation is $(\forall x)(Px \supset Sxj)$. Final Answer: D

Answer Option 9:

The given statement is "All planets are smaller than Jupiter". The statement is a universal generalization, that is, it applies to all planets. Therefore, the correct translation will involve a universal quantifier $(\forall x)$.

Moreover, the statement implies that if x is a planet, then x is smaller than Jupiter. Therefore, the correct translation will involve a conditional (\supset) . The correct answer is thus D: $(\forall x)(Px \supset Sxj)$, which can be read as "For all x, if x is a planet, then x is smaller than Jupiter".

Question 19:

'Select the best translation into predicate logic. José introduces Wilma to Kevin. (j: José; k: Kevin; w: Wilma; lxyz: x introduces y to z)', A. 'lwkj', B. 'ljwk', C. 'lwjk', D. 'ljkw'

=====

Answer Option 1:

B. 'ljwk'

=====

Answer Option 2:

The best translation of the statement "José introduces Wilma to Kevin" into predicate logic using the given symbols is 'ljwk'. Final answer: B. 'ljwk'

=====

Answer Option 3:

The correct translation of the sentence 'José introduces Wilma to Kevin.' into predicate logic would be 'ljwk'. This represents José (x) introduces Wilma (y) to Kevin (z). So, the correct answer is B. 'ljwk'.

=====

Answer Option 4:

The best translation into predicate logic for "José introduces Wilma to Kevin" is 'ljwk'. Here, 'l' represents 'introduces', 'j' represents 'José', 'w' represents 'Wilma', and 'k' represents 'Kevin'. So, 'ljwk' stands for

"José introduces Wilma to Kevin". Final Answer: B

=====

Answer Option 5:

The best translation of the sentence "José introduces Wilma to Kevin" into predicate logic using the given predicates would be 'ljwk'.

This translation represents José (j) introducing Wilma (w) to Kevin (k).

Final Answer: B. 'ljwk'

=====

Answer Option 6:

The best translation into predicate logic for 'José introduces Wilma to Kevin' would be 'ljwk'. In this case, 'j' represents José, 'w' represents Wilma and 'k' represents Kevin. Hence, the answer is B. 'ljwk'.

=====

Answer Option 7:

The correct translation of the statement "José introduces Wilma to Kevin" into predicate logic would mean that José (j) is the one who introduces, Wilma (w) is the one being introduced, and Kevin (k) is the one to whom Wilma is introduced. Therefore, the correct answer is B. 'ljwk'

=====

Answer Option 8:

The best translation of the statement "José introduces Wilma to Kevin" into predicate logic, given the symbols j for José, k for Kevin, w for Wilma and lxyz for "x introduces y to z" would be "ljwk", which interprets as "José introduces Wilma to Kevin".

Final Answer: B. 'ljwk'

=====

Answer Option 9:

'ljwk' is the correct translation into predicate logic for the sentence 'José introduces Wilma to Kevin.' Here, 'l' stands for 'introduces,' 'j' stands for 'José,' 'w' stands for 'Wilma,' and 'k' stands for 'Kevin.' Hence,

'ljwk' means 'José introduces Wilma to Kevin.' Final Answer: B. 'ljwk'

=====

Question 20:

' Select the best translation into predicate logic: No artifacts are people.', A. ' $\neg Pa$ ', B. ' $(\forall x)(Ax \supset \neg Px)$ ', C. ' $\neg Ap$ ', D. ' $(\forall x)(Ax \bullet \neg Px)$ '

=====

Answer Option 1:

The best translation of the given sentence into predicate logic is, B. ' $(\forall x)(Ax \supset \neg Px)$ ', where A stands for artifacts and P for people. This translates into "For all x, if x is an artifact, then x is not a people." which matches the original statement 'No artifacts are people'.

=====

Answer Option 2:

The best translation of "No artifacts are people" into predicate logic would be: B. ' $(\forall x)(Ax \supset \neg Px)$ ' This statement means "For all x, if x is an artifact, then x is not a person." which accurately represents the original statement "No artifacts are people".

=====

Answer Option 3:

The statement "No artifacts are people" means "For all x, if x is an artifact then x is not a person". So the best translation is:

B. ' $(\forall x)(Ax \supset \neg Px)$ '

This translates to "For all x, if x is an artifact (Ax) then x is not a person ($\neg Px$)".

=====

Answer Option 4:

The statement "No artifacts are people" denies the existence of any object that is both an artifact and a person. It can be translated into predicate logic as follows:

B. ' $(\forall x)(Ax \supset \neg Px)$ '

This can be read as "For all x, if x is an artifact then x is not a person", which correctly represents the original statement.

So, the correct answer is B. ' $(\forall x)(Ax \supset \neg Px)$ '.

=====

Answer Option 5:

The correct translation of "No artifacts are people" into predicate logic should indicate that for all elements x, if x is an artifact, then it is not a person. Therefore the correct option is: B. ' $(\forall x)(Ax \supset \neg Px)$ ', which says for all x, if x is an artifact (Ax), then x is not a person ($\neg Px$).

=====

Answer Option 6:

The given statement, "No artifacts are people" is a universal negative statement. It is stating that all things that are artifacts are not people. This is best represented by the option B: ' $(\forall x)(Ax \supset \neg Px)$ ', where $\forall x$ denotes "for all x", Ax denotes "x is an artifact", \supset denotes "implies", and $\neg Px$ denotes "x is not a person". Hence, this statement can be read as "For all x, if x is an artifact, then x is not a person," which is equivalent to the original statement "No artifacts are people". So, the final answer is B.

=====

Answer Option 7:

The statement "No artifacts are people" translates to "For all x, if x is an artifact then x is not a person."

Option A: ' $\neg Pa$ ' represents 'a is not a person' which lacks any reference to artifacts.

Option B: ' $(\forall x)(Ax \supset \neg Px)$ ' is the correct translation. It represents 'For all x, if x is an artifact then x is not a person'.

Option C: ' $\neg Ap$ ' represents 'p is not an artifact' which lacks any reference to persons.

Option D: ' $(\forall x)(Ax \bullet \neg Px)$ ' represents 'For all x, x is an artifact and x is not a person'. It incorrectly assumes that all x's are artifacts.

Final Answer: B. ' $(\forall x)(Ax \supset \neg Px)$ '

=====

Answer Option 8:

The correct translation of the given statement "No artifacts are people" into predicate logic using universal quantification would be "For all objects, if it is an artifact, then it is not a person."

In predicate logic, it is usually represented as follows:

' $\forall x$ (Artifact(x) implies \neg Person(x))', where $\forall x$ represents 'for all x', 'Artifact(x)' represents 'x is an artifact' and ' \neg Person(x)' represents 'x is not a person'.

Therefore, the correct answer is: B. ' $(\forall x)(Ax \supset \neg Px)$ '

=====

Answer Option 9:

The correct translation for the statement "No artifacts are people" in predicate logic should convey the idea that for all entities, if that entity is an artifact, then it is not a person.

Option A: ' $\neg Pa$ ' doesn't use a universal quantifier, so it's not saying "no artifacts" but rather "a specific artifact is not a person".

Option B: ' $(\forall x)(Ax \supset \neg Px)$ ' This can be read as "For all x, if x is an artifact, then x is not a person", which matches our original statement perfectly.

Option C: ' $\neg Ap$ ' again doesn't use a universal quantifier, so it's not saying "no artifacts" but rather "a specific artifact is not a person".

Option D: ' $(\forall x)(Ax \bullet \neg Px)$ ' This can be read as "For all x, x is an artifact and x is not a person", which is not equivalent to the original statement.

Thus, the correct translation is B: ' $(\forall x)(Ax \supset \neg Px)$ '.

=====

Question 21:

'Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$P \supset Q$

$Q \cdot R / \sim P \cdot R$, A. 'Valid', B. 'Invalid. Counterexample when P, R, and Q are true', C. 'Invalid. Counterexample when P and Q are true and R is false', D. 'Invalid. Counterexample when R and Q are true and P is false'

=====

Answer Option 1:

A truth table for this argument is as follows:

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot R$

T T T T F F

T T F T F F

T F T F F F

T F F F F F

F T T T T T

F T F F T F

F F T F T T

F F F F T F

It can be seen that there is no row where both premises are true and the conclusion is false. Therefore, the argument is valid.

Final Answer: A. 'Valid'

=====

Answer Option 2:

A truth table for this argument would be:

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot R$

T T T T F

T T F T F

T F T F F

T F F F F

F T T T T

F T F F F

F F T F T

F F F F F

The argument is valid if and only if every row in which the premises are true, the conclusion is also true. The argument is invalid if there's at least one row where the premises are true and the conclusion is false.

In this case, the argument is invalid because there is a counterexample when P is true, Q is true, and R is false. So the correct answer is:

C. 'Invalid. Counterexample when P and Q are true and R is false'

=====

Answer Option 3:

First, let's construct the truth table:

P Q R $P \supset Q$ $Q \wedge R$ $\sim P \wedge R$

T T T T F

T T F T F

T F T F F

T F F F F

F T T T T

F T F T F

F F T F T

F F F F F

Here, we see that the argument is invalid, because there exists a row in the truth table where the premises are true, but the conclusion is false - that is when P is false, R is true, and Q is true. Therefore, the correct answer is D. 'Invalid. Counterexample when R and Q are true and P is false'

=====

Answer Option 4:

This is a problem of propositional logic. Let's construct a truth table.

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot \sim R$

T T T T T F F

T T F T F F F

T F T F F F F

T F F F F F F

F T T T T T T

F T F T F T F

F F T F F T T

F F F F T F F

From the table, we can see that the statement $P \supset Q$ holds true only when P is False or Q is True. The statement $Q \cdot R$ holds true only when both Q and R are True. The statement $\sim P \cdot \sim R$ holds true only when P is False and R is True.

Comparing, we can see that there are instances when $P \supset Q$ and $Q \cdot R$ are True but $\sim P \cdot \sim R$ is False (e.g., the second row). This means the argument is not logically valid.

Final Answer: B. 'Invalid. Counterexample when P, R, and Q are true'.

Answer Option 5:

A truth table will provide a clear understanding of the whole argument. The condensed truth table is as follows:

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot R$

T T T T T F

T T F T F F

T F T F F F

T F F F F F

F T T T T T

F T F T F F

F F T T F T

F F F T F F

According to the table, there are two rows where all premise columns are true but the conclusion column is false: the first row (where P, Q, and R are all true) and the last row (where P, Q, and R are all false).

Thus, the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when P, R, and Q are true'

Answer Option 6:

Let's write the truth table for the given argument:

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot \sim R$

T T T T T F F

T T F T F F F

T F T F F F F

T F F F F F F

F T T T T T T

F T F T F T F

F F T F F T T

F F F T F T F

In order for the argument to be valid, it needs to be impossible for the premises ($P \supset Q$ and $Q \cdot R$) to be true while the conclusion ($\sim P \cdot \sim R$) is false. As we can see from the truth table, there is no such case.

Therefore, the argument is valid.

Final Answer: A. 'Valid'

Answer Option 7:

The truth table for the propositions $P \supset Q$, $Q \cdot R$, and $\sim P \cdot R$ is as follows:

P Q R $P \supset Q$ $Q \cdot R$ $\sim P \cdot R$

T T T T T F F

T T F T F F F

T F T F F F F

T F F F F F F

F T T T T T T

F T F T F T F

F F T T F T T

F F F T F T F

Looking at the truth table, if $P \supset Q$ and $Q \cdot R$ are true, $\sim P \cdot R$ is not necessarily true. For example, when P, Q, and R are all true, $P \supset Q$ and $Q \cdot R$ are true, but $\sim P \cdot R$ is false.

Therefore, the argument is invalid. The correct counterexample is when P, Q, and R are true.

Final Answer: B. 'Invalid. Counterexample when P, R, and Q are true'.

Answer Option 8:

Let's construct the truth table:

P Q R | $P \supset Q$ | $Q \cdot R$ | $\sim P \cdot R$

T T T | T | T | F

T T F | T | F | F

T F T | F | F | F

T F F | F | F | F

F T T | T | T | T

F T F | T | F | F

F F T | T | F | T

F F F | T | F | F

We can see that in the line where P, R, and Q are all true (T T T), we get different results for the premises and the conclusion. The argument is therefore invalid. The correct counterexample is when P, R, and Q are all true, as in this case, the conclusion $\sim P \cdot R$ is not true ($\sim P$ is false), while the two premises $P \supset Q$ and $Q \cdot R$ are both true.

Therefore, the final answer is B. 'Invalid. Counterexample when P, R, and Q are true'.

Answer Option 9:

Let's create a truth table:

P | Q | R | $P \supset Q$ | $Q \cdot R$ | $\sim P \cdot R$

T | T | T | T | T | F | F

T | T | F | T | F | F | F

T | F | T | F | F | F | F

T | F | F | F | F | F | F

F | T | T | T | T | T | T

F | T | F | T | F | T | F

F | F | T | T | F | T | T

F | F | F | T | F | T | F

The argument is presented as $P \supset Q$, $Q \cdot R$ therefore $\sim P \cdot R$

This argument is considered valid if whenever all the premises ($P \supset Q$, and $Q \cdot R$) are true, the conclusion ($\sim P \cdot R$) is also true.

From the truth table, we can see that there is no row where all premises are true and the conclusion is false. Therefore, the argument is valid.

Final Answer: A. 'Valid'

Question 22:

'Select the best translation into predicate logic. Marco moves from Italy to Spain. (i: Italy; m: Marco; s: Spain; Mxyz: x moves to y from z)', A. 'Msim', B. 'Mmis', C. 'Mims', D. 'Mmsi'

=====

Answer Option 1:

B. 'Mmis'

=====

Answer Option 2:

The correct translation of "Marco moves from Italy to Spain" into predicate logic by using the given symbols would be "Mmis". So, the correct option is B. 'Mmis'.

=====

Answer Option 3:

The correct translation into predicate logic for "Marco moves from Italy to Spain" would be 'Mmis'. So, the final answer is B. 'Mmis'.

=====

Answer Option 4:

The correct translation of "Marco moves from Italy to Spain" into predicate logic using the given predicates would be 'Mmsi'. Thus the correct answer is D. 'Mmsi'.

=====

Answer Option 5:

The best translation into predicate logic for the sentence "Marco moves from Italy to Spain" will be 'Mmis'. This is because in the provided predicate logic structure Mxyz: x moves to y from z, Marco (m) is moving (M), from Italy (i) to Spain (s). Therefore the correct answer is B. 'Mmis'.

=====

Answer Option 6:

The best translation into predicate logic for Marco moves from Italy to Spain would be 'Mmis'. Option B: 'Mmis'. Here, M represents the action (move), m represents the subject (Marco), i represents the initial location (Italy), and s represents the final destination (Spain). Final Answer: B

=====

Answer Option 7:

The best translation for the statement "Marco moves from Italy to Spain" using the predicate logic provided would be 'Mmis'. This is because in the predicate logic 'Mxyz', 'x' represents the person moving, 'y' represents the destination, and 'z' represents the origin. Therefore, 'm' for Marco, 's' for Spain, and 'i' for Italy gives us 'Mmis'. Final Answer: B. 'Mmis'

=====

Answer Option 8:

The best translation into predicate logic of "Marco moves from Italy to Spain" would be 'Mmis'. This is because Mxyz is described as 'x moves to y from z', where x represents who is moving, y represents the destination, and z represents the starting point. In this sentence, Marco (m) is moving to Spain (s) from Italy (i). Hence, the answer is B. 'Mmis'.

=====

Answer Option 9:

The best translation into predicate logic would be 'Mmis'. Here, 'M' stands for the action of moving, 'm' stands for Marco, 'i' stands for Italy (from where the movement is initiated), and 's' stands for Spain (to where the movement is directed). Thus, Mmis can be interpreted as 'Marco moves from Italy to Spain'. Final Answer: B. 'Mmis'.

=====

Question 23:

' Select the best English interpretation of the given proposition, using the following translation key: Ax: x is an apartment Hx: x is a house Lx: x is large Bxy: x is bigger than y $(\forall x)(Ax \supset (\forall y)((Hy \bullet Ly) \supset \neg Bxy))$.'

A. 'All apartments are not bigger than some large house.', B. 'No apartment is bigger than any large house.', C. 'All large houses are not bigger than some apartment.', D. 'No large house is bigger than all apartments.'

=====

Answer Option 1:

B. 'No apartment is bigger than any large house.'

=====

Answer Option 2:

The given proposition can be read as: For all x, if x is an apartment, then for all y, if y is a house and y is large, then x is not bigger than y.

So, the best English interpretation is:

B. 'No apartment is bigger than any large house.'

=====

Answer Option 3:

The proposition can be translated as:

"For all x, if x is an apartment, then for all y, if y is a house and y is large, then x is not bigger than y."

This means that no apartment is bigger than any large house.

So, the correct answer is B. 'No apartment is bigger than any large house.'

=====

Answer Option 4:

The proposition $(\forall x)(Ax \supset (\forall y)((Hy \bullet Ly) \supset \neg Bxy))$ can be translated to English as: "For all x, if x is an apartment, then for all y, if y is a house and y is large, then x is not bigger than y."

So, the best English interpretation of the given proposition is :

B. 'No apartment is bigger than any large house.'

=====

Answer Option 5:

The given proposition $(\forall x)(Ax \supset (\forall y)((Hy \bullet Ly) \supset \neg Bxy))$ translates to 'For all x, if x is an apartment, then for all y, if y is a house and y is large, then x is not bigger than y'. So, the best English interpretation of this would be 'No apartment is bigger than any large house.' Final Answer: B

=====

Answer Option 6:

The given proposition $(\forall x)(Ax \supset (\forall y)((Hy \bullet Ly) \supset \neg Bxy))$ translates to: For all x, if x is an apartment, then for all y, if y is a house and y is large, then it is not the case that x is bigger than y. This is best interpreted as: 'No apartment is bigger than any large house.' So, the correct answer is B. 'No apartment is bigger than any large house.'

=====

Answer Option 7:

The given proposition can be translated as follows:

'For all x, if x is an apartment, then for all y, if y is a house and y is large, then x is not bigger than y.'

This can be interpreted as 'No apartment is bigger than any large house.' Therefore, the correct answer is B. 'No apartment is bigger than any large house.'

=====

Answer Option 8:

The given statement can be translated as: For all x, if x is an apartment then for all y, if y is a house and y is large, then x is not bigger than y. This translates to option B: 'No apartment is bigger than any large house.'

=====

Answer Option 9:

The given proposition $(\forall x)(Ax \supset (\forall y)((Hy \bullet Ly) \supset \neg Bxy))$ can be translated into English as 'For every x, if x is an apartment, then for every y, if y is a house and y is large, then x is not bigger than y.' This is equivalent to the statement 'No apartment is bigger than any large house.' So, the correct answer is B. 'No apartment is bigger than any large house.'

=====

Question 24:

' Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$$J \equiv \neg K$$

$$J \vee L$$

$\neg K / L$, A. 'Valid', B. 'Invalid. Counterexample when J and K are true and L is false', C. 'Invalid. Counterexample when J is true and K and L are false', D. 'Invalid. Counterexample when K is true and J and L are false'

=====

Answer Option 1:

Let's build the truth table:

$$J \ K \ L \ \neg K \ J \equiv \neg K \ J \vee L$$

T T T F F T

T T F F F T

T F T T T T

T F F T T T

F T T F F T

F T F F F F

F F T T F T

F F F T F F

From the truth table, we see that, when J and K are true and L is false, the premises are true but the conclusion is false. Therefore, the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when J and K are true and L is false'

=====

Answer Option 2:

A truth table can be constructed as follows:

$$J \ K \ L \ J \equiv \neg K \ J \vee L$$

T T F F T

T F T T T

F T T F T

F F T T T

T T T F T

T F F T T

F T F F F

F F F T F

From the truth table, we can see that every condition where the premises are true ($J \equiv \neg K$ and $J \vee L$), the conclusion ($\neg K / L$) is also true. Therefore, the argument is valid.

Final Answer: A. 'Valid'

=====

Answer Option 3:

We can construct a truth table as follows:

$$J \ K \ L \ \neg K \ J \equiv \neg K \ J \vee L$$

T T T F F T

T T F F F T

T F T T T T

T F F T T T

F T T F F T

F T F F F F

F F T T F T

F F F T F F

Looking at the truth table, we can see that the argument is invalid because there is a row where the premises are true, but the conclusion is false (last row). In this case, J and K are false and L is false.

Final Answer: D. 'Invalid. Counterexample when K is true and J and L are false'

=====

Answer Option 4:

Constructing the truth table:

$$J \ K \ L \ \neg K \ J \equiv \neg K \ J \vee L$$

T T T F F T
 T T F F F T
 T F T T T T
 T F F T T T
 F T T F F T
 F T F F F F
 F F T T T T
 F F F T T F

From this truth table, the counterexample for the argument is when J is false, K is true, and L is false (sixth row). The argument is therefore invalid.

Final Answer: B. 'Invalid. Counterexample when J and K are true and L is false'

Answer Option 5:

We can make a truth table to solve this. However, for simplicity, let's look at each proposition:

$J \equiv \neg K$ means J is true if and only if K is not true.

$J \vee L$ means J is true or L is true or both are true.

$\neg K / L$ is like saying if K is not true, then L is true.

As per above statements, if J is true, then K must be false and if K is not true, then L must be true. So, there is no possible way for J, K and L to all be true at the same time. Also, it's not possible for J to be true and K and L to be false because if J is true, then K must be false and L must be true. Therefore, the argument is valid.

So, the answer is A. 'Valid'

Answer Option 6:

Let's construct the truth table:

$J \vee K \equiv \neg K \vee J \vee L \equiv \neg K / L$

T T F F T/F T/F

T F T T T/T T/T

F T F F T/F F/T

F F T F F/T F/T

The argument is invalid because there is a counterexample when J is true and K and L are false. In this case, the premises $J \equiv \neg K$ and $J \vee L$ are true, but the conclusion $\neg K / L$ is false. Thus, option C is the correct answer.

Answer Option 7:

A truth table would look like this:

$| J | K | L | \neg K | J \equiv \neg K | J \vee L |$

|---|---|---|---|-----|-----|

| T | T | T | F | F | T |

| T | T | F | F | F | T |

| T | F | T | T | T | T |

| T | F | F | T | T | T |

| F | T | T | F | T | T |

| F | T | F | F | T | F |

| F | F | T | T | F | T |

| F | F | F | T | F | F |

Have a look at the 2nd row. The premises ($J \equiv \neg K$ and $J \vee L$) are true but the conclusion ($\neg K / L$) is false. Therefore, the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when K is true and J and L are false'

Answer Option 8:

We will construct a truth table for the argument:

$| J | K | L | \neg K | J \equiv \neg K | J \vee L |$

|---|---|---|---|-----|-----|

| F | F | F | T | F | F |

| F | F | T | T | F | T |

| F | T | F | F | T | F |

| F | T | T | T | T | T |

T	F	F	T	T	T
T	F	T	T	T	T
T	T	F	F	F	T
T	T	T	F	F	T

The argument is invalid. A counterexample can be seen in the row where J and K are true and L is false. Despite J being equivalent to $\neg K$ and $J \vee L$ being true, $\neg K / L$ is false.

Final Answer: D. 'Invalid. Counterexample when K is true and J and L are false'

Answer Option 9:

The truth table for the given propositions is as follows:

$J \mid K \mid L \mid \neg K \mid J \equiv \neg K \mid J \vee L$

T	F	T	T	T	T
---	---	---	---	---	---

T	F	F	T	T	T
---	---	---	---	---	---

F	T	T	F	F	T
---	---	---	---	---	---

F	T	F	F	F	F
---	---	---	---	---	---

T	T	T	F	F	T
---	---	---	---	---	---

T	T	F	F	F	T
---	---	---	---	---	---

F	F	T	T	T	T
---	---	---	---	---	---

F	F	F	T	T	F
---	---	---	---	---	---

In the truth table, when we look for a situation where the premises ($J \equiv \neg K$ and $J \vee L$) are true and the conclusion ($\neg K / L$) is false, the fourth row applies (J is false, K is true, and L is false). This is a counterexample that shows the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when K is true and J and L are false'

Question 25:

' Which of the given formulas of PL is the best symbolization of the following sentence?

Pablo will go to the store if, and only if, his brother drives him and pays for gas.', A. ' $(P \equiv D) \equiv G$ ', B. ' $(D \bullet G) \supset P$ ', C. ' $P \supset (D \bullet G)$ ', D. ' $P \equiv (D \bullet G)$ '

=====

Answer Option 1:

The best symbolization of the sentence is: ' $P \equiv (D \bullet G)$ '. Therefore, the final answer is D.

=====

Answer Option 2:

In the given sentence, the phrase "if, and only if" typically corresponds to the logical operator of equivalence, denoted by \equiv . This indicates that Pablo will go to the store (P) is equivalent to his brother driving him and paying for gas ($D \bullet G$). Therefore, the correct symbolization is $P \equiv (D \bullet G)$.

Final Answer: D

=====

Answer Option 3:

The given sentence can be symbolized as:

P: Pablo will go to the store.

D: His brother drives him.

G: His brother pays for gas.

The sentence says that Pablo will go to the store if and only if both D and G are true. Hence, the correct symbolization should be ' $P \equiv (D \bullet G)$ '.

So, the final answer is: D. ' $P \equiv (D \bullet G)$ '

=====

Answer Option 4:

The given sentence can be symbolized as follows:

Let P represent 'Pablo will go to the store'

Let D represent 'his brother drives him'

Let G represent 'his brother pays for gas'

The sentence 'Pablo will go to the store if, and only if, his brother drives him and pays for gas' can be symbolized as ' P if and only if (D and G)'.

The correct answer is ' $P \equiv (D \bullet G)$ '

So, the final answer is D.

=====

Answer Option 5:

The sentence 'Pablo will go to the store if, and only if, his brother drives him and pays for gas' is best symbolized by the formula ' $P \equiv (D \bullet G)$ '. This formula correctly represents the sentence as it says Pablo will go to the store (P) if and only if (\equiv) his brother drives him and pays for gas ($D \bullet G$). So the correct answer is D. ' $P \equiv (D \bullet G)$ '.

=====

Answer Option 6:

The sentence 'Pablo will go to the store if, and only if, his brother drives him and pays for gas.' It is a biconditional statement, which means both the condition and the result are necessary and sufficient for each other. In other words, Pablo will go to the store if his brother drives him and pays for gas AND if Pablo goes to the store, then his brother has driven him and paid for gas. The best symbolization of this sentence in propositional logic would be ' $P \equiv (D \bullet G)$ '. So, the correct answer is D. ' $P \equiv (D \bullet G)$ '.

=====

Answer Option 7:

Let P represent 'Pablo will go to the store', D represent 'his brother drives him' and G represent 'pays for gas'. The phrase 'if, and only if' represents a biconditional relationship, which means that both parts of the statement are necessary and sufficient for the other.

So, the best formula to symbolize the sentence would be ' $P \equiv (D \bullet G)$ ' where ' \equiv ' stands for 'if and only if' and ' \bullet ' stands for 'and'. This indicates that Pablo will go to the store if and only if both his brother drives him and pays for gas are true.

Final Answer: D. ' $P \equiv (D \bullet G)$ '

=====

Answer Option 8:

In this case, we can symbolize as follows: P: Pablo will go to the store D: His brother drives him G: Pays for Gas The phrase "if and only if" in logic is represented as an equivalence, or a bi-conditional (\equiv), meaning that both conditions must be fulfilled for the statement to hold true. Therefore, the correct symbolization would be: Pablo will go to the store if and only if (his brother drives him and pays for gas). This can be symbolized as $P \equiv (D \bullet G)$ where \bullet represents "and". So, the Final Answer: D

=====

Answer Option 9:

In the given sentence, the phrase "if, and only if" signifies a biconditional operator (\equiv), which essentially means that both conditions need to be true for the whole statement to be true. Therefore, we can represent the sentence as follows:

P: Pablo will go to the store,

D: His brother drives him,

G: His brother pays for gas.

Pablo will go to the store if and only if both conditions i.e., his brother drives him and pays for the gas, are true. This is best represented as: $P \equiv (D \bullet G)$.

Therefore, the correct answer is: D. ' $P \equiv (D \bullet G)$ '.

Question 26:

' Use indirect truth tables to determine whether each set of propositions is consistent. If the set is consistent, choose an option with a consistent valuation. (There may be other consistent valuations.)

$D \equiv E$

$F \vee D$

$\neg E \cdot \neg F$, A. 'Inconsistent', B. 'Consistent. Consistent valuation when D, E, and F are true', C. 'Consistent. Consistent valuation when D and E are true and F is false', D. 'Consistent. Consistent valuation when D and F are true and E is false'

=====

Answer Option 1:

To determine whether a set of propositions is consistent, we need to find a situation in which all the propositions can be true at the same time.

Given that $D \equiv E$, D and E must have the same truth value.

$F \vee D$ means either F, D or both must be true.

$\neg E \cdot \neg F$ means both E and F must be false.

From the above, we can see that the only consistent valuation is when D and E are false, and F is also false. But none of the options are satisfied this condition. Hence, the set of propositions is inconsistent.

Final Answer: A. 'Inconsistent'

=====

Answer Option 2:

Indirect truth tables start with the assumption that the conclusion is false. So we start by assuming that the set of propositions is inconsistent.

$D \equiv E$

$F \vee D$

$\neg E \cdot \neg F$

Given that $D \equiv E$, if one statement is true, then the other is true and vice versa. In addition, if one statement is false then the other is false.

From $F \vee D$, we know that at least one of F or D is true.

From $\neg E \cdot \neg F$, we know that both E and F are false.

So, if we assume that D, E, and F are all false, this would satisfy all the conditions and thus the set of propositions is consistent.

Therefore, the correct answer is C. 'Consistent. Consistent valuation when D and E are true and F is false'.

=====

Answer Option 3:

First, examine the given propositions:

$D \equiv E$ (D is logically equivalent to E)

$F \vee D$ (F or D is true)

$\neg E \cdot \neg F$ (Both E and F are false)

For the proposition $D \equiv E$ to be true, both D and E must have the same truth value (either both true or both false).

For the proposition $F \vee D$, either F or D (or both) must be true.

For the proposition $\neg E \cdot \neg F$, both E and F must be false.

Considering all these, it can be seen that the only consistent valuation is when D and E are false and F is true. Hence, the set of propositions is consistent with valuation: D is false, E is false, and F is true.

Final Answer: A. 'Inconsistent' because none of the provided options match the above consistent valuation.

=====

Answer Option 4:

An indirect truth table is a tool that is used to determine whether a set of propositions is consistent or not.

$D \equiv E$ means D is logically equivalent to E, so they have the same truth value.

$F \vee D$ means at least one of F or D is true.

$\neg E \cdot \neg F$ means both E and F are false.

Given these propositions, there is no way for all three to be true at the same time. D and E must have the same truth value, but if F is true, then E cannot be false, and if F is false, then D cannot be true. So

the set of propositions is inconsistent.

Final Answer: A. 'Inconsistent'

=====

Answer Option 5:

$D \equiv E$ implies that D and E have the same logical value.

$F \vee D$ implies that at least one of D and F is true.

$\neg E \cdot \neg F$ implies that both E and F are false.

From these premises, we can find a consistent valuation when D, E are false and F is false.

Option B is incorrect because $\neg E \cdot \neg F$ would not hold if E and F are true.

Option C is correct because $D \equiv E$ would hold if D and E are true, $F \vee D$ would hold if D is true (regardless of F), and $\neg E \cdot \neg F$ would hold if E and F are false.

Option D is incorrect because $D \equiv E$ would not hold if D is true and E is false.

So, the correct answer is: C. 'Consistent. Consistent valuation when D and E are true and F is false'

Answer Option 6:

We have three propositions:

$$D \equiv E$$

$$F \vee D$$

$$\neg E \cdot \neg F$$

The notation ' \equiv ' denotes logical equivalence, ' \vee ' denotes logical disjunction (OR), and ' \neg ' denotes logical negation (NOT).

We start by assuming that all propositions are true and work backwards to find a truth assignment.

1. For $D \equiv E$ to be true, D and E must have the same value. Let's say D and E are true.
2. For $F \vee D$ to be true, at least one of F or D must be true. Given that D is true, F can be either true or false.
3. For $\neg E \cdot \neg F$ to be true, both E and F must be false (because we are negating them). However, we have already determined that E is true. Therefore, this set of propositions is inconsistent.

Final Answer: A. 'Inconsistent'

Answer Option 7:

We create a truth table with $D \equiv E$, $F \vee D$, and $\neg E \cdot \neg F$.

D E F

T T T

T T F

T F T

T F F

F T T

F T F

F F T

F F F

$D \equiv E$: Only rows where D and E have the same values are valid. So, the valid rows are 1, 2, 7, and 8.

$F \vee D$: Rows where either F or D is True are valid. So, the valid rows are 1, 2, 3, 6, and 7.

$\neg E \cdot \neg F$: Rows where both E and F are False are valid. So, the valid rows are 4 and 8.

There is no single row that satisfies all three propositions at the same time, so the set is inconsistent.

Final Answer: A. 'Inconsistent'

Answer Option 8:

The given propositions are:

$$D \equiv E$$

$$F \vee D$$

$$\neg E \cdot \neg F$$

We can see that $D \equiv E$ indicates that D and E have the same truth value. $F \vee D$ indicates that at least one of F or D is true. $\neg E \cdot \neg F$ indicates that both E and F are false.

From these, it is clear that having all three of D, E, and F as true cannot be possible because it would contradict the proposition $\neg E \cdot \neg F$.

Having D and E as true and F as false is not possible because it would contradict the proposition $F \vee D$.

Having D and F as true and E as false is not possible because it would contradict the proposition $D \equiv E$.

Therefore, the set of propositions is inconsistent, and none of the given valuations are consistent. So, the correct answer is A. 'Inconsistent'.

Answer Option 9:

The set of propositions is:

$$D \equiv E \text{ (D if and only if E)}$$

$$F \vee D \text{ (F or D)}$$

$$\neg E \cdot \neg F \text{ (not E and not F)}$$

We have to check whether these propositions are consistent. If a set of propositions is consistent, that means there is at least one row in the truth table where all propositions are true.

By indirect truth table method, we start assuming that all three propositions are true, and logically deduce the truth values of D, E, and F.

From the first proposition ($D \equiv E$), D and E must have the same value.

From the third proposition ($\neg E \cdot \neg F$), E and F must be false, because it's the only way for "not E and not F" to be true.

Considering these values in the second proposition ($F \vee D$), D must be true, because it's the only way for "F or D" to be true as F is false.

So, the consistent valuation is D is true, E is false, and F is false. However, this contradicts $D \equiv E$. Therefore, the set of propositions is inconsistent.

Final Answer: A. 'Inconsistent'.

Question 27:

' Which of the given formulas of PL is the best symbolization of the following sentence?

The restaurant serves pie or cheesecake or ice cream for dessert.', A. ' $P \vee (C \vee I)$ ', B. ' $(P \vee C) \vee I$ ', C. ' $P \vee C \vee I$ ', D. 'Options A and B'

=====

Answer Option 1:

The given sentence can be symbolized as either ' $P \vee (C \vee I)$ ' or ' $(P \vee C) \vee I$ '. Both these options represent the logical disjunction (OR operation) where the restaurant serves either pie, cheesecake, or ice cream. The parentheses do not change the overall meaning due to the associative property of the OR operation.

Final Answer: D. 'Options A and B'

Answer Option 2:

In propositional logic, 'or' is inclusive, meaning that ' P or Q ' is true if P is true, Q is true, or both P and Q are true. It doesn't make a difference whether you write ' $P \vee (C \vee I)$ ', ' $(P \vee C) \vee I$ ', or ' $P \vee C \vee I$ '. These three are equivalent.

Final Answer: D. 'Options A and B'

Answer Option 3:

The options A, B, and C are all logically equivalent due to the associative property of disjunction in propositional logic, meaning that the parentheses can be in any position. However, option D is the correct answer as it acknowledges that both A and B are valid symbolizations of the sentence. Final Answer: D.

Answer Option 4:

In this case, any of the three options, pie (P), cheesecake (C), or ice cream (I), can be served for dessert. Thus, it can be expressed as ' $P \vee C \vee I$ ', which means 'Pie or Cheesecake or Ice Cream'. Since the order of the disjunction (\vee) does not matter in logic, both ' $P \vee (C \vee I)$ ' and ' $(P \vee C) \vee I$ ' are also correct. So, the final answer is D. 'Options A and B'

Answer Option 5:

The sentence "The restaurant serves pie or cheesecake or ice cream for dessert" presents three options (pie, cheesecake, ice cream) connected by the conjunction "or". In propositional logic, the "or" operator is represented as \vee and is commutative, meaning that the order in which the variables are arranged does not affect the final outcome. Therefore, option A. ' $P \vee (C \vee I)$ ', option B. ' $(P \vee C) \vee I$ ', and option C. ' $P \vee C \vee I$ ' are all valid symbolizations of the sentence. Hence, the final answer is D. 'Options A and B'.

Answer Option 6:

The sentence "The restaurant serves pie or cheesecake or ice cream for dessert" is a logical disjunction. It states that at least one of the propositions is true. In this case, both options A and B correctly symbolize the sentence. The parentheses do not change the meaning in this case due to the associative property of disjunction, which states that for any propositions, $(P \vee Q) \vee R$ is logically equivalent to $P \vee (Q \vee R)$. Therefore, the final answer is D. 'Options A and B'

Answer Option 7:

The sentence "The restaurant serves pie or cheesecake or ice cream for dessert" indicates that at least one of the three options (P = pie, C = cheesecake, I = ice cream) is available for dessert. In symbolic logic, the disjunction symbol " \vee " is used to denote "or". So the sentence can be symbolized as ' $P \vee C \vee I$ '.

The options A and B ' $P \vee (C \vee I)$ ' and ' $(P \vee C) \vee I$ ' are also correct. Because in logic, the order of the disjunction does not matter (this is the principle of commutativity), and disjunction is associative, meaning that it doesn't matter how we group the ingredients of a multi disjunction.

So, the final answer is D. Options A and B.

Answer Option 8:

The sentence "The restaurant serves pie or cheesecake or ice cream for dessert" is a disjunction of three propositions. The symbol \vee in propositional logic denotes the logical disjunction operation. Both options A and B correctly represent the logical structure.

Option A, ' $P \vee (C \vee I)$ ', means "The restaurant serves pie or (cheesecake or ice cream)", which is logically equivalent to the sentence.

Option B, ' $(P \vee C) \vee I$ ', means "The restaurant serves (pie or cheesecake) or ice cream", which is also logically equivalent to the sentence.

Option C, ' $P \vee C \vee I$ ', is a simplified form of the disjunction, but it does not accurately represent the structure of the original sentence.

Hence, the correct answer would be D, 'Options A and B'.

Answer Option 9:

The sentence "The restaurant serves pie or cheesecake or ice cream for dessert" can be interpreted as "The restaurant serves either pie, cheesecake, or ice cream for dessert." In propositional logic, this can be represented as a disjunction of the three statements. The operators in propositional logic are associative, meaning that the grouping of operands does not matter. Therefore, the three options A. ' $P \vee (C \vee I)$ ', B. ' $(P \vee C) \vee I$ ', and C. ' $P \vee C \vee I$ ' are all equivalent and are logically correct. But option D. 'Options A and B' is more correct as it includes both equivalent forms. So, the final answer is D. 'Options A and B'.

Question 28:

' Which of the given formulas of PL is the best symbolization of the following sentence?

If Beth rides her bike, she gets to work earlier.', A. ' $B \supset W$ ', B. ' $W \supset B$ ', C. ' $B \equiv W$ ', D. 'Both A and B'

=====

Answer Option 1:

A. ' $B \supset W$ '

=====

Answer Option 2:

A. ' $B \supset W$ ' is the correct symbolization since it correctly represents the sentence "If Beth rides her bike (B), then she gets to work earlier (W)". The other options do not correctly represent this relationship.

Final Answer: A

=====

Answer Option 3:

The sentence 'If Beth rides her bike, she gets to work earlier.' can be symbolized as ' $B \supset W$ ' where B represents 'Beth rides her bike' and W represents 'She gets to work earlier'. Therefore, the correct answer is A. ' $B \supset W$ '.

=====

Answer Option 4:

The correct symbolization of the sentence 'If Beth rides her bike, she gets to work earlier.' is ' $B \supset W$ ' where B represents 'Beth rides her bike' and W represents 'she gets to work earlier'. This is because the sentence is a conditional statement where the antecedent is 'Beth rides her bike' and the consequent is 'she gets to work earlier'. Hence the correct answer is: A. ' $B \supset W$ '

=====

Answer Option 5:

The sentence "If Beth rides her bike, she gets to work earlier" is best symbolized as " $B \supset W$ ", where B represents "Beth rides her bike" and W represents "she gets to work earlier". The symbol " \supset " is used to represent "if... then..." in propositional logic. Therefore, the correct answer is A. ' $B \supset W$ '.

=====

Answer Option 6:

In this sentence, if-then structure is used. "Beth rides her bike" can be denoted as B and "she gets to work earlier" can be denoted as W. The "if-then" structure is represented as " \supset " in propositional logic.

Hence, "if Beth rides her bike, she gets to work earlier" can be symbolized as " $B \supset W$." Therefore, the correct answer is A. ' $B \supset W$ '

=====

Answer Option 7:

The correct symbolization of the sentence 'If Beth rides her bike, she gets to work earlier.' is A. ' $B \supset W$ '. Here, B stands for 'Beth rides her bike' and W stands for 'she gets to work earlier'. So, ' $B \supset W$ '

translates to 'If Beth rides her bike, then she gets to work earlier'. Options B and C do not accurately represent the given sentence. So the final answer is A. ' $B \supset W$ '.

=====

Answer Option 8:

The sentence 'If Beth rides her bike, she gets to work earlier.' suggests a conditional relationship between Beth riding her bike (B) and her getting to work earlier (W). In propositional logic, this is symbolized

by the conditional operator (\supset), meaning 'if...then...'. Therefore, the correct symbolization is ' $B \supset W$ '. So the final answer is A: ' $B \supset W$ '.

=====

Answer Option 9:

The sentence "If Beth rides her bike, she gets to work earlier." can be symbolized as " $B \supset W$ ". Here, 'B' stands for 'Beth rides her bike' and 'W' stands for 'she gets to work earlier'. The symbol ' \supset ' represents

the conditional 'if...then...'. Therefore, the correct symbolization is ' $B \supset W$ ', which means 'If Beth rides her bike, then she gets to work earlier'. So, the correct answer is A. ' $B \supset W$ '.

=====

Question 29:

'Select the best translation into predicate logic: Either Taylor or Eric is a latte boy.', A. ' $Lt \vee Le$ ', B. ' $Lx \vee Ly$ ', C. ' $L \vee eL$ ', D. ' $TI \supset EI$ '

=====

Answer Option 1:

A. ' $Lt \vee Le$ '

=====

Answer Option 2:

A. ' $Lt \vee Le$ '

=====

Answer Option 3:

A. ' $Lt \vee Le$ '

=====

Answer Option 4:

The best translation into predicate logic for the statement "Either Taylor or Eric is a latte boy" would be A. ' $Lt \vee Le$ '. This statement says that either Taylor (Lt) or Eric (Le) is a latte boy, and the \vee symbol represents "or" in logic. So, ' $Lt \vee Le$ ' accurately translates the given sentence into predicate logic.

Final Answer: A

=====

Answer Option 5:

The best translation into predicate logic of the sentence 'Either Taylor or Eric is a latte boy.' would be:

A. ' $Lt \vee Le$ '

Here, 'Lt' could represent 'Taylor is a latte boy' and 'Le' could represent 'Eric is a latte boy'. The logical operator ' \vee ' stands for 'or', hence ' $Lt \vee Le$ ' accurately translates the given sentence.

=====

Answer Option 6:

A. ' $Lt \vee Le$ ' is the correct answer. The sentence "Either Taylor or Eric is a latte boy" is a disjunction, which is represented by the " \vee " symbol in predicate logic. Here, "Lt" stands for "Taylor is a latte boy" and "Le" stands for "Eric is a latte boy". Thus, " $Lt \vee Le$ " correctly translates the sentence into predicate logic.

=====

Answer Option 7:

A. ' $Lt \vee Le$ ' is the correct translation into predicate logic. The predicate 'L' stands for 'is a latte boy', 'Lt' is 'Taylor is a latte boy', and 'Le' is 'Eric is a latte boy'. The disjunction operator ' \vee ' stands for 'or', so ' $Lt \vee Le$ ' translates to 'Either Taylor is a latte boy or Eric is a latte boy'.

=====

Answer Option 8:

The best translation into predicate logic for the given statement 'Either Taylor or Eric is a latte boy.' would be represented by ' $Lt \vee Le$ '. Here, 'Lt' represents 'Taylor is a latte boy' and 'Le' represents 'Eric is a latte boy'. The symbol ' \vee ' is used to represent 'or' in predicate logic. So, the Final Answer: A. ' $Lt \vee Le$ '

=====

Answer Option 9:

In predicate logic, variables or terms represent objects in the domain of discourse and predicates represent properties or relations that objects can have. The correct translation of the statement 'Either Taylor or Eric is a latte boy' would be ' $Lt \vee Le$ '. 'Lt' stands for 'Taylor is a latte boy' and 'Le' stands for 'Eric is a latte boy'. The logical operator \vee stands for 'or'. So, ' $Lt \vee Le$ ' translates to 'Either Taylor or Eric is a latte boy'. Therefore, the correct answer is: A. ' $Lt \vee Le$ '.

=====

Question 30:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$E \supset F$

$G \supset \neg F / \neg G \vee \neg E$; A. 'Valid', B. 'Invalid. Counterexample when E, F, and G are true', C. 'Invalid. Counterexample when E and G are true and F is false', D. 'Invalid. Counterexample when F and G are true and E is false'

=====

Answer Option 1:

An argument is invalid if there is some line in a complete truth table in which all the premises are true, but the conclusion is false. If no such line exists, the argument is valid.

In this case, the argument is " $E \supset F, G \supset \neg F$ therefore $\neg G \vee \neg E$ ".

The counterexample occurs when E and G are true and F is false.

In this case, both premises $E \supset F$ (which is false when E is true and F is false) and $G \supset \neg F$ (which is true when both G is true and F is false) are not both true, but the conclusion $\neg G \vee \neg E$ is false (when both G and E are true). Hence, the argument is invalid.

Final Answer: C. 'Invalid. Counterexample when E and G are true and F is false'

Answer Option 2:

An argument is valid if and only if there is no possible situation in which all the premises are true and the conclusion is false.

Let's consider the options.

Option B: If F, E, and G are all true, then $E \supset F$ and $G \supset \neg F$ hold, but $\neg G \vee \neg E$ is false. Hence, it is a counterexample.

Option C: If E and G are true and F is false, then $E \supset F$ is false, but $G \supset \neg F$ and $\neg G \vee \neg E$ are true. Hence, this is not a counterexample.

Option D: If F and G are true and E is false, then $E \supset F$ is false, but $G \supset \neg F$ is also false. Hence, this is not a counterexample.

So, the argument is invalid when E, F, and G are true.

Final Answer: B. 'Invalid. Counterexample when E, F, and G are true'

Answer Option 3:

The argument is invalid. The counterexample that shows this is when E and G are true, but F is false.

$E \supset F$ (If E then F)

$G \supset \neg F$ (If G then not F)

$\neg G \vee \neg E$ (Not G or not E)

The truth table would look like this:

E = True

F = False

G = True

We can see that the two premises are true (G is true and F is false, and E is true while F is false) but the conclusion is false (it is not the case that G is false or E is false). This is a counterexample to the argument, showing that it is invalid.

Final Answer: C. 'Invalid. Counterexample when E and G are true and F is false'

Answer Option 4:

To determine whether the argument is valid, we need to construct an indirect truth table.

$E \supset F$ means if E then F.

$G \supset \neg F$ means if G then not F.

$\neg G \vee \neg E$ means not G or not E.

We start by assuming the conclusion is false, and then we work backwards to see if this leads to a contradiction. If it does, the argument is valid. If it does not, the argument is invalid.

Assuming $\neg G \vee \neg E$ is false, the only way for an "or" statement to be false is if both parts are false. Therefore, G and E must be true.

If G is true, then $\neg F$ must be true according to $G \supset \neg F$. So F is false.

If E is true, then F must be true according to $E \supset F$. But we already determined that F is false.

So there is a contradiction, which means the argument is valid.

Final Answer: A. 'Valid'

Answer Option 5:

We can use an indirect truth table to test the validity of the argument.

1. Assume that all the premises and the negation of the conclusion are true.

2. If this leads to a contradiction, the argument is valid.

3. If it does not lead to a contradiction, the argument is invalid and the assumed case is a counterexample.

So, we start with the premises $E \supset F$ and $G \supset \neg F$ and the negation of the conclusion, which is $\neg(\neg G \vee \neg E)$.

$E \ F \ G \ E \supset F \ G \supset \neg F \ \neg(\neg G \vee \neg E)$

T T T T F T

Now, we have found a case (E, F, and G are all true) where the premises and the negation of the conclusion are all true. Therefore, the argument is invalid. The counterexample is when E, F, and G are all true.

Final Answer: B. 'Invalid. Counterexample when E, F, and G are true'

Answer Option 6:

The original argument is:

$E \supset F$

$G \supset \neg F$

$\neg G \vee \neg E$

This argument is valid if its conclusion is true whenever all its premises are true. We'll use a truth table to evaluate this:

1. Assume E, F, and G are all true. Then, $E \supset F$ is true and $G \supset \neg F$ is false (since G is true but $\neg F$ is false). The conclusion $\neg G \vee \neg E$ is false (since both G and E are true). This is not a counterexample since not all premises are true.

2. Assume E and G are true and F is false. Then, $E \supset F$ is false (since E is true but F is false). The conclusion $\neg G \vee \neg E$ is false (since both G and E are true). This is not a counterexample since not all premises are true.

3. Assume F and G are true and E is false. Then, $E \supset F$ is true (since E is false). The conclusion $\neg G \vee \neg E$ is true (since E is false). This is not a counterexample since the premise $G \supset \neg F$ is false (since G is true but $\neg F$ is false).

So, in all possible cases, the conclusion is true whenever all the premises are true. Thus, the argument is valid.

Final Answer: A. 'Valid'

Answer Option 7:

Let's construct the truth table:

$E \mid F \mid G \mid E \supset F \mid G \supset \neg F \mid \neg G \vee \neg E \mid$

|---|---|---|---|---|---|

| T | T | T | T | F | F |

| T | T | F | T | T | F |

| T | F | T | F | T | F |

| T | F | T | F | T | F |

| T | F | F | F | T | F |

| F | T | T | T | F | T |

| F | T | F | T | T | T |

| F | F | T | T | T | T |

| F | F | F | T | T | T |

From the truth table, we can see that the argument is not valid. There is a row where both premises are true but the conclusion is false (when E, F, and G are all true). So, the correct answer is B. 'Invalid.

Counterexample when E, F, and G are true'.

Answer Option 8:

First, let's understand the argument. The argument has two premises ($E \supset F$ and $G \supset \neg F$) and a conclusion ($\neg G \vee \neg E$). We'll use an indirect truth table to evaluate its validity. An argument is valid if and only if it is impossible for the premises to be true and the conclusion false.

Here's an indirect truth table for this argument:

$E \ F \ G \ E \supset F \ G \supset \neg F \ \neg G \vee \neg E$

T T T T F T

T T F T T T

T F T F T T

T F F F T T

F T T T F T

F T F T T T

F F T T F T

F F F T T T

In each line, the conclusion ($\neg G \vee \neg E$) is true if either $\neg G$ is true or $\neg E$ is true.

We can see that there is no row in which both premises are true and the conclusion is false. Hence, the argument is valid.

Final answer: A. 'Valid'

Answer Option 9:

A counterexample is a special set of truth values for the statement variables that makes all the premises true and the conclusion false. This would show that the argument is invalid.

Looking at the given argument, we have:

1. $E \supset F$ (If E then F)

2. $G \supset \neg F$ (If G then not F)

Conclusion: $\neg G \vee \neg E$ (Not G or not E)

Now, we try to find a counterexample.

Let's check option B: 'Invalid. Counterexample when E, F, and G are true'

In this case:

1. $E \supset F$ becomes $\text{True} \supset \text{True}$ which is True

2. $G \supset \neg F$ becomes $\text{True} \supset \neg \text{True}$ which is $\text{True} \supset \text{False}$, which is False

Conclusion: $\neg G \vee \neg E$ becomes $\neg \text{True} \vee \neg \text{True}$ which is $\text{False} \vee \text{False}$, which is False.

Given that all premises are not true, option B is not a counterexample.

Choosing option C: 'Invalid. Counterexample when E and G are true and F is false'

1. $E \supset F$ becomes $\text{True} \supset \text{False}$ which is False.

2. $G \supset \neg F$ becomes $\text{True} \supset \neg \text{False}$ which is $\text{True} \supset \text{True}$, which is True.

Conclusion: $\neg G \vee \neg E$ becomes $\neg \text{True} \vee \neg \text{True}$ which is $\text{False} \vee \text{False}$, which is False.

Given that all premises are not true, option C is not a counterexample.

Checking option D: 'Invalid. Counterexample when F and G are true and E is false'

1. $E \supset F$ becomes $\text{False} \supset \text{True}$ which is True.

2. $G \supset \neg F$ becomes $\text{True} \supset \neg \text{True}$ which is $\text{True} \supset \text{False}$, which is False.

Conclusion: $\neg G \vee \neg E$ becomes $\neg \text{True} \vee \neg \text{False}$ which is $\text{False} \vee \text{True}$, which is True.

Thus, Option D is not a counterexample either.

Since none of the options present a valid counterexample, we can conclude that the argument is valid.

Final Answer: A. 'Valid'.

Question 31:

' Use indirect truth tables to determine whether each set of propositions is consistent. If the set is consistent, choose an option with a consistent valuation. (There may be other consistent valuations.)

$$A \supset (\neg B \vee C)$$

$$C \supset D$$

$$A \vee (B \cdot \neg D)$$

A = $(B \supset D)$ ', A. 'Inconsistent', B. 'Consistent. Consistent valuation when A and D are true and B and C are false', C. 'Consistent. Consistent valuation when A, B, and D are true and C is false', D. 'Consistent. Consistent valuation when C and D are true and A and B are false'

=====

Answer Option 1:

The indirect truth table is a method used to check the consistency of a set of propositions. We assume that the set is inconsistent (i.e., all the rows of the truth table yield a false value), and we try to obtain a contradiction. If we succeed, then the set is indeed consistent. If we don't, the set is inconsistent.

After creating the truth table for given sets of propositions, we can see that the set of propositions is consistent when A, B, and D are true and C is false. This is the only option in which all the propositions are true, which makes it consistent.

Final Answer: C. 'Consistent. Consistent valuation when A, B, and D are true and C is false'

=====

Answer Option 2:

We can use indirect truth tables to determine whether each set of propositions is consistent. Starting with the most complex proposition, we fill in truth values and check for contradictions.

Starting with $A = (B \supset D)$, we can set A true and B, D false. This would make $A = (B \supset D)$ true, but it contradicts $A \vee (B \cdot \neg D)$, which requires A to be false or B and $\neg D$ to be true (which would require D to be false, contradicting D true from $A \supset (\neg B \vee C)$ and $C \supset D$).

Setting A false, B true, and D false makes $A = (B \supset D)$ true, but it contradicts $A \vee (B \cdot \neg D)$, which requires A to be true or B and $\neg D$ to be true (which contradicts B true).

Given these contradictions, it seems that the set of propositions is inconsistent.

Final Answer: A. 'Inconsistent'

=====

Answer Option 3:

We denote 'true' by 'T' and 'false' by 'F'. To show that the set of statements is consistent, we need to find a valuation such that all statements are true. We start by assuming A is true (i.e., $A = T$) because it appears in every statement. From the first statement, we know that either $\neg B$ or C must be true. Since we know nothing about B yet, let's assume C is true (i.e., $C = T$). From the second statement, we know that if $C = T$, then $D = T$. From the third statement, we know that since $A = T$, it doesn't matter what B or $\neg D$ are. From the fourth statement, we know that if $A = T$, then $(B \supset D)$ must also be true. Since $D = T$, B can be either T or F. So, the set of statements is consistent. One consistent valuation is: $A = T$, $B = T$, $C = T$, $D = T$. Hence, the Correct answer is Option C. 'Consistent. Consistent valuation when A, B, and D are true and C is false'

=====

Answer Option 4:

To determine if a set of propositions is consistent, we have to try and find a truth assignment that makes all of the propositions true. If such a truth assignment exists, then the set is consistent. If not, then the set is inconsistent.

Let's determine the truth value of each proposition given the consistent valuation in each option.

Option B: A and D are true and B and C are false.

$$\neg A \supset (\neg B \vee C) = \text{True} \supset (\neg \text{False} \vee \text{False}) = \text{True} \supset \text{True} = \text{True}$$

$$C \supset D = \text{False} \supset \text{True} = \text{True}$$

$$A \vee (B \cdot \neg D) = \text{True} \vee (\text{False} \cdot \neg \text{True}) = \text{True} \vee \text{False} = \text{True}$$

$$A = (B \supset D) = \text{True} = (\text{False} \supset \text{True}) = \text{True} = \text{True} = \text{True}$$

So, all the propositions are true under this valuation, so the set is consistent.

Therefore, the final answer is B. 'Consistent. Consistent valuation when A and D are true and B and C are false'.

=====

Answer Option 5:

A truth table would be needed to assess the consistency of these propositions.

Indirect truth tables are used to determine consistency by assuming inconsistency and trying to achieve a contradiction.

In this case, the answers are provided in the form of valuations. This means we need to check if any of these valuations are consistent with all four propositions.

Option B suggests that A and D are true, while B and C are false.

Substituting these values into the propositions gives:

$$1) \text{ True} \supset (\neg \text{False} \vee \text{False}) = \text{True} \supset \text{True} = \text{True}$$

$$2) \text{ False} \supset \text{True} = \text{True}$$

$$3) \text{ True} \vee (\text{False} \cdot \neg \text{True}) = \text{True} \vee \text{False} = \text{True}$$

$$4) \text{ True} = (\text{False} \supset \text{True}) = \text{True} = \text{True} = \text{True}$$

All of the propositions are true under this valuation, so the set is consistent.

Final Answer: B. 'Consistent. Consistent valuation when A and D are true and B and C are false'

Answer Option 6:

We have the following propositions:

1. $A \supset (\neg B \vee C)$

2. $C \supset D$

3. $A \vee (B \cdot \neg D)$

4. $A \equiv (B \supset D)$

Let's try to find a consistent valuation:

1. For the first proposition, if A is false, then the proposition is true regardless of the values of B and C. So let's assume that A is false.
2. For the second proposition, if C is false, then the proposition is true regardless of the value of D.
3. Now let's consider the third proposition. Since A is false, for this proposition to be true, B must be true and D must be false.
4. For the fourth proposition, since A is false, then $B \supset D$ must also be false. This can only be the case if B is true and D is false, which is consistent with our valuation from the third proposition.

Therefore, we have a consistent valuation when A is false, B is true, C is false, and D is false.

So, the correct option is not listed above.

Answer Option 7:

The given set of propositions:

$A \supset (\neg B \vee C)$

$C \supset D$

$A \vee (B \cdot \neg D)$

$A \equiv (B \supset D)$

Let's go by indirect truth table method:

1. Assume that we have a contradiction and mark all premises as True (T).
2. In $A \supset (\neg B \vee C)$, for the implication (\supset) to be True, if A is False, then the whole statement becomes True, irrespective of the other variables. But, this won't work because A also appears in other statements where it is not in an implication. So, A must be True. Then, for the statement to be True, $(\neg B \vee C)$ must be True. This means at least one of $\neg B$ or C must be True.
3. In $C \supset D$, since A is True, then C is either True or False. If C is False, then the statement is True. But, if C was True, then D would have to be True.
4. In $A \vee (B \cdot \neg D)$, since A is True, the whole statement is True, irrespective of B or D.
5. In $A \equiv (B \supset D)$, since A is True, $(B \supset D)$ must also be True. This means if B is False, the statement is True. But, if B was True, then D would have to be True.
6. There doesn't seem to be any contradiction and we can find a consistent valuation when A and D are true and B and C are false.

Final Answer: B. 'Consistent. Consistent valuation when A and D are true and B and C are false'

Answer Option 8:

The indirect truth table method is used to determine if a set of formulas is consistent. If there is a row in the truth table where all formulas are true, then the formulas are considered consistent. If no such row exists, they are considered inconsistent.

In this case, let's create a truth table for the given formulas.

$A \supset (\neg B \vee C)$ - This formula is true when A is false or when either B is false or C is true.

$C \supset D$ - This formula is true when C is false or D is true.

$A \vee (B \cdot \neg D)$ - This formula is true when either A is true or both B is true and D is false.

$A \equiv (B \supset D)$ - This formula is true when either both A and B are true and D is true, or both A is false and (B is true and D is false, or B is false).

After observing the possible sets of values, we find that the formulas are consistent when A, B, and D are true, and C is false, so the correct answer is C.

Answer Option 9:

For the set of propositions to be consistent, there must be at least one row in the truth table where all propositions are true.

Let's make a truth table:

$A \ B \ C \ D \ A \supset (\neg B \vee C) \ C \supset D \ A \vee (B \cdot \neg D) \ A \equiv (B \supset D)$

T T T T T T T

T T T F T F F

T T F T T T T

T T F F T T F

T F T T T T T

T F T F T F F

T F F T T T T

TFFFTTTF
FTTTTTTT
FTTFTFFF
FTFTTTFT
FTFFTTFF
FTTTTTTT
FFTFTFTF
FFFTTTFT
FFFFTTFF

Looking at the truth table, we can see that there is at least one row in which all propositions are true: when A, B, and D are true and C is false. Therefore, the set of propositions is consistent.

Final Answer: C. 'Consistent. Consistent valuation when A, B, and D are true and C is false'

Question 32:

' Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$M \vee N$

$\neg M \cdot O / N$, A. 'Valid', B. 'Invalid. Counterexample when M and O are true and N is false', C. 'Invalid. Counterexample when M is true and O and N are false', D. 'Invalid. Counterexample when O is true and M and N are false'

=====

Answer Option 1:

We can construct a truth table for the argument as follows:

M N O $M \vee N$ $\neg M \cdot O$

T T T T F

T T F T F

T F T T F

T F F T F

F T T T T

F T F T F

F F T T T

F F F T F

If the premises are all true and the conclusion is false, then the argument is invalid. In this case, there is no row where all the premises are true and the conclusion is false, therefore the argument is valid.

Final Answer: A. 'Valid'

=====

Answer Option 2:

Let's construct a truth table for the given logical statements:

M N O $M \vee N$ $\neg M \cdot O$ $M \cdot O$ N

T T T F T F T

T T F F F T

T F T F T F

T F F F F F

F T T T T T

F T F T F T

F F T T T F

F F F T F F

The argument is of the form: $(M \vee N), (\neg M \cdot O)$ therefore N. This argument is valid only if there is no row in which both premises are true and the conclusion is false. But we can see that in the fourth row (T F T), both premises are true but the conclusion (N) is false. So, the argument is invalid.

Counterexample when M is true and O and N are false.

Final Answer: C. 'Invalid. Counterexample when M is true and O and N are false'

=====

Answer Option 3:

Let's construct the truth table:

M N O $M \vee N$ $\neg M \cdot O$

T T T T F

T T F T F

T F T T F

T F F T F

F T T T T

F T F T F

F F T T T

F F F T F

From the truth table, we can see that the argument is invalid. There is a counterexample when M is true, O is true, and N is false (4th row). So the correct final answer is B. 'Invalid. Counterexample when M and O are true and N is false'.

=====

Answer Option 4:

A truth table would look like this:

M	N	O	$M \vee N$	$\neg M$	$\neg M \cdot O$
T	T	T	T	F	F
T	T	F	T	F	F
T	F	T	T	F	F
T	F	F	T	F	F
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	F	T	T
F	F	F	F	T	F

From the truth table, we can see that the argument is invalid. We can find a counterexample: When M is true, O is true, and N is false - the premises are true, but the conclusion is false. Therefore, the correct answer is B. 'Invalid. Counterexample when M and O are true and N is false'

Answer Option 5:

To determine whether the argument is valid or invalid, we will construct a truth table. The argument is only valid if whenever the premises are true, the conclusion is also true.

M	N	O	$M \vee N$	$\neg M$	$\neg M \cdot O$	N
T	T	T	T	F	F	T
T	T	F	T	F	F	T
T	F	T	T	F	F	F
T	F	F	T	F	F	F
F	T	T	T	T	T	T
F	T	F	T	T	F	T
F	F	T	F	T	T	F
F	F	F	F	T	F	F

Looking at the truth table, we can see that there are situations where the premises ($M \vee N$ and $\neg M \cdot O$) are true, but the conclusion (N) is false. This occurs when M is true, O is true, and N is false. This means the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when M and O are true and N is false'

Answer Option 6:

Let's construct a truth table for the argument:

M	N	O	$M \vee N$	$\neg M$	$\neg M \cdot O$	$(M \vee N) \wedge (\neg M \cdot O)$	N
T	T	T	T	F	F	F	T
T	T	F	T	F	F	F	T
T	F	T	T	F	F	F	F
T	F	F	T	F	F	F	F
F	T	T	T	T	T	T	T
F	T	F	T	T	F	F	T
F	F	T	F	T	T	F	F
F	F	F	F	T	F	F	F

As we can see from the truth table, there are instances where $(M \vee N) \wedge (\neg M \cdot O)$ is true and N is false, which makes the argument invalid. Those instances occur when M is true and O is true but N is false. Therefore, the correct answer is B: 'Invalid. Counterexample when M and O are true and N is false'.

Answer Option 7:

Let's construct the truth table:

M	N	O	$\neg M$	$\neg M \cdot O$	$M \vee N$
T	T	T	F	F	T
T	T	F	F	F	T
T	F	T	F	F	T
T	F	F	F	F	T
F	T	T	T	T	T
F	T	F	T	F	T
F	F	T	T	T	F
F	F	F	T	F	F

| F | F | F | T | F | F |

The argument is considered valid only if every row that makes all the premises true also makes the conclusion true. Here, the premises are $M \vee N$ and $\sim M \cdot O$, and the conclusion is N . From the truth table, we can see that there is a row where all the premises are true, but the conclusion is false: when M is false, N is false, and O is true. So, the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when O is true and M and N are false'

Answer Option 8:

A truth table would look like this:

| M | N | O | $M \vee N$ | $\sim M \cdot O$ | N |

|---|---|---|-----|-----|---|

| T | T | T | T | F | T |

| T | T | F | T | F | T |

| T | F | T | T | F | F |

| T | F | F | T | F | F |

| F | T | T | T | T | T |

| F | T | F | T | F | T |

| F | F | T | F | T | F |

| F | F | F | F | F | F |

An argument is valid if every time the premises are true, the conclusion is also true. In this case, the premises are $M \vee N$ and $\sim M \cdot O$, and the conclusion is N . We can see from the truth table that there are cases where the premises are true, but the conclusion is false (rows 3, 7), so the argument is invalid.

So, if we look at the options, option C. 'Invalid. Counterexample when M is true and O and N are false' is the correct answer. This corresponds to the third row of the truth table.

Answer Option 9:

Here is the truth table for the given argument:

| M | N | O | $M \vee N$ | $\sim M$ | $\sim M \cdot O$ |

|---|---|---|-----|-----|-----|

| T | T | T | T | F | F |

| T | T | F | T | F | F |

| T | F | T | T | F | F |

| T | F | F | T | F | F |

| F | T | T | T | T | T |

| F | T | F | T | T | F |

| F | F | T | F | T | F |

| F | F | F | F | T | F |

Now we analyze the argument.

The given argument is:

1. $M \vee N$ (premise)
2. $\sim M \cdot O$ (premise)
3. Therefore, N (conclusion)

An argument is valid if and only if it is impossible for all the premises to be true and the conclusion false at the same time.

We can see that the argument is not valid because there is a situation (M is false, N is false, and O is true) where both the premises are true and the conclusion is false.

So, the correct answer is D. 'Invalid. Counterexample when O is true and M and N are false'.

Question 33:

' Which of the following propositions is an immediate (one-step) consequence in PL of the given premises?

$U \supset W$

$W \supset (X \equiv \sim Y)$

$(X \equiv \sim Y) \supset Z$

$\sim Z$, A. ' $U \supset Z$ ', B. ' $U \vee W$ ', C. ' $\sim W$ ', D. ' $\sim(X \equiv \sim Y)$ '

=====

Answer Option 1:

Given the premises, you can directly infer from $(X \equiv \sim Y) \supset Z$ and $\sim Z$ that $\sim(X \equiv \sim Y)$, because if an implication is false, then the only way for it to be false is for the antecedent to be true and the consequent to be false. So, the final answer is D. ' $\sim(X \equiv \sim Y)$ '

Answer Option 2:

Given that $\sim Z$ is true, and $(X \equiv \sim Y) \supset Z$ is a premise, we can conclude that $\sim(X \equiv \sim Y)$ must be true because if $(X \equiv \sim Y)$ were true, Z would be true according to the premise, which contradicts the fact that $\sim Z$ is true. So, the correct answer is D. ' $\sim(X \equiv \sim Y)$ '.

Answer Option 3:

The correct answer is C. ' $\sim W$ '.

Here's why:

Given: $U \supset W$ (1), $W \supset (X \equiv \sim Y)$ (2), $(X \equiv \sim Y) \supset Z$ (3), and $\sim Z$ (4).

We'll use (3) and (4) to conclude that $\sim(X \equiv \sim Y)$ (by Modus Tollens), which is the negation of what statement (2) implies. This means we can conclude that $\sim W$. Hence, C is the immediate consequence.

Answer Option 4:

The immediate consequence of the given premises is C. ' $\sim W$ '. From the third premise, we know that if $(X \equiv \sim Y)$ is true then Z is true. But from the fourth premise, we know that $\sim Z$ is true, which means Z is false. Hence, $(X \equiv \sim Y)$ must be false. From the second premise, we can infer that W must be false because if W is true, then $(X \equiv \sim Y)$ is true which contradicts our previous inference.

Answer Option 5:

A logical consequence (also entailment) in a formal language is a fundamental concept in logic, which describes the relationship between statements that hold true when one statement logically follows from one or more statements

Our premises are:

$U \supset W$

$W \supset (X \equiv \sim Y)$

$(X \equiv \sim Y) \supset Z$

$\sim Z$

This means Z is false. If $(X \equiv \sim Y) \supset Z$ and Z is false the only way this can be is if $(X \equiv \sim Y)$ is true and Z is false. This means that $\sim(X \equiv \sim Y)$ is true.

Final Answer: D. ' $\sim(X \equiv \sim Y)$ '

Answer Option 6:

Given premises are:

$U \supset W$

$W \supset (X \equiv \sim Y)$

$(X \equiv \sim Y) \supset Z$

$\sim Z$

We can write these in a chain of implications as:

$U \supset W \supset (X \equiv \sim Y) \supset Z$

We know that $\sim Z$ is true, then to satisfy the chain of implications, $(X \equiv \sim Y)$ must be false. Therefore, the immediate consequence is:

D. ' $\sim(X \equiv \sim Y)$ '

Answer Option 7:

In this case, we can use a basic rule of PL (Propositional Logic) known as the Modus Tollens rule, which states that if a conditional is accepted, and the consequent is denied, then the antecedent must also be denied. Given that $(X \equiv \sim Y) \supset Z$ and $\sim Z$, we can apply the rule. The immediate consequence of the premises would be $\sim(X \equiv \sim Y)$. So, the final answer is D. ' $\sim(X \equiv \sim Y)$ '.

Answer Option 8:

The premises here are:

1. $U \supset W$
2. $W \supset (X \equiv \neg Y)$
3. $(X \equiv \neg Y) \supset Z$
4. $\neg Z$

Our task is to find an immediate consequence of these premises. An immediate consequence must be derived directly from these premises without the use of additional logical rules.

Let's analyze the options:

- A. ' $U \supset Z$ ': This is not an immediate consequence, as we can't directly derive Z from U based on the given premises.
- B. ' $U \vee W$ ': This is not an immediate consequence as well. The first premise tells us that if U then W, but it doesn't guarantee that U or W is true.
- C. ' $\neg W$ ': This is also not an immediate consequence. The premises don't provide information to derive this conclusion.
- D. ' $\neg(X \equiv \neg Y)$ ': Based on premise 4, we know that Z is not true. From premise 3, we can then derive that $(X \equiv \neg Y)$ is not true, since if it were true, Z would also be true. Hence, ' $\neg(X \equiv \neg Y)$ ' is the immediate consequence of the given premises.

Final Answer: D

Answer Option 9:

The immediate consequence of the premises would be the proposition that can be deduced directly from what's given.

From the premises, we know that:

If U, then W. ($U \supset W$)

If W, then X is equivalent to not Y. ($W \supset (X \equiv \neg Y)$)

If X is equivalent to not Y, then Z. ($(X \equiv \neg Y) \supset Z$)

Not Z. ($\neg Z$)

Logically, the direct consequence of these premises would be that since we have $\neg Z$, and knowing that $(X \equiv \neg Y) \supset Z$, we can deduce that the equivalent of X and not Y is not true. Hence, $\neg(X \equiv \neg Y)$.

So, the correct answer is D. ' $\neg(X \equiv \neg Y)$ '.

Question 34:

'Identify the antecedent of the following conditional proposition: If the Bees don't win their first game, then both the Aardvarks and the Chipmunks win their first games.', A. 'The Aardvarks win their first game.',

B. 'The Bees don't win their first game.', C. 'The Chipmunks win their first game.', D. 'Both the Aardvarks and the Chipmunks win their first games.'

=====

Answer Option 1:

B. 'The Bees don't win their first game.'

=====

Answer Option 2:

B. 'The Bees don't win their first game.'

=====

Answer Option 3:

B. 'The Bees don't win their first game.'

=====

Answer Option 4:

B. 'The Bees don't win their first game.'

=====

Answer Option 5:

B. 'The Bees don't win their first game.'

=====

Answer Option 6:

B. 'The Bees don't win their first game.'

=====

Answer Option 7:

B. 'The Bees don't win their first game.'

=====

Answer Option 8:

In a conditional statement, the antecedent is the part of the statement that follows the word "if". In the given statement, the antecedent is 'The Bees don't win their first game.' So, the correct answer is B. 'The Bees don't win their first game.'

=====

Answer Option 9:

The antecedent of a conditional proposition is the part that must be true in order for the whole statement to be true. In this case, the antecedent is 'The Bees don't win their first game.' So, the correct answer is B. 'The Bees don't win their first game.'

=====

Question 35:

'Select the best translation into predicate logic. Holly loves Frances. (f: Frances; h: Holly; Lxy: x loves y)', A. 'hLf', B. 'fLh', C. 'Lfh', D. 'Lhf'

=====

Answer Option 1:

A. 'hLf'

=====

Answer Option 2:

The best translation into predicate logic for the sentence "Holly loves Frances" is "Lhf".

Final Answer: D. 'Lhf'

=====

Answer Option 3:

The correct translation of "Holly loves Frances" using the given predicates would be 'Lhf'. So, the final answer is D. 'Lhf'.

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Answer Option 4:

The correct translation of the statement 'Holly loves Frances' is A. 'hLf' in predicate logic.

=====

Answer Option 5:

In the given statement, 'Holly loves Frances', Holly is the subject and Frances is the object. In predicate logic, the subject typically comes first. Therefore, the correct translation would be 'Holly loves Frances' as 'Lhf'. Final Answer: D

=====

Answer Option 6:

The best translation of "Holly loves Frances" into predicate logic is 'Lhf'. 'L' denotes the verb 'loves', 'h' represents Holly and 'f' represents Frances. Thus, 'Lhf' is the correct translation. Final Answer: D

=====

Answer Option 7:

The statement "Holly loves Frances" can be translated into predicate logic as "Lhf". Here, 'h' represents Holly, 'f' represents Frances, and 'Lxy' represents 'x loves y'. So, 'Lhf' means 'Holly loves Frances'.

Final Answer: D

=====

Answer Option 8:

The correct translation of "Holly loves Frances" into predicate logic using the given notation would be 'Lhf'. This is because the predicate 'Lxy' is defined as 'x loves y'. Here, 'h' represents Holly and 'f' represents Frances. Thus, 'Lhf' represents 'Holly loves Frances'. Final Answer: D. 'Lhf'

=====

Answer Option 9:

The correct translation of "Holly loves Frances" in predicate logic, using the given symbols, would be 'Lhf'.

This is because 'h' stands for Holly, 'f' stands for Frances, and 'Lxy' means "x loves y".

So, 'Lhf' translates to "Holly loves Frances".

Final Answer: D. 'Lhf'

=====

Question 36:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$P \supset (Q \vee R)$

$(Q \cdot S) \supset \neg P$

$\neg(\neg Q \vee R) / \neg P$, A. 'Valid', B. 'Invalid. Counterexample when P, Q, R, and S are true', C. 'Invalid. Counterexample when P and Q are true and R and S are false', D. 'Invalid. Counterexample when P, R, and S are true and Q is false'

=====

Answer Option 1:

The argument is invalid. A counterexample is when P, Q, R, and S are true. At this point, the premises $P \supset (Q \vee R)$ and $(Q \cdot S) \supset \neg P$ are both true, but the conclusion $\neg P$ is false. Final Answer: B. 'Invalid.

Counterexample when P, Q, R, and S are true'

Answer Option 2:

The argument is Invalid. We can provide a counterexample. Assume that P, Q, R, and S are true. Then $(Q \vee R)$ is true, so $P \supset (Q \vee R)$ is true. Also, $(Q \cdot S) \supset \neg P$ is true, because the antecedent $(Q \cdot S)$ is true and the consequent $\neg P$ is false. However, the conclusion $\neg P$ is false, because P is true. Therefore, the argument is not valid. Final Answer: B. 'Invalid. Counterexample when P, Q, R, and S are true'

Answer Option 3:

$P \rightarrow (Q \vee R)$

$(Q \wedge S) \rightarrow \neg P$

$\therefore \neg P$

The counterexample lies in the case when P and Q are true and R and S are false. In this case:

- The first premise $P \rightarrow (Q \vee R)$ is true because Q is true.
- The second premise $(Q \wedge S) \rightarrow \neg P$ is also true because the antecedent $(Q \wedge S)$ is false (since S is false).
- However, the conclusion $\neg P$ is false because P is true.

So, the argument is invalid when P and Q are true and R and S are false.

Final Answer: C. 'Invalid. Counterexample when P and Q are true and R and S are false'

Answer Option 4:

Option C: 'Invalid. Counterexample when P and Q are true and R and S are false'

This argument is invalid, and a counterexample can be found when P and Q are true, and R and S are false. In the premises, P implies $(Q \vee R)$ would be true, as P is true and Q is also true. $(Q \cdot S)$ implies $\neg P$ would be false, as Q is true, but S is false, so $(Q \cdot S)$ is false, and $\neg P$ is also false. $\neg(\neg Q \vee R)$ would be false, as Q is true, so $\neg Q$ is false, and R is false. Therefore, the final conclusion $\neg P$ is false. This counterexample shows that the argument is invalid.

Answer Option 5:

A counterexample can be found when P, Q, R, and S are true. In this case:

$P \supset (Q \vee R)$ is 'True' because P is true and $(Q \vee R)$ is true as both Q and R are true.

$(Q \cdot S) \supset \neg P$ is 'False' because $(Q \cdot S)$ is true as both Q and S are true but $\neg P$ is false as P is true, so this leads to a contradiction (True \supset False is False).

$\neg(\neg Q \vee R)$ is 'False', because $\neg Q$ is false as Q is true, so $(\neg Q \vee R)$ is true as R is also true, thus $\neg(\neg Q \vee R)$ is false.

$\neg P$ is 'False' because P is true.

So, the argument is not valid. Final Answer: B. 'Invalid. Counterexample when P, Q, R, and S are true'

Answer Option 6:

The argument is valid if there is no possible world (or row on a truth table) in which the premises are all true and the conclusion is false. If there is such a row, then the argument is invalid. Here are the steps to build the indirect truth table:

Step 1: Write all the premises and the negation of the conclusion.

$P \supset (Q \vee R)$

$(Q \cdot S) \supset \neg P$

$\neg(\neg Q \vee R)$

$\neg(\neg P)$

Step 2: Assume that all of these sentences are true.

Step 3: If there is a contradiction, the argument is valid. If there isn't, the argument is invalid.

Upon creating the truth table for the above mentioned logical statements, the argument seems to be invalid. The counterexample is when P, Q, R, and S are all true. Therefore, the correct answer is B.

'Invalid. Counterexample when P, Q, R, and S are true'.

Answer Option 7:

Using an indirect truth table, we can determine the validity of this argument.

We start with the conclusion $\neg P$ and assign it the value of true, as we assume the conclusion to be true in a valid argument.

$\neg(\neg Q \vee R) / \neg P$, $\neg P = \text{True}$, so $P = \text{false}$.

If P is false, then $(Q \cdot S) \supset \neg P$ is always true because a conditional statement is true when the antecedent is false, so we don't even need to consider Q, S .

Finally, consider the first premise $P \supset (Q \vee R)$. Since P is false, this conditional statement is true regardless of the values of Q, R .

Therefore, all the premises are true when the conclusion is true. Hence the argument is valid.

Final Answer: A. 'Valid'

Answer Option 8:

The argument is:

$P \supset (Q \vee R)$

$(Q \cdot S) \supset \neg P$

$\neg(\neg Q \vee R) / \neg P$

After applying the rules, we can convert the argument into:

$\neg P \vee (Q \vee R)$

$\neg(Q \cdot S) \vee \neg P$

$Q \wedge \neg R / \neg P$

Now we need to evaluate the final argument. Let's consider the inputs where P, Q, R , and S are true. Then:

$\neg P \vee (T \vee T) = \neg T \vee T = F \vee T = T$

$\neg(T \cdot T) \vee \neg P = \neg T \vee \neg T = F \vee F = F$

$T \wedge \neg T = T \wedge F = F$

$F / \neg T = F / F = T$

As a result, the argument is valid when all inputs are true. So, the answer is A. 'Valid'.

Answer Option 9:

To use an indirect truth table, we assume that the conclusion is false and the premises are true and then check for contradictions.

Assumption: $\neg P$ is false, therefore P is true

Given: $P \supset (Q \vee R)$, since P is true, either Q or R (or both) must be true.

Given: $(Q \cdot S) \supset \neg P$, since P is true, $Q \cdot S$ must be false. This means either Q is false or S is false (or both).

Given: $\neg(\neg Q \vee R)$, this means both Q is true and R is false.

Combining the assumptions, we have: P is true, Q is true, R is false, and S is false. There are no contradictions, so the argument is invalid.

The counterexample is when P and Q are true and R and S are false, which corresponds to option C.

Final Answer: C. 'Invalid. Counterexample when P and Q are true and R and S are false'

Question 37:

' Construct a complete truth table for the following argument. Then, using the truth table, determine whether the argument is valid or invalid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$T \vee U$

$W \cdot T / U$, A. 'Valid', B. 'Invalid. Counterexample when T and W are true and U is false', C. 'Invalid. Counterexample when T is true and W and U are false', D. 'Invalid. Counterexample when W is true and T and U are false'

=====

Answer Option 1:

Let's construct the truth table:

$T \ U \ W \ T \vee U \ W \cdot T \ U$

T T T T T T

T T F T T T

T F T T T F

T F F T F F

F T T T T T

F T F T F T

F F T F T F

F F F F F F

The argument says, if $T \vee U$ is true and $W \cdot T$ is true, then U is true.

Looking at the truth table, we can see that the argument is invalid. There is a counterexample when T and W are true but U is false. In this case, both $T \vee U$ and $W \cdot T$ are true, but U is not true.

Therefore, the correct answer is B. 'Invalid. Counterexample when T and W are true and U is false'.

Answer Option 2:

To determine whether the argument is valid or invalid, construct a truth table for $(T \vee U)$, $(W \cdot T)$, and U.

$T \ U \ W \ (T \vee U) \ (W \cdot T) \ U$

T T T T T T

T T F T T T

T F T T T F

T F F T F F

F T T T T T

F T F T F T

F F T F T F

F F F F F F

The argument is invalid if there is a situation where both the premises are true, but the conclusion is false. This occurs when T is true, W is true and U is false.

Final Answer: B. 'Invalid. Counterexample when T and W are true and U is false'.

Answer Option 3:

First, we construct the truth table for the argument:

$T \ U \ W \ T \vee U \ W \cdot T \ U$

T T T T T T

T T F T T T

T F T T T F

T F F T F F

F T T T T T

F T F T F T

F F T F T F

F F F F F F

Now we can analyze the argument.

The argument's premises are $T \vee U$ and $W \cdot T$, and the conclusion is U.

We should look for a situation when all premises are true and conclusion is false.

This situation happens when T is true, W is true and U is false.

Therefore, the argument is invalid and the correct answer is:

B. 'Invalid. Counterexample when T and W are true and U is false'.

Answer Option 4:

In this case, the argument is: Premises: $T \vee U, W \cdot T$. Conclusion: U . To determine whether the argument is valid or invalid, we construct a truth table, then look for any cases where all the premises are true but the conclusion is false.

$T \quad U \quad W \quad T \vee U \quad W \cdot T \quad U$

T T T T T T

T T F T T T

T F T T T F

T F F T F F

F T T T T T

F T F T F T

F F T F F F

F F F F F F

We can see from the truth table that there is a case where all the premises ($T \vee U, W \cdot T$) are true but the conclusion (U) is false (the third row). This means the argument is invalid. The counterexample is when T and W are true, but U is false. So, the correct answer is: B. 'Invalid. Counterexample when T and W are true and U is false'.

Answer Option 5:

The truth table for the argument is as follows:

$| T | U | W | T \vee U | W \cdot T | U |$

|---|---|---|-----|-----|---|

| T | T | T | T | T | T |

| T | T | F | T | F | T |

| T | F | T | T | T | F |

| T | F | F | T | F | F |

| F | T | T | T | T | T |

| F | T | F | T | F | T |

| F | F | T | F | F | F |

| F | F | F | F | F | F |

We can see that there is a row in the table where all premises are true ($T \vee U$ and $W \cdot T$), but the conclusion is false (U is false). Specifically, this is the third row. Therefore, the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when T and W are true and U is false'

Answer Option 6:

Here is the complete truth table:

$T \quad U \quad W \quad T \vee U \quad W \cdot T \quad U$

T T T T T T

T T F T F T

T F T T T F

T F F T F F

F T T T F T

F T F T F T

F F T F F F

F F F F F F

The argument is $T \vee U, W \cdot T$ therefore U . However, in the third row of the truth table, where T is true, W is true and U is false, the premises are true but the conclusion is false. This is a violation of the principle of valid reasoning, making the argument invalid.

So, the final answer is B. 'Invalid. Counterexample when T and W are true and U is false'.

Answer Option 7:

A truth table for the given propositions ($T \vee U$) and $(W \cdot T) / U$ can be constructed as follows:

$T \quad U \quad W \quad T \vee U \quad W \cdot T \quad W \cdot T / U$

0 0 0 0 0

0 0 1 0 0

0 1 0 1 0

0 1 1 0 1

1 0 0 1 0 0
 1 0 1 1 1 0
 1 1 0 1 0 1
 1 1 1 1 1 1

From the truth table, we can see that the argument is not valid. This is because there is a case in which $(T \vee U)$ is true, but $(W \cdot T) / U$ is false: when T is true, W is true and U is false. This is a counterexample that disproves the validity of the argument.

So, Final Answer: B. 'Invalid. Counterexample when T and W are true and U is false'

Answer Option 8:

Here is the truth table:

$T \ U \ W \ T \vee U \ W \cdot T \ U$

T T T T T T

T T F T F T

T F T T T F

T F F T F F

F T T T F T

F T F T F T

F F T F F F

F F F F F F

The argument is "If $T \vee U$ and $W \cdot T$, then U"

Looking at the table, we see that the argument is not always valid. For example, in the third row when T is true, U is false and W is true, the premises are true, but the conclusion is false. Therefore, the argument is invalid.

Final Answer: C. 'Invalid. Counterexample when T is true and W and U are false'

Answer Option 9:

Let's construct the truth table:

$T \ U \ W \ T \vee U \ W \cdot T \ U$

0 0 0 0 / 0

0 0 1 0 0 / 0

0 1 0 1 0 / 1

0 1 1 1 0 / 1

1 0 0 1 0 / 0

1 0 1 1 1 / 0

1 1 0 1 0 / 1

1 1 1 1 1 / 1

An argument is invalid if there is a row where the premises are all true and the conclusion is false.

From the table, we can see that the argument is indeed invalid because there is a row where the premises $(T \vee U \text{ and } W \cdot T)$ are true and the conclusion (U) is false: when T and W are true and U is false.

Final answer: B. 'Invalid. Counterexample when T and W are true and U is false'

Question 38:

'Identify the antecedent of the following conditional proposition: The university raises tuition if both the governor approves of it and the board of trustees recommends it.', A. 'The university raises tuition.', B. 'The governor approves of it.', C. 'The board of trustees recommends it.', D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 1:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 2:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 3:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 4:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 5:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 6:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 7:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 8:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Answer Option 9:

D. 'The governor approves of it and the board of trustees recommends it.'

=====

Question 39:

' Identify the antecedent of the following conditional proposition: The restaurant does not have peas, so instead they serve corn and potatoes.', A. 'The restaurant has peas.', B. 'The restaurant does not have peas.', C. 'The restaurant serves corn.', D. 'The restaurant serves potatoes.'

=====

Answer Option 1:

B. 'The restaurant does not have peas.'

Answer Option 2:

B. 'The restaurant does not have peas.'

Answer Option 3:

B. 'The restaurant does not have peas.'

Answer Option 4:

B. 'The restaurant does not have peas.'

Answer Option 5:

B. 'The restaurant does not have peas.'

Answer Option 6:

B. 'The restaurant does not have peas.'

Answer Option 7:

B. 'The restaurant does not have peas.'

Answer Option 8:

B. 'The restaurant does not have peas.'

Answer Option 9:

B. 'The restaurant does not have peas.'

Question 40:

' Select the best translation into predicate logic. All jellybeans are sweeter than all fruit. (Fx: x is a fruit; Jx: x is a jellybean; Sxy: x is sweeter than y)', A. $(\forall x)[Fx \supset (\forall y)(Jy \supset Sxy)]$, B. $(\forall x)(\forall y)[(Fx \bullet Jy) \bullet Sxy]$, C. $(\forall x)(\forall y)[Sxy \supset (Fy \bullet Jx)]$, D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$

=====

Answer Option 1:

The statement "All jellybeans are sweeter than all fruit" is best translated as "for all x, if x is a jellybean, then for all y, if y is a fruit, x is sweeter than y." Therefore, the correct translation into predicate logic would be D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$.

Answer Option 2:

The statement "All jellybeans are sweeter than all fruit" means that "For every x, if x is a jellybean then for all y, if y is a fruit, then x is sweeter than y".

So, the correct translation into predicate logic is $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$.

Final Answer: D

Answer Option 3:

The statement, "All jellybeans are sweeter than all fruit," can be translated as "For every x, if x is a jellybean, then for every y, if y is a fruit, x is sweeter than y." This corresponds to the predicate logic formula: $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$. So, the correct answer is D.

Answer Option 4:

The statement says "All jellybeans are sweeter than all fruit." This statement is saying for every jellybean, for all fruits, that jellybean is sweeter than that fruit.

The correct translation would be: "For all x, if x is a jellybean, then for all y, if y is a fruit, x is sweeter than y." This corresponds to $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$.

Final Answer: D

Answer Option 5:

The given statement "All jellybeans are sweeter than all fruit" suggests that for every jellybean, and for every fruit, the jellybean is sweeter than the fruit. Therefore, the best translation in predicate logic would be:

D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$.

This translates as "For all x, if x is a jellybean, then for all y, if y is a fruit, then x is sweeter than y." This correctly mirrors the structure and meaning of the original sentence.

Answer Option 6:

The best translation into predicate logic for "All jellybeans are sweeter than all fruit" is D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$. This translates directly as "For all x, if x is a jellybean, then for all y, if y is a fruit, x is sweeter than y". This aligns with the original sentence.

Answer Option 7:

The correct translation of "All jellybeans are sweeter than all fruit" into predicate logic would be D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$. Here, for all x, if x is a jellybean, then for all y, if y is a fruit, then x is sweeter than y. This captures the meaning of the statement correctly.

Answer Option 8:

The sentence "All jellybeans are sweeter than all fruit" can be translated as "For every x, if x is a jellybean, then for every y, if y is a fruit, then x is sweeter than y." Thus the correct translation is:

D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$

Answer Option 9:

The correct translation for the sentence "All jellybeans are sweeter than all fruit" is D. $(\forall x)[Jx \supset (\forall y)(Fy \supset Sxy)]$. It translates as "For all x, if x is a jellybean, then for all y, if y is a fruit, then x is sweeter than y". Which is exactly what the original sentence meant.

Question 41:

'Identify the conclusion of the following argument. That the world is my idea is a truth valid for every living creature, though only man can contemplate it. In doing so, he attains philosophical wisdom. No truth is more absolutely certain than that all that exists for knowledge and therefore this world is only object in relation to subject, perception of a perceiver. The world is an idea. (Arthur Schopenhauer, The World as Will and Idea)', A. 'The world is an idea.', B. 'That the world is my idea is a truth valid for every living creature, though only man can contemplate it.', C. 'In doing so, he attains philosophical wisdom.', D. 'No truth is more absolutely certain than that all that exists for knowledge and therefore this world is only object in relation to subject, perception of a perceiver.'

=====

Answer Option 1:

A. 'The world is an idea.'

=====

Answer Option 2:

A. 'The world is an idea.'

=====

Answer Option 3:

A. 'The world is an idea.'

=====

Answer Option 4:

A. 'The world is an idea.'

=====

Answer Option 5:

A. 'The world is an idea.'

=====

Answer Option 6:

A. 'The world is an idea.'

=====

Answer Option 7:

A. 'The world is an idea.'

=====

Answer Option 8:

A. 'The world is an idea.'

=====

Answer Option 9:

A. 'The world is an idea.'

=====

Question 42:

'Select the best translation into predicate logic. Leo is taller than Cathy. (c: Cathy; l: Leo; Txy: x is taller than y)', A. 'Tlc', B. 'Tcl', C. 'ITc', D. 'cTI'

=====

Answer Option 1:

A. 'Tlc'

=====

Answer Option 2:

A. 'Tlc'

=====

Answer Option 3:

In predicate logic, the first object mentioned is the subject of the sentence. So in this case, 'Leo is taller than Cathy' would be translated to 'Tlc'. Therefore, the correct option is A: 'Tlc'.

=====

Answer Option 4:

The best translation into predicate logic for the sentence "Leo is taller than Cathy" is 'Tlc', where 'T' stands for "is taller than", 'l' for "Leo", and 'c' for "Cathy". Therefore, the final answer is: A. 'Tlc'.

=====

Answer Option 5:

The statement "Leo is taller than Cathy." translates into predicate logic as "Tlc" where Txy denotes "x is taller than y", l denotes Leo and c denotes Cathy. So, the correct option is A. 'Tlc'.

=====

Answer Option 6:

The best translation into predicate logic for the statement "Leo is taller than Cathy" is represented by the predicate symbol T (stands for "is taller than") with l and c (stands for Leo and Cathy respectively) as arguments. Since Leo is taller than Cathy, we should place l before c. So, the correct translation is Tlc. Final Answer: A. 'Tlc'

=====

Answer Option 7:

The best translation into predicate logic for the statement "Leo is taller than Cathy" would be option A, 'Tlc'. This is because in the predicate logic Txy, x is the one who is taller and y is the one who is shorter.

So, for the statement "Leo is taller than Cathy", Leo (l) is x and Cathy (c) is y. Therefore, the correct translation is 'Tlc', Leo is taller than Cathy.

=====

Answer Option 8:

The correct translation of the statement "Leo is taller than Cathy" into predicate logic with the given symbols would be "Tlc". This is because 'Txy' represents 'x is taller than y'. Therefore, 'Tlc' represents 'Leo is taller than Cathy'.

Final Answer: A. 'Tlc'

=====

Answer Option 9:

The best translation into predicate logic for the statement "Leo is taller than Cathy" would be 'Tlc'. This is because in the predicate Txy: x is taller than y, x should be replaced by 'l' (Leo) and y should be replaced by 'c' (Cathy) to represent the given information. Hence, the answer is A. 'Tlc'.

=====

Question 43:

'Construct a complete truth table for the following pairs of propositions. Then, using the truth tables, determine whether the statements are logically equivalent or contradictory. If neither, determine whether they are consistent or inconsistent. Justify your answers.

$C \supset (D \vee C)$ and $C \cdot \neg D$, A. 'Logically equivalent', B. 'Contradictory', C. 'Neither logically equivalent nor contradictory, but consistent', D. 'Inconsistent'

=====

Answer Option 1:

Let's make a truth table:

$C \ D \ C \supset (D \vee C) \ C \cdot \neg D$

T T T F

T F T F

F T T F

F F T F

Here, ' $C \supset (D \vee C)$ ' is always true while ' $C \cdot \neg D$ ' is always false. Therefore, the two statements are contradictory.

So, the final answer is B. 'Contradictory'.

=====

Answer Option 2:

$C \ D \ C \supset (D \vee C) \ C \cdot \neg D$

- T T T F

- T F T F

- F T T F

- F F T T

From the truth table, we can see that the two propositions $C \supset (D \vee C)$ and $C \cdot \neg D$ are neither logically equivalent nor contradictory, since there are rows in the truth table where one proposition is true and the other is false. However, they are consistent, since there are rows in the truth table where both propositions are true.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

=====

Answer Option 3:

Let's construct the truth table:

$C \ D \ C \supset (D \vee C) \ C \cdot \neg D$

T T T F

T F T T

F T T F

F F T F

Looking at the truth table, we can see that the two statements are not logically equivalent, because they do not produce the same truth values for all possible combinations of truth values for C and D. They are also not contradictory because there is not exactly one row where one is true and the other is false.

However, there are scenarios (for example when C is true and D is false) where both statements can be true at the same time, therefore they are consistent.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

=====

Answer Option 4:

Let's construct the truth table:

$C \ D \ (D \vee C) \ C \supset (D \vee C) \ \neg D \ C \cdot \neg D$

T T T T F F

T F T T T T

F T T T F F

F F F T F F

From the truth table, we can see that the statements are not equivalent, as there are rows where the truth values of the statements differ. They are also not contradictory, as there are no rows where one statement is true while the other is false. However, they are consistent, as there are rows where both statements can be true.

So the final answer is C. 'Neither logically equivalent nor contradictory, but consistent'.

=====

Answer Option 5:

The truth table for the given pair of propositions $C \supset (D \vee C)$ and $C \cdot \neg D$ is as follows:

$C \ D \ D \vee C \ C \supset (D \vee C) \ \neg D \ C \cdot \neg D$

T T T T F F

T F T T T T

F T T T F F

F F F T T F

From the truth table, it is clear that the two propositions are not logically equivalent since the truth values under $C \supset (D \vee C)$ and $C \cdot \sim D$ are not the same for all cases.

Furthermore, they are not contradictory since there isn't a situation where one proposition is true and the other is false.

The two propositions are consistent because there are situations where both can be true at the same time. For example, when C is true and D is false, both propositions are true.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 6:

First, let's construct the truth table:

$C \supset (D \vee C)$ $C \cdot \sim D$

T T T F

T F T T

F T T F

F F T F

$C \supset (D \vee C)$ is true in all cases, while $C \cdot \sim D$ depends on the truth values of both C and D.

Thus, the statements are not logically equivalent (option A), as their truth values differ in some cases.

They are not contradictory (option B) either, as there are scenarios where both can be true (specifically, when C is true and D is false).

They are consistent (option C), because there are some scenarios where both can be true.

They're not inconsistent (option D), because there isn't a scenario where they're both false at the same time.

Final Answer: C

Answer Option 7:

Let's create the truth table for both the expressions:

$C \supset (D \vee C)$ and $C \cdot \sim D$

$C \supset (D \vee C)$ $C \cdot \sim D$

T T T T F F

T F T T T T

F T T T F F

F F T T T F

From the truth table, we can see that the two expressions are not the same for all possible values of C and D. Therefore, they are not logically equivalent (Option A). There is at least one case (C is true and D is false) in which both statements are true, so they are not contradictory (Option B). Additionally, there are instances where at least one of the statements is true, so they are not inconsistent (Option D).

Therefore, they are neither logically equivalent nor contradictory, but consistent (Option C).

Final Answer: C

Answer Option 8:

To determine the answer, we need to make a truth table for both of the statements ' $C \supset (D \vee C)$ ' and ' $C \cdot \sim D$ '.

Truth Table for ' $C \supset (D \vee C)$ ' and ' $C \cdot \sim D$ '

$C \supset (D \vee C)$ $C \cdot \sim D$

T T T T F F

T F T T T T

F T T T F F

F F T T T F

From the truth table, it's clear that the two propositions are not logically equivalent because they don't have the same truth values in all scenarios. Additionally, they are not contradictory because there isn't a scenario where one is true and the other is false.

At the same time, the two statements are consistent because there is at least one scenario (when C is true and D is false) where both can be true at the same time.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 9:

Let's construct a truth table:

$C \supset (D \vee C)$ $C \cdot \sim D$

-----|-----|-----|

T | T | T | F |

T | F | T | T |

| F | T | T | F |

| F | F | T | F |

The rows in the truth table do not match for the two propositions, so they are not logically equivalent. They are also not contradictory, since there is not a case where if one is true the other is false in all cases.

The statements are consistent, since there are situations (when $C = T$ and $D = F$) where both can be true.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Question 44:

' Construct a complete truth table for the following pairs of propositions. Then, using the truth tables, determine whether the statements are logically equivalent or contradictory. If neither, determine whether they are consistent or inconsistent. Justify your answers.

$\neg O \supset P$ and $O \vee P$, A. 'Logically equivalent', B. 'Contradictory', C. 'Neither logically equivalent nor contradictory, but consistent', D. 'Inconsistent'

=====

Answer Option 1:

Let's construct a truth table for the given statements:

$O \mid P \mid \neg O \supset P \mid O \vee P$

T | T | T | T

T | F | T | T

F | T | T | T

F | F | F | F

Observing the truth table, the propositions ' $\neg O \supset P$ ' and ' $O \vee P$ ' have the same truth values in all cases. Therefore, these two statements are logically equivalent.

Final Answer: A. 'Logically equivalent'

Answer Option 2:

To decide whether the statements are equivalent, contradictory, or neither, we build a truth table:

$O \mid P \mid \neg O \supset P \mid O \vee P$

|---|---|-----|-----|

| T | T | T | T |

| T | F | T | T |

| F | T | T | T |

| F | F | F | F |

$\neg O \supset P$ is equivalent to $O \vee P$. So, we have the two columns of the truth table for $\neg O \supset P$ and $O \vee P$ are identical. Hence, the two statements are logically equivalent.

Final Answer: A. 'Logically equivalent'

Answer Option 3:

Let's construct the truth table:

$O \mid P \mid \neg O \supset P \mid O \vee P$

T T F T T

T F F T T

F T T T T

F F T F F

From the truth table, we can see that the two propositions are not logically equivalent, as the columns for $\neg O \supset P$ and $O \vee P$ do not match.

The two propositions are also not contradictory, as there is no row where $\neg O \supset P$ is true and $O \vee P$ is false or vice versa.

However, the propositions are consistent as there is no row in which $\neg O \supset P$ is true and $O \vee P$ is false, or the other way round.

So, the statements are 'Neither logically equivalent nor contradictory, but consistent'. Final Answer: C.

Answer Option 4:

Here, $\neg O \supset P$ means If not O then P, and $O \vee P$ means O or P. Let's construct a truth table:

$O \mid P \mid \neg O \supset P \mid O \vee P$

T T F T T

T F F T T

F T T T T

F F T F F

From the table, we can see that the two propositions are neither logically equivalent nor contradictory as their truth values are not always the same nor always different. However, they are consistent because there is at least one row (the third one) where both propositions are true.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent.'

Answer Option 5:

Let's construct a truth table for the propositions $\neg O \supset P$ and $O \vee P$.

$O \vee P \rightarrow O \rightarrow P \vee P$

T T F T T

T F F F T

F T T T T

F F T F F

From the above truth table, we can see that for some values of O and P, the propositions $\neg O \rightarrow P$ and $O \vee P$ yield the same result, but not for all values. Therefore, the propositions are not logically equivalent.

However, there is no row in the truth table where both propositions are true or where both are false. Hence, they are not contradictory.

Moreover, there isn't any row in the table where both statements are false at the same time, so the statements are consistent.

Final Answer: C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 6:

The truth table for the given propositions is as follows:

$O \vee P \rightarrow O \rightarrow P \vee P$

T T F T T

T F F F T

F T T T T

F F T F F

From the above truth table, the last two columns represent the two given propositions, $\neg O \rightarrow P$ and $O \vee P$, respectively. It can be seen that in some rows, both propositions are true, while in others, they are not. This means that the two propositions are neither logically equivalent (which would require them to be either both true or both false in all cases) nor contradictory (which would require exactly one of them to be true in all cases). However, they are consistent with each other, as there exist some interpretations (i.e., rows of the truth table) where they are both true.

So, the answer is C. 'Neither logically equivalent nor contradictory, but consistent'.

Answer Option 7:

Here is the complete truth table:

$O \vee P \rightarrow O \rightarrow P \vee P$

T T F T T

T F F F T

F T T T T

F F T F F

By comparing the truth values of each compound proposition ($\neg O \rightarrow P$ and $O \vee P$) in the fourth and fifth columns, we can see that they are not identical in all cases, so they are not logically equivalent (option A is not correct). They are also not contradictory, because there is not a single case where one is true and the other is false in all cases (option B is not correct).

However, it is possible for both $\neg O \rightarrow P$ and $O \vee P$ to be true at the same time, as in the first and third rows of the table. Therefore, these statements are consistent (option C is correct).

So, the final answer is C. 'Neither logically equivalent nor contradictory, but consistent'.

Answer Option 8:

Let's first construct the truth table:

$O \vee P \mid \neg O \mid \neg O \rightarrow P \mid O \vee P$

|---|---|---|---|

| T | T | F | T | T |

| T | F | F | T | T |

| F | T | T | T | T |

| F | F | T | F | F |

From the table, we can analyze the following:

Logically equivalent: Two statements are logically equivalent if they have the same truth values in all cases. The statements ' $\neg O \rightarrow P$ ' and ' $O \vee P$ ' are not logically equivalent because they do not have the same truth values in all cases. So, it is not the answer.

Contradictory: Two statements are contradictory if they have opposite truth values in all cases. The statements ' $\neg O \rightarrow P$ ' and ' $O \vee P$ ' are not contradictory because they do not have opposite truth values in all cases. So, it is also not the answer.

Consistent: Two statements are consistent if it is possible for both to be true at the same time. The statements ' $\neg O \rightarrow P$ ' and ' $O \vee P$ ' are both true in the first three cases so they are consistent.

Hence, the final answer is:

C. 'Neither logically equivalent nor contradictory, but consistent'

Answer Option 9:

First, let's build the truth table:

$O \vee P \rightarrow \neg O \rightarrow P \vee P$

T T F T T

T F F F T

F T T T T

F F T F F

From the truth table, we can see that the two statements ' $\neg O \rightarrow P$ ' and ' $O \vee P$ ' are neither identical (logically equivalent) nor are they the exact opposite of each other (contradictory).

However, there are some situations in which both statements can be true at the same time, such as when 'O' is true and 'P' is true or when 'O' is false and 'P' is true. This means that the two statements are consistent with each other because they can both be true under certain circumstances.

Therefore, the answer is C. 'Neither logically equivalent nor contradictory, but consistent'.

Question 45:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$(T \cdot \neg U) \supset \neg W$

$\neg W \supset X$

$\neg Z \supset W$

$\neg(X \cdot Z) / T \supset U$, A. 'Valid', B. 'Invalid. Counterexample when T, X, and Z are true and U and W are false', C. 'Invalid. Counterexample when T and X are true and U, W, and Z are false', D. 'Invalid.

Counterexample when T, W, and Z are true and U and X are false'

=====

Answer Option 1:

A. 'Valid'

=====

Answer Option 2:

The argument is invalid. We can find a counterexample: When T and X are true and U, W, and Z are false, the premises are all true and the conclusion is false. This makes the argument invalid. Therefore,

the correct answer is C. 'Invalid. Counterexample when T and X are true and U, W, and Z are false'

=====

Answer Option 3:

An argument is valid if and only if it is impossible for the premises to be true and the conclusion false.

In this case, the argument is:

$(T \cdot \neg U) \supset \neg W$

$\neg W \supset X$

$\neg Z \supset W$

$\neg(X \cdot Z) / T \supset U$

We can see that the argument is invalid when T and X are true and U, W, and Z are false. In that case, the premises are true, but the conclusion is false. Therefore, the correct answer is C. 'Invalid.

Counterexample when T and X are true and U, W, and Z are false'.

=====

Answer Option 4:

The argument is not valid. A counterexample can be found when T is true, X is true and U, W and Z are false. So option C is the correct answer.

In this case, we have:

$(T \wedge \neg U) \rightarrow \neg W$ (Truth table: T, F, F)

$\neg W \rightarrow X$ (Truth table: F, T)

$\neg Z \rightarrow W$ (Truth table: F, F)

$\neg(X \wedge Z)$ (Truth table: T, F)

$T \rightarrow U$ (Truth table: T, F)

As we can see from the truth tables, the premises do not necessarily lead to the conclusion $T \rightarrow U$, hence the argument is not valid. A counterexample is when T is true and U is false, which contradicts the

conclusion $T \rightarrow U$. Final Answer: C

=====

Answer Option 5:

The argument is invalid. Here is the counterexample:

Suppose T and X are true and U, W, and Z are false.

$(T \cdot \neg U) \supset \neg W$ becomes $(\text{True} \cdot \text{True}) \supset \text{True}$ which is True because true implies true.

$\neg W \supset X$ becomes $\text{True} \supset \text{True}$ which is True because true implies true.

$\neg Z \supset W$ becomes $\text{True} \supset \text{False}$ which is False because true implies false is false.

$\neg(X \cdot Z)$ becomes $\neg(\text{True} \cdot \text{False})$ which is True because the negation of false is true.

$T \supset U$ becomes $\text{True} \supset \text{False}$ which is False because true implies false is false.

Therefore, under these conditions, the premises are not all true when the conclusion is false, making the argument invalid.

Final Answer: C. 'Invalid. Counterexample when T and X are true and U, W, and Z are false'

=====

Answer Option 6:

The following indirect truth table may be built for the argument:

$(T \wedge \neg U) \supset \neg W$

$\neg W \supset X$

$\neg Z \supset W$

$\neg(X \wedge Z)$

Therefore, $T \supset U$

We begin by assuming the opposite of the conclusion, which is that T is true and U is false.

T U W X Z

T F ? ? ?

Now, from the first premise $(T \wedge \neg U) \supset \neg W$, we know that W must be false.

T U W X Z

T F F ? ?

From the second premise $\neg W \supset X$, we know that X must be true.

T U W X Z

T F F T ?

From the third premise $\neg Z \supset W$, we know that Z must be true.

T U W X Z

T F F T T

However, this contradicts the fourth premise $\neg(X \wedge Z)$, which states that X and Z cannot both be true. This means there is no consistent assignment of truth values that makes all the premises true and the conclusion false, therefore the argument is valid.

Final Answer: A. 'Valid'

Answer Option 7:

Using indirect truth tables, the argument is considered valid until a contradiction is found. If no contradiction is found, the argument is considered valid. Start with the conclusion and work backwards:

The conclusion $T \supset U$ is false when T is true and U is false.

Then we look at the other three lines in the argument.

1st statement $(T \cdot \neg U) \supset \neg W$ is false when T is true, U is false (from our conclusion) and W is true.

2nd statement $\neg W \supset X$ is false when W is true and X is false.

3rd statement $\neg Z \supset W$ is false when Z is true and W is false.

None of the three counterexamples in the options - T, X, Z being true and U, W being false or T, X being true and U, W, Z being false or T, W, Z being true and U, X being false - lead to the conclusion being false without one of the premises being false. Hence, the argument is valid.

Final Answer: A. 'Valid'

Answer Option 8:

Let's use the indirect truth table to determine the validity of the argument.

Step 1: Assume the conclusion is false. Since $T \supset U$ is false, this means T is true and U is false.

Step 2: Trace back the assertions to find a contradiction. If T is true and U is false, then $(T \cdot \neg U)$ is true, which makes $\neg W$ true according to the first assertion. If $\neg W$ is true, then X must be true according to the second assertion. However, $\neg Z \supset W$ implies that Z is false, otherwise W would be true, which contradicts $\neg W$. Lastly, if both X and Z are true, then $\neg(X \cdot Z)$ would be false, which contradicts the given assertion. Hence, this argument is invalid.

Comparing with the options, we can see it fits with option C. So, the answer is 'Invalid. Counterexample when T and X are true and U, W, and Z are false'

Final Answer: C. 'Invalid. Counterexample when T and X are true and U, W, and Z are false'

Answer Option 9:

Using indirect truth tables, we find the following:

- $(T \cdot \neg U) \supset \neg W$: This says that if both T is true and U is not, then W is not true.

- $\neg W \supset X$: This says that if W is not true, then X is.

- $\neg Z \supset W$: This says that if Z is not true, then W is.

- $\neg(X \cdot Z)$: This says that it's not the case that both X and Z are true.

Now we want to determine whether it's possible for all of these statements to be true, but $T \supset U$ not to be (which would make the argument invalid). We have four options.

1) 'Valid': If T is true, then U is also true.

2) 'Invalid. Counterexample when T, X, and Z are true and U and W are false': If T is true but U is not, then the first statement is false, because it says that if T is true and U is not, then W is not true, but we're saying W is true. Therefore, this is a counterexample and the argument is invalid.

3) 'Invalid. Counterexample when T and X are true and U, W, and Z are false': Again, if T is true but U is not, then the first statement is false. Therefore, this is a counterexample and the argument is invalid.

4) 'Invalid. Counterexample when T, W, and Z are true and U and X are false': Again, if T is true but U is not, then the first statement is false. Therefore, this is a counterexample and the argument is invalid.

Final Answer: B. 'Invalid. Counterexample when T, X, and Z are true and U and W are false'

Question 46:

'Select the best translation into predicate logic: Cecilia breaks my heart if, and only if, Maria is either a problem or a girl.', A. ' $Bc \equiv (Pm \vee Gm)$ ', B. ' $Bc \equiv (Pm \bullet Gm)$ ', C. ' $Bc \supset (Pm \vee Gm)$ ', D. ' $Cb \supset (Pm \bullet Gm)$ '

=====

Answer Option 1:

A. ' $Bc \equiv (Pm \vee Gm)$ '

=====

Answer Option 2:

The correct translation for "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl." is ' $Bc \equiv (Pm \vee Gm)$ ', as the "if, and only if" translates to equivalence (\equiv), and "either...or" translates to disjunction (\vee). Final Answer: A

=====

Answer Option 3:

The best translation into predicate logic for the statement "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl" is A. ' $Bc \equiv (Pm \vee Gm)$ '. This is because "if, and only if" translates to equivalence (\equiv) in logic, and "either...or" translates to disjunction (\vee). Therefore, Cecilia breaking my heart is equivalent to Maria being either a problem or a girl.

=====

Answer Option 4:

The translation of the statement is: "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl."

The best predicate logic translation would be: "Cecilia breaks my heart if and only if Maria is a problem or Maria is a girl."

In symbolic form, this would be: " $Bc \equiv (Pm \vee Gm)$ "

Option A: $Bc \equiv (Pm \vee Gm)$, correctly represents the given statement.

Final Answer: A

=====

Answer Option 5:

The best translation into predicate logic for the statement 'Cecilia breaks my heart if, and only if, Maria is either a problem or a girl.' is: A. ' $Bc \equiv (Pm \vee Gm)$ '. This is because the statement is saying that Cecilia breaks my heart if and only if either of the two conditions for Maria are met - she is a problem or a girl. Therefore, the logical equivalence operator (\equiv) and the logical disjunction operator (\vee) are used.

=====

Answer Option 6:

The statement "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl." is a biconditional, which means that both conditions must be true for the statement to be true. Therefore, the correct translation into predicate logic is A. ' $Bc \equiv (Pm \vee Gm)$ '. This represents "Cecilia breaks my heart (Bc) if and only if (\equiv) Maria is either a problem (Pm) or a girl (Gm)".

=====

Answer Option 7:

The best translation into predicate logic for the given statement is ' $Bc \equiv (Pm \vee Gm)$ ' because the statement 'Cecilia breaks my heart if and only if Maria is either a problem or a girl' is a biconditional statement that is true if both components have the same truth value. The 'if, and only if' part indicates a biconditional, which is represented by ' \equiv '. 'either...or' is represented by ' \vee '. Therefore, option A is the correct answer.

=====

Answer Option 8:

The best translation into predicate logic for the statement "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl" is ' $Bc \equiv (Pm \vee Gm)$ '. Here, Bc stands for 'Cecilia breaks my heart', Pm stands for 'Maria is a problem', and Gm stands for 'Maria is a girl'. The logical connective \equiv stands for 'if, and only if' and \vee stands for 'or'. Therefore, the correct final answer is A. ' $Bc \equiv (Pm \vee Gm)$ '.

=====

Answer Option 9:

The best translation into predicate logic for the sentence "Cecilia breaks my heart if, and only if, Maria is either a problem or a girl" is A. ' $Bc \equiv (Pm \vee Gm)$ '. This is because the phrase "if, and only if" implies a logical equivalence, represented by \equiv . Meanwhile, "either... or" indicates a logical disjunction, represented by \vee . So, if Bc stands for "Cecilia breaks my heart", Pm stands for "Maria is a problem", and Gm stands for "Maria is a girl", then the whole sentence can be translated into predicate logic as ' $Bc \equiv (Pm \vee Gm)$ '.

=====

Question 47:

'Select the best translation into predicate logic: If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan.', A. ' $Nd \supset (Bj \bullet Sl)$ ', B. ' $Nd = (Bx \bullet Ly)$ ', C. ' $Nd = (Bj \bullet Sl)$ ', D. ' $Nd \supset (Bj \vee Sl)$ '

=====

Answer Option 1:

D. ' $Nd \supset (Bj \vee Sl)$ '

=====

Answer Option 2:

The correct translation into predicate logic for the statement: "If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan" is $Nd \supset (Bj \vee Sl)$.

So, the correct answer is D. ' $Nd \supset (Bj \vee Sl)$ '

=====

Answer Option 3:

The given sentence is a conditional sentence in the form of "If P, then Q". In predicate logic, we use the symbol ' \supset ' to represent 'if...then'. Option D, ' $Nd \supset (Bj \vee Sl)$ ', correctly translates into "If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan." So, the final answer is D.

=====

Answer Option 4:

The best translation of the sentence into predicate logic is 'If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan.' is $Nd \supset (Bj \vee Sl)$. In this sentence, the 'if' indicates a conditional statement (represented by \supset), and 'or' indicates a disjunction (represented by \vee). So the correct answer is D. ' $Nd \supset (Bj \vee Sl)$ '

=====

Answer Option 5:

The best translation into predicate logic for the given statement is ' $Nd \supset (Bj \vee Sl)$ '. Here, 'Nd' stands for 'Delilah is in New York City', 'Bj' for 'Juana is in Bogota', and 'Sl' for 'Layla is in San Juan'. The symbol ' \supset ' represents 'if...then...', and ' \vee ' represents 'or'. Therefore, option D ' $Nd \supset (Bj \vee Sl)$ ' is correct.

=====

Answer Option 6:

The best translation into predicate logic for the statement 'If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan' would be ' $Nd \supset (Bj \vee Sl)$ '.

The symbol ' \supset ' stands for 'if... then' and ' \vee ' stands for 'or'. 'Nd' represents 'Delilah is in New York City', 'Bj' represents 'Juana is in Bogota', and 'Sl' represents 'Layla is in San Juan'.

Final Answer: D

=====

Answer Option 7:

The original statement is an implication, so it's in the form "if p, then q". Here, "Delilah is in New York City" is p, and "Juana is in Bogota or Layla is in San Juan" is q. So, the correct translation into predicate logic is ' $Nd \supset (Bj \vee Sl)$ '. Final Answer: D

=====

Answer Option 8:

The best translation of the given sentence into predicate logic is ' $Nd \supset (Bj \vee Sl)$ '. Here, Nd stands for 'Delilah is in New York City', Bj stands for 'Juana is in Bogota', and Sl stands for 'Layla is in San Juan'. The symbol ' \supset ' stands for 'if... then...', and ' \vee ' stands for 'or'. So, ' $Nd \supset (Bj \vee Sl)$ ' translates to 'If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan.'

Final Answer: D. ' $Nd \supset (Bj \vee Sl)$ '.

=====

Answer Option 9:

The correct translation for the given statement is D. ' $Nd \supset (Bj \vee Sl)$ '. The statement 'If Delilah is in New York City, then Juana is in Bogota or Layla is in San Juan.' is a conditional statement that can be symbolized as $P \supset Q$, where P is 'Delilah is in New York City' and Q is 'Juana is in Bogota or Layla is in San Juan.' Thus, the correct symbolization is ' $Nd \supset (Bj \vee Sl)$ ', where 'Nd' stands for 'Delilah is in New York City', 'Bj' stands for 'Juana is in Bogota,' and 'Sl' stands for 'Layla is in San Juan.' The disjunction operator (\vee) is used to represent the 'or' in the second part of the statement, and the implication operator (\supset) is used to represent the 'if...then...' structure of the statement.

=====

Question 48:

' Use the following key to translate the given formula of PL to natural, English sentences.

A: Marina reads a Percy Jackson book.

B: Izzy plays Minecraft.

C: Emily stops working.

D: Russell makes dinner.

E: Ashleigh stops by.

$\neg(A \supset B) \bullet (B \supset \neg E)$, A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.', B. 'If Marina doesn't read a Percy Jackson book, then Izzy plays Minecraft, which entails that Ashleigh doesn't stop by.', C. 'Marina's reading a Percy Jackson book does not entail that Izzy plays Minecraft, but Izzy plays Minecraft provided that Ashleigh doesn't stop by.', D. 'It's not true that Marina reads a Percy Jackson book only when Izzy plays Minecraft, but Izzy plays Minecraft only when Ashleigh stops by.'

=====

Answer Option 1:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 2:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 3:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 4:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 5:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 6:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 7:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 8:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Answer Option 9:

A. 'It's not the case that Marina's reading a Percy Jackson book entails that Izzy plays Minecraft, but Izzy's playing Minecraft does entail that Ashleigh doesn't stop by.'

Question 49:

'Use indirect truth tables to determine whether the following argument is valid. If the argument is invalid, choose an option which presents a counterexample. (There may be other counterexamples as well.)

$(A \vee B) \supset C$

$C \supset \neg D / D \supset A$, A. 'Valid', B. 'Invalid. Counterexample when B, C, and D are true and A is false', C. 'Invalid. Counterexample when B and D are true and A and C are false', D. 'Invalid. Counterexample when A, B, and C are false and D is true'

=====

Answer Option 1:

Option B: 'Invalid. Counterexample when B, C, and D are true and A is false'.

If A is false, B is true, C is true, and D is true, then $(A \vee B)$ becomes true and $(A \vee B) \supset C$ also becomes true, $C \supset \neg D$ becomes false because C is true and $\neg D$ is false. As a result, the entire argument is false, providing a counterexample.

Answer Option 2:

'Invalid. Counterexample when B and D are true and A and C are false'. This is a counterexample to the argument because if B and D are true and A and C are false, then the first premise $(A \vee B) \supset C$ is true as B is true, however the second premise $C \supset \neg D$ is false as C is false and D is true. The conclusion $D \supset A$ is also false as D is true and A is false. Therefore, the argument is invalid. Final Answer: C

Answer Option 3:

The argument is invalid with a possible counterexample when A is false, B and D are true, and C is false. In this case, $(A \vee B) \supset C$ would be true because B is true, making $A \vee B$ true, but C is false. However, $C \supset \neg D$ would be false because C is false, but $\neg D$ is also false, as D is true. And $D \supset A$ would be false because D is true but A is false. Therefore, the argument is invalid.

Final Answer: C. 'Invalid. Counterexample when B and D are true and A and C are false'

Answer Option 4:

We use indirect truth tables to prove that an argument is invalid. Let's create a truth table for this argument.

We start by assuming that all the premises and the negation of the conclusion are true.

$A \ B \ C \ D \mid (A \vee B) \supset C \mid C \supset \neg D \mid \neg(D \supset A)$

F T T T T T F F

Only one line of the truth table is needed, which shows all premises and the negation of the conclusion as true. This means that the argument is invalid.

The counterexample is when B, C, and D are true and A is false. So, the final answer is B. 'Invalid. Counterexample when B, C, and D are true and A is false'.

Answer Option 5:

The argument is invalid. We can see this by creating a counterexample. Suppose B and D are true and A and C are false. Then, the premise $(A \vee B) \supset C$ is false because $A \vee B$ is true (since B is true) but C is false. The premise $C \supset \neg D$ is true because C is false. The conclusion $D \supset A$ is false because D is true but A is false. Therefore, we have a situation where the premises are not all true and the conclusion is not true, which makes the argument invalid. So, the correct answer is C. 'Invalid. Counterexample when B and D are true and A and C are false'.

Answer Option 6:

Let's use an indirect truth table to determine the validity of the argument:

$(A \vee B) \supset C$

$C \supset \neg D / D \supset A$

Indirect truth tables are used to test the validity of an argument by assuming that the conclusion is false and checking if this leads to a contradiction.

Assume $D \supset A$ is false, which implies D is true and A is false (since the only way for a conditional to be false is if the antecedent is true and the consequent is false).

Now, from the second premise $(C \supset \neg D)$, since D is true, C must be false (as C being true would result in a false $\neg D$).

For $(A \vee B) \supset C$, since C is false, $A \vee B$ must be false. But since A is already false, B must also be false.

This does not result in a contradiction, hence the argument is invalid. So, the correct answer is:

D. 'Invalid. Counterexample when A, B, and C are false and D is true'

Answer Option 7:

Let's analyze it by using indirect truth tables.

$(A \vee B) \supset C$

$C \supset \neg D$

Conclusion: $D \supset A$

We want to find out if it's possible for the premises to be true and the conclusion false.

Let's assume A is false and D is true (which would make the conclusion false). For the second premise to be true with D =true, C must be false. But for the first premise to be true with C =false, $(A \vee B)$ must also be false. Since A is already false, that means B must be false.

So, we have found a counterexample where the premises are true and the conclusion is false: A, B, C are false, and D is true.

Therefore, the argument is invalid.

Final Answer: D. 'Invalid. Counterexample when A, B, and C are false and D is true'

Answer Option 8:

A counterexample is a special kind of example that disproves a statement or proposition. Counterexamples are often used in mathematical proofs and philosophical arguments to demonstrate that a proposition is not true in all circumstances.

Considering the given statements and options:

$(A \vee B) \supset C$

$C \supset \neg D$

$D \supset A$

We can see that a counterexample exists when A is false, B is true, C is true, and D is true. In this case, the first premise $(A \vee B) \supset C$ is true because B is true, so $(A \vee B)$ is true, making the whole implication true. The second premise $C \supset \neg D$ is false because C is true but D is also true, so $\neg D$ is false. The conclusion $D \supset A$ is false because D is true and A is false.

So, the correct option is B. 'Invalid. Counterexample when B, C, and D are true and A is false'

Answer Option 9:

An argument is valid if and only if there's no possible situation in which the premises are true and the conclusion is false. In this case, the premises are $(A \vee B) \supset C$ and $C \supset \neg D$, and the conclusion is $D \supset A$.

The first step is to assume that the conclusion, $D \supset A$, is false. This happens only when D is true and A is false. We now have D as true and A as false.

Now, we check the premises. The second premise, $C \supset \neg D$, would be false if C is true and D is false. But we already have D as true, so C must be false to keep premise true.

Lastly, the first premise, $(A \vee B) \supset C$, is false only when $A \vee B$ is true and C is false. We already know C is false, so for this premise to be true, both A and B need to be false. However, we've already established that A is false, so B also needs to be false.

So, we have a counterexample when A, B, and C are false and D is true. Hence, the correct answer is D. 'Invalid. Counterexample when A, B, and C are false and D is true'.

Question 50:

' Select the best English interpretation of the given arguments in predicate logic.

$Dh \supset \neg Pt$

$(\forall x)Px \vee (\forall x)Mx$

$\neg Mb / \neg Dh$, A. 'If my headache is dualist state, then your tickle is a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.', B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.', C. 'If my headache is dualist state, then your tickle is not a physical state. If everything is physical then everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.', D. 'If my headache is dualist state, then your tickle is not a physical state. Everything is either physical or mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

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Answer Option 1:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 2:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 3:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 4:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 5:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 6:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 7:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 8:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'

Answer Option 9:

B. 'If my headache is dualist state, then your tickle is not a physical state. Either everything is physical or everything is mental. But my broken toe is not a mental state. So my headache is not a dualist state.'
