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Instructions: fill **completely** the bubbles with the digits of the SID (one for each column); in the lower part of the sheet, fill **completely** the bubbles with the correct answers to the corresponding question. Use a black or dark blue pen or pencil, trying to fill completely the inside of the bubble. Write only in the designated areas

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						N	Mark the answers of the	multiple-	choic	e qu	estio	ns			
(1)	A	$^{\odot}$	©	D	E	(F)	G	(8)	A	$^{\odot}$	©	D	E	F	G
(2)	A	$^{\odot}$	©	D	E	(F)	G	(9)	A	$^{\odot}$	©	D	E	F	G
(3)	\bigcirc	$^{\odot}$	©	D	E	F	G	(10)	\bigcirc	$^{\odot}$	©	D	E	F	G
(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	G
(5)	A	$^{\odot}$	©	D	E	F	G	(12)	\bigcirc	$^{\odot}$	©	D	E	F	G
(6)	A	$^{\odot}$	©	D	E	F	G	(13)	\bigcirc	$^{\odot}$	©	D	E	F	G
(7)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	(14)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)

(1) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X is false, we can conclude that
\Box (a) Y is false and Z is false.
\Box (b) Z implies X.
(c) Y is false.
\bigcirc (d) Y is false, Z is false and Z implies X.
(e) Z is false.
(f) No conclusion can be drawn.
\square (g) Y is false and Z implies X.
(2) Let <i>X</i> and <i>Y</i> be statements. If we want to DISPROVE the claim that "At least one of <i>X</i> and <i>Y</i> are true", we need to show that
\Box (a) X does not imply Y, and Y does not imply X.
\bigcirc (b) X is false.
\bigcirc (c) Exactly one of X and Y are false.
\bigcirc (d) X is true if and only if Y is false.
\bigcirc (e) X and Y are both false.
\bigcirc (f) At least one of X and Y are false.
\square (g) Y is false.
(3) Let X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
(a) X is true, but Y is false.
\bigcirc (b) Y is false.
\bigcirc (c) X is false.
\bigcirc (d) Exactly one of X and Y are false.
\bigcirc (e) At least one of X and Y is false.
\bigcap (f) X and Y are both false.
\square (g) Y is true, but X is false.

(4) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we need to prove that
\Box (a) There exists an integer m such that $P(n, m)$ is false for all integers n .
\square (b) For every integer m, there exists an integer n such that $P(n, m)$ is false.
\Box (c) There exists an integer n such that $P(n, m)$ is false for all integers m .
\Box (d) There exists integers n,m such that $P(n,m)$ is false.
\square (e) For every integer n , and every integer m , the property $P(n, m)$ is false.
\square (g) For every integer n , there exists an integer m such that $P(n, m)$ is false.
(5) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for all x of type X ", then we have to
\Box (a) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
\Box (b) Show that for every x in X , $P(x)$ is false.
\square (c) Show that there exists an x of type X for which $P(x)$ is false.
\Box (d) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\square (e) Show that there are no objects x of type X .
\Box (f) Show that for every x in X, there is a y not equal to x for which $P(y)$ is true.
\square (g) Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
(6) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
\Box (a) Exactly one of X and Y are false.
\Box (b) X is true if and only if Y is false.
\Box (c) X is false.
\Box (d) Y is false.
\square (e) X does not imply Y, and Y does not imply X.
\Box (f) At least one of X and Y are false.
(g) X and Y are both false.

(7) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
 (a) Show that for every x in X, there is a y not equal to x for which P(y) is true. (b) Assume that P(x) is true for every x in X, and derive a contradiction. (c) Show that there exists an x of type X for which P(x) is false. (d) Show that there are no objects x of type X. (e) Show that there exists an x which is not of type X, but for which P(x) is still true. (f) Show that for every x in X, P(x) is false. (g) Show that P(x) being true does not necessarily imply that x is of type X.
(8) Let $P(n,m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we should do the following:
 (a) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that P(n, m) is true. (b) Let n and m be arbitrary integers. Then show that P(n, m) is true. (c) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that P(n, m) is true. (d) Show that whenever P(n, m) is true, then n and m are integers. (e) Find an integer m such that P(n, m) is true for every integer n. (f) Find an integer n such that P(n, m) is true for every integer m. (g) Find an integer n and an integer m such that P(n, m) is true.
(9) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that
 (a) None of the above conclusions can be drawn. (b) Z is false. (c) Z is false and X implies Z. Correct Answer. X is false and X implies Z. (d) X is false. (e) X implies Z. (f) X is false and Z is false and X implies Z.

(10) Let $P(n, m)$ be a property about two integers n and an integer n such that $P(n, m)$ is true for all integers m ,	$\it m.$ If we want to DISPROVE the claim that "There exists then we need to prove that
\Box (a) There exists integers n,m such that $P(n,m)$ is fa	lse.
\bigcirc (b) There exists an integer n such that $P(n,m)$ is fall	se for all integers m .
\bigcirc (c) For every integer m , there exists an integer n such	ch that $P(n,m)$ is false.
\bigcirc (d) If $P(n,m)$ is true, then n and m are not integers.	
\bigcirc (e) For every integer n , there exists an integer m such	ch that $P(n,m)$ is false.
\bigcirc (f) For every integer n , and every integer m , the pro-	perty $P(n, m)$ is false.
\bigcirc (g) There exists an integer m such that $P(n, m)$ is fa	lse for all integers n .
(11) Suppose one wishes to prove that "if all X are Y , the	en all Z are W . To do this, it would suffice to show that
(c) All X are Z, and all W are Y.	
(d) All Y are Z, and all W are X.	
(e) All Z are X, and all Y are W.	
\bigcirc (g) All Z are Y, and all X are W.	
(49) I - 4 V 1 V	. V then me and the second of the t
(12) Let <i>X</i> and <i>Y</i> be statements. If we know that <i>X</i> impli	
\bigcirc (a) At least one of X and Y is true.	\bigcirc (e) If Y is false, then X is false.
(b) X cannot be false.	\bigcap (f) X is true, and Y is also true.
\bigcirc (c) If Y is true, then X is true.	\square (g) If X is false, then Y is false.
(d) Y cannot be false.	

(13) that		sose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show
	(a) Se	ome Z are X , and some Y are W .
	(b) A	All Z are X , and all W are Y .
	(c) A	Il X are Z , and some Y are W .
	(d) Se	ome Z are X , and all Y are W .
	(e) A	A = X = X, and all Y are W.
	(f) Sc	ome X are Z , and all Y are W .
	(g) A	All X are Z , and all Y are W .
(14)	Let X	X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
	(a) A	Assume that X is true, and Y is false, and deduce a contradiction.
	(b) S	how that either X is false, or Y is true, or both.
	(c) Sł	how that <i>X</i> implies some intermediate statement <i>Z</i> , and then show that $Z \implies Y$.
		how that X implies some intermediate statement Z , and then show that $Z \Longrightarrow Y$. how that some intermediate statement $Z \Longrightarrow Y$, and then show that $X \Longrightarrow Z$.
	(d) Sl	
	(d) Sl (e) A	how that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.



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(6)	A	$^{\odot}$	©	D	E	F	G	(13)	\bigcirc	$^{\odot}$	©	D	E	F	G
(7)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	(14)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)

(1) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y false, we can conclude that
\square (a) X is false and Z is false and X implies Z.
\bigcirc (b) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
(c) Z is false.
\Box (d) X implies Z.
(e) None of the above conclusions can be drawn.
\bigcap (f) X is false.
(2) Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
\Box (a) All Y are Z, and all W are X.
\bigcirc (b) All X are Z, and all W are Y.
\bigcirc (c) All Y are X, and all Z are W.
\bigcirc (d) All Z are Y, and all X are W.
\bigcirc (e) All X are Z, and all Y are W.
\bigcirc (f) All Z are X, and all Y are W.
\bigcirc (g) All Z are X, and all W are Y.
(3) Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to sho that
\bigcirc (a) Some Z are X, and some Y are W.
\bigcirc (b) All X are Z, and all Y are W.
\bigcirc (c) All Z are X, and all W are Y.
\bigcirc (d) All Z are X, and all Y are W.
\bigcirc (e) Some X are Z, and all Y are W.
\bigcap (f) All X are Z, and some Y are W.
\bigcirc (g) Some Z are X, and all Y are W.

(4) Let X	X and Y be statements. If we want to DISPROVE the claim that "X \implies Y", we need to show that
(a) 2	X is false.
(b) A	At least one of X and Y is false.
(c) X	X and Y are both false.
(d) Y	Y is false.
(e) Z	X is true, but Y is false.
(f) E	Exactly one of X and Y are false.
(g) Y	Y is true, but X is false.
(5) Let <i>X</i>	X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
(a) S	Show that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.
(b) A	Assume that X is true, and Y is false, and deduce a contradiction.
(c) S	Show that either X is false, or Y is true, or both.
(d) A	Assume that Y is false, and then use this to show that X is false.
(e) A	Assume that X is false, and Y is true, and deduce a contradiction.
(f) A	Assume that X is true, and then use this to show that Y is true.
(g) S	Show that X implies some intermediate statement Z , and then show that $Z \implies Y$.
	(x) be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for type X ", then we have to
(a) S	Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
(b) S	Show that $P(x)$ being true does not necessarily imply that x is of type X .
(c) S	Show that there exists an x of type X for which $P(x)$ is false.
(d) S	Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
(e) A	Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
☐ (f) S	show that for every x in X , $P(x)$ is false.
(g) S	Show that there are no objects x of type X .

(7) Let X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need to show that
(a) X and Y are both false.
\bigcirc (b) X is true if and only if Y is false.
(c) Exactly one of X and Y are false.
\bigcirc (d) X does not imply Y, and Y does not imply X.
(e) X is false.
(f) Y is false.
\bigcirc (g) At least one of X and Y are false.
(8) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X is false, we can conclude that
\square (a) Y is false, Z is false and Z implies X.
\bigcirc (b) Y is false and Z implies X.
\bigcirc (c) Z is false.
\Box (d) Z implies X.
(e) No conclusion can be drawn.
\bigcirc (f) Y is false and Z is false.
(g) Y is false.
(9) Let $P(n,m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we should do the following:
\square (a) Show that whenever $P(n, m)$ is true, then n and m are integers.
\bigcirc (b) Find an integer n and an integer m such that $P(n,m)$ is true.
\square (c) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n, m)$ is true.
\bigcirc (d) Find an integer m such that $P(n, m)$ is true for every integer n .
\square (e) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
\square (f) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n, m)$ is true.
\square (g) Find an integer n such that $P(n, m)$ is true for every integer m .

(10) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\square (a) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
\Box (b) Show that there exists an x of type X for which $P(x)$ is false.
\Box (c) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\Box (d) Show that for every x in X, $P(x)$ is false.
\square (e) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
\Box (f) Show that there are no objects x of type X.
\square (g) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
(11) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n, m)$ is true", then we need to prove that
\square (a) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\Box (b) There exists integers n,m such that $P(n,m)$ is false.
\square (c) If $P(n, m)$ is true, then n and m are not integers.
\square (d) There exists an integer n such that $P(n, m)$ is false for all integers m.
\square (e) There exists an integer m such that $P(n, m)$ is false for all integers n .
\square (f) For every integer m, there exists an integer n such that $P(n,m)$ is false.
\square (g) For every integer n , and every integer m , the property $P(n, m)$ is false.
(12) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
\square (a) Exactly one of X and Y are false.
(b) Y is false.
\Box (c) X is true if and only if Y is false.
\Box (d) X and Y are both false.
\square (e) X does not imply Y, and Y does not imply X.
\bigcap (f) X is false.
\square (g) At least one of X and Y are false.

(13) Let X and Y be statements. If we know that X implies Y, then we can also conclude that

(e) Y cannot be false.
\Box (f) At least one of X and Y is true.
\square (g) If X is false, then Y is false.
$\frac{1}{2}m$. If we want to DISPROVE the claim that "There exists, then we need to prove that
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						N	Mark the answers of the	multiple-	choic	e qu	estio	ns				
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(2)	\bigcirc	$^{\odot}$	©	D	E	F	G	(9)	\widehat{A}	$^{\odot}$	©	D	E	F	©	
(3)	A	$^{\odot}$	©	D	E	F	G	(10)	A	$^{\odot}$	©	D	E	F	G	
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(6)	A	$^{\odot}$	©	D	E	F	G	(13)	A	B	©	D	E	F	G	
(7)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	(14)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	

(1) Let X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
(a) Assume that <i>Y</i> is false, and then use this to show that <i>X</i> is false.
\bigcirc (b) Assume that X is false, and Y is true, and deduce a contradiction.
\bigcirc (c) Show that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.
\bigcirc (d) Assume that X is true, and Y is false, and deduce a contradiction.
\square (e) Show that X implies some intermediate statement Z, and then show that $Z \implies Y$.
\bigcirc (f) Assume that X is true, and then use this to show that Y is true.
\bigcirc (g) Show that either X is false, or Y is true, or both.
(2) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that
(a) None of the above conclusions can be drawn.
\bigcirc (b) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
(c) X is false.
\bigcirc (d) Z is false.
\bigcirc (e) X is false and Z is false and X implies Z .
\bigcap (f) X implies Z.
(3) Let $P(n,m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we should do the following:
\square (a) Find an integer m such that $P(n,m)$ is true for every integer n.
\bigcirc (b) Find an integer n such that $P(n, m)$ is true for every integer m.
\square (c) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n,m)$ is true.
\bigcirc (d) Find an integer n and an integer m such that $P(n,m)$ is true.
\square (e) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
\bigcap (f) Show that whenever $P(n,m)$ is true, then n and m are integers.
\square (g) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n, m)$ is true.

(4) Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
\Box (a) All Z are X, and all W are Y.
\Box (b) All Z are X, and all Y are W.
\Box (c) All X are Z, and all Y are W.
\Box (d) All X are Z, and all W are Y.
\square (e) All Z are Y, and all X are W.
\Box (f) All Y are X, and all Z are W.
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(5) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\Box (a) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\Box (b) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
\square (c) Show that there exists an x of type X for which $P(x)$ is false.
\Box (d) Show that for every x in X , $P(x)$ is false.
\square (e) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
\Box (f) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\square (g) Show that there are no objects x of type X .
(6) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Z implies X . If we also know that Y is false, we can conclude that
(a) Z implies Y.
\Box (b) X is false.
\Box (c) X is false and Z implies Y.
\Box (d) Z is false.
\square (e) X is false, Z is false, and Z implies Y .
\Box (f) Z is false and Z implies Y.
(g) None of the above conclusions can be drawn.

	P(x) be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for type X ", then we have to
(a)	Show that there are no objects x of type X .
(b)	Show that there exists an x of type X for which $P(x)$ is false.
(c) S	Show that $P(x)$ being true does not necessarily imply that x is of type X .
(d)	Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
(e) S	Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
(f) s	Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
(g)	Show that for every x in X , $P(x)$ is false.
(8) Let X	X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
(a)	At least one of X and Y is false.
(b)	Exactly one of X and Y are false.
(c)	X is true, but Y is false.
(d)	X is false.
(e) .	X and Y are both false.
\Box (f)	Y is false.
(g)	Y is true, but X is false.
(9) Let λ to show the	X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need that
(a)	Y is false.
(b)	X is true if and only if Y is false.
(c) 1	Exactly one of X and Y are false.
(d)	X does not imply Y , and Y does not imply X .
(e) 2	X is false.
(f) I	At least one of X and Y are false.
(g)	X and Y are both false.

(10) Let $P(n, m)$ be a property about two integers n an integer n , there exists an integer m such that $P(n, m)$ is t	d m . If we want to DISPROVE the claim that "For every true", then we need to prove that
(a) There exists an integer m such that $P(n, m)$ is far (b) For every integer n , and every integer m , the product (c) For every integer n , there exists an integer m such (d) There exists an integer n such that $P(n, m)$ is far (e) There exists integers n, m such that $P(n, m)$ is far (f) If $P(n, m)$ is true, then n and m are not integers. (g) For every integer m , there exists an integer n such	operty $P(n,m)$ is false. ch that $P(n,m)$ is false. lse for all integers m .
(11) Let X and Y be statements. If we want to DISPROVI that	E the claim that "Both X and Y are true", we need to show
 (a) X is true if and only if Y is false. (b) X does not imply Y, and Y does not imply X. (c) At least one of X and Y are false. (d) Exactly one of X and Y are false. (e) X and Y are both false. (f) Y is false. (g) X is false. 	
 (12) Let X and Y be statements. If we know that X implied (a) If Y is false, then X is false. (b) If X is false, then Y is false. (c) X is true, and Y is also true. (d) If Y is true, then X is true. 	ies Y, then we can also conclude that (e) At least one of X and Y is true. (f) X cannot be false. (g) Y cannot be false.

	Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exists a teger n such that $P(n, m)$ is true for all integers m ", then we need to prove that
	(a) There exists an integer m such that $P(n, m)$ is false for all integers n .
	(b) There exists integers n,m such that $P(n,m)$ is false.
	(c) For every integer n , there exists an integer m such that $P(n, m)$ is false.
	(d) There exists an integer n such that $P(n, m)$ is false for all integers m .
	(e) For every integer n , and every integer m , the property $P(n, m)$ is false.
	(f) If $P(n, m)$ is true, then n and m are not integers.
	(g) For every integer m , there exists an integer n such that $P(n, m)$ is false.
(14) that	Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show
	(a) Some Z are X , and some Y are W .
	(b) Some Z are X , and all Y are W .
	(c) All Z are X , and all W are Y .
	(d) All Z are X , and all Y are W .
	(e) All X are Z , and all Y are W .
	(f) Some X are Z , and all Y are W .
	(g) All X are Z , and some Y are W .



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Instructions: fill **completely** the bubbles with the digits of the SID (one for each column); in the lower part of the sheet, fill **completely** the bubbles with the correct answers to the corresponding question. Use a black or dark blue pen or pencil, trying to fill completely the inside of the bubble. Write only in the designated areas.

Last Name:				me:First name:				• • • •	Signature:							
	Mark the answers of the multiple-choice questions															
(1)	A	$^{\odot}$	©	D	E	(F)	G	(8)	A	$^{\odot}$	©	D	E	F	G	
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(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	©	
(5)	A	$^{\odot}$	©	D	E	F	G	(12)	\bigcirc	$^{\odot}$	©	D	E	F	©	
(6)	\bigcirc	$^{\odot}$	©	D	E	(F)	G	(13)	\bigcirc	$^{\odot}$	©	D	E	F	©	
(7)		(B)		\bigcirc	(F)	(E)		(14)		®			(F)	(F)		

(1) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we need to prove that
\square (a) There exists an integer n such that $P(n, m)$ is false for all integers m .
\Box (b) There exists an integer m such that $P(n,m)$ is false for all integers n .
\bigcirc (c) There exists integers n,m such that $P(n,m)$ is false.
\square (d) For every integer n , and every integer m , the property $P(n, m)$ is false.
\square (e) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\Box (f) For every integer m, there exists an integer n such that $P(n,m)$ is false.
\square (g) If $P(n, m)$ is true, then n and m are not integers.
(2) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that
\square (a) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
\bigcirc (b) X is false.
(c) None of the above conclusions can be drawn.
\Box (d) X implies Z.
\square (e) Z is false.
\bigcap (f) X is false and Z is false and X implies Z.
(3) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for all x of type X ", then we have to
\Box (a) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\square (b) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\square (c) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
\Box (d) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
\square (e) Show that for every x in X , $P(x)$ is false.
\bigcap (f) Show that there are no objects x of type X.
\square (g) Show that there exists an x of type X for which $P(x)$ is false.

(4) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X is false, we can conclude that
(a) Z is false.
\bigcirc (b) Y is false, Z is false and Z implies X.
(c) Y is false.
\Box (d) Z implies X.
\square (e) Y is false and Z is false.
\bigcap (f) Y is false and Z implies X.
(g) No conclusion can be drawn.
(5) Let <i>X</i> and <i>Y</i> be statements. If we want to DISPROVE the claim that "Both <i>X</i> and <i>Y</i> are true", we need to show that
\Box (a) X is true if and only if Y is false.
\bigcirc (b) X and Y are both false.
\bigcirc (c) X is false.
\bigcirc (d) Exactly one of X and Y are false.
\bigcirc (e) X does not imply Y , and Y does not imply X .
(f) Y is false.
\square (g) At least one of X and Y are false.
(6) Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show that
\Box (a) Some Z are X, and all Y are W.
\bigcirc (b) All Z are X, and all Y are W.
\bigcirc (c) Some Z are X, and some Y are W.
\bigcirc (d) All Z are X, and all W are Y.
\bigcirc (e) All X are Z, and some Y are W.
\Box (f) All X are Z, and all Y are W.
\square (g) Some X are Z , and all Y are W .

(7) Let X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
\square (a) Show that some intermediate statement $Z \Longrightarrow Y$, and then show that $X \Longrightarrow Z$.
\bigcirc (b) Assume that X is true, and Y is false, and deduce a contradiction.
\square (c) Show that X implies some intermediate statement Z, and then show that $Z \implies Y$.
\bigcirc (d) Show that either X is false, or Y is true, or both.
\bigcirc (e) Assume that Y is false, and then use this to show that X is false.
\bigcirc (f) Assume that X is false, and Y is true, and deduce a contradiction.
\bigcirc (g) Assume that X is true, and then use this to show that Y is true.
(8) Let $P(n,m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we should do the following:
\square (a) Let n and m be arbitrary integers. Then show that $P(n, m)$ is true.
\square (b) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n,m)$ is true.
\bigcirc (c) Find an integer n and an integer m such that $P(n,m)$ is true.
\square (d) Show that whenever $P(n, m)$ is true, then n and m are integers.
\square (e) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n, m)$ is true.
\square (g) Find an integer n such that $P(n, m)$ is true for every integer m .
(9) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exists are integer n such that $P(n, m)$ is true for all integers m ", then we need to prove that
\square (a) There exists integers n,m such that $P(n,m)$ is false.
\bigcirc (b) For every integer n , and every integer m , the property $P(n,m)$ is false.
\bigcirc (c) There exists an integer m such that $P(n, m)$ is false for all integers n .
\bigcirc (d) For every integer m , there exists an integer n such that $P(n, m)$ is false.
\square (e) There exists an integer n such that $P(n,m)$ is false for all integers m .
\bigcap (f) If $P(n,m)$ is true, then n and m are not integers.
\square (g) For every integer n , there exists an integer m such that $P(n, m)$ is false.

(10) Let X and Y be statements. If we want to DISPROV to show that	E the claim that "At least one of X and Y are true", we need
\Box (a) X is true if and only if Y is false.	
\bigcirc (b) Y is false.	
\bigcirc (c) X is false.	
\bigcirc (d) Exactly one of X and Y are false.	
\bigcirc (e) X and Y are both false.	
\bigcap (f) X does not imply Y, and Y does not imply X.	
\square (g) At least one of X and Y are false.	
(11) Let X and Y be statements. If we want to DISPROV	VE the claim that " $X \implies Y$ ", we need to show that
\bigcirc (a) Exactly one of X and Y are false.	
\bigcirc (b) At least one of X and Y is false.	
\bigcirc (c) X is true, but Y is false.	
\bigcirc (d) X and Y are both false.	
\bigcirc (e) Y is true, but X is false.	
\bigcap (f) X is false.	
\bigcirc (g) Y is false.	
(12) Let $P(x)$ be a property about some object x of type for some x of type X , then we have to	e X . If we want to DISPROVE the claim that " $P(x)$ is true
\Box (a) Show that for every x in X, $P(x)$ is false.	
\bigcirc (b) Show that for every x in X , there is a y not equ	al to x for which $P(y)$ is true.
\bigcirc (c) Show that there are no objects x of type X .	
\Box (d) Show that $P(x)$ being true does not necessarily	imply that x is of type X .
\bigcirc (e) Show that there exists an x which is not of type	e X, but for which $P(x)$ is still true.
\bigcirc (f) Show that there exists an x of type X for which	P(x) is false.
\square (g) Assume that $P(x)$ is true for every x in X , and	derive a contradiction.
(13) Let X and Y be statements. If we know that X imp	lies Y , then we can also conclude that
(a) If <i>X</i> is false, then <i>Y</i> is false.	\bigcirc (c) If Y is false, then X is false.
(b) Y cannot be false.	\Box (d) At least one of X and Y is true.

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	(e) X cannot be false.(f) If Y is true, then X is true.	(g)	${\cal X}$ is true, and ${\cal Y}$ is also true.
(14)	Suppose one wishes to prove that "if all X are Y , the	n all Z are V	W". To do this, it would suffice to show that
	(a) All Z are X , and all Y are W .		
	(b) All Y are X , and all Z are W .		
	(c) All X are Z , and all W are Y .		
	(d) All Z are Y , and all X are W .		
	(e) All Z are X , and all W are Y .		
	(f) All Y are Z , and all W are X .		
	(g) All X are Z , and all Y are W .		



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Last Name:						lame:Signature:Signature:									
	Mark the answers of the multiple-choice questions														
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(2)	A	$^{\odot}$	©	D	E	(F)	G	(9)	A	$^{\odot}$	©	D	E	F	G
(3)	\bigcirc	$^{\odot}$	©	D	E	F	G	(10)	\bigcirc	$^{\odot}$	©	D	E	F	G
(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	G
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(6)	A	$^{\odot}$	©	D	E	F	G	(13)	\bigcirc	$^{\odot}$	©	D	E	F	G
(7)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	(14)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)

. If we want to DISPROVE the claim that " $P(x)$ is true for			
If to x for which $P(y)$ is true. Imply that x is of type X .			
P(x) is false. erive a contradiction.			
X, but for which $P(x)$ is still true.			
s Y , then we can also conclude that			
 (e) If Y is false, then X is false. (f) X is true, and Y is also true. (g) At least one of X and Y is true. 			
(g) At least one of X and Y is true.			
implies Y , and that Y implies Z . If we also know that Y is			
 (c) None of the above conclusions can be drawn. (d) Z is false and X implies Z. Correct Answer. X is false and X implies Z. 			
(e) X implies Z.			

	P(n, m) be a property about two integers n and m . If we want to DISPROVE the claim that "For every n , there exists an integer m such that $P(n, m)$ is true", then we need to prove that
(a)	For every integer n , there exists an integer m such that $P(n, m)$ is false.
(b)	If $P(n, m)$ is true, then n and m are not integers.
(c)	There exists integers n,m such that $P(n,m)$ is false.
(d)	For every integer m , there exists an integer n such that $P(n, m)$ is false.
(e)	For every integer n , and every integer m , the property $P(n,m)$ is false.
(f)	There exists an integer m such that $P(n, m)$ is false for all integers n .
(g)	There exists an integer n such that $P(n, m)$ is false for all integers m .
(5) Sup	pose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
(a)	All Z are X , and all Y are W .
(b)	All Y are Z , and all W are X .
(c)	All Z are X , and all W are Y .
(d)	All X are Z , and all W are Y .
(e)	All Z are Y , and all X are W .
(f)	All Y are X , and all Z are W .
(g)	All X are Z , and all Y are W .
	P(x) be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for type X ", then we have to
(a)	Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
(b)	Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
(c)	Show that there are no objects x of type X .
(d)	Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
(e)	Show that there exists an x of type X for which $P(x)$ is false.
(f)	Show that $P(x)$ being true does not necessarily imply that x is of type X .
(g)	Show that for every x in X , $P(x)$ is false.

(7) Let X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
\square (a) Show that X implies some intermediate statement Z, and then show that $Z \implies Y$.
(b) Assume that Y is false, and then use this to show that X is false.
\bigcirc (c) Assume that X is true, and then use this to show that Y is true.
\bigcirc (d) Assume that X is false, and Y is true, and deduce a contradiction.
\square (e) Show that either X is false, or Y is true, or both.
\square (f) Assume that X is true, and Y is false, and deduce a contradiction.
\square (g) Show that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.
/·>
(8) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
(a) Y is false.
\bigcirc (b) X is true if and only if Y is false.
\bigcirc (c) X and Y are both false.
\Box (d) X is false.
\square (e) X does not imply Y, and Y does not imply X.
\Box (f) At least one of X and Y are false.
(g) Exactly one of <i>X</i> and <i>Y</i> are false.
(9) Let X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need to show that
\Box (a) X is false.
(b) X and Y are both false.
\Box (c) Y is false.
\Box (d) At least one of X and Y are false.
(e) Exactly one of X and Y are false.
(f) X is true if and only if Y is false.
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(10) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X is false, we can conclude that
\Box (a) Y is false and Z implies X.
\Box (b) Z is false.
\bigcirc (c) Y is false, Z is false and Z implies X.
\Box (d) Y is false.
\square (e) Y is false and Z is false.
\Box (f) Z implies X.
(g) No conclusion can be drawn.
(11) Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show that
\square (a) All X are Z, and some Y are W.
\Box (b) All Z are X, and all W are Y.
\bigcirc (c) Some Z are X, and all Y are W.
\Box (d) All X are Z, and all Y are W.
\bigcirc (e) Some Z are X, and some Y are W.
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\square (g) Some X are Z, and all Y are W.
(12) Let $P(n, m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n, m)$ is true", then we should do the following:
\square (a) Show that whenever $P(n,m)$ is true, then n and m are integers.
\square (b) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n, m)$ is true.
\square (c) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
\square (e) Find an integer n such that $P(n, m)$ is true for every integer m .
(f) Find an integer n and an integer m such that $P(n, m)$ is true.
\square (g) Find an integer m such that $P(n, m)$ is true for every integer n.

(13) Let X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
(a) Y is false.
\bigcirc (b) X and Y are both false.
\bigcirc (c) X is true, but Y is false.
\bigcirc (d) Y is true, but X is false.
\bigcirc (e) X is false.
\bigcirc (f) Exactly one of X and Y are false.
\bigcirc (g) At least one of X and Y is false.
(14) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exist an integer n such that $P(n, m)$ is true for all integers m ", then we need to prove that
\square (a) There exists an integer n such that $P(n, m)$ is false for all integers m .
\square (b) For every integer n, there exists an integer m such that $P(n,m)$ is false.
\bigcirc (c) For every integer m , there exists an integer n such that $P(n,m)$ is false.
(d) There exists integers n,m such that $P(n,m)$ is false.
\bigcirc (e) For every integer n , and every integer m , the property $P(n, m)$ is false.
(f) There exists an integer m such that $P(n, m)$ is false for all integers n .
\bigcirc (g) If $P(n,m)$ is true, then n and m are not integers.



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(1) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\square (a) Show that for every x in X, there is a y not equal to x for which $P(y)$ is true.
\Box (b) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\bigcirc (c) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
\bigcirc (d) Show that for every x in X , $P(x)$ is false.
\bigcirc (e) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\bigcirc (f) Show that there are no objects x of type X .
\square (g) Show that there exists an x of type X for which $P(x)$ is false.
(2) Let X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
\Box (a) X is true, but Y is false.
\bigcirc (b) Exactly one of X and Y are false.
\bigcirc (c) X and Y are both false.
\bigcirc (d) Y is true, but X is false.
\bigcirc (e) At least one of X and Y is false.
\bigcap (f) X is false.
(g) Y is false.
(3) Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
\Box (a) All X are Z, and all Y are W.
\bigcirc (b) All Z are X, and all Y are W.
\bigcirc (c) All Z are X, and all W are Y.
\bigcirc (d) All X are Z, and all W are Y.
\bigcirc (e) All Y are X, and all Z are W.
\Box (f) All Z are Y, and all X are W.
\square (g) All Y are Z, and all W are X.

(4) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we need to prove that						
 (a) There exists an integer n such that P(n, m) is fall (b) For every integer m, there exists an integer n such that P(n, m) is fall (c) There exists an integer m such that P(n, m) is fall (d) There exists integers n,m such that P(n, m) is fall (e) For every integer n, and every integer m, the pro (f) If P(n, m) is true, then n and m are not integers. (g) For every integer n, there exists an integer m such that P(n, m) is fall 	The second content of					
(5) Let $P(n,m)$ be a property about two integers n and exists an integer m such that $P(n,m)$ is true", then we sh						
\Box (a) Find an integer n such that $P(n,m)$ is true for ex-	very integer <i>m</i> .					
\Box (b) Find an integer m such that $P(n, m)$ is true for e	very integer n .					
\bigcirc (c) Let n and m be arbitrary integers. Then show that	at $P(n,m)$ is true.					
\bigcirc (d) Let m be an arbitrary integer. Then find an integ	er n (possibly depending on m) such that $P(n, m)$ is true.					
$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	m are integers.					
\bigcap (f) Find an integer n and an integer m such that $P(n)$	(n,m) is true.					
$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	er m (possibly depending on n) such that $P(n, m)$ is true.					
(6) Let X and Y be statements. If we know that X implies	s Y , then we can also conclude that					
(a) X cannot be false.	\bigcirc (e) X is true, and Y is also true.					
\bigcirc (b) If X is false, then Y is false.	\bigcap (f) If Y is true, then X is true.					
\bigcirc (c) At least one of X and Y is true.	(g) Y cannot be false.					
\bigcirc (d) If Y is false, then X is false.						

(7) Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show that
\Box (a) All Z are X, and all W are Y.
\bigcirc (b) All X are Z, and all Y are W.
\bigcirc (c) All Z are X, and all Y are W.
\bigcirc (d) Some Z are X, and some Y are W.
\bigcirc (e) Some X are Z, and all Y are W.
\bigcap (f) All X are Z, and some Y are W.
\square (g) Some Z are X, and all Y are W.
(8) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
\Box (a) X and Y are both false.
\bigcirc (b) At least one of X and Y are false.
\bigcirc (c) X is false.
\bigcirc (d) Exactly one of X and Y are false.
\bigcirc (e) X does not imply Y , and Y does not imply X .
(f) Y is false.
\square (g) X is true if and only if Y is false.
(9) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Z implies X . If we also know that Y is false, we can conclude that
\Box (a) Z implies Y.
\bigcirc (b) X is false.
\bigcirc (c) X is false, Z is false, and Z implies Y.
\square (d) Z is false and Z implies Y.
\bigcirc (e) X is false and Z implies Y.
\Box (f) Z is false.
(g) None of the above conclusions can be drawn.

(10) Let X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need to show that
(a) X and Y are both false.
\bigcirc (b) At least one of X and Y are false.
(c) Y is false.
\Box (d) X does not imply Y, and Y does not imply X.
\bigcirc (e) X is true if and only if Y is false.
\Box (f) X is false.
\square (g) Exactly one of X and Y are false.
(11) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that
\Box (a) X implies Z.
\square (b) X is false and Z is false and X implies Z.
\Box (c) Z is false.
\square (d) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
(e) X is false.
(f) None of the above conclusions can be drawn.
(12) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for all x of type X ", then we have to
\Box (a) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\Box (b) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
\Box (c) Show that for every x in X , $P(x)$ is false.
\square (d) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
\Box (e) Show that there are no objects x of type X .
\Box (f) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\square (g) Show that there exists an x of type X for which $P(x)$ is false.

		P(n,m) be a property about two integers n and m . If we want to DISPROVE the claim that "There exists for n such that $P(n,m)$ is true for all integers m ", then we need to prove that
	(a)	If $P(n, m)$ is true, then n and m are not integers.
	(b)	For every integer n , there exists an integer m such that $P(n, m)$ is false.
	(c)	There exists integers n,m such that $P(n,m)$ is false.
	(d)	There exists an integer n such that $P(n, m)$ is false for all integers m .
	(e)	There exists an integer m such that $P(n, m)$ is false for all integers n .
	<i>(f)</i>	For every integer n , and every integer m , the property $P(n, m)$ is false.
	(g)	For every integer m , there exists an integer n such that $P(n, m)$ is false.
(14)	Let	t X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
	(a)	Show that either X is false, or Y is true, or both.
	(b)	Assume that X is true, and Y is false, and deduce a contradiction.
	(c)	Show that X implies some intermediate statement Z , and then show that $Z \implies Y$.
	(d)	Show that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.
	(e)	Assume that X is true, and then use this to show that Y is true.
	<i>(f)</i>	Assume that Y is false, and then use this to show that X is false.
	(g)	Assume that <i>X</i> is false, and <i>Y</i> is true, and deduce a contradiction.



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Instructions: fill **completely** the bubbles with the digits of the SID (one for each column); in the lower part of the sheet, fill **completely** the bubbles with the correct answers to the corresponding question. Use a black or dark blue pen or pencil, trying to fill completely the inside of the bubble. Write only in the designated areas.

Last Name:				• • • •		First name:			• • • •	Signature:					
Mark the answers of the multiple-choice questions															
(1)	A	$^{\odot}$	©	D	E	(F)	G	(8)	A	$^{\odot}$	©	D	E	F	G
(2)	A	$^{\odot}$	©	D	E	(F)	G	(9)	A	$^{\odot}$	©	D	E	F	G
(3)	\bigcirc	$^{\odot}$	©	D	E	F	G	(10)	\bigcirc	$^{\odot}$	©	D	E	F	G
(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	G
(5)	A	$^{\odot}$	©	D	E	F	G	(12)	\bigcirc	$^{\odot}$	©	D	E	F	G
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(1) Let $P(n, m)$ be a property about two integers n and integer n , there exists an integer m such that $P(n, m)$ is t	•
	se for all integers m . The that $P(n,m)$ is false. Use for all integers n . Perty $P(n,m)$ is false.
 (2) Let X, Y, Z be statements. Suppose we know that X is false, we can conclude that (a) Y is false and Z is false. (b) No conclusion can be drawn. (c) Y is false and Z implies X. (d) Y is false, Z is false and Z implies X. (e) Z implies X. (f) Y is false. (g) Z is false. 	implies Y , and that Y implies Z . If we also know that X is
 (3) Let X and Y be statements. If we know that X implie (a) Y cannot be false. (b) If Y is true, then X is true. (c) X cannot be false. (d) X is true, and Y is also true. 	s Y, then we can also conclude that (e) At least one of X and Y is true. (f) If Y is false, then X is false. (g) If X is false, then Y is false.

(4) Let X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
\Box (a) Show that either X is false, or Y is true, or both.
\Box (b) Assume that Y is false, and then use this to show that X is false.
\square (c) Assume that X is false, and Y is true, and deduce a contradiction.
\Box (d) Assume that X is true, and then use this to show that Y is true.
\square (e) Show that X implies some intermediate statement Z , and then show that $Z \implies Y$.
\Box (f) Assume that X is true, and Y is false, and deduce a contradiction.
\square (g) Show that some intermediate statement $Z \Longrightarrow Y$, and then show that $X \Longrightarrow Z$.
(5) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is false, we can conclude that
(a) Z is false.
\square (b) X is false and Z is false and X implies Z.
\square (c) X implies Z.
\Box (d) X is false.
\square (e) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
(f) None of the above conclusions can be drawn.
(6) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
\Box (a) At least one of X and Y are false.
\bigcirc (b) X does not imply Y, and Y does not imply X.
\Box (c) Y is false.
\Box (d) X is true if and only if Y is false.
\square (e) X is false.
\Box (f) Exactly one of X and Y are false.
\square (g) X and Y are both false.

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(a) Exactly one of X and Y are false.
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\bigcirc (c) X is true, but Y is false.
(d) X and Y are both false.
\square (e) Y is true, but X is false.
(f) X is false.
(g) Y is false.
(8) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exists an integer n such that $P(n, m)$ is true for all integers m ", then we need to prove that
\square (a) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\square (b) There exists an integer m such that $P(n,m)$ is false for all integers n .
\square (c) If $P(n, m)$ is true, then n and m are not integers.
\square (d) There exists an integer n such that $P(n, m)$ is false for all integers m .
\square (e) For every integer m, there exists an integer n such that $P(n, m)$ is false.
\Box (f) There exists integers n,m such that $P(n,m)$ is false.
\square (g) For every integer n , and every integer m , the property $P(n, m)$ is false.
(9) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\Box (a) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\Box (b) Show that for every x in X, there is a y not equal to x for which $P(y)$ is true.
\Box (c) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\Box (d) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
\Box (e) Show that for every x in X , $P(x)$ is false.
\Box (f) Show that there exists an x of type X for which $P(x)$ is false.
\Box (g) Show that there are no objects x of type X.

(10) that	Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show
	(a) Some Z are X, and all Y are W.
	(b) All X are Z , and all Y are W .
	(c) Some X are Z , and all Y are W .
	(d) All Z are X , and all Y are W .
	(e) All Z are X , and all W are Y .
	(f) Some Z are X , and some Y are W .
	(g) All X are Z , and some Y are W .
(11)	Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
	(a) All Y are X , and all Z are W .
	(b) All Y are Z , and all W are X .
	(c) All Z are X , and all Y are W .
	(d) All Z are Y , and all X are W .
	(e) All Z are X , and all W are Y .
	(f) All X are Z , and all Y are W .
	(g) All X are Z , and all W are Y .
	Let $P(n, m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there is an integer m such that $P(n, m)$ is true", then we should do the following:
	(a) Find an integer n such that $P(n, m)$ is true for every integer m .
	(b) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n, m)$ is true.
	(c) Find an integer m such that $P(n, m)$ is true for every integer n .
	(d) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n, m)$ is true.
	(e) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
	(f) Show that whenever $P(n, m)$ is true, then n and m are integers.
	(g) Find an integer n and an integer m such that $P(n, m)$ is true.

	et $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true x of type X ", then we have to
(a	1) Show that for every x in X , $P(x)$ is false.
\Box (t	Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
(c	e) Show that there exists an x of type X for which $P(x)$ is false.
(a	d) Show that $P(x)$ being true does not necessarily imply that x is of type X .
(e	s) Show that there are no objects x of type X .
	Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
(g	g) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
(14) L to sho	et X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need we that
(a	a) X does not imply Y , and Y does not imply X .
(t	Y(X) is true if and only if $Y(X)$ is false.
(c	e) Y is false.
(a	l) Exactly one of X and Y are false.
(e	e) X is false.
\Box (f.	Y) At least one of X and Y are false.
□ (g	Y Y and Y are both false.



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						M	lark the answers of the	multiple-	choic	e qu	estio	ns			
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(2)	A	$^{\odot}$	©	D	E	E	©	(9)	A	$^{\odot}$	©	D	E	F	©
(3)	$\widehat{\mathbb{A}}$	$^{\odot}$	©	D	E	F	G	(10)	A	$^{\odot}$	©	D	E	F	G
(4)	$\widehat{\mathbb{A}}$	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	G
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(1) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is to some x of type X ", then we have to	ue for
\square (a) Assume that $P(x)$ is true for every x in X , and derive a contradiction.	
\bigcirc (b) Show that $P(x)$ being true does not necessarily imply that x is of type X .	
\bigcirc (c) Show that there exists an x of type X for which $P(x)$ is false.	
\bigcirc (d) Show that for every x in X , $P(x)$ is false.	
\bigcirc (e) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.	
\bigcirc (f) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.	
\bigcirc (g) Show that there are no objects x of type X .	
(2) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For integer n , there exists an integer m such that $P(n, m)$ is true", then we need to prove that	every
\Box (a) There exists integers n,m such that $P(n,m)$ is false.	
\bigcirc (b) For every integer m , there exists an integer n such that $P(n, m)$ is false.	
\bigcirc (c) For every integer n , and every integer m , the property $P(n,m)$ is false.	
\bigcirc (d) For every integer n , there exists an integer m such that $P(n, m)$ is false.	
\bigcirc (e) There exists an integer m such that $P(n,m)$ is false for all integers n .	
\bigcap (f) There exists an integer n such that $P(n, m)$ is false for all integers m.	
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(a) Exactly one of X and Y are false.	
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\bigcirc (d) X does not imply Y , and Y does not imply X .	
(e) X is false.	
\bigcap (f) X is true if and only if Y is false.	
\bigcirc (g) X and Y are both false.	

(4) Suppose one wishes to prove that "if all X are Y , then	all Z are W ". To do this, it would suffice to show that				
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(a) All Z are Y, and all X are W.					
(b) All Y are Z, and all W are X.					
(c) All Y are X, and all Z are W.					
\bigcirc (d) All Z are X, and all W are Y.					
(e) All X are Z, and all Y are W.					
\bigcirc (f) All X are Z, and all W are Y.					
\bigcirc (g) All Z are X, and all Y are W.					
(5) Let <i>X</i> and <i>Y</i> be statements. Which of the following st	rategies is NOT a valid way to show that " $X \implies Y$ "?				
.,	·				
\bigcap (a) Show that some intermediate statement $Z \implies$	Y and then show that $X \Longrightarrow Z$				
\square (a) Show that some intermediate statement $Z \Longrightarrow Y$, and then show that $X \Longrightarrow Z$. \square (b) Assume that Y is false, and then use this to show that X is false.					
(d) Assume that X is true, and Y is false, and deduce	(c) Assume that X is true, and then use this to show that Y is true.				
(e) Assume that X is false, and Y is true, and deduce					
	a contradiction.				
(f) Show that either X is false, or Y is true, or both.	at 7 and then about that 7 - V				
\square (g) Show that X implies some intermediate statement	at Z, and then show that $Z \implies Y$.				
(6) Let X and Y be statements. If we know that X implies	s Y, then we can also conclude that				
\Box (a) If Y is false, then X is false.	\bigcirc (e) X cannot be false.				
\bigcirc (b) X is true, and Y is also true.	\bigcap (f) If X is false, then Y is false.				
\bigcirc (c) If Y is true, then X is true.	\bigcirc (g) At least one of X and Y is true.				
(d) Y cannot be false.					

(7) Let X and Y be statements. If we want to DISPROVE the claim that "At least one of X and Y are true", we need to show that
\Box (a) X does not imply Y, and Y does not imply X.
(b) X is true if and only if Y is false.
(c) Y is false.
\bigcirc (d) At least one of X and Y are false.
\bigcirc (e) X and Y are both false.
\Box (f) X is false.
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(8) Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show that
\Box (a) Some X are Z, and all Y are W.
\Box (b) Some Z are X, and some Y are W.
\Box (c) All Z are X, and all W are Y.
\Box (d) All X are Z, and all Y are W.
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\Box (a) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
\square (b) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n, m)$ is true.
\square (c) Find an integer m such that $P(n, m)$ is true for every integer n .
\square (d) Find an integer n and an integer m such that $P(n, m)$ is true.
\square (e) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n, m)$ is true.
\square (f) Show that whenever $P(n, m)$ is true, then n and m are integers.
\square (g) Find an integer n such that $P(n, m)$ is true for every integer m.

(10) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X is false, we can conclude that
\Box (a) Z implies X.
\bigcirc (b) Y is false, Z is false and Z implies X.
\bigcirc (c) Y is false and Z implies X.
(d) No conclusion can be drawn.
\bigcirc (e) Z is false.
\bigcap (f) Y is false and Z is false.
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\Box (a) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
\bigcirc (b) Show that there are no objects x of type X .
\square (c) Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
\bigcirc (d) Show that for every x in X , $P(x)$ is false.
\square (e) Show that there exists an x of type X for which $P(x)$ is false.
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\square (g) Show that $P(x)$ being true does not necessarily imply that x is of type X .
(12) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exist an integer n such that $P(n,m)$ is true for all integers m ", then we need to prove that
\square (a) For every integer n , and every integer m , the property $P(n, m)$ is false.
\bigcirc (b) If $P(n, m)$ is true, then n and m are not integers.
\bigcirc (c) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\bigcirc (d) There exists an integer n such that $P(n, m)$ is false for all integers m .
\bigcirc (e) There exists an integer m such that $P(n, m)$ is false for all integers n .
\bigcap (f) For every integer m, there exists an integer n such that $P(n,m)$ is false.
\square (g) There exists integers n,m such that $P(n,m)$ is false.

(13)	Let	X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
	(a)	X is false.
	(b)	Y is false.
	(c)	X is true, but Y is false.
	(d)	X and Y are both false.
	(e)	At least one of X and Y is false.
	<i>(f)</i>	Y is true, but X is false.
	(g)	Exactly one of X and Y are false.
		X, Y , Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y we can conclude that
	lse,	
is fal	lse,	we can conclude that
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Instructions: fill **completely** the bubbles with the digits of the SID (one for each column); in the lower part of the sheet, fill **completely** the bubbles with the correct answers to the corresponding question. Use a black or dark blue pen or pencil, trying to fill completely the inside of the bubble. Write only in the designated areas.

Last Name:				First name:				Signature:							
						N	fark the answers of the	multiple-	choic	e qu	estio	ns			
(1)	A	B	©	(D)	E	(F)	G	(8)	A	B	©	(D)	E	(F)	G
(2)	A	$^{\odot}$	©	D	E	(F)	G	(9)	\widehat{A}	$^{\odot}$	©	D	E	F	©
(3)	A	$^{\odot}$	©	D	E	(F)	G	(10)	A	$^{\odot}$	©	D	E	F	G
(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\bigcirc	$^{\odot}$	©	D	E	F	G
(5)	A	$^{\odot}$	©	(D)	E	F	G	(12)	\bigcirc	$^{\odot}$	©	D	E	F	G
(6)	A	$^{\odot}$	©	D	E	(F)	G	(13)	A	$^{\odot}$	©	D	E	F	G
(7)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)	(14)	(A)	(B)	(C)	\bigcirc	(E)	(F)	(G)

(1) Let X and Y be statements. If we want to DISPROVE to show that	The claim that "At least one of X and Y are true", we need			
 (a) X does not imply Y, and Y does not imply X. (b) At least one of X and Y are false. (c) Exactly one of X and Y are false. (d) X is false. (e) Y is false. (f) X and Y are both false. (g) X is true if and only if Y is false. 				
(b) Let n and m be arbitrary integers. Then show that (c) Find an integer n such that $P(n, m)$ is true for every	bould do the following: or m (possibly depending on n) such that $P(n,m)$ is true. or $P(n,m)$ is true. ery integer m .			
 (d) Show that whenever P(n, m) is true, then n and m are integers. (e) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that P(n, m) is true. (f) Find an integer m such that P(n, m) is true for every integer n. (g) Find an integer n and an integer m such that P(n, m) is true. 				
 (3) Let X and Y be statements. If we know that X implies (a) If Y is true, then X is true. (b) X is true, and Y is also true. (c) If Y is false, then X is false. (d) At least one of X and Y is true. 	 ∴ Y, then we can also conclude that ☐ (e) X cannot be false. ☐ (f) Y cannot be false. ☐ (g) If X is false, then Y is false. 			

(4) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we need to prove that
\Box (a) There exists an integer m such that $P(n,m)$ is false for all integers n .
\square (b) For every integer n , and every integer m , the property $P(n,m)$ is false.
\square (c) For every integer m , there exists an integer n such that $P(n, m)$ is false.
\square (d) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\square (e) There exists an integer n such that $P(n, m)$ is false for all integers m .
\square (g) There exists integers n,m such that $P(n,m)$ is false.
(5) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exists are integer n such that $P(n, m)$ is true for all integers m ", then we need to prove that
\square (a) For every integer n , and every integer m , the property $P(n,m)$ is false.
\square (b) For every integer m , there exists an integer n such that $P(n, m)$ is false.
\square (c) If $P(n, m)$ is true, then n and m are not integers.
\square (d) There exists an integer m such that $P(n,m)$ is false for all integers n.
\square (e) There exists integers n,m such that $P(n,m)$ is false.
\square (f) There exists an integer n such that $P(n,m)$ is false for all integers m.
\square (g) For every integer n , there exists an integer m such that $P(n, m)$ is false.
(6) Let X and Y be statements. Which of the following strategies is NOT a valid way to show that " $X \implies Y$ "?
\square (a) Show that X implies some intermediate statement Z, and then show that $Z \implies Y$.
\bigcirc (b) Show that either X is false, or Y is true, or both.
\bigcirc (c) Assume that X is true, and Y is false, and deduce a contradiction.
\square (d) Show that some intermediate statement $Z \implies Y$, and then show that $X \implies Z$.
\bigcirc (e) Assume that X is true, and then use this to show that Y is true.
\square (f) Assume that X is false, and Y is true, and deduce a contradiction.
\square (g) Assume that Y is false, and then use this to show that X is false.

(7) Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
\Box (a) All Z are Y, and all X are W.
\Box (b) All X are Z, and all W are Y.
\square (c) All Y are Z, and all W are X.
\Box (d) All X are Z, and all Y are W.
\square (e) All Z are X, and all Y are W.
\Box (f) All Z are X, and all W are Y.
\square (g) All Y are X, and all Z are W.
(8) Let X, Y, Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that Y is
false, we can conclude that
\Box (a) X implies Z.
\square (b) X is false and Z is false and X implies Z.
\square (c) Z is false and X implies Z. Correct Answer. X is false and X implies Z.
\Box (d) Z is false.
(e) None of the above conclusions can be drawn.
\Box (f) X is false.
(9) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\Box (a) Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
\Box (b) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
\Box (c) Show that there are no objects x of type X .
\square (d) Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
\square (e) Show that there exists an x of type X for which $P(x)$ is false.
\Box (f) Show that for every x in X, $P(x)$ is false.
\square (g) Show that $P(x)$ being true does not necessarily imply that x is of type X .

(10)	Let	t X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
	(a)	Exactly one of X and Y are false.
	(b)	X is false.
	(c)	X is true, but Y is false.
	(d)	At least one of X and Y is false.
	(e)	Y is true, but X is false.
	<i>(f)</i>	X and Y are both false.
	(g)	Y is false.
		t $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true of type X ", then we have to
	(a)	Show that for every x in X , $P(x)$ is false.
	(b)	Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
	(c)	Show that there exists an x of type X for which $P(x)$ is false.
	(d)	Show that there exists an x which is not of type X , but for which $P(x)$ is still true.
	(e)	Show that $P(x)$ being true does not necessarily imply that x is of type X .
	<i>(f)</i>	Show that for every x in X , there is a y not equal to x for which $P(y)$ is true.
	(g)	Show that there are no objects x of type X .
		t X, Y, Z be statements. Suppose we know that X implies Y , and that Z implies X . If we also know that Y we can conclude that
	(a)	None of the above conclusions can be drawn.
	(b)	X is false and Z implies Y .
	(c)	Z is false and Z implies Y .
	(d)	Z implies Y.
	(e)	X is false.
	<i>(f)</i>	X is false, Z is false, and Z implies Y .
	(g)	Z is false.

(13) that	Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show
	(a) Y is false.
	(b) At least one of X and Y are false.
	(c) Exactly one of X and Y are false.
	(d) X and Y are both false.
	(e) X is false.
	(f) X does not imply Y , and Y does not imply X .
	(g) X is true if and only if Y is false.
(14) that	Suppose one wishes to prove that "if some X are Y , then some Z are W ". To do this, it would suffice to show
	(a) All X are Z, and some Y are W.
	(b) All Z are X , and all Y are W .
	(c) Some Z are X , and some Y are W .
	(d) All Z are X , and all W are Y .
	(e) Some X are Z , and all Y are W .
	(f) Some Z are X , and all Y are W .
	(g) All X are Z, and all Y are W.



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Instructions: fill **completely** the bubbles with the digits of the SID (one for each column); in the lower part of the sheet, fill **completely** the bubbles with the correct answers to the corresponding question. Use a black or dark blue pen or pencil, trying to fill completely the inside of the bubble. Write only in the designated areas.

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						N	fark the answers of the	multiple-	choic	e qu	estio	ns				
(1)	A	$^{\odot}$	©	D	E	F	G	(8)	A	$^{\odot}$	©	D	E	F	G	
(2)	A	$^{\odot}$	©	D	E	(F)	G	(9)	A	$^{\odot}$	©	D	E	F	G	
(3)	A	$^{\odot}$	©	D	E	F	G	(10)	\widehat{A}	$^{\odot}$	©	D	E	F	G	
(4)	A	$^{\odot}$	©	D	E	F	G	(11)	\widehat{A}	$^{\odot}$	©	D	E	F	G	
(5)	A	$^{\odot}$	©	D	E	(F)	G	(12)	A	$^{\odot}$	©	D	E	F	G	
(6)	A	$^{\odot}$	©	D	E	F	G	(13)	\widehat{A}	$^{\odot}$	©	D	E	F	G	
(7)	$\overline{\pi}$	(D)			(E)	(E)		(14)	$\overline{\pi}$	P		\bigcirc	(F)	(E)		

(1) Suppose one wishes to prove that "if some X are Y , that	then some Z are W ". To do this, it would suffice to show
 (a) Some Z are X, and all Y are W. (b) All Z are X, and all Y are W. (c) Some Z are X, and some Y are W. (d) Some X are Z, and all Y are W. (e) All X are Z, and all Y are W. (f) All Z are X, and all W are Y. (g) All X are Z, and some Y are W. 	
 (2) Let X and Y be statements. If we know that X implies (a) If Y is false, then X is false. (b) Y cannot be false. (c) X is true, and Y is also true. (d) At least one of X and Y is true. 	s Y, then we can also conclude that (e) If X is false, then Y is false. (f) If Y is true, then X is true. (g) X cannot be false.
(3) Let <i>X</i> and <i>Y</i> be statements. Which of the following statements.	trategies is NOT a valid way to show that " $X \implies Y$ "?
 (a) Assume that X is false, and Y is true, and deduced (b) Assume that Y is false, and then use this to show (c) Show that some intermediate statement Z ⇒ (d) Show that either X is false, or Y is true, or both. (e) Assume that X is true, and then use this to show (f) Assume that X is true, and Y is false, and deduced (g) Show that X implies some intermediate statement 	w that X is false. Y , and then show that $X \Longrightarrow Z$. It that Y is true. It a contradiction.

(4) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is true for some x of type X ", then we have to
\Box (a) Show that there exists an x of type X for which $P(x)$ is false.
\Box (b) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
\Box (c) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\square (d) Show that for every x in X, there is a y not equal to x for which $P(y)$ is true.
\bigcirc (e) Show that for every x in X , $P(x)$ is false.
\Box (f) Show that there are no objects x of type X.
\square (g) Assume that $P(x)$ is true for every x in X , and derive a contradiction.
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\square (a) Z is false and X implies Z . Correct Answer. X is false and X implies Z .
\bigcirc (b) X implies Z.
\bigcirc (c) X is false.
\bigcirc (d) Z is false.
(e) None of the above conclusions can be drawn.
\bigcap (f) X is false and Z is false and X implies Z.
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\bigcirc (b) Y is false.
\bigcirc (c) At least one of X and Y are false.
\bigcirc (d) X is false.
\bigcirc (e) Exactly one of X and Y are false.
\bigcap (f) X and Y are both false.
\square (g) X does not imply Y, and Y does not imply X.

(7) Let $P(n, m)$ be a property about two integers n and m . If we want to prove that "For every integer n , there exists an integer m such that $P(n, m)$ is true", then we should do the following:
\square (a) Let n and m be arbitrary integers. Then show that $P(n,m)$ is true.
\square (b) Let n be an arbitrary integer. Then find an integer m (possibly depending on n) such that $P(n,m)$ is true.
\square (c) Show that whenever $P(n, m)$ is true, then n and m are integers.
\square (d) Let m be an arbitrary integer. Then find an integer n (possibly depending on m) such that $P(n,m)$ is true
\square (e) Find an integer n such that $P(n, m)$ is true for every integer m .
\square (g) Find an integer n and an integer m such that $P(n, m)$ is true.
(8) Let X and Y be statements. If we want to DISPROVE the claim that "Both X and Y are true", we need to show that
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\Box (c) At least one of X and Y are false.
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(9) Suppose one wishes to prove that "if all X are Y , then all Z are W ". To do this, it would suffice to show that
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\Box (b) All Z are Y, and all X are W.
\bigcirc (c) All Y are Z, and all W are X.
\Box (d) All X are Z, and all Y are W.
\square (e) All Z are X, and all Y are W.
\Box (f) All Z are X, and all W are Y.
\square (g) All X are Z, and all W are Y.

(10) Let $P(x)$ be a property about some object x of type X . If we want to DISPROVE the claim that " $P(x)$ is tru for all x of type X ", then we have to
\Box (a) Show that $P(x)$ being true does not necessarily imply that x is of type X .
\Box (b) Show that there exists an x of type X for which $P(x)$ is false.
\Box (c) Show that for every x in X, there is a y not equal to x for which $P(y)$ is true.
\Box (d) Assume there exists an x of type X for which $P(x)$ is true, and derive a contradiction.
\square (e) Show that there exists an x which is not of type X, but for which $P(x)$ is still true.
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(11) Let $P(n, m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "There exist an integer n such that $P(n, m)$ is true for all integers m ", then we need to prove that
\Box (a) For every integer m , there exists an integer n such that $P(n,m)$ is false.
\square (b) There exists an integer m such that $P(n,m)$ is false for all integers n .
\square (c) For every integer n , there exists an integer m such that $P(n, m)$ is false.
\square (d) For every integer n , and every integer m , the property $P(n,m)$ is false.
\square (e) If $P(n, m)$ is true, then n and m are not integers.
\bigcap (f) There exists integers n,m such that $P(n,m)$ is false.
\square (g) There exists an integer n such that $P(n, m)$ is false for all integers m .
(12) Let $P(n,m)$ be a property about two integers n and m . If we want to DISPROVE the claim that "For every integer n , there exists an integer m such that $P(n,m)$ is true", then we need to prove that
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\bigcirc (b) For every integer n, there exists an integer m such that $P(n, m)$ is false.
\bigcirc (c) There exists an integer m such that $P(n,m)$ is false for all integers n .
\bigcirc (d) For every integer m , there exists an integer n such that $P(n,m)$ is false.
\square (e) There exists an integer n such that $P(n, m)$ is false for all integers m .
\bigcap (f) For every integer n , and every integer m , the property $P(n,m)$ is false.
\square (g) If $P(n, m)$ is true, then n and m are not integers.

(13)	Let	X and Y be statements. If we want to DISPROVE the claim that " $X \implies Y$ ", we need to show that
	(a)	Y is true, but X is false.
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	(d)	X and Y are both false.
	(e)	X is false.
	<i>(f)</i>	X is true, but Y is false.
	(g)	At least one of X and Y is false.
		X, Y , Z be statements. Suppose we know that X implies Y , and that Y implies Z . If we also know that X
is fa	lse,	we can conclude that
	lse,	
is fa	lse, (a)	we can conclude that
is fa	lse, (a) (b)	we can conclude that Z implies X .
is fa	lse, (a) (b) (c)	we can conclude that Z implies X . Z is false.
is fa	(a) (b) (c) (d)	we can conclude that Z implies X . Z is false. Y is false and Z implies X .
is fa	lse, (a) (b) (c) (d) (e)	we can conclude that Z implies X . Z is false. Y is false and Z implies X . Y is false.