```
-------------------------------------------------------------------------------------------
1a) ∃x P(x), where P(x) is the statement “x<2”
--> 0 < 2, hence proving the statement True
-------------------------------------------------------------------------------------------
1b) ∀x P(x), where P(x) is the statement “x<2”
--> 2 >= 2, hence proving the statement False
-------------------------------------------------------------------------------------------
1c) ∃x (P(x) v Q(x)) where P(x) is the statement “x<2” and where Q(x) is the statement “x>7”
--> 0 < 2 or 0 > 5, hence proving the statement True
-------------------------------------------------------------------------------------------
1d) ∀x (P(x) v Q(x)) where P(x) is the statement “x<2” and where Q(x) is the statement “x>7”
--> 2 < (x = 2) < 7, hence proving the statement False
-------------------------------------------------------------------------------------------
1e) Prove De Morgan’s Law for the Existential Quantifier where P(x) is the statement “x<5”
prove !∃x (x < 5) == ∀x (x >= 5)
First proving: not(for some P(x), the negation
--> 0 < 5 proves the statement is False and the negation of that is True
-------------------------------------------------------------------------------------------
Proving: for all (not(P(x))
--> not(5 >= 5), proving True
Since the negation and ∀x (x >= 5) proven True the statement is True
-------------------------------------------------------------------------------------------
1f) Prove De Morgan’s Law for the Universal Quantifier where P(x) is the statement “x<5”
prove !∀x (x < 5) == ∃x (x >= 5)
First proving: not(for all P(x), the negation
--> 0 < 5 proves the statement is False and the negation of that is True
-------------------------------------------------------------------------------------------
Proving: for some (not(P(x))
--> not(5 >= 5), proving True
Since the negation and ∃x (x >= 5) are proven True the overall statement is True
```

```
-------------------------------------------------------------------------------------------
2a) ∀x∀yP(x,y)
--> False For (x, y) = (1, 1), xy = 1 proves the statement wrong
-------------------------------------------------------------------------------------------
2b) ∀x∃yP(x,y)
True
--> (x, y) = (0, 0) satisfies the problem statement xy = 0
--> (x, y) = (1, 0) satisfies the problem statement xy = 0
--> (x, y) = (2, 0) satisfies the problem statement xy = 0
--> (x, y) = (3, 0) satisfies the problem statement xy = 0
--> (x, y) = (4, 0) satisfies the problem statement xy = 0
--> (x, y) = (5, 0) satisfies the problem statement xy = 0
--> (x, y) = (6, 0) satisfies the problem statement xy = 0
--> (x, y) = (7, 0) satisfies the problem statement xy = 0
--> (x, y) = (8, 0) satisfies the problem statement xy = 0
--> (x, y) = (9, 0) satisfies the problem statement xy = 0
--> (x, y) = (10, 0) satisfies the problem statement xy = 0
-------------------------------------------------------------------------------------------
2c) ∃x∀yP(x,y)
--> True, for x = 0, the proposition is true for all values of y
-------------------------------------------------------------------------------------------
2d) ∃x∃yP(x,y)
--> True: for (x, y) = (0, 0), xy = 0 proves the statement true

Process finished with exit code 0
```