Below, for each problem on this test, "Perfect" is the percentage of students who received full credit, "Partial" is the percentage who received partial credit, and "Zero" is the percentage who received zero credit.

(Due to rounding, values below may be only approximate estimates.)

Problem 1.

Problem 2.

We will release these numbers as they become available.

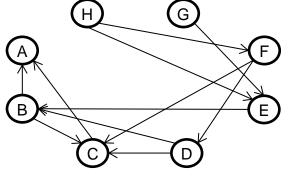
CS-171, Intro to A.I. — Quiz#4 — Winter Quarter, 2016 — 20 minutes

See Section 8.1-4.SEAT:See Section 8.1-4.ROW:SEAT:1. (70 pts total, 10 pts each) For each English sentence below, write the letter corresponding to its best or closest FOPC (FOL) sentence (wff, or well-formed formula).The first one is done for you, as an example.1. a (example)	
1.a (example)D"Every butterfly likes some flower."A. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)1.a "Every butterfly likes some flower."A. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)5. Everything(x) is a butterfly(x) and there is some flower(y) and x likes y.B. $\forall x \exists y$ Butterfly(x) \land Flower(y) \land Likes(x, y)5. Everything(x) is a butterfly(x) and there is some flower(y) and x likes y.D. $\forall x \exists y$ Butterfly(x) \Rightarrow (Flower(y) \land Likes(x, y)5. Creat.A. $\forall x$ Butterfly(x) \Rightarrow (Flower(x) \land Likes(x, y)1.b "All butterflies are insects."A. $\forall x$ Butterfly(x) \land Insect(x)6. Correct.B. $\forall x$ Butterfly(x) \Rightarrow Insect(x)1.c "For every flower, there is a butterfly.C. $\exists x$ Butterfly(x) \land Insect(x)1.c "For every flower(x) \land Butterfly(y) \land Likes(y, x)D. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x)D. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x)D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \exists Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) d Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) d Lik	vample
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N. Vx Vy Butterfly(x) \wedge Flower(y) \wedge Likes(x, y)B. Everything(x) is a butterfly(x) and there is some flower(y) and x likesB. $\forall x \exists y$ Butterfly(x) \Rightarrow (Flower(y) \wedge Likes(x, y)B. Everything(x) is a butterfly(x) and there is some flower(y) and x likesC. $\forall x \forall y$ Butterfly(x) \Rightarrow (Flower(y) \wedge Likes(x, y)D. Correct.D. $\forall x \exists y$ Butterfly(x) \Rightarrow Insect(x)Likes(x, y)B. $\forall x$ Butterfly(x) \Rightarrow Insect(x)Likes(x, y)C. $\exists x$ Butterfly(x) \Rightarrow Insect(x)Likes(y, x)D. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x)D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(y, x)D. $\forall x \forall y$ Butterfly(x) \Rightarrow Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \Rightarrow Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y)D. $\forall x \forall y$ Bu	nd x likes v.
C. $\forall x \forall y$ Butterfly(x) \Rightarrow (Flower(y) \land Likes(x, y)) D. $\forall x \exists y$ Butterfly(x) \Rightarrow (Flower(y) \land Likes(x, y)) 1.b (10 pts) <u>B</u> "All butterflies are insects." A. $\forall x$ Butterfly(x) \land Insect(x) B. $\forall x$ Butterfly(x) \land Insect(x) C. $\exists x$ Butterfly(x) \land Insect(x) D. $\exists x$ Butterfly(x) \land Butterfly(y) \land Likes(y, x) B. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(y, x) I.d (10 pts) <u>A</u> "Every butterfly likes every flower. A. $\forall x \forall y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) 1.e (10 pts) <u>B</u> "There is some butterfly in Irvine that is pretty." A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. \bigcirc There there is a butterfly and is in invine(x) and is pretty(X). B. \bigcirc There there is a butterfly and is in invine(x) and is pretty(X). B. \bigcirc There is a butterfly (x) \land Brower(x) \land Butterfly (x) \land Brower(x) \land Brower(x) \land Brower(x) \land Brower(x) \land B	wer(y) and x likes y.
D. $\forall x \exists y$ Butterfly(x) \Rightarrow (Flower(y) \land Likes(x, y)) 1.b (10 pts) <u>B</u> "All butterflies are insects." A. $\forall x$ Butterfly(x) \land Insect(x) B. $\forall x$ Butterfly(x) \Rightarrow Insect(x) C. $\exists x$ Butterfly(x) \land Insect(x) D. $\exists x$ Butterfly(x) \Rightarrow Insect(x) D. $\exists x$ Butterfly(x) \Rightarrow Insect(x) A. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) B. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) C. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(y, x) D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(y, x) I.d (10 pts) <u>A</u> "Every butterfly likes every flower." A. $\forall x \forall y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Diver(x) A. $\forall x \forall y$ [Butterfly(x) \land Flower(y) \land Diver(x) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Diver(x) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Diver(x) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Dive(x) B. $\forall x \forall y$ Butterfly(x) \land Flower(s a flower(y) and x likes y
1.b (10 pts) <u>B</u> "All butterflies are insects." A. $\forall x$ Butterfly(x) \land Insect(x) B. $\forall x$ Butterfly(x) \Rightarrow Insect(x) C. $\exists x$ Butterfly(x) \land Insect(x) D. $\exists x$ Butterfly(x) \Rightarrow Insect(x) 1.c (10 pts) <u>C</u> "For every flower, there is a butterfly A. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) B. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) C. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) 1.d (10 pts) <u>A</u> "Every butterfly likes every flower. A. $\forall x \forall y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists z$ Likes(x, y) B. $\forall x \forall y$ Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) B. $\forall z \forall y$ Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x, y) D. $\forall z \exists y$ [Butterfly(x) $\land z$ Flower(y) $\exists z$ Likes(x) $\exists z$ Flowe	
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B. $\forall x$ Butterfly(x) \Rightarrow Insect(x) C. $\exists x$ Butterfly(x) \Rightarrow Insect(x) D. $\exists x$ Butterfly(x) \Rightarrow Insect(x) 1.c (10 pts) _C_ "For every flower, there is a butterfly A. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) B. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) C. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(y, x) D. $\forall x \forall y$ Flower(x) \land Butterfly(y) \land Likes(y, x) 1.d (10 pts) _A_ "Every butterfly likes every flower." A. $\forall x \exists y$ Flower(x) \land Butterfly(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\land x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) B. $\forall x \forall y$ Butterfly(x) \land Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land x$ Flower(y) $\exists x$ Likes(x, y) D. $\forall x \exists y$ [Butterfly(x) $\land x$ Flower(y) $dx \forall y$ Butterfly in Irvine that is pretty." A. $\forall x$ Butterfly(x) $\land x$ In(x, Irvine) $\land x$ Pretty(x) B. Correct. B. Correct. B. Correct. C. Everything(x) is a butterfly and is in Irvine(x) and is pretty(x). B. Correct. B. Correct. B. Correct	
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A. $\forall x \forall y [$ Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y) B. $\forall x \forall y$ Butterfly(x) $\Rightarrow [$ Flower(y) \land Likes(x, y)] C. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y [$ Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y) 1.e (10 pts) <u>B</u> "There is some butterfly in Irvine tha A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y) 1.e (10 pts) <u>B</u> "There is some butterfly in Irvine tha A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. $\exists x \exists y $	
D. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y [$ Butterfly(x) \land Flower(y) $] \Rightarrow$ Likes(x, y) 1.e (10 pts) <u>B</u> "There is some butterfly in Irvine that A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land Flower(y) $] \Rightarrow$ Likes(x, y) 1.e. "There is some butterfly in Irvine that is pretty." A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. Correct.	
C. $\forall x \forall y$ Butterfly(x) \land Flower(y) \land Likes(x, y) D. $\forall x \exists y [$ Butterfly(x) \land Flower(y) $] \Rightarrow$ Likes(x, y) 1.e (10 pts) <u>B</u> "There is some butterfly in Irvine that A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) D. Vacuously true if anything(y) is not a flower. 1.e. "There is some butterfly in Irvine that is pretty." A. Everything(x) \land In(x, Irvine) \land Pretty(x) B. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. $\forall x \exists y [$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. Correct.	
1.e (10 pts) B "There is some butterfly in Irvine that A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. Correct.	la x likes y.
A. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. $\forall x$ Butterfly(x) \land In(x, Irvine) \land Pretty(x) B. Correct.	
B. Correct. B. Correct.	
	pretty(x).
	en that thing is pretty(x).
C. $\forall x [Butterfly(x) \land ln(x, Irvine)] \Rightarrow Pretty(x)$ D. Vacuously true if anything(x) is not a butterfly(x).	
D. $\exists x \text{ Butterfly}(x) \Rightarrow [\ln(x, \text{Irvine}) \land \text{Pretty}(x)]$	
1.f (10 pts) <u>C</u> "Every butterfly in Irvine is pretty." 1.f "Every butterfly in Irvine is pretty."	
A. $\forall x \text{ Butterfly}(x) \land \ln(x, \text{ Irvine}) \land \text{ Pretty}(x)$ A. Everything(x) is a butterfly(x) and is in Irvine(x) and is pretty(x). B. There is something(x) that is a butterfly(x) and is in Irvine(x) and is pretty(x).	
B. $\exists x $ Butterfly(x) \land In(x, Irvine) \land Pretty(x) C. Correct.	
C. $\forall x [Butterfly(x) \land ln(x, Irvine)] \Rightarrow Pretty(x)$	
D. $\exists x \text{ Butterfly}(x) \Rightarrow [\ln(x, \text{ Irvine})] \land \text{Pretty}(x)$	
1.g (10 pts) "Every butterfly likes some flower."	
A. $\forall x \exists y [Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y)$ A. $\forall x \exists y [Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y)$	
B. $\forall x \exists y $ Butterfly(x) \land Flower(y) \land Likes(x, y) B. Everything(x) is a butterfly(x) and there is some flower(y) and x likes y.	
C. $\forall x \forall y $ Butterfly(x) \land Flower(y) \land Likes(x, y) D. Correct.	id x likes y.
D. $\forall x \exists y Butterfly(x) \Rightarrow [Flower(y) \land Likes(x, y)]$	
1.h (10 pts) A "Some butterfly likes some flower." 1.h "Some butterfly likes some flower."	
A. $\exists x \exists y Butterfly(x) \land Flower(y) \land Likes(x, y)$ A. Correct.	huttorflu(x) on in ant c
B. $\exists x \exists y [Butterfly(x) \land Flower(y)] \Rightarrow Likes(x, y)$ B. Vacuously true if there is anything(x,y) that is not a butterfly(x) or is n flower(y).	Dutterny(x) of is not a
C. $\exists x \exists y Butterfly(x) \Rightarrow [Flower(y) \land Likes(x, y)]$ C. $\forall x \exists y Butterfly(x) \Rightarrow [Flower(y) \land Likes(x, y)]$	
D. $\forall x \forall y $ Butterfly(x) \land Flower(y) \land Likes(x, y) D. Everything(x,y) is a butterfly and is a flower(y) and x likes y.	х пкез у.

**** TURN PAGE OVER. QUIZ CONTINUES ON THE REVERSE. ****

2. (30 pts total, 10 pts each) BAYESIAN NETWORKS.

2.a. (10 pts) Write down the factored conditional probability expression corresponding to this Bayesian Network:

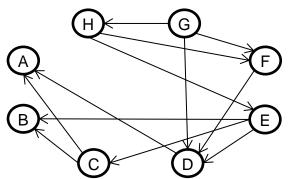




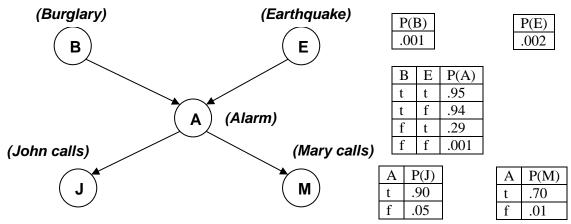
P(A | B, C) P(B | D, E) P(C | B, D, F) P(D | F) P(E | G, H) P(F | H) P(G) P(H)

2.b. (10 pts) Draw the Bayesian Network corresponding to this factored conditional probability expression:

P(A | C, D) P(B | C, E) P(C | E) P(D | E, F, G) P(E | H) P(F | G, H) P(G) P(H | G)



2.c. (10 pts) Shown below is the Bayesian network corresponding to the Burglar Alarm problem, i.e., P(J,M,A,B,E) = P(J | A) P(M | A) P(A | B, E) P(B) P(E). This is Fig. 14.2 in your R&N textbook.



Write down an expression that will evaluate to $P(J=f \land M=t \land A=t \land B=t \land E=f)$. Express your answer as a series of numbers (numerical probabilities) separated by multiplication symbols. You do not need to carry out the multiplication to produce a single number (probability). SHOW YOUR WORK, first as the symbolic conditional probabilities from the graphs, then as the corresponding numeric probabilities from the tables above.

P(J= $f \land M=t \land A=t \land B=t \land E=f$)

[put symbolic here] = $P(J=f | A=t) * P(M=t | A=t) * P(A=t | B=t \land E=f) * P(B=t) * P(E=f)$

[put numeric here]

Note: P(E=f) = [1 - P(E=t)] = [1 - .002)] = .998 P(J=f | A=t) = [1 - P(J=t | A=t)] = .10