

- a) You get an A in this class, but you do not do every exercise in this book.
 b) You get an A on the final, you do every exercise in this book, and you get an A in this class.
 c) To get an A in this class, it is necessary for you to get an A on the final.
 d) You get an A on the final, but you don't do every exercise in this book; nevertheless, you get an A in this class.
 e) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class.
 f) You will get an A in this class if and only if you either do every exercise in this book or you get an A on the final.

15. Let p , q , and r be the propositions

- p : Grizzly bears have been seen in the area.
 q : Hiking is safe on the trail.
 r : Berries are ripe along the trail.

Write these propositions using p , q , and r and logical connectives (including negations).

- a) Berries are ripe along the trail, but grizzly bears have not been seen in the area.
 b) Grizzly bears have not been seen in the area and hiking on the trail is safe, but berries are ripe along the trail.
 c) If berries are ripe along the trail, hiking is safe if and only if grizzly bears have not been seen in the area.
 d) It is not safe to hike on the trail, but grizzly bears have not been seen in the area and the berries along the trail are ripe.
 e) For hiking on the trail to be safe, it is necessary but not sufficient that berries not be ripe along the trail and for grizzly bears not to have been seen in the area.
 f) Hiking is not safe on the trail whenever grizzly bears have been seen in the area and berries are ripe along the trail.

16. Determine whether these biconditionals are true or false.

- a) $2 + 2 = 4$ if and only if $1 + 1 = 2$.
 b) $1 + 1 = 2$ if and only if $2 + 3 = 4$.
 c) $1 + 1 = 3$ if and only if monkeys can fly.
 d) $0 > 1$ if and only if $2 > 1$.

17. Determine whether each of these conditional statements is true or false.

- a) If $1 + 1 = 2$, then $2 + 2 = 5$.
 b) If $1 + 1 = 3$, then $2 + 2 = 4$.
 c) If $1 + 1 = 3$, then $2 + 2 = 5$.
 d) If monkeys can fly, then $1 + 1 = 3$.

18. Determine whether each of these conditional statements is true or false.

- a) If $1 + 1 = 3$, then unicorns exist.
 b) If $1 + 1 = 3$, then dogs can fly.
 c) If $1 + 1 = 2$, then dogs can fly.
 d) If $2 + 2 = 4$, then $1 + 2 = 3$.

19. For each of these sentences, determine whether an inclusive or, or an exclusive or, is intended. Explain your answer.

- a) Coffee or tea comes with dinner.
 b) A password must have at least three digits or be at least eight characters long.
 c) The prerequisite for the course is a course in number theory or a course in cryptography.
 d) You can pay using U.S. dollars or euros.
 20. For each of these sentences, determine whether an inclusive or, or an exclusive or, is intended. Explain your answer.
 a) Experience with C++ or Java is required.
 b) Lunch includes soup or salad.
 c) To enter the country you need a passport or a voter registration card.
 d) Publish or perish.
 21. For each of these sentences, state what the sentence means if the logical connective or is an inclusive or (that is, a disjunction) versus an exclusive or. Which of these meanings or do you think is intended?
 a) To take discrete mathematics, you must have taken calculus or a course in computer science.
 b) When you buy a new car from Acme Motor Company, you get \$2000 back in cash or a 2% car loan.
 c) Dinner for two includes two items from column A or three items from column B.
 d) School is closed if more than 2 feet of snow falls or if the wind chill is below -100 .
 22. Write each of these statements in the form "if p , then q " in English. [Hint: Refer to the list of common ways to express conditional statements provided in this section.]
 a) It is necessary to wash the boss's car to get promoted.
 b) Winds from the south imply a spring thaw.
 c) A sufficient condition for the warranty to be good is that you bought the computer less than a year ago.
 d) Willy gets caught whenever he cheats.
 e) You can access the website only if you pay a subscription fee.
 f) Getting elected follows from knowing the right people.
 g) Carol gets seasick whenever she is on a boat.
 23. Write each of these statements in the form "if p , then q " in English. [Hint: Refer to the list of common ways to express conditional statements.]
 a) It snows whenever the wind blows from the northeast. The apple trees will bloom if it stays warm for a week. That the Pistons win the championship implies that they beat the Lakers.
 d) It is necessary to walk 8 miles to get to the top of Long's Peak.
 e) To get tenure as a professor, it is sufficient to be world-famous.
 f) If you drive more than 400 miles, you will need to buy gasoline.
 g) Your guarantee is good only if you bought your CD player less than 90 days ago.
 h) Jan will go swimming unless the water is too cold.