

Section 1.11: The Conditional

Exercises

In the following exercises, let p denote “The movie was popular” and q denote “The movie will make a lot of money.” Translate the following propositions into English sentences.

1. $p \rightarrow q$
2. $\bar{p} \rightarrow \bar{q}$
3. $\bar{q} \rightarrow \bar{p}$
4. $q \rightarrow p$
5. $\bar{p} \vee q$
6. $p \wedge \bar{q}$

In the following exercises, let p denote “Pat eats a burger for dinner” and q denote “Pat is too full for dessert.” Translate the following sentences into logical symbols.

7. If Pat eats a burger for dinner, she will be too full for dessert.
8. If Pat does not eat a burger for dinner, she will not be too full for dessert.
9. If Pat is too full for dessert, then she ate a burger for dinner.
10. If Pat is not too full for dessert, then she did not eat a burger for dinner.
11. If Pat is too full for dessert, then she did not eat a burger for dinner.
12. Pat being too full for dessert implies that she ate a burger for dinner.
13. Pat not being too full for dessert implies that she did not eat a burger for dinner.
14. Pat not eating a burger for dinner implies that she will not be too full for dessert.
15. Pat eating a burger for dinner implies that she will be too full for dessert.
16. Either Pat does not eat a burger for dinner or she will be too full for dessert.
17. Either Pat is not too full for dessert or she ate a burger for dinner.
18. Either Pat is too full for dessert or she did not eat a burger for dinner.

19. The following conditional statement is true: If Pat is eaten by bears, she will not finish her marking. Given that, answer the following questions.

- a) Pat is eaten by bears. Did she finish her marking?
- b) Pat is not eaten by bears. Did she finish her marking?
- c) Pat finished her marking. Was she eaten by bears?
- d) Pat did not finish her marking. Was she eaten by bears?

20. The following conditional statement is true: If Rich is asleep, then he is not playing ping-pong. Given that, answer the following questions.

- a) Rich is playing ping-pong. Is he asleep?
- b) Rich is asleep. Is he playing ping-pong?
- c) Rich is not asleep. Is he playing ping-pong?
- d) Rich is not playing ping-pong. Is he asleep?

Of course, for the previous questions, I chose situations in which you can use common sense to determine the answer. However, the true test of whether you understand the concept is to replace the above propositions by complete nonsense.

21. The following conditional statement is true: If ettercaps are green, then toves are slithy. Given that, answer the following questions.

- a) Toves are slithy. Are ettercaps green?
- b) Toves are not slithy. Are ettercaps green?
- c) Ettercaps are green. Are toves slithy?
- d) Ettercaps are red. Are toves slithy?

22. The following conditional statement is true: If the hare reads the Times Colonist, the tortoise will take out the recycling. Given that, answer the following questions.

- a) The hare does not read the Times Colonist. Will the tortoise take out the recycling?
- b) The hare reads the Times Colonist. Will the tortoise take out the recycling?
- c) The tortoise takes out the recycling. Does the hare read the Times Colonist?
- d) The tortoise is not taking out the recycling. Does the hare read the Times Colonist?

Given the conditional statement, “If fratting is non-responsive, then the runges must be strunking”, write the corresponding English sentences for the following.

23. The contrapositive ($\bar{q} \rightarrow \bar{p}$)

24. The converse ($q \rightarrow p$)

25. The inverse ($\bar{p} \rightarrow \bar{q}$)
26. The “or” form ($\bar{p} \vee q$)
27. Given the conditional statement, “If Bossy is mooing, she must be a cow,” which of the four following statements is the contrapositive ($\bar{q} \rightarrow \bar{p}$)?
- a) If Bossy is not a cow, she is not mooing.
 - b) If Bossy is a cow, then she is mooing.
 - c) If Bossy is mooing, then she must be a cow.
 - d) If Bossy is not mooing, then she must not be a cow.
28. Given the conditional statement, “If Bossy is mooing, she must be a cow,” which of the four following statements is the converse ($q \rightarrow p$)?
- a) If Bossy is not a cow, she is not mooing.
 - b) If Bossy is a cow, then she is mooing.
 - c) If Bossy is mooing, then she must be a cow.
 - d) If Bossy is not mooing, then she must not be a cow.
29. If the statement “If Bossy is mooing, then she must be a cow,” is a true statement, which of the four following statements is also true?
- a) If Bossy is not a cow, she is not mooing.
 - b) If Bossy is a cow, then she is mooing.
 - c) Either Bossy is mooing or she is a cow.
 - d) If Bossy is not mooing, then she must not be a cow.
30. Which of the following is the correct “or” form for the conditional “If Bossy is mooing, then she must be a cow”?
- a) Bossy is a cow or she is not mooing.
 - b) Bossy is not a cow or she is not mooing.
 - c) Bossy is not a cow or she is mooing.
 - d) Bossy is a cow or she is mooing.
31. If the statement “If Bossy is mooing, then she must be a cow” is a true statement, which of the following cannot occur?
- a) Bossy is mooing and she is a cow.
 - b) Bossy is mooing and she is not a cow.
 - c) Bossy is not mooing and she is not a cow.
 - d) Bossy is not mooing and she is a cow.

32. Consider the following “or” form statement, “Either Superman has a cape or he cannot fly.” Which of the following is the correct form of the corresponding conditional?
- If Superman does not have a cape, then he cannot fly.
 - If Superman has a cape, then he can fly.
 - If Superman can fly, then he has a cape.
 - If Superman cannot fly, then he doesn’t have a cape.
33. Consider the conditional “If John has the flu or misses the bus, he will be late for work”. Which of the following is the corresponding contrapositive statement ($\bar{q} \rightarrow \bar{p}$)?
- If John is late for work, then he had the flu or missed the bus.
 - If John is late for work, then he did not have the flu or did not miss the bus.
 - If John is not late for work, then he did not have the flu or did not miss the bus.
 - If John is not late for work, then he did not have the flu and did not miss the bus.
34. Consider the conditional “If Rich doesn’t show his work or makes a mistake, then he will not get full credit”. Which of the following is the corresponding contrapositive statement ($\bar{q} \rightarrow \bar{p}$)?
- If Rich received full credit, then he showed his work and did not make a mistake.
 - If Rich received full credit, then he showed his work or did not make a mistake.
 - If Rich did not get full credit, then he didn’t show his work and made a mistake.
 - If Rich did not get full credit, then he didn’t show his work or made a mistake.
35. Consider the conditional “If Pat is late and has not called her husband, he will be worried”. Which of the following is the corresponding contrapositive statement ($\bar{q} \rightarrow \bar{p}$)?
- If Pat’s husband is not worried, then she is not late and did call him.
 - If Pat’s husband is not worried, then she is not late or did call him.
 - If Pat’s husband is worried, then she is late and has not called him.
 - If Pat’s husband is not worried, then she is late and did not call him.
36. Consider the conditional “If grunkles are circular, then runges are square and triptrops are blue”. Which of the following is the corresponding contrapositive statement ($\bar{q} \rightarrow \bar{p}$)?
- If runges are not square and triptrops are not blue, then grunkles are not circular.
 - If runges are not square or triptrops are not blue, then grunkles are circular.
 - If runges are not square or triptrops are not blue, then grunkles are not circular.

d) If runges are not square and triptrops are not blue, then grunkles are circular.