

Philosophy 109 Final Exam Practice

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1 Concepts

Directions: To answer the true or false section, you need to know the following concepts and rules:

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|---------------------------|---|
| 1. Statement | 13. Game of Chance |
| 2. Argument | 14. Bayesian Probability |
| 3. Validity | 15. Mutually Exclusive Sentences |
| 4. Soundness | 16. Independent Sentences |
| 5. Logical Truth | 17. Conditional Probability |
| 6. Logical Falsehood | 18. General and Limited Conjunction Rules |
| 7. Contingent statement | 19. General and Limited Disjunction Rules |
| 8. Equivalent | 20. Bayes Theorem |
| 9. Contradictory | 21. Entailment rule |
| 10. Consistent | 22. The Gamblers Fallacy |
| 11. Inconsistent | |
| 12. Strength (proposal 3) | |

2 Translation

Directions: Translate each of the following claims to TFL. **Make sure to provide a complete dictionary.**

1. If John and Kate both go to the party, Bill will go too.

2. Provided you don't get lost, the drive will last three hours.
3. You will win only if you practice.
4. Larry is the fastest and most agile, unless you count Beth.
5. If you can save \$100 a month, then if you can afford the insurance, then you can buy a motorcycle
6. We will reinstitute a military draft, only if either we are attacked on our soil or too few people sign up voluntarily
7. Either he is not allowed to go to the concert or if he finishes work on time, then he can meet us at the coffee shop.
8. The average man will bristle if you say his father was dishonest, but he will brag a little if he discovers that his great-grandfather was a pirate
9. She is athletic and creative, unless I am mistaken.
10. Soccer is the world's most popular sport and if it catches on in the US, football and basketball will lose fans.

3 Validity Testing

On the test, you will be asked to use both the full truth table method (but allowed to use the short method if you prefer). I'm adding practice for both here, since I think people need it more than the full tables. See the practice midterm and other practice sheets for more practice on full truth tables and short tables.

1. Use the full truth table method to evaluate the following argument for validity.

$$\begin{array}{l}
 \text{P1 } A \rightarrow C \\
 \text{P2 } B \rightarrow C \\
 \text{P3 } A \vee B \\
 \hline
 C \therefore C
 \end{array}$$

2. Use the short truth table method to evaluate the following argument for validity.

$$\begin{array}{l}
 \text{P1 } A \rightarrow B \\
 \text{P2 } \neg(C \vee D) \leftrightarrow B \\
 \text{P3 } D \rightarrow \neg E \\
 \hline
 C \therefore \neg E \rightarrow (B \rightarrow C)
 \end{array}$$

3. Use the full truth table method to evaluate the following argument for validity.

$$\begin{array}{l}
 \text{P1 } A \rightarrow B \\
 \text{P2 } B \rightarrow (C \vee D) \\
 \text{P3 } \neg D \\
 \hline
 C \therefore A \rightarrow C
 \end{array}$$

4. Use the short truth table method to evaluate the following argument for validity.

P1 $\neg A \vee B$

P2 $\neg C \rightarrow D$

P3 $(C \wedge A) \rightarrow E$

$C \therefore B \rightarrow (\neg D \rightarrow E)$

4 Probabilities with Tables

Directions: Use the probabilistic truth-table below to answer the questions.

World	A	B	C	Pr(w_i)
w_1	T	T	T	1/12
w_2	T	T	F	5/24
w_3	T	F	T	1/24
w_4	T	F	F	1/8
w_5	F	T	T	7/24
w_6	F	T	F	1/24
w_7	F	F	T	1/6
w_8	F	F	F	1/24

1. What is $\Pr(A)$?
2. What is $\Pr(B|A \vee C)$?
3. What is $\Pr(\neg(A \leftrightarrow B)|\neg C \rightarrow (A \rightarrow B))$?
4. Is the following argument strong according to our definition (proposal 3)?

P1 $A \wedge B$

C C

5. Is the following argument strong according to our definition (proposal 3)?

P1 $A \rightarrow B$

P2 B

C A

6. Is the following argument strong according to our definition (proposal 3)?

P1 $(B \wedge C) \vee A$

P2 $\neg(B \wedge C)$

C A

5 Probabilities and Gambles without Tables

5.1 Story 1

Directions: Answer the questions about the following story using our rules for probability (e.g., The limited Conjunction Rule and the General Conjunction Rule).

Story: Megan and Sara are playing a tabletop science fiction board game called Twilight Imperium. TI is played using 10 sided dice. Megan is in a tough spot: in order to win a space battle, she needs her battlecruiser to survive another attack by Sara, and then defeat Sara's dreadnaught. This means Sara's next die roll needs to roll less than 5 (S). Then, assuming this happens, Megan's die needs to roll greater than 7 (M). Megan will not get to roll her die if Sara's attack lands. Both dice are fair (and remember that they each have 10 sides!). Determine the following probabilities:

1. What is the probability that Megan wins? I.e., what is $Pr(M \wedge S)$?
2. What is the probability that either Sara will roll less than 5 or Megan will roll greater than 7? i.e., what is $Pr(S \vee M)$.
3. What is the probability Sara wins? i.e., what is the $Pr(\neg S \vee \neg M)$?
4. Suppose Sara offers Megan the following bet: Sara pays Megan \$1000 if she wins, \$500 if she survives the round but doesn't win (i.e., if $\neg M \wedge S$), but Megan has to pay Sara \$300 if Sara wins and Megan doesn't survive the round. What is the value of this bet to Megan? Should she take it or leave it?

5.2 Story 2

Directions: Answer the questions about the following story using our rules for probability (e.g., The limited Conjunction Rule and the General Conjunction Rule).

Story: Lisa is a mathlete competing in the annual Rutgers mathlympics. There are 15 events, she is competing in two of them, Algebra and Calculus. She is excellent at algebra, and so she thinks she has an 80% chance of winning that event (A). She is not quite so good at Calculus, so she think she has only a 20% chance of winning that. She thinks that winning the one is independent of winning the other. For each event she wins, Lisa will be entered into a grand prize winners raffle, where the winning ticket is selected randomly from the tickets given to the 15 winners.

1. What is the probability that Lisa wins both events and the grand prize raffle? I.e., what is $Pr((A \wedge C) \wedge R)$?

2. What is the probability that Lisa will win either the Algebra or the Calculus event?
3. What is the probability Lisa does not win the grand prize raffle?
4. How much should Lisa be willing to pay, rationally speaking, for a bet which pays her \$500 if she wins the grand prize raffle, and \$200 for winning Algebra, and the same for winning calculus (so she gets \$900 if she wins all three)?

6 Bayes Theorem

1. Frances is supposed to arrive at work by 9am. She leaves for work at 8am 40% of the time, but she leaves for work at 8:30 60% of the time. On the days she leaves for work at 8, she arrive by 9am 70% of the time. But for the days she leaves at 8:30, she arrives by 9am only 30% of the time. If she arrived at work by 9am today, then what is the probability that she left for work at 8?
2. A student has a nubmer of books that she purchased for her classes: 70% of her books cost under \$100, and 30% of her books cost \$100 or more. Of the books that cost under \$100, 10% are hardbacks and 90% are paperbacks. Of the books that cost \$100 or more, 80% are hardbacks and 20% are paperbacks. She recently loaned one of her hardbacks to a friend. Given that it was hardback, what is the probability that this book cost under \$100
3. Carly took her car to a garage for inspection and the mechanic said that her engine needed some major work. Since her car was old, Carly was not sure she wanted to invest the money for repairs. The mechanic said that if she did the repairs, then there was a .25 probability that the engine will break down within the next 25,000 miles. But if she did not do the repairs, then there was a .67 probability that the engine will break down within the next 25,000 miles. Suppose that Carly's car did break down within the next 25,000 miles. What is the probability that she did the repairs?