

Lab Questions

Thursday, 8 January 2026 9:10 AM

1. Tanvir wants to figure out the relative salaries of three coworkers: Gurkiran, Amit, and Tanvir, based on two facts. First, he knows that if Tanvir is not the highest paid, then Gurkiran is. Second, he knows that if Gurkiran is not the lowest paid, then Amit is the highest paid. Can Tanvir determine who earns the most and who earns the least based on this information? If so, who has the highest salary and who has the lowest? Explain your reasoning.

2. In a room there are only two types of people, namely Type 1 and Type 2. Type 1 people always tell the truth and Type 2 people always lie. You give a fair coin to a person in that room, without knowing which type he is from and tell him to toss it and hide the result from you till you ask for it. Upon asking, the person replies the following.

"The result of the toss is head if and only if I am telling the truth."
Then what is the result of the toss?

1. State the converse, contrapositive, and inverse of each of these conditional statements:
 a. I come to class whenever there is going to be a quiz.
 b. A positive integer is a prime only if it has no divisors other than 1 and itself.

On a certain island, there are only two types of islanders:

4. • knights, who always tell the truth, and
 • knaves, who always lie.

You meet two islanders named Aditya and Bhumika.

Aditya: Bhumika is a Knight and I am a knight.

Bhumika: Aditya is a Knave or I am a Knave.



Question: What types of islanders are Aditya and Bhumika?

5. Given the propositions:

- p : You get an A on the final exam.
- q : You do every exercise in this book.
- r : You get an A in this class.

What is the correct logical expression for the sentence: "To get an A in this class, it is necessary for you to get an A on the final"?

- a) $r \rightarrow p$
- b) $D \rightarrow r$

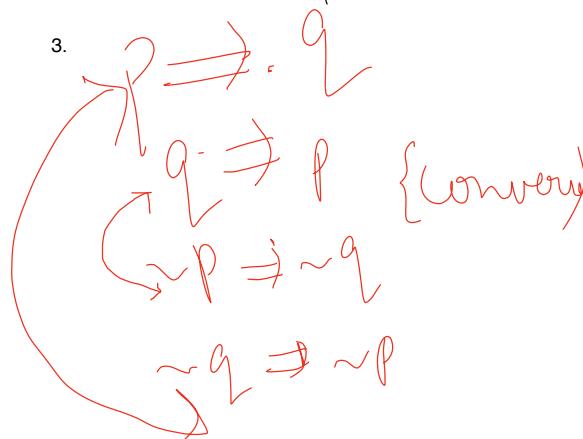
| Tanvir | Gurkiran | Amit |
|--------|----------|------|
| ✓ 1 | 2 | 3 |
| ✓ 2 | 1 | 3 |
| ✗ 2 | 3 | ✗ |
| ✗ 3 | 2 | ✗ |
| ✓ 3 | 1 | 2 |

1 : highest paid
 3 : lowest paid

$\models p : \text{Result is head}$

$q : \text{I am telling truth}$

| p | q | $p \leftrightarrow q$ | \Rightarrow | head |
|-----|-----|-----------------------|---------------|------|
| T | T | T | \Rightarrow | head |
| T | F | F | \Rightarrow | head |



$$\begin{array}{l}
 \text{c) } \mu \wedge p \\
 \text{d) } \neg p \rightarrow \neg \mu
 \end{array}$$

$\stackrel{4}{=}$ p : Aditya is knight $\neg p$: Aditya is knave
 q : Bhumika is knight $\neg q$: Bhumika is knave
 Aditya's statement: $p \wedge q$ Bhumika's statement: $(\neg p) \vee (\neg q)$

| Aditya | Bhumika | p | q | $\neg p$ | $\neg q$ | $p \wedge q$ | $\neg p \vee \neg q$ |
|----------|---------|-----|-----|----------|----------|--------------|----------------------|
| X Knight | Knight | T | T | F | F | T | F |
| X Knight | Knave | T | F | F | T | F | T |
| ✓ Knave | Knight | F | T | T | F | F | T |
| X Knave | Knave | F | F | T | T | F | T |