

Through Student Eyes: Assessing Their Ability to Evaluate Human and AI-generated Formative Feedback

Example of the task, authentic student response, and variants of feedback for two courses.

| Task (Example in English) | |
|---|--|
| <p>Let x be a real number. Prove that if x^2 is irrational, then x is irrational using:</p> <ol style="list-style-type: none"> 1) a proof by contraposition 2) a proof by contradiction <p>Detail the two proofs in a way that shows that you understood the difference between a proof by contraposition and a proof by contradiction.</p> | |
| Response | |
| <p>1. CONTRAPOSITION</p> <p>If x^2 is rational, then x is rational.</p> <ol style="list-style-type: none"> 1. x is rational 2. $x = 2k$, k is rational 3. $x^2 = 4k^2 = 2 \cdot (2k^2)$. Let's say that $k' = 2k^2$ 4. $x^2 = 2k'$ 5. $x = \sqrt{2k} = \sqrt{2} \cdot k$ <p>but $\sqrt{2}$ isn't rational so k is not rational. It means that x is not rational, then x^2 is not rational either. Therefore x is irrational and so is x^2.</p> <p>2. CONTRADICTION</p> <p>By contradiction, we suppose that x^2 is rational. It means that there exists two integers, a and b such that $x = a/b$. We then suppose that a and b have no factors in common. Then we obtain $x^2 = a^2 / b^2$ it implies that $x^2 \cdot b^2 = a^2$. Or, if b is even, then so is b^2 and so is a^2. Same if b is odd. So there is a contradiction and there can't be any positive integers a and b such that $x^2 = a^2 / b^2$, and therefore x is irrational.</p> | |
| Human feedback | AI feedback |
| In your contraposition attempt, your understanding of what constitutes a rational number appears flawed. A rational number is expressed as the quotient of two integers, not just as a product involving an integer. Your step " $x = 2k$, k is rational" doesn't necessarily ensure x is rational. | <p>You've shown good understanding of how to approach proofs. However, in the contraposition proof, your steps 2 and 3 aren't clear - specifically your assumption that if x is rational then $x=2k$.</p> <p>Contraposition implies proving that if x is rational (i.e., $x=a/b$), then x^2 is rational. In the contradiction proof, while you made a good start by assuming x^2 as rational and</p> |

In the contradiction approach, the logic connecting the evenness of b to a^2 isn't sufficiently explained, leading to an incorrect conclusion. Both methods require a clearer understanding of rational numbers and a more rigorous application of the respective proof techniques.

Your assumptions are unfortunately also nor right. For the contraposition you don't want to prove that "If x^2 is rational, then x is rational." but the inverse that "If x is rational, then x^2 is rational.". In proposition you say that $p \rightarrow q$ is equivalent to $\text{NOT } q \rightarrow \text{NOT } p$. So just proving that x rational implies that x^2 is also rational is enough to prove that x^2 irrational implies x irrational.

For the contradiction proof, your assumption is also not right. You don't want to prove that if x^2 irrational then x rational leads to a contradiction, but x^2 irrational AND x rational leads to a contradiction. The logic behind it is that what at the end you want to prove is that " x^2 irrational $\rightarrow x$ irrational" and this is FALSE only if x^2 irrational is TRUE and x irrational is FALSE and thus by proving that x^2 irrational AND x rational is always FALSE then you prove that " x^2 irrational $\rightarrow x$ irrational" is always TRUE because it can never be FALSE. That is the proof by contradiction

deriving a contradiction for it, there's confusion when you mention "even" and "odd". Remember we're considering irrationality or rationality here and not parity. Keep going!

Task (Example in French)

Dans cet exercice, nous souhaitons implémenter un algorithme pour chiffrer un message en mélangeant les lettres de ce message selon la règle suivante:
Soit $m = c_{\{1\}}c_{\{1\}}\dots c_{\{n\}}$, le message à chiffrer contenant n caractères, alors le message chiffré contient également n caractères et s'obtient en prenant la première lettre de m , puis la dernière, puis la seconde, puis l'avant-dernière, et ainsi de suite jusqu'à ce que toutes les lettres de m soient ajoutées dans le message chiffré.

Par exemple:

Si le message initial est bonjour, alors le message chiffré est brounoj ;

Si le message initial est examen, alors le message chiffré est enxeam.

On attire votre attention sur l'importance de la parité du nombre de caractères dans le mot à chiffrer.

a) Écrivez une fonction `encrypt(s: str) -> str` qui prend en paramètre le message en clair `s` et le chiffre selon l'algorithme décrit plus haut.

b) Écrivez une fonction `decrypt(s: str) -> str` qui prend en paramètre le message chiffré `s` et le déchiffre en sachant que la méthode de chiffrement est celle décrite plus haut.

Response

```
a) def encrypt(s: str) -> str:
    mot_chiffre : List[str] = [ ]
    x = 0
    y = len(s)

    while x != y :
        m = s.index[x]
        m = s.index[y]
        mot_chiffre.extend[m, n]

        x += 1
        y = y - 1
        if x==y:
            return : mot_chiffre
```

b)

Human feedback

Bonne logique, mais code légèrement incomplet. Initialisation correcte mais gestions des cas limites pas pris en compte. Faites attention aux fonctions utilisées sur les strings, elle n'existent pas vraiment ou s'utilisent pas exactement

AI feedback

Il semble que vous ayez compris le concept de l'algorithme. Cependant, votre code contient plusieurs erreurs. Pour la fonction `encrypt`, les indices sont mal utilisés (vous avez écrit `s.index[x]` au lieu de `s[x]`), l'extension du mot chiffré est

| | |
|---|--|
| comme cela, je conseillerai une révision de méthodes des strings pour la suite! | incorrecte et <code>`return`</code> n'est pas une commande valide en Python (<code>`return`</code>). Pour la fonction <code>`decrypt`</code> , vous n'avez rien fait. Essayez d'utiliser la solution donnée comme guide pour corriger vos erreurs. Continuez à travailler dur! |
|---|--|