# 3 mistakes Students make in **Number Properties** Questions - I

$32^2 = 1024$

Odd × Odd = **Odd**

Cyclicity of
0, 1, 5, 6, and 10 = 1

$Z = x^2 + y^2 + 4$

X = 0.25
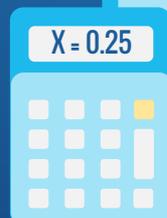
Number Properties

$Z = 8k - 3$

3 Mistakes Students Make in Number Properties Questions – Part I
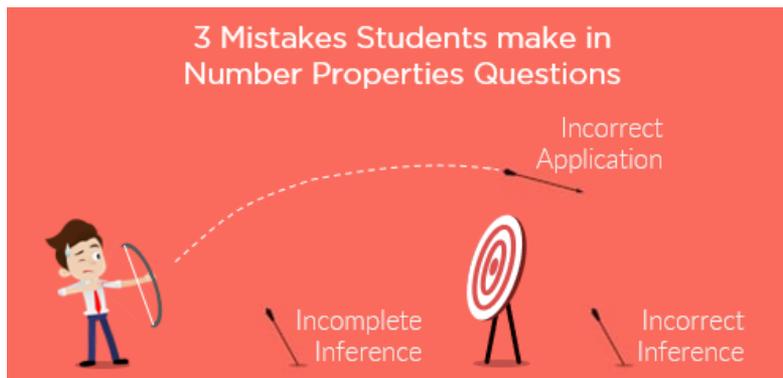
Why should you read this article?

Many students who do reasonably well in problem-solving questions continue to struggle with data sufficiency questions. Many times, they realise that when they make mistakes in DS questions, they knew the concept that was being tested – yet they are not able to get the questions right!

This article is designed to understand why these people make mistakes and essentially, how they can reduce or eliminate making those mistakes.

Agenda of the Article:

A major part of solving a DS question correctly involves inferring the information from the question stem...

- And, this is an area where students typically falter.

To help you, we will discuss three major mistakes that students make while applying inferences in a DS question.

These 3 mistakes are:

1. Drawing incorrect inference from the question stem.
2. Drawing incomplete inference from the question stem.
3. Faltering while applying the inferences.

We will take one question each to discuss the above 3 types of mistakes.

- And, all the questions are e-GMAT practice quiz questions, so we will also provide the accuracy and total number of forum queries for each question.

Let us discuss the first mistake.

Mistake 1: Drawing Incorrect Inference from the Question Stem

Many times, a student knows exactly how to solve a question correctly – he knows all the concepts, he even has all the processes in his mind, but all the learnings fail when he makes an incorrect inference to hasten the process of question-solving.

In mistake 1, we will look at one e-GMAT Practice question where students have made this type of mistake.

Let us look at the question first.

e-GMAT example with explanation

x, y, and z are positive integers, where x is an odd number and $z = x^2 + y^2 + 4$. Is y^2 divisible by 4?

1. **$z = 8k - 3$.**
2. **$(z - x + 1) = 2q + 1$.**

(For e-GMAT students: This question is present in the Even-Odd practice quiz of Number properties module)

    1.3   Even and Odd Integers Practice Quiz

Accuracy of the question: 55.10%

Total relevant forum post queries posted for this question: 14

- We know that 45% of the students got this question wrong and out of this 45%, 40% of the students got this one wrong despite knowing the required concepts.

So, let us understand this question first!

⚙ Solution:

Given:

- x, y, and z are positive integer and x is an odd number.
- $z = x^2 + y^2 + 4$

Inference from the given information:

- $z = Odd + y^2 + Even$
- $z = Odd + y^2$ *(As Odd + Even = Odd)*

To Find:

We need to find whether y^2 is divisible by 4 or not.

Inference from what we need to find:

Now, let us first look at one incorrect inference.

Student's Mistake - Incorrect Inference:

Notice the highlighted part of this query.

PS: Not sure if this happened with others but my monkey brain read that for y2 to be even, y needs to be even and therefore assumed that the question meant: y needs to be divisible by 4 and landed with the answer that (c) is correct. I quickly realised that I faltered in step 1 which is 'understand the question'. Definitely need to keep calm and practice more.
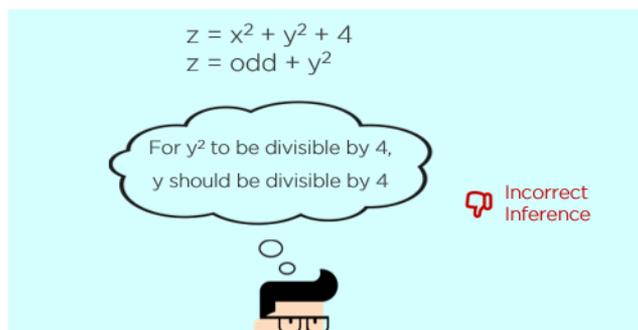
Now, is there anything wrong in this inference drawn by the student?
- It is actually partially incorrect.
  - The reason is that <u>student is considering only those values of y that are divisible by 4</u>.
  - What if y is divisible by 2 only and not divisible by 4?
    - For example, what if y = 2 or 6 or 10?
      - Is y^2 = 4 or 36 or 100 not divisible by 4?
      - It is.

Correct Inference:

Hence, the correct inference is that if y is divisible by 2 then y^2 will be divisible by 4.
- Or, essentially if y is even then y^2 is divisible by 4.

So, if you focus on <u>processing information in the correct manner</u> then you can get the question correct.
- The best thing is you don't need to learn any new concepts, it is only about developing good habits i.e. following step by step and methodical process.

How to avoid drawing incorrect inferences:

1. The first reason why students make this mistake is because <u>drawing inferences from question stem is not a part of their process to solve a DS question</u>.
   a. Basically, they start to draw inferences from the statements and that is how they make this mistake.
   b. So, make sure to include this step in your process.

2. Secondly, you might be drawing inferences from question stem, but <u>you rush to solve the question</u>.
    a. So, you make incomplete inferences.
    b. And, by focussing on processing the information, you can get the question correct.
3. It might happen that you are not rushing through the question and you are also inferring information from question stem, but you actually <u>don't have the depth/capability of understanding to draw inferences.</u>
    a. You should use these questions as an opportunity to learn and you will improve as you keep on practicing more questions.

Mistake 2: Drawing Incomplete Inference from the Question Stem

This is the second type of mistake where students infer incomplete information from the question stem.

To understand what I really mean by incomplete inference, let us look at another e-GMAT question.

e-GMAT question 2

e-GMAT example with explanation

The number x is a positive odd integer. If the unit digit of x^3 is subtracted from the unit digit of x^2, it results in 0. What is the unit digit of the number x + 7?

1. **The unit digit of the product of 105 and x is 5.**
2. **2. When x is divided by 5, it leaves no remainder.**

(For e-GMAT students: This question is present in units digit practice quiz of Number properties module)

3.3 Units Digit Practice Quiz

Accuracy of the question: 44.47%

Total relevant forum post queries posted for this question: 14
- Out of the 55% who got this question wrong, 35% of the students got this one wrong despite knowing the required concepts.

Let us understand why this happened.

⚙ <u>Solution:</u>

So, let us understand this question first!

<u>Given:</u>

- x is a positive odd integer.
- When the unit digit of x^3 is subtracted from the unit digit of x^2, it results in 0.

<u>Inference from the given information:</u>

Let us look at one incomplete inference first.

Student's Mistake - Incorrect Inference:

. Why Statement 1 is wrong?
  It says x = 5 and the solution you shown is also 5.
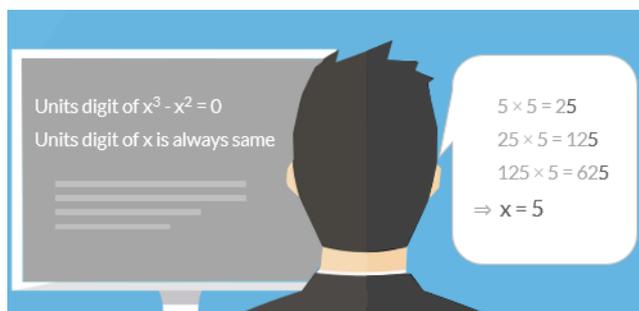
This student thinks that 105 is ending with 5 and its multiplication with another number is also ending with 5.

- So, he does some calculation in the back of his mind that:
    - 5×5 ends with 5
    - 25×5 also ends with 5
    - 125×5 also ends with 5.
- Therefore, x should be 5.

Now, all of you know that this is incomplete inference.

But, before reading further, I want you to find the correct inference by yourself.

Correct Inference:

Since the subtraction of units digits of x^3 and x^2 is resulting in 0, we can say that their **<u>units digits are equal</u>**.

- Units digit of x^3 = Units digit of x^2

Hence, we can say that the cyclicity of x is 1.

- *<u>Therefore, the possible units digit of odd integers with cyclicity 1 can be either 1 or 5 and not just 5</u>*.

For example:

- For x = 11, last digit of (105 × 11) = last digit of (5 × 1) = 5.
- For x = 31, last digit of (105 × 31) = last digit of (5 × 1) = 5.
- For x = 35, last digit of (105 × 35) = last digit of (5 × 5) = 5.
- For x = 65, last digit of (105 × 65) = last digit of (5 × 5) = 5.

So, the student made two mistakes.

1. He forgot to consider that the units digit of x can also be 1 – *which is an incomplete inference.*
2. He also relied on *number substitution* which gives wrong answers in many questions.
   a. The reason is simple – you take only one value and do not think of other possible values.
   b. As we saw in this question, last digit 5 works but it is not the only value of the last digit of x that works.

And, do you know that test makers also form such questions by keeping in minds these traps?

- *Want to see how…?*

Let us read statement 1 again.

Statement 1: The unit digit of the product of 105 and x is 5.

- Units digit of (105 × x) = 5

For units digit of x = 1 or 5, the units digit of (105 × x) is 5. For example:

1. Units digit of (105 × 11) = Units digit of (5 × 1) = 5.
2. Units digit of (105 × 25) = Units digit of (5 × 5) = 5.

If the student draws an incomplete inference and considers only 5 or only 1, then he will think that statement 1 is sufficient to answer and that is how he will fall into the trap.

- And, the only way to ensure that one does not fall into these kinds of traps is to <u>completely and correctly</u> infer all the information present in the question.

How to avoid drawing incomplete inferences

- You can avoid making incomplete inferences by following a proper step by step and methodical approach in every DS question.
- As in this question, we first found that cyclicity of x is 1 and then we found *two possible values of x* rather than directly coming to a value without proper analysis.
- This ensures that we are not missing out any inference that might be useful to solve a question correctly.

So, we have learned to avoid the 2 most common mistakes in DS questions.

We will discuss *"Mistake 3: Faltering while applying the inferences"* in the next article.

1. We discussed how important it is to draw inferences from the question stem.
    a. Please understand that the question stem provides important information that needs to be processed and inferred first.
    b. If this step is still not in your process, do add this and your accuracy will improve.
2. If you rush through things, then make sure you don't do that because you might miss out making some important inferences.
    a. Make a conscious effort to not rush through things. To start off, you can even assign yourself 45 sec – 1 min to process information and with practice, this process will happen automatically every time you will solve a question.
3. It might happen that you actually don't have the capability to draw those deep inferences in certain questions and it is in a way good.
    a. You can use these questions as a learning opportunity.
    b. Write down the inferences from the questions that you were unable to solve and revise those questions, so you don't make those mistakes again. ☺

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