

Chapel Hill Math Circle

1 Bibi writes 10 on a piece of paper and gives it to 5 students. Every student adds 1 **or** 3 **or** subtracts 1 **or** 3 from the number she/he got, and gives the result to the next student. **Can the resulting number be 22?**

For example, $10 \rightarrow 13 \rightarrow 16 \rightarrow 19 \rightarrow 18 \rightarrow 21$ is a way to get 21

Hint: Look at even/odd

2 One strange boy always tells the truth on Tuesdays and Wednesdays, always lies on Sundays, and other days of the week tells the truth, or lies, depending on his mood. The boy was asked his name 7 days in a row.

Here are his answers: Andy, Bob, Carl, Dave, Carl, Bob, Andy. **What is the boy's name?**

3 The boy was asked his middle name 6 days in a row.

Here are his answers: John, Alex, Paul, Sam, Mike, Sam. What is the boy's name?

4 We're on a special island where everyone is either a knight or a knave.

Knights always tell the truth.

Knives always lie.

You meet two people. Zoey says Mel is a knave. Mel says "Neither Zoey nor I are knaves."

Can you determine who is a knight and who is a knave?

5 You meet two people. Peggy tells you that "of Zippy and I, exactly one is a knight". Zippy tells you that only a knave would say that Peggy is a knave.

Can you determine who is a knight and who is a knave?

6 While traveling on the island, you want to go to the capital, but aren't sure if you're going the right way. You meet someone. You ask them 2 questions:

A: Is this the correct way to the capital?

B: Did you just answer YES?

They answer NO and YES. Is this the correct way to the capital?

What is the answers are NO and NO? Can you determine if they are a knight or knave?