Interpreting DNA Fingerpointing

A Paternity Case: Mr. I.M. Megabucks, the wealthiest man in the world, has recently died. Since his death, three women have come forward. Each woman claims to have a child by Megabucks and demands a substantial share in his estate for her child. Lawyers for the estate have insisted on DNA typing of each of the alleged heirs. Fortunately, Megabucks anticipated trouble like this before he died, and arranged to have a sample of his blood frozen for DNA typing.

Laboratory technicians used the Southern hybridization method to look at three highly variable chromosome regions. The results of the blots are shown below. Your job is to analyze the data and determine if any of the children could be Megabucks’ heir.

Remember that every person has two of each chromosome, one inherited from his/her mother and one from his/her father. Therefore, half of the children’s DNA bands will come from their mother, and the other half from their father. The question is, could that father be I.M. Megabucks?

1. For the first child (X’s child), identify the bands in the DNA profile that came from the mother (X). (Remember: not all of the mother’s DNA is transmitted to the child; just one of each pair of chromosomes is transmitted.) **Mark the bands that came from the mother with an M.**

2. Compare the remaining bands with the DNA profile from Megabucks. If he is the father, then all of the bands in the child’s profile that did not come from the mother should have a corresponding band in Megabucks’ profile. (Remember: not all of the father’s DNA is transmitted to the child; just one of each pair of chromosomes is transmitted.) Use a straight edge to help you line the bands up accurately. **Mark any band that matches one from Megabucks with an F.**

3. Repeat the analysis for the other alleged heirs (Y’s Child and Z’s child). Could any of them be Megabucks’ children? If so, which one(s)? _______________________

### Results of Southern Hybridization Analysis
A Mix-up at the Hospital: On June 6 at approximately 1:00 pm, Mrs. Smith, Mrs. Stevenson, and Mrs. Jones each delivered a healthy baby boy at Metropolitan General Hospital. At 1:20 pm, the hospital’s fire alarm sounded. Nurses and orderlies scrambled to evacuate patients. The three new babies were rushed to safety. After the danger had passed, the hospital staff was distressed to find that in the confusion, they had forgotten which baby was which! Because the babies were rescued before receiving their identification bracelets, there was no easy way to identify them. Dr. Anne Robinson, head of pediatrics, ordered that DNA typing be performed on the babies and their parents. The DNA typing laboratory looked at two different highly variable chromosome regions. The DNA profiles are shown below. Your job is to decide which baby belongs to which set of parents. To assign a baby to a set of parents, every band in the baby’s profile should match a band from either the mother or the father. Not all of the bands in the mother’s or father’s profiles will have a counterpart in the baby’s DNA profile. Use a ruler or straight edge to help you line up the bands.

Which baby belongs to which couple? Show which bands each baby inherited from its mother and from its father by marking each one with “M” and “F.” Put the baby’s number in the box to the right.

Who’ Who? Here’s the story of a lovely lady, who was bringing up one very lovely girl. She had blonde hair, just like her mother except she had curls. Here’s the story, of a man named Brady, who was busy with one adopted boy of his own. They were two men, living all together, yet they were all alone. Till the one day when the lady met this fellow, and before they knew it there was two more to their bunch. Now all these kids somehow form a family. That’s the way they all became the family Hunch.

Which children belong to just Mrs. Hunch? Which belong to both Hunches? And which child is adopted?

D1 belongs to _________________
D2 belongs to _________________
S1 belongs to _________________
S2 belongs to _________________