

Forensic Genetics

Module 19 – Topic 8 Answers

Exercise 1a: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$, and alternative hypotheses:

- The DNA in the sample came from a brother of the suspect;

Exercise 1a: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$:

- $LR = \frac{1}{0.25p_A^2 + 0.5p_A + 0.25} \approx 3.7;$

Exercise 1b: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$, and alternative hypotheses:

- The DNA in the sample came from a brother of the suspect;
- The DNA in the sample came from an identical twin of the suspect.

Exercise 1b: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$:

- $LR = \frac{1}{0.25p_A^2 + 0.5p_A + 0.25} \approx 3.7;$
- $LR = 1.$

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. What are the LR values when:

- $G_M = AA$ and $G_{AF} = BB$;

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. The LR values are:

- $$\text{LR} = \frac{\Pr(G_C=AB|G_M=AA,G_{AF}=BB,H_p)}{\Pr(G_C=AB|G_M=AA,H_d)} = \frac{1}{p_B};$$

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. What are the LR values when:

- $G_M = AA$ and $G_{AF} = BB$;
- $G_M = AA$ and $G_{AF} = CD$;

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. The LR values are:

- $$\text{LR} = \frac{\Pr(G_C=AB|G_M=AA,G_{AF}=BB,H_p)}{\Pr(G_C=AB|G_M=AA,H_d)} = \frac{1}{p_B};$$

- $$\text{LR} = \frac{\Pr(G_C=AB|G_M=AA,G_{AF}=CD,H_p)}{\Pr(G_C=AB|G_M=AA,H_d)} = 0;$$

Exercise 2b: Paternity Index

Calculate the weight of the evidence for the following data:

Locus	G_C	G_M	G_{AF}
TPOX	(6,9)	(6,12)	(8,9)
vWA	(17,17)	(17,16)	(17,17)
TH01	(7,9)	(9,10)	(7,9)

Locus	Allele	Frequency
TPOX	6	0.006
	8	0.506
	9	0.094
	12	0.038
vWA	16	0.276
	17	0.300
TH01	7	0.147
	9	0.232
	10	0.116

Source: Introduction to Statistics for Forensic Scientist (Lucy, 2005).

Exercise 2b: Paternity Index

Calculate the weight of the evidence for the following data:

Locus	G_C	G_M	G_{AF}
TPOX	(6,9)	(6,12)	(8,9)
vWA	(17,17)	(17,16)	(17,17)
TH01	(7,9)	(9,10)	(7,9)

We calculate single-locus LR's and combine these results through multiplication:

- TPOX: $LR = \frac{0.25}{0.5p_9} = \frac{1}{2 \times 0.094} = 5.32$;
- vWA: $LR = \frac{1}{p_{17}} = \frac{1}{0.3} = 3.33$;
- TH01: $LR = \frac{0.25}{0.5p_7} = \frac{1}{2 \times 0.147} = 3.40$.

Our overall LR is in this case 60.23, yielding evidence in favor of H_p .