

CHAPTER 4 Answers to Problems

Problem 4.1.

No.	uSAT-1	uSAT-2	uSAT-3
F1	10/10	15/15	2/2
P1	8/10	15/19	2/6
F2	10/12	21/22	8/10
P2	11/12	17/21	2/10
F3	5/10	16/22	6/8
P3	5/10	15/22	2/8
F4	8/12	18/22	2/6
P4	8/8	18/22	6/6
F5	5/11	15/21	2/8
P5	10/11	21/21	2/8
M1	5/10	19/21	8/8
M2	8/10	18/18	6/8
M3	5/11	15/17	2/2
M4	10/12	15/15	10/10
M5	8/11	19/19	6/6
M6	11/11	21/21	6/10
M7	10/10	16/16	8/8
M8	12/12	17/19	10/10
M9	10/12	18/22	8/8
M10	11/12	17/21	2/2

Problem 4.2. P1: M5; P2: M3 or M10; P3 :M3; P4 :M2; P5 : M1.

Problem 4.3. You should mate individual 9 with an individual that does not have the 183 allele (e.g., individual 5 (*195/199*)). If individual 9 is *183/183* then all progeny should be *183/195* or *183/199*. However, if 9 is *183/null* then one-half of the progeny should be either *195/null* or *199/null*. The presence of a single *195/null* or *199/null* progeny would confirm that 9 is *183/null*. At least 7 progeny that were neither *195/null* nor *199/null* would have to be examined to be more than 99% sure that 9 is not *183/null*. The probability of a progeny not receiving the null allele from a null allele heterozygote is 0.5. Using the multiplication rule (Box 5.1; Appendix Section A1), the probability of 7 consecutive progeny from a null allele heterozygote not receiving the null allele is 0.008.

Problem 4.4. The first male from the left was the father. There are several bands in the chicks that were not present in the mother and were only carried by this male.

Problem 4.5. The restriction sites are highlighted below:

INDIVIDUAL 1

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1  gtcaagttac  agggttgtgt  ctgtctgtgt  gactgagtgt  aactttgttc  attcattatg
61  tcctagacaa  cagaggtttg  tgtcgtctgt  gttttgacct  tcatttgtca  agtcatcgag
121  tacgtttttt  gtttttagga  gtcacctctt  cccgaactca  tggaaagatt  catgattgat
181  ttgacgcatt  atactgattg  ttccatagtc  acatacaaaa  acagggtcca  tcggcgagag
241  gtggtacatg  gagaaaatct  catgtttcct  cctggtgata  cattaaaaca  tgtgttctcc
301  atctataaaa  acagtggccc  caaacaagcg  gcaacatact  gaaccgacca  ccacactttc
361  aagtgaagta  atcatccttg  gcaattaaaga  gaaaaaaatg  ggacaaggta  aaccagcttt
421  tattttattt  ttttaagtgg  gaagtcagtg  taccatttaa  taccatttaa  cttaacatt
481  aaatcactga  ggcaggggcc  aagaaggcag  agaagagtg  aacaagtaat  gtactgccat
541  gaggtataaa  tctacttaca  cagaaccact  tcctttaaca  acctaaccat  gtgatctatt
601  agatttacat  ttgagttatt  tagcagagac  tcttatccag  agcgacttac  aggagcaatt
661  agggttaagt  gccttgctca  agggcacatc  aacagatttc  tcacctagtc  agctcagggg
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841  tttgacttac  tcgtttttat  acatttctta  ttttctgtca  tctctctttt  agtgtttctg
901  ctgatgccag  tcttactggg  cagttgtttc  ctgggtcaag  gggcggcgat  ggaaaaccaa
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INDIVIDUAL 2

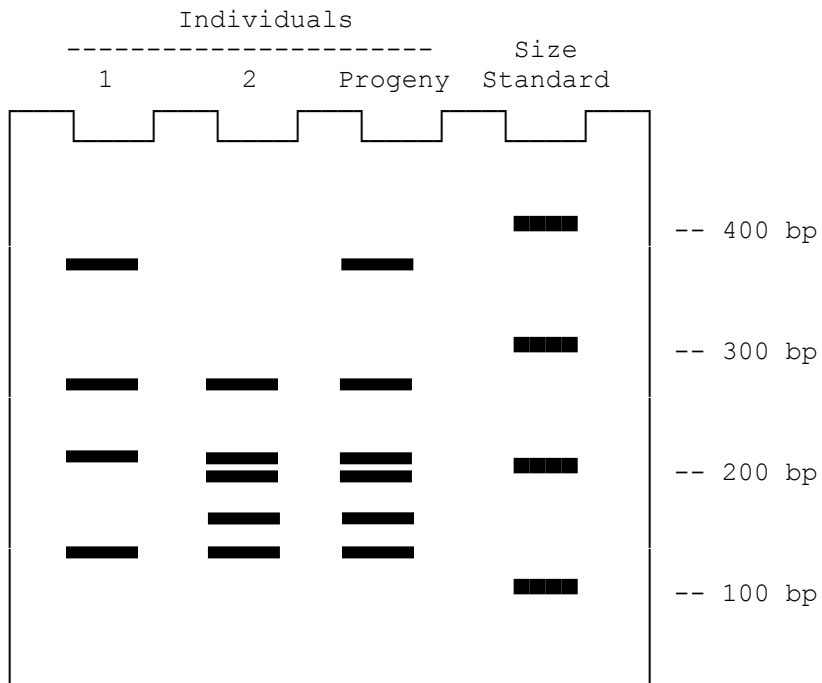
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1  gtcaagAtac  agggttgtgt  ctgtctgtgt  gactgagtgt  aactttgttc  attcattatg
61  tcctagacaa  cagaggtttg  tgtcgtctgt  gttttgacct  tcatttgtca  agtcatcgag
121  tacgtttttt  gtttttagga  gtcacGGctt  cccgaactca  tggaaaAatt  catgattgat
181  ttgacgcatt  atactgattg  ttccatagtc  acatacaaaa  acagggtcca  tcggcgagag
241  gtggtacatg  gagaaaatct  catgtttcct  cctggtgata  cattaaaaca  tgtgttctcc
301  atctataaaa  acagtggccc  caaacaagcg  gcaacatact  gaaTcgacca  ccacactttc
361  aagtgaagta  atcatccttg  gcaattaaaga  gaaaaaaatg  ggacaaggta  aaccagcttt
421  tattttattt  ttttaagtgg  gaagtcagtg  taccatttaa  taccatttaa  cttaacatt
481  taatcactga  ggcaggggcc  aagaaggcag  agaagagtg  aacaagtaat  gtacAgccat
541  gaggtataaa  tctacttaca  cagaaccact  tcctttaaca  acctaaccat  gtgatctatt
601  agatttacat  ttgagttatt  tagcagagac  tcttatccag  agcgacttac  aggagcaatt
661  agggttaagt  gccttgctca  agggcacatc  aacagatttc  tcacctagtc  agctcagggg
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841  tttgacttac  tcgtttttat  acatttctta  ttttctgtca  tctctctttt  agtgtttctg
901  ctgaGgccag  tcttactggg  cagttgtttc  ctgggtcaag  gggcAgcgat  ggaaaaccaa
961  cggctcttca  acatcgcggg  caaccgggtg  caaTacctcc  acctatGtggc  tcagaaaatg
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We expect the following fragments:

Individual 1: 132 bp, 230 bp, 274 bp, 384 bp.

Individual 2: 132 bp, 168 bp, 216 bp, 230 bp, 274 bp,

Individual 1: 132 bp, 168 bp, 216 bp, 230 bp, 274 bp, 384 bp.



Problem 4.7. These fragments are probably on the W chromosome that is not present in males. These fragments should not be used since they result from a difference between the W and Z chromosomes, and do are not an intraspecific polymorphism .

Problem 4.8. Identical twins.

Problem 4.10. There are four cut sites and therefore five fragments with *EcoRI* (see below): 627 bp , 762 bp, 3,390 bp, 4,063 bp, 7,800 bp.

```
1      acggctacagctatgtacaactgtaaagtgttataacttgtaaaccatggttataactaca
61     tctatgtataatattacatattatgtatttaccatataataactgcttgtgagtagta
121    cattatatgtattatcaacatacgggtgatttttaaccctcatacatcagcacaatcca
181    aggtttacattaagccaaacacgtgataataaccaactaagttgttttaactgattaat
241    tgctatatcaataaaaactccaattaacacggggtccgtctttaccaccaactttcagca
301    tcagtcgggcttaatgtagtaagaaccgaccaacgatttatcggtaggcataactcttatt
361    gatggtcaggggcagatatcgtattaggtcgcacatctcgtgaattattcctggcatttggg
421    tcctaagtcaagggctatccttaagaaaccagccccctgaaagccgaatgtaaagcatctg
481    gttaatgggtgtcaatcttattgccccgttaccaccaagccgggcttctcttatatgcat
541    agggttctctttttttttttttttttttttcagcttgcatatacaagtgcaagcaaagaag
601    tctaacaaggtcgaactagatcttGAATTCcagagaaccatgtatcatggtgaaatgat
661    attctataaagaatcacatacttggatatacaagtgcataagggtcaattattttcttcaca
721    gatacctaagatcgcctcccggcttttgcgcgggtaaaccctacccttaagctgaaa
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841    tatacattaataaaacttttatgcaacttttagcatttggcaccgacagcgcgtgtaatgcgta
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1021   aaagcataaacactgaagctgttaagacggaccctagaaagtcccgttagcacaaggctt
1081   ggtcctgactttactatcagctctaaactgaacttacacatgcaagtctccgcattcctgt
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1201   ccacgacgccttgctaagccacaccccccaaggaaactcagcagtgataaatattaagcca
1261   taagcgaaagcttgacttagttaagggttaagagggcgggtaaaactcgtgccagccaccg
1321   cggttatacagagagaccctagttgataactaccggcgtaaagagtggttatggaaaatat
1381   ttaataaagccgaacacccccctcagccgtcatacgcacctgggagcagcaagacctactg
1441   cgaaagcagcgtttaactatgcctgacccacgacagctaagaaacaaactgggattaga
1501   taccactatgcctagccgtaaaccttgatagaaatatacaattgatatccgccagggaa
1561   ctacaagcgcagcttaaaaccacaaaggacttggcgggtgcctcagaccacctagaggag
1621   cctgttctagaaccgataacccccgttcaacctcaccaccccttggtttaccgcctata
1681   taccaccgtcgtcagcttaccctgtgaaggccccatagtagcaaaatgggcaaaaccaa
1741   acgtcaggtcgaggtgtagcgcacatgaggtgggaagaaatgggctacattctctaaattag
1801   agcactacgaaccacgctgtgaaatcagcgtccgaaggtgaaattttagcagtaaacagaa
1861   aacagagagttctcttgaaactggctctgagggcgcgcacacaccgcccgtcactctccc
1921   aagttcaacctgtccttctaactaagaagttaaccgaacaaaggggagggcaagtctgaac
1981   atggtaagtgtaccggaaggtgagcttgggaataaccagagtgtagctaaaataggaaagc
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2161   acaaaccatttttccaccttagtagggggcgaccgaaaaggagataattgagcaacagaaa
2221   aagtagcgaaggggaagctgaaagagaattgaaataaccatttaagcctagagaagca
2281   gagattaaatctcgtaccttttgcacatgatatttagccagcacacctgagcaagagaaac
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2401   ccgtctctgtggcaaaagagtgaggacgagccccgagtagaggtgataaacctatcgagcc
2461   tagttatagctgggttgccttaggaaatgaatagaagttcagccccccggctttcttaggac
2521   cttaagggtaaaactaatattgtcccaaagaaaccaggagaggttagtcaaaggaggtacag
2581   ctctttgaacaaggacacaaccttaacagggcggctaaaggatcatagttccaaggtaacc
2641   tgttacagtgggcctaagagcagccacctgcacagaaagcgttaaagctcagacagatac
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9601 caggccaccaactaattgctacagcagcctttgttcttctacctataatacctacagtag
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There are 43 cut sites and therefore 44 fragments with *Mbo*I (see below).

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