Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Independence and Base Rates

Use joint and marginal probabilities to check independence. In Bayes problems, keep the prior visible.

1. **The same test has sensitivity 0.9 and false-positive rate 0.2. Compare P(condition | positive) in populations with priors 0.1 and 0.3.**

Reference: Bayes: posterior=(prior x sensitivity)/[(prior x sensitivity)+(1-prior)x false-positive rate].

2. **A condition has prior 0.1. A test has P(positive | condition)=0.75 and P(positive | no condition)=0.1. A student claims P(condition | positive)=0.75. Explain the error and find the correct posterior.**

Reference: Reversing a conditional changes its denominator. Use the prior and total positive probability.

State the model or rule, show exact setup, then round only the final decimal.

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3. **A 96-person table has 48 in A, 24 in B, and 12 in both A and B. Complete the four cell counts and decide whether A and B are independent.**

Reference: Events are independent exactly when P(A intersection B)=P(A)P(B).

4. **The same test has sensitivity 0.8 and false-positive rate 0.2. Compare P(condition | positive) in populations with priors 0.1 and 0.3.**

Reference: Bayes: posterior=(prior x sensitivity)/[(prior x sensitivity)+(1-prior)x false-positive rate].

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5. **A 112-person table has 56 in A, 28 in B, and 14 in both A and B. Complete the four cell counts and decide whether A and B are independent.**

Reference: Events are independent exactly when P(A intersection B)=P(A)P(B).

6. **A condition has prior 0.1. A test has P(positive | condition)=0.75 and P(positive | no condition)=0.05. A student claims P(condition | positive)=0.75. Explain the error and find the correct posterior.**

Reference: Reversing a conditional changes its denominator. Use the prior and total positive probability.

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7. **A 128-person table has 64 in A, 32 in B, and 16 in both A and B. Complete the four cell counts and decide whether A and B are independent.**

Reference: Events are independent exactly when P(A intersection B)=P(A)P(B).

8. **The same test has sensitivity 0.8 and false-positive rate 0.1. Compare P(condition | positive) in populations with priors 0.01 and 0.4.**

Reference: Bayes: posterior=(prior x sensitivity)/[(prior x sensitivity)+(1-prior)x false-positive rate].