Stat 134 Study Group  
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Midterm 1 Review Solution

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<tbody>
<tr>
<td>1. a</td>
<td>$P(H_1) = \frac{8}{10}$</td>
<td>b</td>
<td>$P(H_2) = \frac{8}{10}$</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>$P(H_2</td>
<td>H_1) = \frac{15}{16}$</td>
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<td>2.</td>
<td>$P(Y = X) = \binom{2n}{n} \left(\frac{1}{2}\right)^{2n}$</td>
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<td>3. a</td>
<td>$x + 3x(x-1) + x(x-1)(x-2) = x^3$</td>
<td>b</td>
<td>$E(X^3) = \mu + 3\mu^2 + \mu^3$</td>
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<td>4. a</td>
<td>$P(X = 1) = 10 \cdot \left(\frac{1}{10}\right)^{12}$</td>
<td>b</td>
<td>$P(X = 2) = \left(\frac{10}{2}\right) \left[\left(\frac{2}{10}\right)^{12} - 2 \left(\frac{1}{10}\right)^{12}\right]$</td>
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<tr>
<td></td>
<td>c</td>
<td>$E(X) = 10 \left[1 - \left(\frac{9}{10}\right)^{12}\right]$</td>
<td>d</td>
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<td>5. a</td>
<td>$P(X = x) = \binom{20}{x} \left(\frac{30}{x-7}\right) \left(\frac{50}{x-1}\right) \cdot \frac{14}{51-x}$, on ${7, ..., 37}$</td>
<td></td>
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<td>b</td>
<td>$E(X) = 17$</td>
<td>c</td>
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<td>6. a</td>
<td>$x = 2, 3, ..., 11$</td>
<td>b</td>
<td>$E(X) = \frac{41}{6}$</td>
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<td>7. a</td>
<td>$P(X &lt; Y) = \frac{1}{2}$</td>
<td>b</td>
<td>$P(X = 3, Y = 8) = \left(\frac{4}{6}\right)^2 \cdot \frac{1}{6} \cdot \left(\frac{5}{6}\right)^4 \cdot \frac{1}{6}$</td>
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<td></td>
<td>c</td>
<td>$P(X \leq k, Y \leq k) = 1 - 2 \left(\frac{5}{6}\right)^k + \left(\frac{4}{6}\right)^k$</td>
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<td>8. a</td>
<td>$P(S = s) = (s-1)p^2(1-p)^{s-2}$</td>
<td>b</td>
<td>$P(S = s) = \frac{q_1^{s-1} - q_1^{-s-1}}{q_2 - q_1}$</td>
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<td>9. a</td>
<td>$P(X = x) = (q_1q_2q_3)^{x-1}(1 - q_1q_2q_3)$ $\sim Geom(1 - q_1q_2q_3)$ on ${1, 2, 3, \ldots}$</td>
<td>b</td>
<td>$P(X \leq 10) = 1 - (q_1q_2q_3)^{10}$</td>
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<td></td>
<td>c</td>
<td>$Var(X) = \frac{q_1q_2q_3}{(1 - q_1q_2q_3)^2}$</td>
<td>d</td>
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<td>10. a</td>
<td>$P(X + Y \geq 1) = 1 - e^{-7}$</td>
<td>b</td>
<td>$P(X = 5) = \left(\frac{11}{5}\right)^3 \left(\frac{3}{5}\right)^6 \left(\frac{4}{7}\right)$</td>
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<td>11. a</td>
<td>$P(X = x</td>
<td>N = n) = \binom{n}{x} \mu^x q^{n-x}$</td>
<td>b</td>
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<tr>
<td>12. a</td>
<td>$P(X \geq 150) \leq \frac{2}{3}$</td>
<td>b</td>
<td>$P(X \geq 150) \leq \frac{8}{13}$</td>
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<tr>
<td></td>
<td>c</td>
<td>$P(X \geq 150) \leq \frac{1}{4}$</td>
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<td>13. a</td>
<td>$P(X^2 \geq 625) \leq \frac{36}{389}$ by Chebychev</td>
<td>b</td>
<td>$P(X^2 \geq 400) \leq \frac{1}{4}$ by either method</td>
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<tr>
<td></td>
<td>c</td>
<td>$P(X^2 \geq 225) \leq \frac{1}{5}$ by Markov</td>
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Written by Mike Leong, mleong@berkeley.edu  
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