Himanshu Rana
2/18
MA331 Hw 3
"I pledge my honor that I have abided by the Stevens Honor System" - Himanshu Rana

1) | 5 BK |
| 3 R |
| 1 BL |

$X = \begin{cases} 1 = \text{black marble} \\ 0 = \text{non-black marble} \end{cases}$

a) $p = \frac{5}{9}$ $E(X) = p = \frac{5}{9}$ $V(X) = p(1-p) = \frac{5}{9}(\frac{4}{9}) = \frac{20}{81}$

b) $P(Y \leq 2) = P(Y=0) + P(Y=1) + P(Y=2)$
$\binom{4}{0}(\frac{5}{9})^0(\frac{4}{9})^4 + \binom{4}{1}(\frac{5}{9})^1(\frac{4}{9})^3 + \binom{4}{2}(\frac{5}{9})^2(\frac{4}{9})^2 \approx .834$

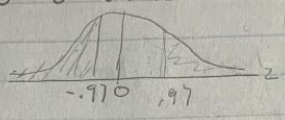
c) This sample can be considered an SRS because Billy is picking the marbles with replacement which means the second is not affected by the first marble he chose. Each marble has the same probability of being chosen. and leads to i.i.d. RVs.

d) -

2) a) $n=20$ $P(B \leq 4) = .237$
$n=30$ $P(B \leq 4) = .030$
$n=40$ $P(B \leq 4) = .0025$
$n=50$ $P(B \leq 4) = .00017$
$n=60$ $P(B \leq 4) = 9.9 \times 10^{-6}$

b) $n=20 \quad \mu = (20)(.3) = 6 \quad \sigma = \sqrt{(20)(.3)(.7)} = 2.05$

$z = \frac{4-6}{2.05} = -.97$ $\quad = 1 - .166$




$n=30 \quad \mu = (30)(.3) = 9 \quad \sigma = \sqrt{(30)(.3)(.7)} = 2.51$

$z = \frac{4-9}{2.51} = -1.99 \Rightarrow .0213$

$n=40 \quad \mu = (40)(.3) = 12 \quad \sigma = \sqrt{(40)(.3)(.7)} = 2.89$

$z = \frac{4-12}{2.89} = -2.76 \Rightarrow .0029$

$n=50 \quad \mu = (50)(.3) = 15 \quad \sigma = \sqrt{(50)(.3)(.7)} = 3.24$

$z = \frac{4-15}{3.24} = -3.39 \Rightarrow .0003$

$n=60 \quad \mu = (60)(.3) = 18 \quad \sigma = \sqrt{(60)(.3)(.7)} = 3.54$

$z = \frac{4-18}{3.54} = -3.9 \Rightarrow .00003$

c) $n=20 \quad |.237 - .166| = .071$

$n=30 \quad |.030 - .0213| = .0087$

$n=40 \quad |.0025 - .0029| = .0004$

$n=50 \quad |.00017 - .0003| = .00013$

$n=60 \quad |9.9 \times 10^{-6} - .00003| = .00002$