Day 1:

$X \sim Bin(0.02, 20)$

$E[X] = np = 0.02(20) = 0.4$

$P(X=0) = \binom{20}{0}(0.02)^0(0.98)^{20} = 0.6676$

$P(X=1) = \binom{20}{1}(0.02)^1(0.98)^{19} = 0.2725$

$P(X=2) = \binom{20}{2}(0.02)^2(0.98)^{18} = 0.0528$

$P(X=3) = \binom{20}{3}(0.02)^3(0.98)^{17} = 0.0065$

$P(X=4) = \binom{20}{4}(0.02)^4(0.98)^{16} = 0.0006$

$E[\text{Day 2}] = 0(0.4457)$

$+ 1(0.1819 + 0.1856)$

$+ 2(0.0352 + 0.0720 + 0.0367)$

$+ 3(0.0043 + 0.0132 + 0.0135 + 0.0046)$

$+ 4(0.0004 + 0.0015 + 0.0023 + 0.0016 + 0.0004)$

$+ 5(0.0001 + 0.0003)$

$= 0.7889$

Day 2:

Conditional Probabilities:

$P(X_2=0 \mid X_1=0) = 0.6676$

$P(X_2=0 \cap X_1=0) = 0.6676^2 = 0.4457 \quad X=0$

$P(X_2=1 \mid X_1=0) = 0.2725$

$P(X_2=1 \cap X_1=0) = 0.2725(0.6676) = 0.1819 \quad X=1$

$P(X_2=2 \cap X_1=0) = (0.0528)(0.6676) = 0.0352 \quad X=2$

$P(X_2=3 \cap X_1=0) = (0.0065)(0.6676) = 0.0043 \quad X=3$

$P(X_2=4 \cap X_1=0) = (0.0006)(0.6676) = 0.0004 \quad X=4$

$P(X_2=0 \mid X_1=1) = \binom{19}{0}(0.02)^0(0.98)^{19} = 0.6812 \quad X=1$

$P(X_2=0 \cap X_1=1) = 0.6812(0.2725) = 0.1856$

$P(X_2=1 \mid X_1=1) = \binom{19}{1}(0.02)^1(0.98)^{18} = 0.2642 \quad X=2$

$P(X_2=1 \cap X_1=1) = 0.2642(0.2725) = 0.0720$

$P(X_2=2 \mid X_1=1) = \binom{19}{2}(0.02)^2(0.98)^{17} = 0.0485 \quad X=3$

$P(X_2=2 \cap X_1=1) = 0.0485(0.2725) = 0.0132$

$P(X_2=3 \mid X_1=1) = \binom{19}{3}(0.02)^3(0.98)^{16} = 0.0056 \quad X=4$

$P(X_2=3 \cap X_1=1) = 0.0056(0.2725) = 0.0015$

$P(X_2=4 \mid X_1=1) = \binom{19}{4}(0.02)^4(0.98)^{15} = 0.0005 \quad X=5$

$P(X_2=4 \cap X_1=1) = 0.0005(0.2725) = 0.0001$

$P(X_2=0 \mid X_1=2) = \binom{18}{0}(0.02)^0(0.98)^{18} = 0.6951$

$P(X_2=0 \cap X_1=2) = 0.6951(0.0528) = 0.0367 \quad X=2$

$P(X_2=1 \mid X_1=2) = \binom{18}{1}(0.02)^1(0.98)^{17} = 0.2554 \quad X=3$

$P(X_2=1 \cap X_1=2) = 0.2554(0.0528) = 0.0135$

$P(X_2=2 \mid X_1=2) = \binom{18}{2}(0.02)^2(0.98)^{16} = 0.0443 \quad X=4$

$P(X_2=2 \cap X_1=2) = 0.0443(0.0528) = 0.0023$

$P(X_2=3 \mid X_1=2) = \binom{18}{3}(0.02)^3(0.98)^{15} = 0.0048 \quad X=5$

$P(X_2=3 \cap X_1=2) = 0.0048(0.0528) = 0.0003$

$P(X_2=0 \mid X_1=4) = \binom{16}{0}(0.02)^0(0.98)^{16} = 0.7238$

$P(X_2=0 \cap X_1=4) = 0.7238(0.0006) = 0.0004$

$X=4$

$P(X_3=0 \mid X_1=3) = \binom{17}{0}(0.02)^0(0.98)^{17} = 0.7093 \quad X=3$

$P(X_3=0 \cap X_1=3) = 0.7093(0.0065) = 0.0046$

$P(X_3=1 \mid X_1=3) = \binom{17}{1}(0.02)^1(0.98)^{16} = 0.2461 \quad X=4$

$P(X_3=1 \cap X_1=3) = 0.2461(0.0065) = 0.0016$

$P(X_3=2 \mid X_1=3) = \binom{17}{2}(0.02)^2(0.98)^{15} = 0.0402 \quad X=5$

$P(X_3=2 \cap X_1=3) = 0.0402(0.0065) = 0.0003$