1. 設
L: l female LB
B: b male lb

(a)
female: LLBB, LlBb,
LlBB, LlBb, #

male: llbb #

(b)
(i) LLBB × llbb

L-l-B-b → LlBb

(ii) LLBb × llbb

L-l-B-b → LlBb
\
b-b → Llbb ✓

(iii) LlBB × llbb

L-l-B-b → LlBb
l-l-B-b → llBb

(iiii)
LlBb × llbb

L-l < B-b → LlBb
\ b-b → Llbb ✓
l-l < B-b → llBb
\ b-b → llbb

(c) 找到白化雄龙

(i) 0%

(ii) 50%

(iii) 0%

(iiii) 25% #

2. A：母猪*車我

B：牛有 infected virus.

(a) $\frac{40}{200} = 0.2$ #

(b) $\frac{40}{100} = 0.4$ #

(c) 牛有 infected virus 的机率：$P(B) = \frac{60}{200} = 0.3$ #

3.

(a) (1) $\frac{4}{100000} \times 200,000 = 8$ #

(2) $\lambda = np = 8$

$p(x) = \frac{e^{-8} 8^x}{x!}$

$p(0) + p(1) + p(2) + \cdots + p(10) = \frac{e^{-8} 8^0}{0!} + \frac{e^{-8} 8^1}{1!} + \cdots + \frac{e^{-8} 8^{10}}{10!} = 0.816$ #

(3)

$p(6) + p(7) + p(8) + p(9) + p(10) = \frac{e^{-8} 8^6}{6!} + \frac{e^{-8} 8^7}{7!} + \cdots + \frac{e^{-8} 8^{10}}{10!} = 0.625$ #

(b)

$p = \frac{5}{10^6}$

$\lambda = np = 2 \times 10^6 \times \frac{5}{10^6} = 10$

$1 - p(0) = 1 - \frac{e^{-10} 10^0}{0!} = 0.99995$ #

(c)

(1) $p = \frac{1}{50}$

$700 \times \frac{1}{50} = 14$ #

(2) $\lambda = 14$, $p(x) = \frac{e^{-14} \cdot 14^x}{x!}$

$p(0) + p(1) + \cdots + p(10) = \frac{e^{-14} 14^0}{0!} + \frac{e^{-14} 14^1}{1!} + \cdots + \frac{e^{-14} \cdot 14^{10}}{10!} = 0.1757$ #

(3)

$0.1757 \times 0.1757 \times 0.1757 = (0.1757)^3 = 0.00542$ #

4.

(a)

(i) $P(X \leq 3) = 0.1 + 0.15 + 0.5 = 0.75$ #

(ii) $P(X > 1) = 1 - P(X \leq 1) = 1 - 0.1 = 0.9$ #

(iii) $P(2 \leq X \leq 4) = 0.15 + 0.5 + 0.15 = 0.8$ #

(b) $1 \times 0.1 + 2 \times 0.15 + 3 \times 0.5 + 4 \times 0.15 + 5 \times 0.1 = 3$ #

(c) $\sigma^2 = E(X^2) - E^2(X)$

$E(X^2) = 1^2 \times 0.1 + 2^2 \times 0.15 + 3^2 \times 0.5 + 4^2 \times 0.15 + 5^2 \times 0.1 = 10.1$

$\sigma^2 = 10.1 - 3^2 = 1.1$ #

(d) $E(e^X) = 0.1 \times e^1 + 0.15 \times e^2 + 0.5 \times e^3 + 0.15 \times e^4 + 0.1 \times e^5 = 34.4540$ #

(e) $E(\sqrt{X}) = 0.1 \times \sqrt{1} + 0.15 \times \sqrt{2} + 0.5 \times \sqrt{3} + 0.15 \times \sqrt{4} + 0.1 \times \sqrt{5} = 1.7018$ #

5.

(a) (i) $20 \times 0.6 = 12$ ✱

(ii) $\binom{20}{0} 0.6^0 0.4^{20} + \binom{20}{1} 0.6^1 0.4^{19} + \cdots + \binom{20}{9} 0.6^9 0.4^{11}$

$= 0.1275 > 0.05$

$\because 0.1275 > 0.05$.

$\therefore p = 0.6$ is reasonable ✱

(b) 存活率 $\frac{16}{20} = 0.8$.

$n = 10$.

at least 8個存活.

$\binom{10}{8} 0.8^8 0.2^2 + \binom{10}{9} 0.8^9 0.2^1 + \binom{10}{10} 0.8^{10} 0.2^0 = 0.6777$ ✱