p107 Ex5A no.1

1. $X \sim B(6, \frac{1}{3})$

a) $P(X=2) = {}^6C_2 \left(\frac{1}{3}\right)^2 \left(\frac{2}{3}\right)^4$

$= \frac{6\times5}{2\times1} \cdot \frac{2^4}{3^6}$

$= \frac{15 \cdot 16}{27^2}$

$= \frac{80}{243}$

b) $P(X<2) = P(X=0) + P(X=1)$

$= {}^6C_0 \left(\frac{1}{3}\right)^0 \left(\frac{2}{3}\right)^6 + {}^6C_1 \left(\frac{1}{3}\right)^1 \left(\frac{2}{3}\right)^5$

$= 1 \cdot \frac{2^6}{3^6} + 6 \cdot \frac{2^5}{3^6}$

$= \frac{256}{729}$

c) $P(X \geq 1) = 1 - P(X<1)$

$= 1 - P(X=0)$

$= 1 - \frac{2^6}{3^6}$

$= \frac{665}{729}$.

Ex 5A no. 2

$X \sim B(10, 0.3)$

a) $P(X=9) = 0.00013778\ldots$

$= 0.0001$ (4dp)

from binompdf(10, 0.3, 9)

b) $P(X=0) = 0.028248$

≈ 0.0282 (4dp)

from binompdf(10, 0.3, 0)

c) $P(X \leq 5) = 0.952651\ldots$

≈ 0.9527 (4dp)

from binomcdf(10, 0.3, 0, 5)

Ex5A no. 3

3. 3 white, 1 red.

4 rolls.

X = no. times red face down

$X \sim B(4, \frac{1}{4})$

We want x s.t. $P(X=x)$ is maximised

From binompdf $(4, \frac{1}{4})$ we see

x	0	1	2	3	4
$P(X=x)$	0·32	0·42	0·21	0·05	0

∴ the most likely number of times is once.

Ex5A no. 4

$P(\text{get a lift}) = 0.6$

X = no. of days I get a lift

$X \sim B(5, 0.6)$

$P(X=2) = 0.2304$ (4dp) by binompdf(5, 0.6, 2)

Ex 5A no. 5.

10 tested

rejected if >1 are faulty

P(pen faulty) = 0.02

X = no. of faulty pens in a sample of 10

$X \sim B(10, 0.02)$

P(consignment accepted) = $P(X \leq 1)$

= 0.983822 binomcdf(10, 0.02, 0, 1)

= 0.9838 (4dp)