Binomial Probability and Hypothesis Testing.

1a) $X = 5 \quad N = 15 \quad p = 0.35$

$P(X = 5) = \underline{\underline{0.212}}$ (3sf)

b) $X = 3 \quad N = 15 \quad p = 0.35$ (cumulative)

$P(X < 4) = \underline{\underline{0.173}}$ (3sf)

c) $X = 10 \quad N = 15 \quad p = 0.35$ (cumulative)

$P(X \leq 10) = \underline{\underline{0.997}}$ (3sf)

2a) $X = 1 \quad N = 30 \quad P = 0.1$

$P(X = 1) = \underline{\underline{0.141}}$ (3sf)

b) probability of more than 4 = 1 − P(4 or less)

$X = 4 \quad N = 30 \quad P = 0.1$ (CD)

$1 - 0.8245 = \underline{\underline{0.175}}$ (3sf)

c) $X = 2 \quad N = 30 \quad P = 0.1$ (CD)

$\underline{\underline{0.411}}$ (3sf)

3a) $X = 7 \quad N = 20 \quad P = 0.41$ $\quad X = 3 \quad N = 20 \quad P = 0.41$

$P(X \leq 7) = 0.38044...$ $\quad P(X \leq 3) = 0.01278...$

$0.38044 - 0.01278 = \underline{\underline{0.368}}$ (3sf)

3b) $H_0: p = 0.3$
$H_1: p < 0.3$
$n = 40$ 5% sig level

$P(X \leq 7) = 0.0553$

$0.0553 > 5\%$ ∴ we accept H_0.

Not enough evidence that prop. has decreased.

c) $0.0553 < 10\%$ ∴ we would accept H_1.
The prop. has decreased.

4a) $P(X \geq 12) = 1 - P(X \leq 11)$

$X = 11$ $N = 30$ $P = 0.58$ CD.

$P(X \leq 11) = 0.0151$ (3sf)

$P(X \geq 12) = 1 - 0.0151$
$= 0.985$ (3sf)

b) $H_0: p = 0.3$
$H_1: p > 0.3$
$n = 40$ 1% sig level.

$P(X \geq 19) = 1 - P(X \leq 18)$
$= 1 - 0.9852$
$= 0.0148$

$0.0148 > 1\%$ Accept H_0.
prop ordering coffee not incr.

c) $0.0148 < 5\%$ Accept H_1.
prop. ordering coffee has incr.

5a) $P(X \geq 2) = 1 - P(X \leq 1)$

$X = 1 \quad N = 15 \quad P = 0.08$

$P(X \geq 2) = 1 - 0.65972...$

$= \underline{0.340}$ (3sf)

b) $H_0 : p = 0.08$

$H_1 : p > 0.08$

$n = 20 \quad 5\%$ sig. level

$P(X \geq 3) = 1 - P(X \leq 2)$

$= 1 - 0.7879...$

$= 0.212$ (3sf)

$0.212 > 5\% \quad \therefore$ Accept H_0.

Not enough evidence to say probability is more than 0.08.

6a) i/ $X = 15 \quad N = 20 \quad P = 0.6$ PD

$P(X = 15) = 0.0746$ (3sf)

ii/ $P(X > 15) = 1 - P(X \leq 15)$

$X = 15 \quad N = 20 \quad P = 0.6$ CD

$1 - 0.949\ldots$

~~0.0501~~ (3sf)

0.0510

b/ $H_0: P = 0.6$

$H_1: P \neq 0.6$

10% Sig level Two tail [5% each side]

$N = 50$

$P(X \geq 35) = 1 - P(X \leq 34)$

$= 1 - 0.904498\ldots$

$= 0.095501\ldots$

$0.0955 > 5\%$ $\therefore$ accept H_0.

There is not enough evidence to suggest the prob. has changed

7a) $X = 5 \quad N = 20 \quad p = 0.4$

$P(X = 5) = 0.0746$

b) $H_0 : p = 0.4$
$H_1 : p \neq 0.4$

c) $X \leq 3$ chance of rejection 0.0160
$X \geq 13$ chance of rejection $1 - 0.9790$
$= 0.0210$

d) $0.016 + 0.021 = 0.037 \quad (3.7\%)$

e) There is not enough evidence to say the prob. is not 0.4.
Accept H_0.