University of Technology Sydney
School of Mathematical and Physical Sciences

Probability and Random Variables (37161) –
Class 4 Preparation Work
SOLUTIONS

1. i) Of one randomly selected individual from the country's population, the number of people called Bob $\sim Bern(p)$ where p is the proportion of people called Bob in the country.

   ii) The number of times a person takes his/her driving test, assuming that he/she is equally likely to pass any given time $\sim Geo(p)$ where p is the probability that he/she passes the test on any one sitting.

   iii) Not Bernoulli, Binomial or Geometric, since the draws are not independent trials (because cards are not returned to the deck.)

   iv) From a randomly chosen selection of 10 people from the country's population, the number of males selected $\sim Bin(10,0.5)$, assuming half of people are male.

   v) Not Bernoulli, Binomial or Geometric, since the draws are not independent trials (because members of the same family are more likely than unrelated people to watch the same television shows.)

   vi) Not Bernoulli, Binomial or Geometric as range of possible values is $\{0,2,3,...\}$

   viii) Not Bernoulli, Binomial or Geometric, since the draws are not independent trials (for example, if the front pin is knocked down, this increases the chance that those behind it will also be knocked down.)

   ix) In a single turn of 10-pin bowling, the number of times a bowler knocks down at least one pin $\sim Bern(p)$ where p is the probability that the bowler knocks down at least one pin in a given turn.

   x) From 6 independent draws from a random number generator which produces integer values between 1 and 1000 inclusively, the number of draws whose final digit is $0 \sim Bin(6,0.1)$

2. i) $P(X=0)=(0.8)^7$ ii) $P(X=4)=\frac{7!}{4!3!}(0.2)^4(0.8)^3$.

iii) $P(X=10)=0$ iv) $E(X)=7(0.2)=1.4$

v) $Var(X)=7(0.2)(1-0.2)=1.12$.

3. i) $P(Y=0)=0$ since the range of Y is $\{1,2,3,...\}$

ii) $P(Y=4)=0.7(0.3)^3$

iii) $P(Y>1)=1-P(Y=1)=0.3$

iv) $P(Y>15)=(0.3)^{15}$.

4.

i) $n_1=z_1+z_2+...+z_5=0+0+0+1+0=1$
$n_2=z_6+z_7+...+z_{10}=1+0+1+1+1=4$
$n_3=z_{11}+z_{12}+...+z_{15}=1+0+0+0+1=2$
$n_4=z_{16}+z_{17}+...+z_{20}=0+1+0+0+1=2$

ii) $g_1=4,g_2=2,g_3=2,g_4=1,g_5=1,g_6=1,g_7=4,g_8=2,g_9=3$.