

Homework 2

DATA604 Simulation and Modeling

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February 21, 2016

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Suppose that X is a discrete random variable having probability function $Pr(X = k) = ck^2$ for $k = 1, 2, 3$. Find c , $Pr(X \leq 2)$, $E[X]$ and $Var(X)$.

This suggests the following:

$$Pr(X = 1) + Pr(X = 2) + Pr(X = 3) = 1$$

$$1^2c + 2^2c + 3^2c = 1$$

$$1c + 4c + 9c = 1$$

$$14c = 1$$

$$c = \frac{1}{14}$$

```
# Define an R function for the probability function
```

```
prXk <- function(k)
```

```
{
```

```
  c = 1/14
```

```
  p <- c * k^2
```

```
  return (p)
```

```
}
```

```
prX1 <- prXk(1)
```

```
prX1
```

```
## [1] 0.07142857
```

```
prX2 <- prXk(2)
```

```
prX2
```

```
## [1] 0.2857143
```

```
prX3 <- prXk(3)
```

```
prX3
```

```
## [1] 0.6428571
```

```
ExpVal <- prX1 + (2*prX2) + (3*prX3)
```

```
secondMoment <- prX1 + (2^2*prX2) + (3^2*prX3)
```

$$Pr(X \leq 2) = 0.3571429$$

The expected value $E[X] = 1 \times 0.0714286 + 2 \times 0.2857143 + 3 \times 0.6428571 = 2.5714286$.

The variance $Var(X) = E[X^2] - (E[X])^2 = 7 - 6.6122449 = 0.3877551$