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6.1 Probability distributions

1) a) Yes, 6 discrete outcomes, will occur randomly.

b) No, time is a continuous variable

c) No, since it is fixed as always being 24.

2) a)

x	1	2	3	4	5	6
$P(X=x)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

b) $P(X=x) = \frac{1}{6}$,

$$x = 1, 2, 3, 4, 5, 6$$

c) The range of possible outcomes is a specific set

of discrete variables where the probability of each set occurring is the same

$$3) a) \frac{1}{k} + \frac{2}{k} + \frac{3}{k} = 1$$

$$\frac{6}{k} = 1$$

$$k = 6$$

b)

x	1	2	3
$P(Y=y)$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$

$$c) i) P(Y > 1) = P(Y=2) + P(Y=3)$$

$$\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$$

$$ii) 0$$

$$4) a) P(X \leq 2) = P(X=1) + P(X=2) =$$

$$0.1 + 0.15 = 0.25$$

$$b) P(X > 3) = P(X=4) + P(X=5) +$$

$$P(X=6) = 0.2 + 0.22 + 0.21 =$$

$$= 0.63$$

$$c) P(2 \leq X < 6) = P(X=2) + P(X=3) +$$

$$P(X=4) + P(X=5) = 0.15 + 0.12 +$$

$$0.2 + 0.22 = 0.69$$

$$5) a) k + 2k + 3k + 4k + 5k = 1$$

$$15k = 1$$

$$k = \frac{1}{15}$$

$$b) P(X > 2) = P(X=3) + P(X=4) + P(X=5) = \frac{3}{15} + \frac{4}{15} + \frac{5}{15} = \frac{4}{5}$$

$$6) a) \alpha + \frac{1}{6} + \alpha - \frac{1}{8} + \alpha + 2\alpha = 1$$

$$5\alpha + \frac{1}{24} = 1$$

$$5\alpha = \frac{23}{24}$$

$$\alpha = \frac{23}{120}$$

$$b) P(1 < Y < 4) = P(Y=2) + P(Y=3) =$$

$$\left(\frac{23}{120} - \frac{1}{8}\right) + \frac{23}{120} = \frac{31}{120}$$

7) a) Discrete Uniform Distribution

b) i) $P(X = \frac{1}{20})$ - in discrete uniform

distribution probabilities are
same

$$P(X > 15) = \frac{5}{20} = \frac{1}{4}$$

$X = 16, 17, 18, 19, 20 \Rightarrow 5$ values

$$\text{ii) } P(2 \leq X \leq 17) = \frac{16}{20} = \frac{4}{5}$$

$X = 3, 4, 5, 6, 7, 8, 9, 10,$

$11, 12, 13, 14, 15, 16, 17 \Rightarrow 16$ values

$$\text{c) } \frac{9}{20} \times \frac{9}{20} = \frac{81}{400}$$

$$\text{8) } P(X = r) = P(X = 5 - r)$$

If $P(X = r)$ then $P(X = 5 - r) \therefore$ if

$$P(X = 1) = 0.28 \text{ then } P(X = 5 - 1) = 0.28$$

$$P(X=2) = P(X=5 - \overset{\rightarrow 3}{2}) = ?$$

X	1	2	3	4
$P(X=X)$	0.28	0.22	0.22	0.28

$$1 - 2(0.28) = 0.44$$

$$0.44 \div 2 = 0.22$$

$$b) P(3,4) + P(4,3) + P(4,4) =$$

$$P(3,4) = 0.22 \times 0.28 = \frac{77}{1250}$$

$$P(4,3) = 0.28 \times 0.22 = \frac{77}{1250}$$

$$P(4,4) = 0.28 \times 0.28 = \frac{49}{625}$$

$$\frac{77}{1250} + \frac{77}{1250} + \frac{49}{625} = 0.2016$$

g)

X	1	2	3	4	5
$P(X=X)$	$\frac{4}{7}$	$\frac{12}{49}$	$\frac{36}{343}$	$\frac{108}{2401}$	$\frac{81}{2401}$

$$1) G = 4/7$$

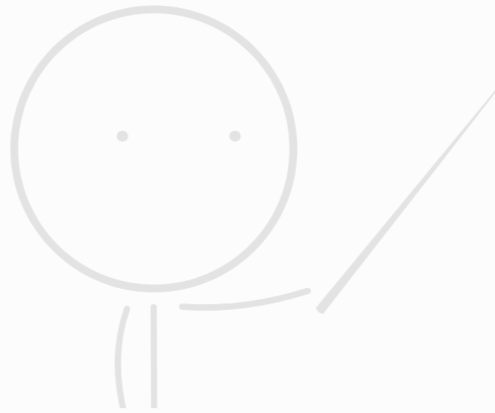
$$2) PG = (3/7) \times 4/7$$

$$3) PPG = (3/7)^2 \times 4/7$$

$$4) PPPG = (3/7)^3 \times 4/7$$

$$5) PPPPG = (3/7)^4 \times 4/7$$

$$5) PPPPP = (3/7)^5$$



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