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Chapter 6 Problem Solving Set A:

Bronze:

a) $\frac{1}{k} + \frac{2}{k} + \frac{3}{k} + \frac{4}{k} = 1$

$\frac{10}{k} = 1 \quad \therefore k = 10$

b)

x	1	2	3	4
$P(X=x)$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

c) $P(X > 2) \rightarrow P(3) + P(4)$

$= \frac{3}{10} + \frac{2}{5} = \frac{7}{10} = 0.7$

Silver:

a) $0.2 + 2a + 0.35 + a = 1$

$0.55 + 3a = 1$

$3a = 0.45$

$a = 0.15$

P(Total score is 4) $\rightarrow P(1,3) + P(2,2) + P(3,1)$

$\rightarrow (0.2 \times 0.35) + (0.3 \times 0.3) + (0.35 \times 0.2)$

$= 0.23$

b) P(Greater than 5) $\rightarrow P(4,2) + P(4,3) + P(4,4) + P(2,4) + P(3,3) + P(3,4)$

$\rightarrow (0.15 \times 0.3) + (0.15 \times 0.35) + (0.15 \times 0.15) + (0.3 \times 0.15) + (0.35 \times 0.35) + (0.35 \times 0.15)$

$= 0.34$

Gold:

a) The probability of a cat catching a mouse is constant; the attempts are independent

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

$B(5, 0.2)$

$P(X=0) = {}^5C_0 (0.2)^0 (0.8)^5 = 0.32768$

$P(X=1) = {}^5C_1 (0.2)^1 (0.8)^4 = 0.4096$

$P(X=2) = {}^5C_2 (0.2)^2 (0.8)^3 = 0.2048$

$P(X \leq 2) = 0.32768 + 0.4096 + 0.2048 = 0.94208$

$P(X \geq 3) = 1 - 0.94208 = 0.05792$

c) $P(Y=3) = P(\text{fail, fail, succeed}) = (0.8)^2 \times 0.2 = 0.128$

d) $P(Y=n) = 0.1 + (n-1)k$ for $n = 1, 2, 3, 4, 5$

i) $0.1 + 0.1 + k + 0.1 + 2k + 0.1 + 3k + 0.1 + 4k =$

$= 0.5 + (1 + 2 + 3 + 4)k = \underline{0.5 + 10k = 1}$

$0.5 + 10k = 1$

$10k = 0.5$

$k = 0.05$

e) $P(Y = 3) = 0.1 + (3 - 1)k$

$= 0.1 + 2(0.05) = 0.2$

f) Karen's model assumes that the probability of catching the mouse is constant whereas Ian's model assumes that the probability increases with each attempt

OR

In Karen's model, the cat may not catch the mouse, whereas in Ian's model the cat will definitely catch the ~~mouth~~ mouse in its first 5 attempts.