MAT-120 – HW #12– Answers

Please select the correct answer number of each question. There are more answers than questions. Answers may be repeated.

1) No; requirement #3 is not met. There are more than 2 possible outcomes.

2) 46%

3)

X is a binomial RV, because the experiment has a fixed number of trials (n=3); each trial results in 2 complimentary possibilities: a ball is green (success) and a ball is red (failure); and the probability of success p =4/7 for any trial (trials are independent because we choose with replacement)

4) Yes; all four requirements are met.

5)

E(X)=1.7143.

6) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$P(X=2) = \left[\frac{6!}{4!\,2!}\right] \cdot (0.45)^2 \cdot (0.55)^4$

$= [15] \cdot (0.45)^2 (0.55)^4 = 0.2780$

7) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$P(X=15) = \left[\frac{15!}{15!\,0!}\right] \cdot (0.85)^{15} \cdot (0.15)^0$

$= [1] \cdot (0.874) \cdot (1) = 0.0874$

8)

Yes, the results of the survey suggest that gender of a child, aged 6-11, has an effect on the probability of reading books for fun every day. In this survey, girls were more likely to read for fun than boys (28.1% chance vs. 20.9%). However, to draw the conclusion about population (all children ages 6-11), the claim must be tested using Hypothesis Testing (Chi-square test for independence).

9) $P(x \leq 2) = P(x = 0 \text{ or } x = 1 \text{ or } x = 2) = P(x = 0) + P(x = 1) + P(x = 2) = 0.0005 + 0.0071 + 0.0462 = 0.0538$

10)

E(X)= np=0.2

11) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$$P(X = 4) = \left[\frac{6!}{4!\,2!}\right] \cdot (0.55)^4 \cdot (0.45)^2$$

$$= [15] \cdot (0.55)^4 (0.45)^2 = [15] \cdot (0.915) \cdot (0.2025) = 0.2779$$

12)

Profit ($)	Probability
8	1/6
-2	5/6

13) 20.9%

14)

X # of green	P(X)	XP(X)
0	${}_3C_0(4/7)^0(3/7)^3=0.0787$	0
1	${}_3C_1(4/7)^1(3/7)^2=0.3149$	0.3149
2	${}_3C_2(4/7)^2(3/7)^1=0.4198$	0.8396
3	${}_3C_3(4/7)^3(3/7)^0=0.1866$	0.5598
		E(X)=1.7143

15)

Lose $44

16) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$$P(X = 8) = \left[\frac{8!}{3!\,5!}\right] \cdot \left(\frac{1}{4}\right)^4 \cdot \left(\frac{3}{4}\right)^6 = [56] \cdot (0.25)^3 \cdot (0.75)^5 = 0.208$$

17) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$$P(X = 2) = \left[\frac{6!}{2!\,4!}\right] \cdot (0.09)^2 \cdot (0.91)^4 = [15] \cdot (0.0081) \cdot (0.6857) = 0.0833$$

18)

P(X<=1) = P(X=0) + P(X=1) = 0.8171 +0.1667 = 0.9838

19)

The events are not independent. For independent events, P(A and B) = P(A)*P(B). P("fun" and "boy") = 48/500; P("fun")*P("boy") = 124/500*230/500. P("fun" and "boy") ≠ P("fun")*P("boy"). Thus they are not independent.

20) $P(x) = \left[\frac{n!}{x!}(n-x)!\right] \cdot p^x \cdot (1-p)^{n-x}$

$$P(x \leq 1) = P(X=0) + P(x=1) = \left[\frac{24!}{0!\,24!}\right] \cdot (0.04)^0 \cdot (0.96)^{24} + \left[\frac{24!}{1!\,23!}\right] \cdot (0.04)^1 \cdot (0.96)^{23}$$

$$= [1] \cdot (1) \cdot (0.3754) = 0.7508$$

21)

-$0.33 expected loss of 33 cents per game

22)

$$P(X \geq 5) = P(X = 5 \text{ } or \text{ } X = 6) = P(x=5) + P(x=6) = 0.3283 + 0.1428 = 0.4711$$

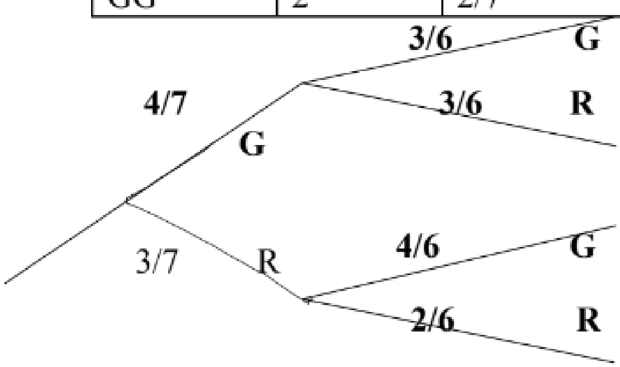
23) Yes; since P (not having more than one on time) = 1-0.9924 = 0.0076 $<$ 0.05, not having more than one on time would be an unusual occurrence.

24)

X is not binomial RV, because trials are not independent. Probability of choosing a green ball changes from trial to trial, and depends on the outcome of previous trials, because we choose without replacement.

25)

event	X # of green	P(X)
RR	0	1/7
RG or GR	1	4/7
GG	2	2/7



26) 28.1%

27)

X is a **binomial** random variable:

- There is a fixed number of trials, n=10
- Each trial has 2 outcomes. “Success”: “a TV set is defective’
- The trials are independent, because the population we choose from is very large.
- Probability of success, p=0.02

28)

If the described experiment is repeated a lot of times, the average number of green balls per each attempt is about 1.7

29) No; sine 0.544> 0.05, “at most one wrong number” is not an unsual occurrence when the error rate is 15%

30)

0.055

31)

mean = 5, std. dev = 1.581

32)

the usual # of correct answers is 2 to 8. So passing by guessing is not unusual.

33) 10, 0.2