Probability

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CLASS: XII-B	SUBJECT: Applied Math	
ROLL NO.: 01	DATE: 11/11/2025	

SECTION A

1. (c) The outcomes must be continuous.
2. (c) $\sum x_i p_i$
3. (b) npq
4. (b) 3
5. (b) is equal to the mean
6. (a) Both A and R are true and R is the correct explanation of A.
7. (d) ~~Both~~ A is false and R is true
8.

SECTION-B

8. x represents the number of heads obtained

$\Rightarrow x = 0, 1, 2, 3$

p = probability of success = $1/2$ q = failure = $1/2$

let $x = r$

$\Rightarrow P(r=0) = {}^nC_r\, p^r q^{n-r}$

$= {}^3C_0\, p^0 q^{3-0} = 1 \cdot 1 \cdot \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

$P(r=1) = {}^3C_1\, p^1 q^{3-1}$

$= \frac{3!}{1!(3-1)!} \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^2 = \frac{3}{8}$

$P(r=2) = {}^3C_2\, p^2 q^{3-2}$

$= \frac{3!}{2!(3-2)!} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^1 = \frac{3}{8}$

$P(r=3) = {}^3C_3\, p^3 q^{3-3} = \frac{\cancel{3!}}{\cancel{3!}(3-3)!} \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

x	0	1	2	3
$P(x)$	1/8	3/8	3/8	1/8

6738 (625) 0.042112 50

1000000 1000000

6738
× 625
33690
134760
4042800
4211250

10. p = success = getting a girl baby = 0.5 or $\frac{1}{2}$ p(failure)(boy) = $\frac{1}{2}$

no. of babies born = n = 6

let R be the no. of girls born ⇒ R = 0, 1, 2, 3, 4

$P(R=4) = {}^{n}C_R\, p^R q^{n-r}$

$= {}^{6}C_4 \left(\frac{1}{2}\right)^4 \left(\frac{1}{2}\right)^{6-4}$

$= \frac{6!}{4!(4-6)!} \left(\frac{1}{2}\right)^6$

$= \frac{\cancel{6}^{3}\times 5}{\cancel{2}} \left(\frac{1}{2}\right)^6 = \frac{15}{64}$ //

⇒ probability of getting exactly 4 girl babies is $\frac{15}{64}$ //

11. let x be the number of accidents in a month

$P(x=3) = \frac{e^{-\lambda}\cdot\lambda^x}{x!}$ $= \frac{0\cdot 3608}{2}$

$\boxed{= 0.1804}$

here, $\lambda = 2$

$\Rightarrow P(x=3) = \frac{e^{-2}\cdot 2^3}{3!} = \frac{(0.1353)8}{3\times 2} = \frac{1.0824}{3} = \boxed{0.3608}$

⇒ Probability of exactly 3 accidents happening = 0.~~3608~~ 1804.

12. mean = μ = 170 σ = 8cm. x = 182 cm

z score = $\frac{x-\mu}{\sigma} = \frac{182-170}{8} = \frac{12}{8} = 1.5$

~~⇒ Out of 100 people,~~ This z score implies that ~~he is and~~ his height is above the mean in the data provided

9.

Y	P(Y)	E(Y) $(P_i y_i)$
0	0.2	0
1	0.3	0.3
2	0.4	0.8
3	0.1	0.3

⇒ E(Y) = 1.4.

$\Sigma P_i x_i = 1.4$

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SECTION - C

13. ~~Sol (i) $\Sigma P(x) = 1$ $\Sigma p_i x_i = 1$~~

~~$\Rightarrow 0.1 + (0)$~~

(i) $\Sigma P(x) = 1$

$\Rightarrow 0.1 + k + 2k + k + 0.2 = 1$

$\Rightarrow 0.3 + 4k = 1 \Rightarrow 4k = 0.7 \Rightarrow k = 0.7/4 = 0.175$

$\Rightarrow$ new table

X	0	1	2	3	4
P(x)	0.1	0.175	0.35	0.175	0.2

(b) $P(x \geq 2)$

$= P(x=2) + P(x=3) + P(x=4)$

$= 0.35 + 0.175 + 0.2 = 0.725$

(c)

x	P(x)	$p_i x_i$
0	0.1	0
1	0.175	0.175
2	0.35	0.7
3	0.175	0.525
4	0.2	0.8
	$\Sigma p_i x_i$	2.200

$E(X) = \Sigma p_i x_i$

$\boxed{= 2.2}$

14. (a) Binomial.

This is because each answer has only two outcomes — success and failure. This means that every option chose can either be a correct answer (success) or a wrong answer (failure)

(b) here, $n = 10$. p = success $= \frac{1}{4} = 0.25$ and q(failure) $= 1 - 0.25 = 0.75$

let r be no. of correct answers.

$\Rightarrow P(r=7) = {}^nC_r\, p^r q^{n-r}$

$= {}^{10}C_7\, p^7 q^{(10-7)}$

$= \frac{10!}{7!(10-7)!} \left(\frac{1}{4}\right)^7 \left(\frac{3}{4}\right)^3 = \frac{10 \times \cancel{9}^{3} \times \cancel{8}^{4}}{\cancel{3} \times \cancel{2}} \left(\frac{1}{4}\right)^7 \left(\frac{3}{4}\right)^3$

0000030384 $\frac{12.6}{10000}$ 0.0006 0000072

$.422 \times 72 = 844 + 29540 = 30384$

$= 120\,(0.25)^7(0.75)^3$

$= 120\,(0.00006)\,(0.422)$

$= 12\,(0.0006)\,(0.422) = (0.0072)(0.422)$

$= \frac{72}{10000} \times 0.422 = \frac{72 \times 422}{10000 \times 1000}$

$= \frac{30384}{10000000} = \underline{0.0030384}$

$\Rightarrow$ Probability of getting exactly 7 correct answers $= 0.003084$

or 0.0031 (rounded)

(c) $P(r \geq 1)$

$= P(r=1) + P(r=2) + P(r=3) \ldots + P(r=10)$

$= \cancel{{}^{10}C_1 (0.25)^1 (0.75)^{10-1} + {}^{10}C_2 (0.25)^2 (0.75)^{10-2}}$

$= \cancel{(0.25)(0.75)^{10-1}}$

$= 1 - P(r=0)$

$= 1 - {}^{10}C_0\, p^0 q^{10-0} = 1 - \frac{10!}{0!(10-0)!} (0.25)^0 (0.75)^{10}$

$= 1 - 0.0563 = \underline{\underline{0.9437}}$

$1.000000 - 0.0563 = 0.9437$

15. $\lambda = 5$ let r = no. of calls received.

(a) $P(r=4) = \frac{e^{-\lambda} \cdot \lambda^r}{r!}$

$= \frac{e^{-5} \cdot 5^4}{4!} = \frac{(0.006738)(625)}{4 \cdot 3 \cdot 2} = \frac{4.21125}{24}$

$= 0.1754 \approx \boxed{0.175}$

(b) $P(2 < r \leq 5) = P(r=3) + P(r=4)$

$= \frac{e^{-5} \cdot 5^3}{3!} + \frac{e^{-5} \cdot 5^4}{4!}$ (from (a) we know $P(r=4) = 0.175$)

$= \frac{(0.006738)(125)}{3 \cdot 2} + 0.175$

$= \frac{0.706250}{6} + 0.175 = 0.11770833 + 0.175$

$= 0.118 + 0.175$

$= \boxed{0.298} = \boxed{0.293}$