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FOUNDATION

class: 9th. MATHEMATICS

6. PROBABILITY

Teaching Task (Tee mains)

01. Coin is tossed twice.

$$S = \{ HH, HT, TH, TT \} \rightarrow n(S) = 4$$

$$E = \{ HT, TH \} \rightarrow n(E) = 2$$

$$\therefore P(E) = \frac{2}{4} = \frac{1}{2}$$

Ans: B

02 $S = \{ 1, 2, 3, 4, 5, 6 \} \rightarrow n(S) = 6$

$$E = \{ 5, 6 \} \rightarrow n(E) = 2$$

$$\therefore P(E) = \frac{2}{6} = \frac{1}{3}$$

Ans: B

03 $n(S) = 52$

$$E = \text{Red King} \Rightarrow n(E) = 2$$

$$\therefore P(E) = \frac{2}{52} = \frac{1}{26}$$

Ans: B

04. $P(\text{girl}) = \frac{4}{10} = \frac{2}{5}$

Ans: A

05 $S = \{ 1, 2, 3, 4, 5, 6 \} \rightarrow n(S) = 6$

$$E = \{ 2, 3, 5 \} \rightarrow n(E) = 3$$

$$\therefore P(E) = \frac{3}{6} = \frac{1}{2}$$

Ans: A

06 $S = \{ HH, HT, TH, TT \} \rightarrow n(S) = 4$

$$E = \{ HT, TH, TT \} \rightarrow n(E) = 3$$

$$\therefore P(E) = \frac{3}{4}$$

Ans: B

67. $S = \{1, 2, 3, \dots, 100\} \rightarrow n(S) = 100$ (2)
 $E = \{5, 10, 15, \dots, 100\} \rightarrow n(E) = 20$
 $\therefore P(E) = \frac{20}{100} = \frac{1}{5}$ Ans: C

08 Students = 30, Boys = 18, girls = 12
 $\therefore P(E) = \frac{12}{30} = \frac{2}{5}$ Ans: A

09 $P(E) = \frac{1}{5}$ Ans: B

10 $S = \{P, R, O, B, A, B, I, L, I, T, Y\} \rightarrow n(S) = 11$
 $E = \{O, A, I, I, Y\} = 4$
 $\therefore P(E) = \frac{4}{11}$ Ans: B

JEE ADVANCED

01. Total no. of girls = $900 + 600 + 500 + 0 = 2000$.

A) $P(\text{Age group } 0-10) = \frac{900}{2000} = \frac{9}{20} \checkmark$

B) $P(\text{Age group } 11-18) = \frac{600}{2000} = \frac{3}{10} \times$

C) $P(\text{Age group } 0-18) = \frac{900+600}{2000} = \frac{1500}{2000} = \frac{3}{4} \checkmark$

D) $P(\text{Age group } 19-25) = \frac{500}{2000} = \frac{1}{4} \times$

Ans: A, C

02. No. of yellow ~~strip~~ ^{Sectors} = 4

1) blue ~~strip~~ ^{Sectors} = 5

1) Red sectors = 3 $\therefore \text{Total} = 12$

$$A) p(\text{yellow}) = \frac{4}{12} = \frac{1}{3} \checkmark$$

$$B) p(\text{Red}) = \frac{3}{12} = \frac{1}{4} \checkmark$$

$$C) p(\text{Blue}) = \frac{5}{12} \checkmark$$

Ans. A, B, C

3. Statement I:

$$\text{We have } p(1) + p(2) + p(3) + p(4) = 1$$

$$\Rightarrow x + 2x + 3x + 4x = 1$$

$$\Rightarrow 10x = 1 \Rightarrow x = \frac{1}{10} \text{ (True)}$$

Statement II: Conceptual (True)

Ans. A

04. Statement I: $S = \{1, 2, 3, \dots, 100\} \rightarrow n(S) = 100$
 $E = \{4, 8, 16, \dots, 100\} \rightarrow n(E) = 25$

$$\therefore p(E) = \frac{25}{100} = \frac{1}{4} \text{ (True)}$$

Statement II: $p(E) = \frac{n(E)}{n(S)}$ (True)

Ans. A

05. Assertion: $S = \{H, T\}$, $E = \{H\}$

$$\therefore p(E) = \frac{1}{2} \text{ (True)}$$

Reason: Conceptual (True)

Ans. A

06. Assertion: $S = \{1, 2, 3, 4, 5, 6\}$

$$E = \{2, 3, 5\}$$

$$\therefore p(E) = \frac{3}{6} = \frac{1}{2} \text{ (True)}$$

Reason: Conceptual (True)

Ans. A

07.

$$P(\text{size } 39) = \frac{39}{200}$$

Ans: (4) B

08

$$E = \{\text{size less than } 40\} = 15 + 25 + 39 = 79$$

$$\therefore P(< 40) = \frac{79}{200}$$

Ans. -

09

$$P(30-35) = \frac{20}{100} = \frac{1}{5}$$

$$P(45-50) = \frac{15}{100} =$$

$$\text{Difference} = \frac{20}{100} - \frac{15}{100} = \frac{5}{100} = \frac{1}{20}$$

Ans. D

10.

$$E(\text{less than 25 years}) = 8 + 2 = 10$$

$$\therefore P(\text{less than 25 years}) = \frac{10}{100} = \frac{1}{10}$$

Ans. B

11.

In 30 Consecutive numbers, there are 15 even numbers and 15 odd numbers.

We know, Sum of two integers is odd means

$$\text{Even} + \text{odd} = \text{odd}$$

Case (i) First no. is even

$$\text{probability of this} = \frac{15}{30} = \frac{1}{2}$$

To get an odd number, the Second number must be odd.

$$\text{probability of getting odd} = \frac{15}{29}$$

$$\therefore \text{Total probability} = \frac{1}{2} \times \frac{15}{29} = \frac{15}{58}$$

Case (ii) First number is odd

$$\text{probability of this} = \frac{15}{30}$$

Second number must be Even

$$\text{probability of this} = \frac{15}{29}$$

$$\therefore \text{Total probability} = \frac{1}{2} \times \frac{15}{29} = \frac{15}{58}$$

$$\therefore \text{Required probability} = \frac{15}{58} + \frac{15}{58} = \frac{15}{29}$$

$$\therefore \frac{p}{q} = \frac{15}{29} \Rightarrow p+q = 15+29 = 44 \quad \text{Ans. 44}$$

12. PROBABILITY.

$$P(\text{vowel}) = \frac{4}{11} = \frac{p}{q}$$

$$\therefore pq = 4 \times 11 = 44$$

Ans. 44

13 a) $S = \{1, 2, 3, \dots, 50\} \Rightarrow n(S) = 50$
 $E = \{5, 10, 15, \dots, 50\} \Rightarrow n(E) = 10$
 $\therefore P(E) = \frac{10}{50} = \frac{1}{5} (P)$

b) $S = \{1, 2, 3, \dots, 30\} \rightarrow n(S) = 30$
 $E = \{3, 6, 9, \dots, 30\} \rightarrow n(E) = 10$
 $\therefore P(E) = \frac{10}{30} = \frac{1}{3} (q)$

c) $S = \{1, 2, 3, 4, 5, \dots, 10\} \rightarrow n(S) = 10$
 $E = \{2, 3, 5, 7\} \rightarrow n(E) = 4$
 $\therefore P(E) = \frac{4}{10} (r)$

d) $S = \{1, 2, 3, \dots, 20\} \rightarrow n(S) = 20$
 $E = \{2, 4, 6, \dots, 20\} \rightarrow n(E) = 10$
 $\therefore P(E) = \frac{10}{20} = \frac{1}{2} (s)$

Ans: P, q, r, s

- 14 a) $P(\text{King}) = \frac{4}{52} = \frac{1}{13} (P)$ (6)
- b) $P(\text{Red Card}) = \frac{26}{52} = \frac{1}{2} (Q)$
- c) $S = \{S, T, A, T, I, S, T, I, C, S\} \rightarrow n(S) = 10$
 $E = \{A, I, I\} \rightarrow n(E) = 3$
 $\therefore P(E) = \frac{3}{10} (R)$
- d) $P(E) = \frac{1}{10} (S)$ Ans. P, Q, R, S

LEARNERS TASK (CUE'S)

01.	Conceptual	Ans: C
02.	Conceptual	Ans: C
03.	Conceptual	Ans: B
04.	Conceptual	Ans: A
05.	Conceptual	Ans: D
06.	Conceptual	Ans: B
07.	$2^3 = 8$	Ans: B
08.	$S = \{H, T\}$	Ans: A
09.	$S = \{HH, HT, TH, TT\} \rightarrow n(S) = 4$ $E = \{HT, TH\} \rightarrow n(E) = 2$ $\therefore P(E) = \frac{2}{4} = \frac{1}{2}$	Ans: D
10.	Conceptual	Ans: D

JEE MAINS LEVEL

①

01. $S = \{H, T\} \rightarrow n(S) = 2$

$E = \{T\} \rightarrow n(E) = 1$

$\therefore P(E) = \frac{1}{2}$

Ans: B

02. $S = \{1, 2, 3, 4, \dots, 20\} \rightarrow n(S) = 20$

$E = \{4, 8, 12, 16, 20\} \rightarrow n(E) = 5$

$\therefore P(E) = \frac{5}{20} = \frac{1}{4}$

Ans: A

03. $S = \{HH, HT, TH, TT\} \rightarrow n(S) = 4$

$E = \{HT, TH, TT\} \rightarrow n(E) = 3$

$\therefore P(E) = \frac{3}{4}$

Ans: C

04. $S = \{1, 2, 3, 4, 5, 6\} \rightarrow n(S) = 6$

$E = \{1, 4, 6\} \rightarrow n(E) = 3$

$\therefore P(E) = \frac{3}{6} = \frac{1}{2}$

Ans: B

05. Total = $5 + 3 = 8$

girls = 3

$\therefore P(\text{girls}) = \frac{3}{8}$

Ans: C

06. $S = \{BB, BG, GB, GG\}$

Given one of the child is Boy, Now we have to eliminate GG.

Now, our sample space is

$\therefore S = \{BB, BG, GB\} \rightarrow n(S) = 3$

$E = \{BB\} \rightarrow n(E) = 1$

$\therefore P(E) = \frac{1}{3}$

Ans: B



07 QNM No. of girls = 2

No. of Boys = 3

A Committee of 3 is to be selected, so that all 3 members should be boys.

Case(i) probability that the first person selected being a boy = $\frac{3}{5}$

Case(ii) probability that the second person (being first one boy) is a boy = $\frac{2}{4}$

Case(iii) probability that the third person (First two are boys) is a boy = $\frac{1}{3}$

$$\therefore P(\text{All boys}) = \frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} = \frac{1}{10} \quad \text{Ans: A}$$

08

$$P(Q \cup K) = P(Q) + P(K)$$
$$= \frac{4}{52} + \frac{4}{52}$$
$$= \frac{8}{52} = \frac{2}{13}$$

$$Q \cap K = \emptyset$$

Ans: C

09. $S = \{2R, 3G, 5B\} \rightarrow n(S) = 10$

$$E = \{2R, 3G\} \rightarrow n(E) = 5$$

$$\therefore P(E) = \frac{5}{10} = \frac{1}{2}$$

Ans: A

10 $S = \{S, T, A, T, I, S, T, I, C, S\} \rightarrow n(S) = 10$

$$E = \{S, S, S\} \rightarrow n(E) = 3$$

$$\therefore P(E) = \frac{3}{10}$$

Ans: A



JEE ADVANCED

9

01 $S = \{-3, -2, -1, 0, 1, 2, 3\} \rightarrow n(S) = 7$

Now $(-1)^2 = 1 \leq 1 \checkmark$

$0^2 = 0 \leq 1 \checkmark$

$1^2 = 1 \leq 1 \checkmark$

$\therefore E = \{-1, 0, 1\} \rightarrow n(E) = 3$

$\therefore p(E) = \frac{3}{7}$ or

Ans: B

02 $P(\text{Not rain}) = 1 - P(\text{rain})$

$= 1 - 0.75$

$= 0.25 = \frac{25}{100} = \frac{1}{4}$

Ans: B, C

03 Statement I:

$P(\text{good egg}) = 0.028$

$\Rightarrow \frac{\text{Good Eggs}}{500} = 0.028$

$\Rightarrow \text{Good Eggs} = 0.028 \times 500 = 14$

$\therefore \text{Bad Eggs} = 500 - 14 = 486$ (True)

Statement II: Conceptual (False)

Ans: C

04 Statement I:

$S = \{\text{pack of cards}\} \Rightarrow n(S) = 52$

$E = \{\text{Red face cards}\} \Rightarrow n(E) = 6$

$\therefore p(E) = \frac{6}{52} = \frac{3}{26}$ (True)

Statement II: Conceptual (True)

Ans: A



05 Assertion(A)

$$S = \{HH, HT, TH, TT\} \rightarrow n(S) = 4$$

$$E = \{TT\} \rightarrow n(E) = 1$$

$$\therefore P(E) = \frac{1}{4} \text{ (True)}$$

Ans: A

Reason: Conceptual (True)06 Assertion:

$$S = \{3 \text{ girls}, 2 \text{ Boys}\} \Rightarrow n(S) = 3+2 = 5$$

$$E = \{2 \text{ Boys}\} \Rightarrow n(E) = 2$$

$$\therefore P(E) = \frac{2}{5} \text{ (False)}$$

Ans: D

Reason: Conceptual (True)

07 Total no. of bulbs = 500

$$\therefore n(S) = 500$$

$$E = \{ \text{less than 1500 hours} \} \Rightarrow n(E) = 10$$

$$\therefore P(E) = \frac{10}{500} = \frac{1}{50} = \frac{2}{100} = 0.02 \text{ Ans: D}$$

08 $E = \{ \text{more than 2500 hours} \} = 250 + 90 = 340$

$$\therefore P(E) = \frac{340}{500} = \frac{680}{1000} = 0.68$$

Ans: D

09. $S = \{51, 52, 53, \dots, 100\} \Rightarrow n(S) = 100$ $E = \{ \text{not prime numbers} \}$

$$E' = \{ \text{prime numbers} \} = \{53, 59, 61, 67, 71, 73, 79, 83, 89, 97\}$$

$$\therefore n(E') = 10$$

$$P(E') = \frac{10}{100} = \frac{1}{10}$$

$$\therefore P(E) = 1 - P(E') = 1 - \frac{1}{10} = \frac{9}{10}$$

Ans: D

10. $S = \{M, O, B, I, L, E\} \rightarrow n(S) = 6$
 $E = \{O, I, E\} \rightarrow n(E) = 3$
 $\therefore P(E) = \frac{3}{6} = \frac{1}{2}$

(11)

Ans.. D

11. Total no. of tosses = 1000

Head = 625

$\therefore$ Tail = $1000 - 625 = 375$

$\therefore P(\text{Tail}) = \frac{375}{1000} = \frac{3}{8} = \frac{a}{b} \Rightarrow a+b = 11$

Ans.. 11

12. $S = \{100, 101, 102, \dots, 999\}$
 $\therefore n$

$\Rightarrow n(S) = 900$

$E = \{100, 102, 104, \dots, 998\}$

$n(E) = 450$ ✓

$\therefore P(E) = \frac{450}{900} = \frac{1}{2}$

Ans.. 450

13. a) $S = \{M, A, T, H, E, M, A, T, I, C, S\}, n(S) = 11$

$E = \{A, E, A, I\}, n(E) = 4$

$\therefore P(E) = \frac{4}{11} (P)$

b) $P(E) = \frac{3}{9} (Q)$

c) $P(E) = \frac{2}{4} = \frac{1}{2} (R)$

d) Impossible Even $\Rightarrow P(I) = 0 (S)$
 Ans.. P, Q, R, S

14. a) Conceptual (P)

b) Conceptual (Q)

c) Conceptual (R)

d) Conceptual (S)

Ans.. P, Q, R, S

$\Rightarrow$ THE END $\in$