① $3! = 3 \times 2 \times 1 = \underline{\underline{6}}$ ways

② 1 out of 5 = $\underline{\underline{5}}$ ways

③ All 3 are unique → permutation.

$3! = 3 \times 2 \times 1 = 6$ ways

④ $^4C_2 = \frac{4!}{2!(4-2)!}$

$= \frac{4 \times 3}{2 \times 1} = \underline{\underline{6}}$ ways

⑤ Total outcomes = 2 (Head, Tail)

$P(\text{Head}) = \underline{\underline{1/2}}$

⑥ Total outcome = 6 (1 to 6)
Favourable = 1 (only 4)

$P(4) = \underline{\underline{1/6}}$

⑦ 1st digit : 3 options (1, 2, 3)
2nd digit : 2 remaining options

$3 \times 2 = 6$ numbers.

⑧ Total fruits = $3 + 4 = 7$
Apples = 3

$P(\text{Apple}) = \underline{\underline{3/7}}$

(9) $4! = 4 \times 3 \times 2 \times 1 = 24$ ways

(10) Total ball = 5
Green = 2

$P = 2/5$

(11) 1st digit : 4 options
2nd -"- : 3 -"-
3rd -"- : 2 -"-

$4 \times 3 \times 2 = 24$ numbers

(12)

$${}^7C_3 = \frac{7!}{3!\,(7-3)!} = \frac{7 \times 6 \times 5}{3 \times 2 \times 1} = 35 \text{ ways}$$

(13) Total Cards = 52
Kings in deck = 4 (one/suit)
Favourable outcomes = 4
Total outcomes = 52

$P = 4/52 = 1/13$

(14) $5! = 5 \times 4 \times 3 \times 2 \times 1$
$= 120$ ways

(15) Total Balls $= 6 + 4 = 10$
Black Balls = 4

$$P = \frac{4}{10} = 2/5$$

(16) $${}^4P_3 = \frac{4!}{(4-3)!} = 4 \times 3 \times 2 = 24 \text{ passwords}$$

(17) Even number in die = 2, 4, 6 → Total = 3
Total outcomes = 6

$$P = 3/6 = 1/2$$

(18) Total letter = 4 (M, A, T, H)
ways to choose 2:

$$^4C_2 = \frac{4 \times 3}{2 \times 1} = 6 \text{ ways}$$

(19) Total cards = 52
Hearts = 13

$$P = 13/52 = 1/4$$

(20) Circular permutation of n people = (n−1)!

$$(4-1)! = 3! = 3 \times 2 \times 1 = 6 \text{ ways}$$

(21) Digits : 1, 2, 3, 4, 5.

Even digits : 2 & 4 → only these can be the last digit

- Case 1 : 2 → 3 digit from remaining {1, 3, 4, 5}
  $^4P_3 = 4 \times 3 \times 2 = 24$.

- Case 2 : 4 → 3 digit — " — {1, 2, 3, 5}
  $^4P_3 = 24$

Total = 24 + 24 = 48

(22) Total Balls = 3 + 4 + 5 = 12

ways to choose 2 balls from 12:

$$^{12}C_2 = \frac{12 \times 11}{2} = 66$$

2 green balls from 5:

$$^5C_2 = \frac{5 \times 4}{2} = 10$$

probability = $P = \frac{10}{66} = \frac{5}{33}$

(23) Total arrangement of 5 students.

$5! = 120$

ways to arrange 4 units: $4! = 24$.

The 2 students can switch $2! = 2$

Together $= 4! \times 2$
$= 24 \times 2$
$= 48$

so. Number of ways they are not together
$120 - 48 = 72$ ways

(24) case 1: 2 w, 2 m

$$^8C_2 \times {}^{10}C_2 = 28 \times 45 = 1260$$

case 2: 3 w, 1 m

$$^8C_3 \times {}^{10}C_1 = 56 \times 10 = 560$$

case 3 : 4 W

$$^8C_4 = 70$$

$$1260 + 560 + 70 = \underline{\underline{1890 \text{ ways}}}$$

(25) Total outcomes $= 6 \times 6 = 36$

pairs that sum to 7

$(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)$

$$P(\text{sum} = 7) = 6/36 = \underline{\underline{1/6}}$$

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