Probability

Q1. Probability that a student likes both subjects.

Ans: Total students = 200
Both maths and science = 50

$$P(\text{Math} \cap \text{Science}) = \frac{50}{200} = 0.25.$$

Q2. Probability that item is from Machine B given it's defective (Baye's Theorem).

Ans: Let A = Machine A, B = Machine B

$P(A) = 0.6$
$P(B) = 0.4$
$P(D/A) = 0.05$
$P(D, B) = 0.10$

$$P(D) = P(A)\,P(D/A) + P(B)\,P(D/B) = 0.6 \times 0.05 + 0.4 \times 0.10 = 0.07$$

$$P(B/D) = \frac{P(B)\,P(D/B)}{P(D)} = \frac{0.4 \times 0.10}{0.07} = 0.5714$$

Q3. Probability of orange.

$$P(\text{Orange}) = \frac{4}{6+4} = \frac{4}{10} = 0.4$$

Q4. Probability person has condition given positive test (Bayes).

$P(C) = 0.01$, $P(\neg C) = 0.99$

$P(T^+|C) = 0.9$, $P(T^+|\neg C) = 0.1$

$P(T^+) = 0.01 \times 0.9 + 0.99 \times 0.1 = 0.108$

$P(C|T^+) = \frac{0.01 \times 0.9}{0.108} = 0.0833$

Q5. Probability of coding in Python or Java

Ans: $P(\text{Python} \cup \text{Java}) = \frac{100+100-50}{300} = \frac{230}{300}$

$= 0.7667.$

Q6. Probability of rain and carrying umbrella

Ans: $P(\text{Rain} \cap \text{umbrella}) = 0.6 \times 0.9$

$= 0.54$

Q7. Probability student studied given they passed.

Ans: $P(\text{studied} | \text{passed}) = 0.8$

Q8. Probability sum of two dice is 7.

Ans: Favorable outcomes = (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) → 6 out of

$P(\text{Sum} = 7) = \frac{6}{36} = 0.1667.$

Q9. Probability of red or green ball.

Ans: $P(\text{Red} \cup \text{Green}) = \frac{3+2}{10} = 0.5$.

Q10. Student who uses public transport.

Ans: $P(\text{student} \cap \text{Public}) = 0.3 \times 0.6$
$= 0.18$

Q11. Likes at least one drink.

Ans: $P(\text{Tea} \cup \text{coffee}) = 0.4 + 0.5 - 0.2$
$= 0.7$

Q12. Probability of exactly 2 heads in 3 flips.

Ans: $\binom{3}{2} \times (0.5)^2 \times (0.5)^1 = 3 \times 0.25 \times 0.5$
$= 0.375$

Q13. Probability gave positive feedback given second purchase.

Ans: $P(\text{Pos}) = 0.5$
$P(\text{Purchase} | \text{Pos}) = 0.6$
$P(\text{Pos} \cap \text{Purchase}) = 0.5 \times 0.6 = 0.3$
$P(\text{Purchase}) = 0.3$
$P(\text{Pos} | \text{Purchase}) = \frac{0.3}{0.3} = 1.0$

Q14. Liked veg or non-veg

Ans: $P(\text{Veg} \cup \text{Non-veg}) = 0.4 + 0.35 - 0.2$

$= 0.55.$

Q15. Repeat buyer and loyalty member.

Ans: $P = \frac{200}{1000} = 0.2$

Q16. Lower risk of heart disease.

Ans: $P(\text{lower}) = 0.6 \times 0.9 + 0.4 \times 0.1 = 0.54 + 0.04$

$= 0.58.$

Q17. Enrolled in CS or Math.

Ans: $\frac{250 + 100 + 150}{500} = \frac{500}{500} = 1.0$

Q18. Promotion given excellent performance.

Ans: $P(\text{Promotion} | \text{Excellent}) = 0.5$

Q19. Took quiz and shared results.

Ans: $0.25 \times 0.4 = 0.1$

Q20. Owns smartphone or tablet.

Ans: $0.6 + 0.4 - 0.25 = 0.75$.

Q21. Visits and purchases.

Ans: $0.7 \times 0.5 = 0.35$

Q22. Satisfied and productive.

Ans: $P = \frac{500}{1000} = 0.5$

Q23. Prefers A or B.

Ans: $0.5 + 0.3 - 0.2 = 0.6$

Q24. Excels in at least one subject.

Ans: $0.4 + 0.3 - 0.15 = 0.55$.