Probability

Assertion Reason Questions

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).
Choose the correct answer out of the following choices.
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of A.
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

1. Assertion (A): A coin is tossed. If it shows Reason (R):
head, we draw a ball from a bag consisting of 3 brown and 4 red balls; if it shows tail we throw a die, then the sample space of this experiment is S
= {HB_1 HB_2, HB_3, HR_1, HR_2, HR_3, HR_4, T1, T2, T3, T4, T5, T6}.
Reason (R): Consider the experiment in which a coin is tossed repeatedly until a head comes up, then the sample space is S = {H, TH, TTH, TITH, ...}.

Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
Explanation: Let us denote brown balls by B_1, B_2, B_3, and the red balls by R_1, R_2, R_3, R_4. Then, a sample space of the experiment is S = {HB_1, HB_2 HB_3, HR_1, HR_2, HR_3, HR_4, T1, T2, T3, T4, T5, T6}. In the experiment, head may come up on the 1st toss, or the 2^{nd} toss, or the 3^{rd} toss and so on till head is obtained. Hence, the desired sample space is S = {H, TH, TTH, TTTH, TTTTH,

2. Assertion (A): A coin is tossed and then a die is rolled only in case a head is shown on the coin. The sample space for the experiment is
S = {H_1, H_2, H_3, H_4, H_5, H_6, T}.

Reason (R): 2 boys and 2 girls are in room X, and 1 boy and 3 girls are in room Y. Then, the sample space for the experiment in which a room is selected and then a person, is S = {XB_1, XB_2, XG_1, XG_2, YB_3 YG_3, YG_4 YG_5}.
where B, denote the boys and Gj, denote the girls.

Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

Explanation: When coin is tossed, either we get head or tail.
Lets head be denoted by H and tail denoted by T.
According to a question when head is shown then a die is rolled.
Hence, Total number of sample space S associated with the experiment.
$S = \{H_1, H_2, H_3, H_4 H_5, T\}$
When the room x is selected, then

X	Y
B_1, B_2 G_1, G_2	B_3 G_3, G_4, G_5

There are four possibilities for selection of a person which are B_1, B_2, G_1, G_2, similarly, there will be four possibilities for room Y.
So, the sample space is
$S = \{XB_1, XB_2, XG_1, XG_2, YB_3, YG_3, YG_4 YG_5\}$

3. Consider the experiment of rolling a die. Then,
sample space is S = {1, 2, 3, 4, 5, 6}.
Assertion (A): The event E:" the number appears on the die is a multiple of 7", is an impossible event.

Reason (R): The event F" the number turns up is odd or even", is a sure event.
Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
Explanation: Given, E be the event "the number appears on the die is a multiple of 7". It is impossible to have a multiple of 7 on the upper face of the die. Thus, the event E = $ is an impossible event. The another event F is "the number turns up is odd or even". Clearly, F = {1,2,3,4,5,6} = S, i.e., all possible outcomes of the experiment ensure the occurrence of the event F. Thus, the event F is a sure event.

4. Assertion (A): If sample space of an experiment is S = {1,2,3,4,5,6}
and the events A and B are defined as A: "a number less than or equal to 3 appears" B: "a number greater than or equal to 3 appears" Then A and B are exhaustive events.
Reason (R): Events are exhaustive if atleast one of them necessarily occurs whenever the experiment is performed.

Ans. (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
Explanation: If we throw a dice, then the sample space

S = {1, 2, 3, 4, 5, 6}
We have A = {1, 2, 3} and B = {3, 4, 5, 6}
Since, AU BS, so, A and B are exhaustive events.

5. Assertion (A): The probability of drawing either an ace or a king from a pack of cards in a single draw

is $\frac{2}{13}$.

Reason (R): For two events A and B which are not mutually exclusive,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

Explanation: P (Drawing either an ace or a king)

$= \frac{4}{52} + \frac{4}{52} = \frac{8}{52}$

$= \frac{2}{13}$

(:- Both events are mutually exclusive)

If two events A and B are not mutually exclusive,

then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.