MISCONCEPTION
EQUIPROBABILITY (SIMPLE & COMPOUND EVENTS)

Pretest Item: Suppose one rolls two dice simultaneously. Which of the following has a greater chance of happening?

a) Getting both a 5 and a 6
b) Getting two 6's
c) Both a) and b) have the same chance.

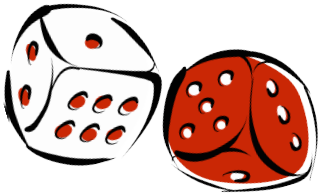
Correct Answer: a)

The misconception revolves around the concepts of **compound events** and **simple events**. By not differentiating between simple and compound events, students often assign equal probabilities to compound events when assigning equal probabilities to simple events would be appropriate.

The sample space for the experiment of rolling two die is:

(Written as (Green, Red)

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



The probability of each of the 36 outcomes is 1/36.

The event of getting both a 5 & a 6 consists of the two outcomes (5,6) and (6,5). The probability is 2/36 or .056. This is a compound event.

The event of getting two 6's consists of the single outcome (6,6) and thus the probability is 1/36 or .028. This is a simple event.

If a student chooses c) he may be thinking that (5,6) and (6,5) are the same outcome and thus getting both a 5 and a 6 is equally likely as getting two 6's. In this case the sample space would be

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

Thus there would be 21 outcomes in the sample space and the probability of getting both a 5 and a 6, as well as the probability of getting two 6's would be 1/21 or .048 (as compared with the correct probabilities of .056 for getting a 5 & a 6 and .028 for getting two 6's)

Let's run simulations to see how the real world operates. Is the probability of getting both a 5 and a 6 really .056 or .048?

The TI-73 Probability Simulator App allows one to simulate the rolling of two die and arrive at an experimental probability based on the desired number of trials. Running 999 trials (the max allowed with the push of one button) gives the following results.

- 999 trials: % of time we get a sum of 11 is .065
  % of time we get a sum of 12 is .025
- 999 trials: % of time we get a sum of 12 is .060
  % of time we get a sum of 12 is .025

Need more trials to be more convincing (to get more consistent results). Using probability applet from www.math.uah.edu/stat

- 10,000 trials: % of time we get a sum of 11 is .055
  % of time we get a sum of 12 is .026
- 10,000 trials: % of time we get a sum of 11 is .055
  % of time we get a sum of 12 is .027