Teacher Guide Section (7:29 minutes):

Hello. This is Mohammad Al-Raqab again and I am talking to you as the high school teachers. I am now willing to explain some ideas and thoughts to be considered throughout the four breaks. The main objective of this lesson is to motivate students thoughts and get them excited with some probability concepts.

In the first break, it is extremely important for the student to figure out the connection between this case problem (three-door problem) and the probability theory. Within this break, after I introduce the case problem,, the teacher may lead the class by focusing on two issues. The first issue is to convince the students that the probability helps them figure out the likelihood of something happening. The second issue is to ask students to present other similar problems.

Break # 2 allows the teacher and students to interact more effectively. The teacher would ask the students to run the three-envelope experiment multiple times switching and sometimes staying, and see what happens. Precisely, the students can play 12 times using Strategy 1 (sticking with the first choice) then 12 times using Strategy 2 (switching doors) and then compare the results which would be presented in the table given below. Check whether either strategy is better. Based on a real experiment, it is easily observed that it is preferable to switch when given the chance.

With regard to Break #3 after presenting the problem in a realistic situation as well as having observed the possibilities of the outcomes, students are expected to be engaged more in getting an exact solution for the probability values. One way to draw the student's attention to the correct answer is asking them to enumerate all the possibilities taking into account that there are two stages. It is important if you as a teacher can ask the students to enumerate the possibilities of the 5-envelope experiment:

			Envelope			
Case	A	B	C	D	E	Result
1	20 JD	---	---	---	---	Stick and Win
2	---	20 JD	---	---	---	Stick and Loss
3	---	---	20 JD	---	---	Stick and Loss
4	---	---	---	20 JD	---	Stick and Loss
5	---	---	---	---	20 JD	Stick and Loss
1	20 JD	---	---	---	---	Choose and Loss
2	---	20 JD	---	---	---	Stick and Win
3	---	---	20 JD	---	---	Stick and Win
4	---	---	---	20 JD	---	Stick and Win
5	---	---	---	---	20 JD	Stick and Win

This will guide the students to the right methodology in getting the probability numbers and making the correct decision. Therefore

$$P(\text{Wining in case of stick with the choice}) = \frac{1}{5} = 20\%$$

$$P(\text{Wining in case of changing the choice}) = \frac{4}{5} = 80\%$$

Break # 4 should mainly focus on the likelihood of an event. Let me suggest a simple example here the teacher can discuss with his students. Consider a jar with three colored balls (blue, yelow, green) such that the jar contains 5 blue, 3 yelow, 2 green balls. The marginal probabilities of drawing blue, yelow and green, respectively are

$$P(getting\ a\ blue\ ball) = \frac{5}{10}$$

$$P(getting\ a\ yelow\ ball) = \frac{3}{10}$$

and

$$P(getting\ a\ greenball) = \frac{2}{10}.$$

If the first drawn ball is blue, the probability of geeting a blue ball in the second trial (you draw without replacement) is 4/9. This is a conditional probility. Now joint probability of getting blue ball in the first draw and blue ball in the second draw)=(5/10)x(4/9)=2/9. The joint probability should be changed if the drawing is with replacement. That is, once you draw the first ball you place it in the jar before drawing the second ball. In consuence, the probability of getting blue balls in the first and second draws = (5/10)(5/10)=(1/4). These facts will help the students to get a definite number for the probabilities of the events raised in this lesson as they computed in the following section.

I wish you best and hope that I can meet you in another meeting.