Worksheet Penalty Shoot-Out

1. Use the table of random numbers to simulate 20 times a penalty shoot-out in which each team has a probability of 0.5 of scoring.

   a) What was the mean number of kicks made per shoot-out?

   b) What is the most likely result?

   c) How many times did you reach the next stage?

2. Use the table of random numbers to simulate 20 times a penalty shoot-out in which one team (England) has a probability of 0.5 of scoring and the other team (Portugal) has a probability of 0.6 of scoring.

   a) How many times did England win?

   b) What is the most likely result?

   c) How many times did they reach the next stage

3. You will need two people for this simulation.

   Assign a probability to each of the players on each side. You can choose a value between 0.3 and 0.7 but the overall average for each team should be 0.5. Choose the order of the penalty takers for your team and simulate the penalty shoot-out 10 times.

   Is there a best strategy for using the players?

4. Undertake a similar simulation, this time assigning individual probabilities to each member of the team.

5. Use a spreadsheet or computer program to simulate penalty shoot-outs. You can then generate not just 20 simulations but thousands, and hence have more confidence in the trends uncovered (for example, the total number of kicks, what fraction continue to the knock-out stage, etc.).