

# ***FACULTY NOTES***

The LTAs and Spinoffs are designed so that each professor can implement them in a way that is consistent with his/her teaching style and course objectives. This may range from using the materials as out-of-class projects with minimal in-class guidance to doing most of the work in class. The LTAs and Spinoffs are amenable to small group cooperative work and typically benefit from the use of some learning technology. Since the objective of the LTAs and Spinoffs is to support the specific academic goals you have set for your students, the Faculty Notes are not intended to be prescriptive. The purpose of the Faculty Notes is to provide information that assists you to take full advantage of the LTAs and Spinoffs. This includes suggestions for instruction as well as answers for the exercises.



## SPINOFF 3A

### A Cost-Benefit Analysis of the Doppler Radar Wind Profiler at the Kennedy Space Center

#### Solutions

##### Exercises

- 1) There are two outcomes in event  $E$ , so  $S = 2$ . There are 12 outcomes in the sample space, so  $T = 12$ .

$$p = \frac{S}{T} = \frac{2}{12} = \frac{1}{6}$$

- 2)  $S = \{(H,H,H), (H,H,T), (H,T,H), (H,T,T), (T,H,H), (T,H,T), (T,T,H), (T,T,T)\}$   
 $E = \{(H,H,T), (H,T,H), (T,H,H)\}$

$$p = \frac{3}{8}$$

- 3) Answers will vary. The theoretical probability is

$$p = \frac{6}{36} + \frac{2}{36} = \frac{2}{9}$$

##### Solution of the Spinoff Problem

- 1) **Define the problem**

Fact sheet: A Space Shuttle costs \$2,000,000,000 to replace. A Titan rocket with payload is worth approximately \$200,000,000. The probability of an unobserved change in wind velocity large enough to destroy a launch vehicle is approximately 0.001. The instructor can “make up” any other information requested.

- 2) **Devise a plan**

Student plans should include the use of mathematical expectation.

- 3) **Carry out the plan**

Mathematical expectation (M.E.):

$$\begin{aligned} \text{M.E.} &= 0.001 \{(2,000,000,000)(8) + (200,000,000)(2)\} - 250,000 \\ &= 0.001(16,400,000,000) - 250,000 \\ &= 16,400,000 - 250,000 \\ &= 16,150,000 \end{aligned}$$

The benefits of the DRWP outweigh the costs by \$16,150,000. Its use should be continued.

- 4) **Looking back**

Answers will vary.