RUN FOR YOUR FLIGHT

Rubric and Sample Responses

Question 1

RUBRIC

Score	Description
8	Response demonstrates thorough understanding of computing compound probabilities. • For each part, assign 1 point for the correct probability. • For each part, assign 1 point for using the correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

a. What is the likelihood that Carlos will have a delayed departure from San Francisco?

(# Departure Delays) ÷ Total Departures = (# Air Traffic Delays + # Weather Delays) ÷ Total Departures = (42 + 15) ÷ 195 = 57 ÷ 195 = 0.292 or 29.2 %

b. If there is a delay is San Francisco, what is the likelihood that it will be more than 1 hour?

Carlos has a 1-hour layover in Los Angeles before flying to Denver. Therefore, his departure from San Francisco must not be delayed more than 1 hour: (# delays > 1 hour) ÷ (# of delays) = (# delays 61-75 minutes + # delays 761-90 minutes + # delays > 90 minutes) ÷ (# Air Traffic Delays + # Weather Delays) = (12+12+13) ÷ (42 + 15) = 37 ÷ 57 = 0.649 or 64.9%

c. What is the likelihood that Carlos will have a delay of more than 1 hour?

(likelihood of a late departure) x (likelihood of the departure being ≥ 60 minutes) = 29.2% X 64.9% = 0.292 X 0.649 = 19.0% OR
((42 delays due to air traffic + 15 delays due to weather) ÷ 195 total departure flights) x ((12 delays 61-75 minutes + 12 delays 76 – 90 minutes + 13 delays > 90 minutes) ÷ (42 Air Traffic Delays + 15 Weather Delays)) = (57 ÷ 195) x (37 ÷ 57) = (0.292) x (0.649) = 0.190 or 19.0%

d. What is the likelihood that Carlos will depart San Francisco on time for his flight to Denver? (Type your answer below and record the result on paper for later use.)

100% - 19.0% = 81.0%

Thus, Carlos has an 81.0% chance that he will depart from San Francisco in time for his flight to Denver.

Question 2

RUBRIC

Score	Description
8	Response demonstrates thorough understanding of computing compound probabilities. • For each part, assign 1 point for the correct probability. • For each part, assign 1 point for using the correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

a. What is the likelihood that Carlos will have a delayed departure from Los Angeles?

(# Departure Delays) ÷ Total Departures = (# Air Traffic Delays + Weather Delays) ÷ Total Departures = (25 + 15) ÷ 150 = 40 ÷ 150 = 0.2667 or 26.7%

b. If there is a delay in Los Angeles, what is the likelihood that it will be more than 30 minutes?

Carlos has a 30 minute layover in Denver before flying back to Los Angeles. Therefore, his departure from Los Angeles must not be delayed more than 30 minutes.

(# delays ≥ 31 minutes) ÷ (# of delays) =

(# delays 31 – 45 minutes + delays 46 – 60 minutes + delays 61-75 minutes + delays 76-90 minutes + delays > 90 minutes) ÷ (# Air Traffic Delays + Weather Delays) = 26 (8 + 7 + 2 + 1 + 1) ÷ (25 + 15) = 19 ÷ 40 = 47.5%

c. What is the likelihood that Carlos will have a delay of more than 30 minutes?

(likelihood of a late departure) x (likelihood of the departure being ≥ 31 minutes) = 0.267 x 0.475 = 0.1268 or 12.7%

OR

((25 delays due to air traffic + 15 delays due to weather) ÷ 150 total departure flights)) x ((8 delays 31 – 45 minutes + 7 delays 46 – 60 minutes + 2 delays 61-75 minutes +1 delays 761-90 minutes + 1 delays > 90 minutes) ÷ (25 Air Traffic Delays + 15 Weather Delays))

= (40 ÷ 150) x (19 ÷ 40) = (0.267) x (0.475) = = 0.1268 or 12.7%

d. What is the likelihood that Carlos will depart Las Vegas in time to fly to Seattle? (Type your answer below and record the result on paper for later use.)

Therefore, the likelihood that he will arrive in time is 100% - 12.7% or 87.3%.

Question 3

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Carlos has a 60-minute (1 hour) layover in Los Angeles before flying to Seattle. Therefore, his departure from Los Angeles must not be delayed more than 60-minute (1 hour) or:

(likelihood of a late departure x likelihood of the departure being > 60 minutes)

= ((20 delays due to air traffic + 55 delays due to weather) ÷ 150 total departure flights) x ((12 delays 61-75 minutes + 15 delays 76 – 90 minutes + 19 delays > 90 minutes)) ÷ (20 air traffic delays + 55 weather delays))

= (75 ÷150) x (46 ÷ 75) = 0.50 X 0.6133 = 0.3067 or 30.7%

Therefore, the likelihood that he will depart in time is 100% - 30.7% or 69.3%.

Question 4

RUBRIC

Score	Description
5	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for each correct Compound Likelihood. (3 points) • Assign 1 point for correctly interpreting each set of probabilities to determine the need for a standby pilot. (2 points)
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Flight Number	Origination City	Departure Time	Destination City	Arrival Time	Flight Length	Likelihood of On-Time Departure	Accumulated Likelihood
1569	San Francisco	7:15 a.m.	Los Angeles	8:45 a.m.	1.5 hours	81.0%	Assign
855	Los Angeles	9:45 a.m.	Denver	12:45 p.m.	2 hours	87.3%	Assign
2135	Denver	1:15 p.m.	Los Angeles	2:45 p.m.	2.5 hours	69.3%	Assign
1423	Los Angeles	3:45 p.m.	San Francisico	5:00 p.m.	1.25 hours		

Will a delayed arrival or departure for Carlos reach a point at which a standby pilot must be scheduled? If so, for which flight do you need a standby pilot?

Yes, the likelihood that Carlos will make it to Los Angeles in time for his flight to San Francisco is less than 75%. A standby pilot should be scheduled to take Carlos' flight from Los Angeles to San Francisco.

Will the accumulated chance of a delayed arrival or departure for Carlos reach a point at which a standby pilot must be scheduled? If so, for which flight do you need a standby pilot?

Question 5

RUBRIC

Score	Description
8	Response demonstrates thorough understanding of computing compound probabilities. • For each part, assign 1 point for the correct probability. • For each part, assign 1 point for using the correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

a. What is the likelihood that Steven will depart Denver in time to fly to Las Vegas?

(# Departure Delays) ÷ Total Departures =
(# Air Traffic Delays + # Weather Delays) ÷ Total Departures = (20 + 55) ÷ 150 = 75 ÷ 150 = 0.50 or 50%

b. If there is a delay in Denver, what is the likelihood that it will be more than 75 minutes (1 hour 15 minutes)?

Steven has a 75 minute (1 hour 15 minutes) layover in Seattle before flying to Las Vegas. Therefore, his departure from Denver must not be delayed more than 75 minutes.

(# delays ≥ 75 minutes) ÷ (# of delays) =
(# delays 76 – 90 minutes + # delays > 90 minutes) ÷ (# Air Traffic Delays + # Weather Delays) = 31
(15 + 19) ÷ (20 + 55) = 34 ÷ 75 = 0.4533 or 45.3%

c. What is the likelihood that Steven will have a delay of more than 75 minutes?

(likelihood of a late departure) x (likelihood of the departure being ≥ 75 minutes) = 0.50 x 0.453 = 0.2265 or 22.7% OR ((20 delays due to air traffic + 55 delays due to weather) ÷ 150 total departure flights) x ((15 delays 76 – 90 minutes + 19 delays > 90 minutes) ÷ (20 + 55)) = (75 ÷ 150) x (34 ÷ 75) = (0.50) x (0.453) = 0.2265 or 22.7%

d. What is the likelihood that Steven will depart Denver in time to fly to Las Vegas? (Type your answer below and record the result on paper for later use.)

Therefore, the likelihood that he will arrive in time is 100% - 22.7% or 77.3%.

Question 6

RUBRIC

Score	Description
8	Response demonstrates thorough understanding of computing compound probabilities. • For each part, assign 1 point for the correct probability. • For each part, assign 1 point for using the correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

a. What is the likelihood that Steven will depart Seattle in time to fly to Denver?

(# Departure Delays) ÷ Total Departures =
(# Air Traffic Delays + # Weather Delays) ÷ Total Departures = (21 + 29) ÷ 173 = 50 ÷ 173 = 0.289 or 28.9%

b. If there is a delay in Seattle, what is the likelihood that it will be more than 45 minutes?

Steven has a 45 minute layover in Las Vegas before flying to Denver. Therefore, his departure from Seattle must not be delayed more than 45 minutes.

(# delays ≥ 46 minutes) ÷ (# of delays) =
(# delays 46 – 60 minutes + # delays 61 – 75 minutes + # delays 76 – 90 minutes + # delays > 90 minutes) ÷ (# Air Traffic Delays + # Weather Delays) =
(12 + 11 + 11 + 7) ÷ (21 + 29) = 41 ÷ 50 = 0.82 or 82%

c. What is the likelihood that Steven will have a delay of more than 45 minutes?

(likelihood of a late departure) x (likelihood of the departure being ≥ 46 minutes) = 0.289 x 0.82 = 0.2369 or 23.7%

OR

((21 delays due to air traffic + 29 delays due to weather) ÷ 173 total departure flights) x ((12 delays 46 – 60 minutes + 11 delays 61 – 75 minutes + 11 delays 76 – 90 minutes + 7 delays > 90 minutes) ÷ (21 + 29))

= (50 ÷ 173) x (41 ÷ 50) = (0.289) x (0.82) = 0.2369 or 23.7%

d. What is the likelihood that Steven will depart Seattle in time to fly to Denver? (Type your answer below and record the result on paper for later use.)

Therefore, the likelihood that he will arrive in time is 100% - 23.7% or 76.3%.

Question 7

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for each correct Compound Likelihood. (2 points) • Assign 1 point for correctly interpreting each set of probabilities to determine the need for a standby pilot. (2 points)
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Flight Number	Origination City	Departure Time	Destination City	Arrival Time	Flight Length	Likelihood of On-Time Departure	Accumulated likelihood
2237	Denver	8:30 a.m.	Seattle	10:15 a.m.	2.75 hours	77.3%	77.3%
1367	Seattle	11:30 a.m.	Las Vegas	2:00 p.m.	2.5 hours	76.3%	59.0%
956	Las Vegas	2:45 p.m.	Denver	5:30 p.m.	1.75 hours		

Will a delayed arrival or departure for Steven reach a point at which a standby pilot must be scheduled?

No, all of his flights have a likelihood > 75% of departing on time.

Will the accumulated chance of a delayed arrival or departure for Steven reach a point at which a standby pilot must be scheduled? If so, for which flight do you need a standby pilot?

Yes, the accumulated likelihood that Steven will depart Seattle on time to make his flight to Denver is 59%. 59% < 65%, so a standby pilot should be called to fly from Las Vegas to Denver.

Question 8

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Daniel is scheduled to arrive in Phoenix 75 minutes (1 hour and 15 minutes) before his flight to San Francisco. He must not leave Denver more than 75 minutes (1 hour and 15 minutes) late. The likelihood of his being delayed 75 minutes is the likelihood of a late departure from Denver times the likelihood that the departure is more than 75 minutes late.

SAMPLE RESPONSE

Daniel is scheduled to arrive in Phoenix 75 minutes (1 hour and 15 minutes) before his flight to San Francisco. He must not leave Denver more than 75 minutes (1 hour and 15 minutes) late. The likelihood of his being delayed 75 minutes is the likelihood of a late departure from Denver times the likelihood that the departure is more than 75 minutes late.

(likelihood of a late departure x likelihood of the departure being > 75) =

((20 air traffic delays + 55 weather delays) ÷ 150 Total Departures) x ((15 delays 76 – 90 minutes + 19 delays > 90 minutes) ÷ (20 air traffic delays + 55 weather delays)) =

(75 ÷ 150) x (34 ÷ 75) = 0.50 x 0.453 = 0.2265 or 22.7%

100% - 22.7% = 77.3%

Daniel has a 77.3% chance of arriving in Phoenix on time.

Question 9

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of converting measurement units. • Assign 1 point for correct number of lemons.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Daniel is scheduled to arrive in San Francisco 30 minutes before his flight back to Phoenix. He must not leave Phoenix more than 30 minutes late. The likelihood of his being delayed 30 minutes is the likelihood of a late departure from Phoenix times the likelihood that the departure is more than 30 minutes late.

(likelihood of a late departure x likelihood of the departure being > 30) = ((21 air traffic delays + 4 weather delays) ÷ 144 Total Departures) x ((4 delays 31 – 45 minutes + 7 delays 46 – 60 minutes + 6 delays 61 – 75 minutes + 5 delays 76 – 90 minutes + 3 delays > 90 minutes) ÷ (21 air traffic delays + 4 weather delays)) =

(25 ÷ 144) x (25 ÷ 25) = 0.1736 X 1.0 = 0.1736 or 17.4%

100% - 17.4% = 82.6%

Daniel has an 82.6% chance that he will depart Phoenix in time.

Question 10

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Daniel is scheduled to arrive in Phoenix 45 minutes before his flight back to Denver. He must not leave San Francisco more than 45 minutes late. The likelihood of his being delayed more than 45 minutes is the likelihood of a late departure from San Francisco times the likelihood that the departure is more than 45 minutes late.

(likelihood of a late departure X likelihood of the departure being > 45) =

((42 air traffic delays + 15 weather delays) ÷ 195 Total Departures) x ((13 delays 46 – 60 minutes + 12 delays 61- 75 minutes + 12 delays 76 - 90 minutes + 13 delay > 90 minutes) ÷ (42 air traffic delays + 15 weather delays)) =

(57 ÷ 195) x (50 ÷ 57) = 0.292 x 0.877 = 0.256 or 25.6%

100% - 25.6% = 74.4%

Daniel has a 74.4% chance of departing San Francisco in time.

Question 11

RUBRIC

Score	Description
5	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for each correct Compound Likelihood. (3 points) • Assign 1 point for correctly interpreting each set of probabilities to determine the need for a standby pilot. (2 points)
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Flight Number	Origination City	Departure Time	Destination City	Arrival Time	Flight Length	Likelihood of On-Time Departure	Accumulated Likelihood
845	Denver	6:00 a.m.	Las Vegas	7:45 a.m.	1.75 hours	77.3%	77.3%
670	Phoenix	8:30 a.m.	San Francisco	10:00 a.m.	2 hours	82.6%	63.8%
2751	San Francisco	10:45 p.m.	Phoenix	1:30 p.m.	2. hours	74.4%	47.5%
2134	Phoenix	1:45 p.m.	Denver	4:00 p.m.	1.75 hours		

Will a delayed arrival or departure for Daniel reach a point at which a standby pilot must be scheduled?

Yes, the likelihood that Daniel will make it to Phoenix in time for his flight to Denver is less than 75%. A standby pilot should be scheduled to take Daniel?s flight from Phoenix to Denver.

Will the accumulated chance of a delayed arrival or departure for Daniel reach a point at which a standby pilot must be scheduled? If so, for which flight do you need a standby pilot?

The accumulated likelihood that Daniel will depart Phoenix in time to make his flight back to Phoenix is only 63.8 %. 63.8% < 65%, so a standby pilot should be scheduled to take Daniel?s flight from San Francisco to Phoenix.

**NOTE: Some students may realize that 2 stand-by pilots are requested but not necessary, because if the standby takes the flight from Phoenix to San Francisco, the accumulated likelihood for the new pilot will be calculated from his/her initial flight.

Question 12

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Sofia is scheduled to arrive in Denver 90 minutes (1 hour and 30 minutes) before her flight to Phoenix. She must not leave Seattle more than 90 minutes late. The likelihood of her being delayed more than 90 minutes is the likelihood of a late departure from Seattle times the likelihood that the departure is more than 90 minutes late.

(likelihood of a late departure x likelihood of the departure being > 90) =

((21 air traffic delays + 29 weather delays) ÷ 173 Total Departures) x (7 delay > 90 minutes ÷ (21 air traffic delays + 29 weather delays)) =

(50 ÷ 173) x (7 ÷ 50) = 0.289 x 0.14 = 0.040 or 4%

100% - 4% = 96%

Sofia has an 96% chance of departing Seattle on time.

Question 13

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Sofia is scheduled to arrive in Phoenix 60 minutes before her flight to Las Vegas. She must not leave Denver more than 60 minutes late. The likelihood of her being delayed more than 60 minutes is the likelihood of a late departure from Denver times the likelihood that the departure is more than 60 minutes late.

(likelihood of a late departure x likelihood of the departure being > 61) =

((20 air traffic delays + 55 weather delays) ÷ 150 Total Departures) x ((12 delays 61- 75 minutes + 15 delays 76 - 90 minutes + 19 delay > 90 minutes) ÷ (20 air traffic delays + 55 weather delays)) =

(75 ÷ 150) x (46 ÷ 75) = 0.50 x 0.613 = 0.3065 or 30.7%

100% - 30.7% = 69.3%

Sofia has a 69.3% chance that she will depart Denver in time to fly to Las Vegas.

Question 14

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for correct probability. • Assign up to 3 points for a completely correct strategy.
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Sofia is scheduled to arrive in Las Vegas 90 minutes (1 hours and 30 minutes) before her flight to Seattle. She must not leave Phoenix more than 90 minutes late. The likelihood of her being delayed more than 90 minutes is the likelihood of a late departure from Phoenix times the likelihood that the departure is more than 90 minutes late.

(likelihood of a late departure x likelihood of the departure being >90) =

((21 air traffic delays + 4 weather delays) ÷ 144 Total Departures) x (3 delay > 90 minutes ÷ (21 air traffic delays + 4 weather delays)) =

(25 ÷ 144) x (3 ÷ 25) = 0.1736 x 0.12 = 0.0208 or 2.1%

Therefore, the likelihood that Sofia will depart on time is 100% - 2.1% or 97.9%

Question 15

RUBRIC

Score	Description
5	Response demonstrates thorough understanding of computing compound probabilities. • Assign 1 point for each correct Compound Likelihood. (3 points) • Assign 1 point for correctly interpreting each set of probabilities to determine the need for a standby pilot. (2 points)
0	The student's response is all or mostly incorrect.

SAMPLE RESPONSE

Flight Number	Origination City	Departure Time	Destination City	Arrival Time	Flight Length	Likelihood of On-Time Departure	Accumulated Likelihood
845	Seattle	6:00 a.m.	Denver	8:45 a.m.	2.5hours	96.0%	96.0%
670	Denver	8:30 a.m.	Phoenix	11:30 a.m.	1.75 hours	69.3%	66.5%
2751	Phoenix	10:45 p.m.	Las Vegas	12:30 p.m.	1 hour	97.9%	65.1%
2134	Las Vegas	1:45 p.m.	Seattle	4:00 p.m.	2.5 hours		

Will a delayed arrival or departure for Sofia reach a point at which a standby pilot must be scheduled?

Yes. The likelihood of her departing Denver on time is only 69.3%. A standby pilot should be called in to cover her flight from Phoenix to Las Vegas.

Will the accumulated chance of a delayed arrival or departure for Sophia reach a point at which a standby pilot must be scheduled? If so, for which flight do you need a standby pilot?

No. The accumulated likelihood of a delay is always more than 65%.

**NOTE: Some students may realize that if the standby takes the flight from Phoenix to Las Vegas, the accumulated likelihood for the new pilot will be calculated from his/her initial flight.