



EIN 5226

Applications of Basic Probability in Quality

Part B

Karen E. Schmahl Ph.D., P.E.

UNIVERSITY OF WISCONSIN - STEVENS POINT
COLLEGE OF ENGINEERING

Order Fulfillment Problem

An on-line retailer ships orders in packages containing one part number in the package with multiple quantities of that item (part number).

Customer complaints triggered an investigation and it appears one warehouse has significant problems.

For any order from the warehouse, there is

- A 8% probability that an order will the incorrect version of the item in it
- A 10% probability that the package will contain the incorrect quantity for the item.

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Order Fulfillment Problem

For any order, there is

- A 8% probability that an order will the incorrect version of the item in it
- A 10% probability that the package will contain the incorrect quantity for the item.

T / F The event that a package will have the incorrect version of the item and the event that the package will have the incorrect quantity are mutually exclusive.

T / F The event that a package will have the incorrect version of the item and the event that the package will have the incorrect quantity are independent events.

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Order Fulfillment Problem

For any order, there is

- A 8% probability that an order will the incorrect version of the item in it
- A 10% probability that the package will contain the incorrect quantity for the item.

What percent of packages will have both the wrong version and incorrect quantity?

- A. 18% B. 0.8% C. 9% D. 1.8%.

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Order Fulfillment Problem

For any order from the warehouse, there is

- A 8% probability that an order will the incorrect version of the item in it

Let Y = event of incorrect version in package

$$P(\text{incorrect version}) = P(Y) = 0.08$$

- A 10% probability that the package will contain the incorrect quantity for the item.

Let Z = event of wrong quantity in package

$$P(\text{wrong quantity}) = P(Z) = 0.10$$

For independent events Y and Z

$$P(\text{incorrect version AND wrong Quantity}) = P(Y \text{ and } Z)$$

$$= P(Y \cap Z) = P(Y) \times P(Z) = .08 \times .10 = .008$$

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Order Fulfillment Problem

For any order, there is

- A 8% probability that an order will the incorrect version of the item in it (example, shipped blue color rather than the red which was ordered)
- A 10% probability that the package will contain the incorrect quantity for the item.

What is the probability of a package having the correct item version?

- A. 8% B. 10% C. 90% D. 92%.

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Order Fulfillment Problem

For any order from the warehouse, there is

- A 8% probability that an order will the incorrect version of the item in it

Let Y = event of incorrect version in package

$$P(\text{incorrect version}) = P(Y) = 0.08$$

$$P(\text{correct version}) = P(\text{not } Y) = 1 - P(Y) = 1 - 0.08 = .92$$

- A 10% probability that the package will contain the incorrect quantity for the item.

Let Z = event of wrong quantity in package

$$P(\text{wrong quantity}) = P(Z) = 0.10$$

$$P(\text{correct quantity}) = P(\text{not } Z) = 1 - P(Z) = 1 - 0.10 = .90$$

$$\text{Complement of Event A: } P(A^c) = P(\text{not } A) = 1 - P(A)$$

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Order Fulfillment Problem

For any order, there is

- A 8% probability that an order will the incorrect version of the item in it (example, shipped blue color rather than the red which was ordered)
- A 10% probability that the package will contain the incorrect quantity for the item.

What percent of packages will have both the correct version and correct quantity?

- A. 80.0% B. 81.7% C. 82.0% D. 82.8%

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Order Fulfillment Problem

For any order from the warehouse, there is

- A 8% probability that an order will the incorrect version of the item in it

$$P(\text{incorrect version}) = P(Y) = 0.08$$

$$P(\text{correct version}) = P(\text{not } Y) = 1 - P(Y) = 1 - 0.08 = .92$$

- A 10% probability that the package will contain the incorrect quantity for the item.

$$P(\text{wrong quantity}) = P(Z) = 0.10$$

$$P(\text{correct quantity}) = P(\text{not } Z) = 1 - P(Z) = 1 - 0.10 = .90$$

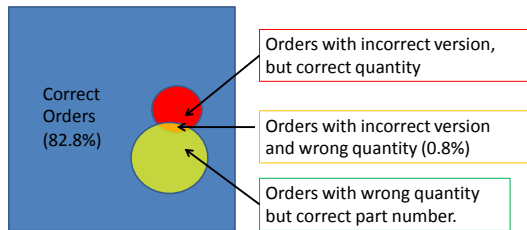
For independent events (not Y) and (not Z)

$$P(\text{correct version AND correct Quantity}) = P(\text{not } Y \text{ and not } Z)$$

$$= P(\text{not } Y \cap \text{not } Z) = P(\text{not } Y) \times P(\text{not } Z) = .92 \times .90 = .828$$

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Package Sample Space



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Order Fulfillment Problem

For any order, there is

- 8% probability incorrect version $P(Y) = .08$
- 10% probability incorrect quantity $P(Z) = .10$

Outcome	Independent event Formulas	Calculation	Prob.
Wrong version, wrong quantity	$P(Y) \times P(Z)$	$(0.08) \times (0.10)$	0.008
Correct version, correct quantity	$P(\text{not } Y) \times P(\text{not } Z)$	$(1 - 0.08) \times (1 - 0.10)$	0.828
Wrong version, correct quantity	$P(Y) \times P(\text{not } Z)$	$(0.08) \times (1 - 0.10)$	0.072
Correct version, wrong quantity	?	?	?

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Order Fulfillment Problem

For any order, there is

- 8% probability incorrect version $P(Y) = .08$
- 10% probability incorrect quantity $P(Z) = .10$

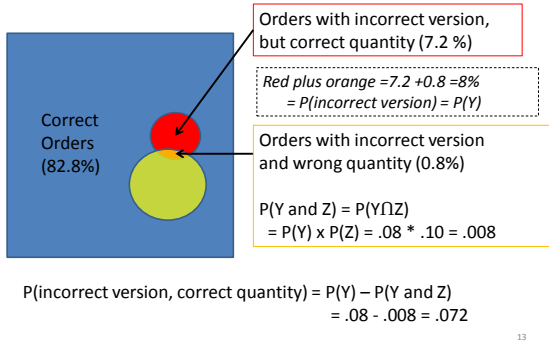
Outcome	Independent event Formulas	Calculation	Prob.
Wrong version, wrong quantity	$P(Y) \times P(Z)$	$(0.08) \times (0.10)$	0.008
Correct version, correct quantity	$P(\text{not } Y) \times P(\text{not } Z)$	$(1 - 0.08) \times (1 - 0.10)$	0.828
Wrong version, correct quantity	$P(Y) \times P(\text{not } Z)$	$(0.08) \times (1 - 0.10)$	0.072
Correct version, wrong quantity	?	?	?

What percent of packages will have the correct version and wrong quantity?

- A. 10.0% B. 8.2% C. 7.2% D. 9.2%

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Package Sample Space



Order Fulfillment Problem

Outcome	Independent event Formulas	Calculation	Prob.
Wrong version, wrong quantity	$P(Y) \times P(Z)$	$(0.08) \times (0.10)$	0.008
Correct version, correct quantity	$P(\text{not } Y) \times P(\text{not } Z)$	$(1-.08) \times (1-.10)$	0.828
Wrong version, correct quantity	$P(Y) \times P(\text{not } Z)$	$(0.08) \times (1-.10)$	0.072
Correct version, wrong quantity	$P(\text{not } Y) \times P(Z)$	$(1-.08) \times (0.10)$	0.092

What percent of packages will have at least one thing wrong with it?

- A. 18.0% B. 8.2% C. 17.2% D. 16.4%

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Order Fulfillment Problem

Outcome	Independent event Formulas	Calculation	Prob.
Wrong version, wrong quantity	$P(Y) \times P(Z)$	$(0.08) \times (0.10)$	0.008
Correct version, correct quantity	$P(\text{not } Y) \times P(\text{not } Z)$	$(1-.08) \times (1-.10)$	0.828
Wrong version, correct quantity	$P(Y) \times P(\text{not } Z)$	$(0.08) \times (1-.10)$	0.072
Correct version, wrong quantity	$P(\text{not } Y) \times P(Z)$	$(1-.08) \times (0.10)$	0.092

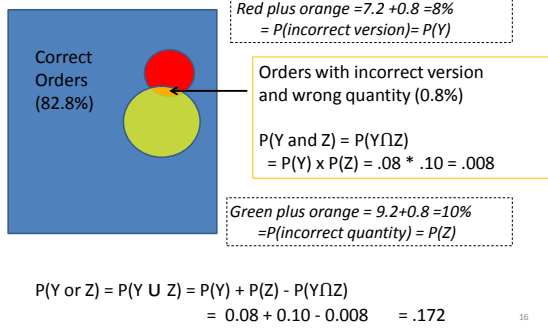
What percent of packages will have at least one thing wrong with it?

$P(\text{at least one thing wrong}) = 1 - P(\text{nothing wrong})$

Complement of Event A: $P(A^c) = P(\text{not } A) = 1 - P(A)$

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Another way to calculate P(one or more)





Related Assignments

Please see Blackboard for related assignments
