

Total Probability and Bayes' Theorem

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

1. A randomly selected item passes inspection. Find P(Source B | passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	9/20	3/10
Source B	11/20	13/20

2. A randomly selected item comes from the source branches in the table. Find P(passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	3/10	7/20
Source B	7/10	7/10

Total Probability and Bayes' Theorem

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

3. A randomly selected item comes from the source branches in the table. Find P(passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	1/5	11/20
Source B	7/20	9/10
Source C	9/20	2/5

4. A randomly selected item passes inspection. Find P(Source B | passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	1/10	1/4
Source B	7/20	3/5
Source C	11/20	1/10

Total Probability and Bayes' Theorem

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

5. A randomly selected item passes inspection. Find $P(\text{Source B} \mid \text{passes inspection})$.

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$\frac{1}{10}$	$\frac{9}{10}$
Source B	$\frac{7}{20}$	$\frac{2}{5}$
Source C	$\frac{11}{20}$	$\frac{3}{4}$

6. A randomly selected item comes from the source branches in the table. Find $P(\text{passes inspection})$.

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$\frac{3}{10}$	$\frac{11}{20}$
Source B	$\frac{7}{10}$	$\frac{9}{10}$

Total Probability and Bayes' Theorem

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

7. A randomly selected item passes inspection. Find P(Source B | passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	9/20	3/4
Source B	11/20	1/4

8. A randomly selected item comes from the source branches in the table. Find P(passes inspection).

Assumptions: The source branches are exhaustive and disjoint; the displayed conditional rates apply within their source.

Source	P(source)	P(passes inspection source)
Source A	3/10	13/20
Source B	1/4	3/20
Source C	9/20	1/2

Total Probability and Bayes' Theorem
Worked Answer Key

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

1. A randomly selected item passes inspection. Find $P(\text{Source B} \mid \text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	9/20	3/10
Source B	11/20	13/20

Answer: 143/197; approximately 0.726

- 1. First find $P(\text{passes inspection}) = 197/400$, approximately 0.493.
- 2. The conditioning event has positive probability 197/400.
- 3. $P(\text{Source B} \mid \text{passes inspection}) = [11/20 \times 13/20] / 197/400 = 143/197$, approximately 0.726.

2. A randomly selected item comes from the source branches in the table. Find $P(\text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	3/10	7/20
Source B	7/10	7/10

Answer: 119/200; approximately 0.595

- 1. $P(\text{passes inspection}) = 0.1050 + 0.4900 = 119/200$, approximately 0.595.
- 2. Each product is $P(\text{source}) \times P(\text{passes inspection} \mid \text{source})$; the disjoint branches are then added.

Total Probability and Bayes' Theorem
Worked Answer Key

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

3. A randomly selected item comes from the source branches in the table. Find P(passes inspection).

Source	P(source)	P(passes inspection source)
Source A	1/5	11/20
Source B	7/20	9/10
Source C	9/20	2/5

Answer: 121/200; approximately 0.605

- 1. P(passes inspection) = 0.1100 + 0.3150 + 0.1800 = 121/200, approximately 0.605.
- 2. Each product is P(source) x P(passes inspection | source); the disjoint branches are then added.

4. A randomly selected item passes inspection. Find P(Source B | passes inspection).

Source	P(source)	P(passes inspection source)
Source A	1/10	1/4
Source B	7/20	3/5
Source C	11/20	1/10

Answer: 21/29; approximately 0.724

- 1. First find P(passes inspection) = 29/100, approximately 0.290.
- 2. The conditioning event has positive probability 29/100.
- 3. P(Source B | passes inspection) = [7/20 x 3/5] / 29/100 = 21/29, approximately 0.724.

Total Probability and Bayes' Theorem**Worked Answer Key**

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

5. A randomly selected item passes inspection. Find $P(\text{Source B} \mid \text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$1/10$	$9/10$
Source B	$7/20$	$2/5$
Source C	$11/20$	$3/4$

Answer: 56/257; approximately 0.218

1. First find $P(\text{passes inspection}) = 257/400$, approximately 0.643.
2. The conditioning event has positive probability $257/400$.
3. $P(\text{Source B} \mid \text{passes inspection}) = [7/20 \times 2/5] / 257/400 = 56/257$, approximately 0.218.

6. A randomly selected item comes from the source branches in the table. Find $P(\text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$3/10$	$11/20$
Source B	$7/10$	$9/10$

Answer: 159/200; approximately 0.795

1. $P(\text{passes inspection}) = 0.1650 + 0.6300 = 159/200$, approximately 0.795.
2. Each product is $P(\text{source}) \times P(\text{passes inspection} \mid \text{source})$; the disjoint branches are then added.

Total Probability and Bayes' Theorem
Worked Answer Key

Use the exhaustive, disjoint source branches. Show the total-event sum before any reverse conditional probability, then round only the final result.

7. A randomly selected item passes inspection. Find $P(\text{Source B} \mid \text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$\frac{9}{20}$	$\frac{3}{4}$
Source B	$\frac{11}{20}$	$\frac{1}{4}$

Answer: $\frac{11}{38}$; approximately 0.289

- First find $P(\text{passes inspection}) = \frac{19}{40}$, approximately 0.475.
- The conditioning event has positive probability $\frac{19}{40}$.
- $P(\text{Source B} \mid \text{passes inspection}) = [\frac{11}{20} \times \frac{1}{4}] / \frac{19}{40} = \frac{11}{38}$, approximately 0.289.

8. A randomly selected item comes from the source branches in the table. Find $P(\text{passes inspection})$.

Source	$P(\text{source})$	$P(\text{passes inspection} \mid \text{source})$
Source A	$\frac{3}{10}$	$\frac{13}{20}$
Source B	$\frac{1}{4}$	$\frac{3}{20}$
Source C	$\frac{9}{20}$	$\frac{1}{2}$

Answer: $\frac{183}{400}$; approximately 0.458

- $P(\text{passes inspection}) = 0.1950 + 0.0375 + 0.2250 = \frac{183}{400}$, approximately 0.458.
- Each product is $P(\text{source}) \times P(\text{passes inspection} \mid \text{source})$; the disjoint branches are then added.