



UNIVERSITY OF
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Bag A or Bag B?

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Bag A or Bag B?

BAG A

Face Value	Frequency
- 1,000	1
10	7
20	6
30	2
40	2
50	1
60	1

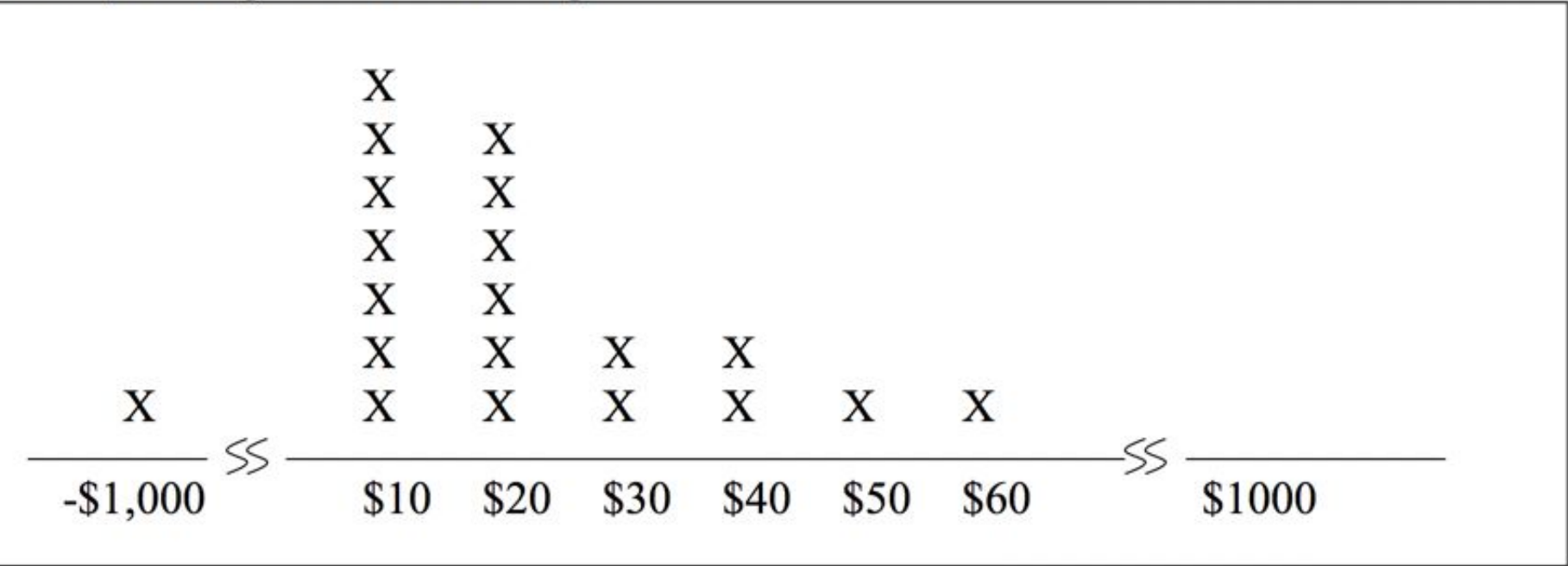
Total Value: -\$560

BAG B

Face Value	Frequency
10	1
20	1
30	2
40	2
50	6
60	7
1,000	1

Total Value: -\$1890

Frequency Plot for Bag A:

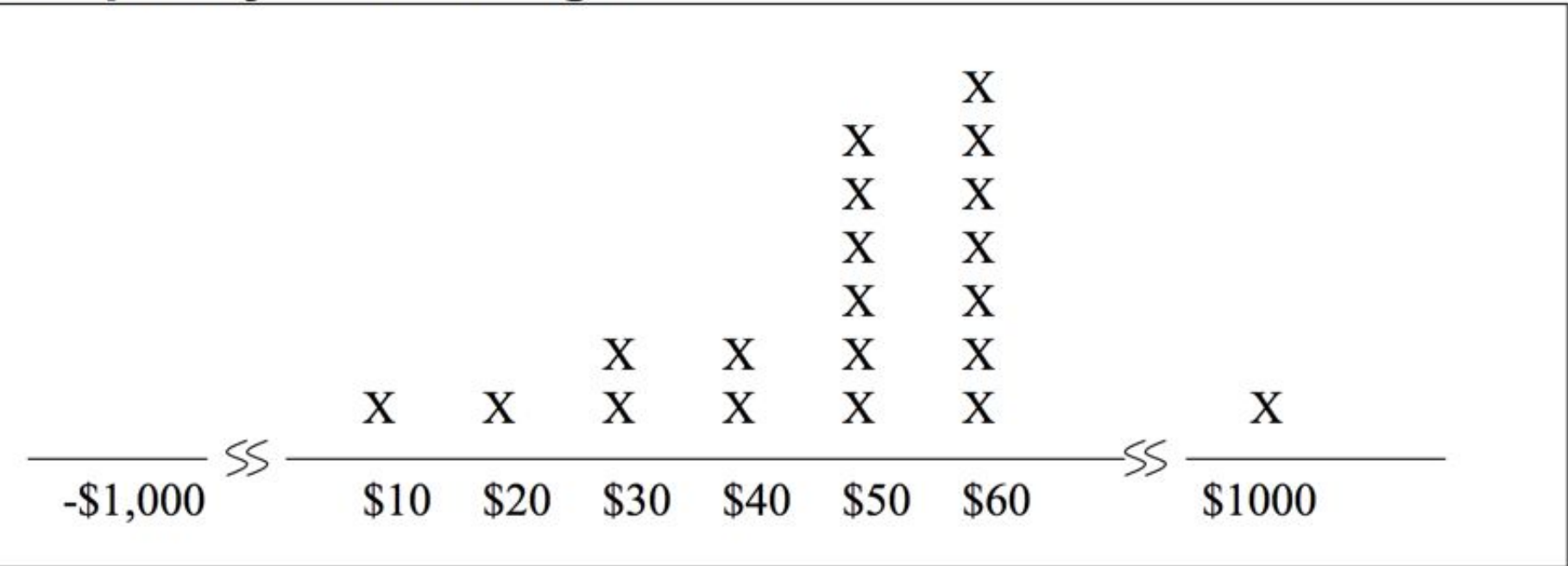


Select one voucher at random from shown bag and decide between two competing theories

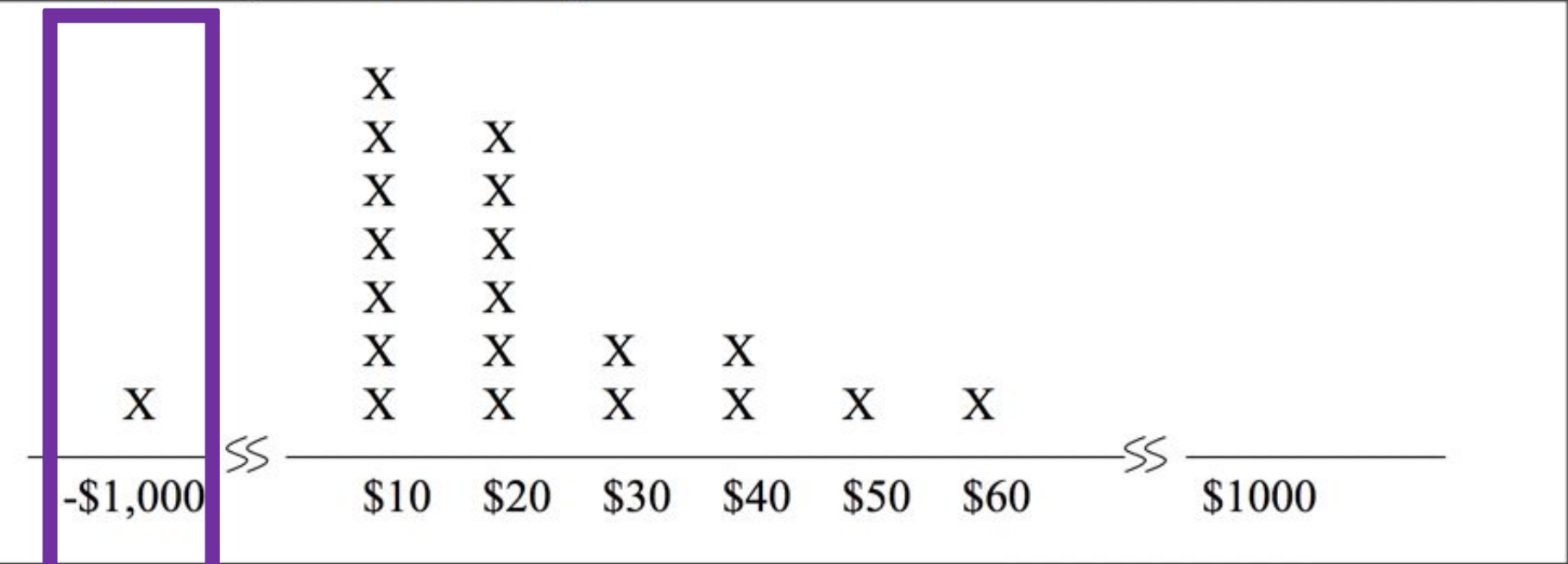
Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

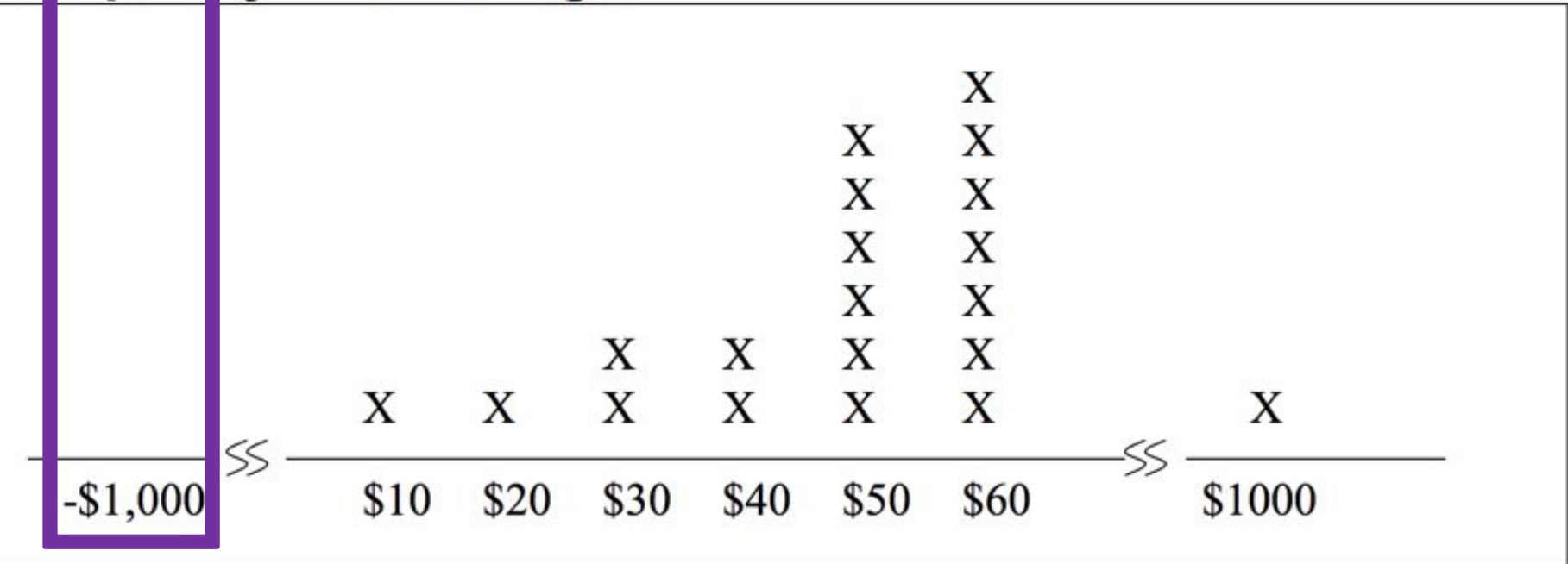
Frequency Plot for Bag B:



Frequency Plot for Bag A:



Frequency Plot for Bag B:

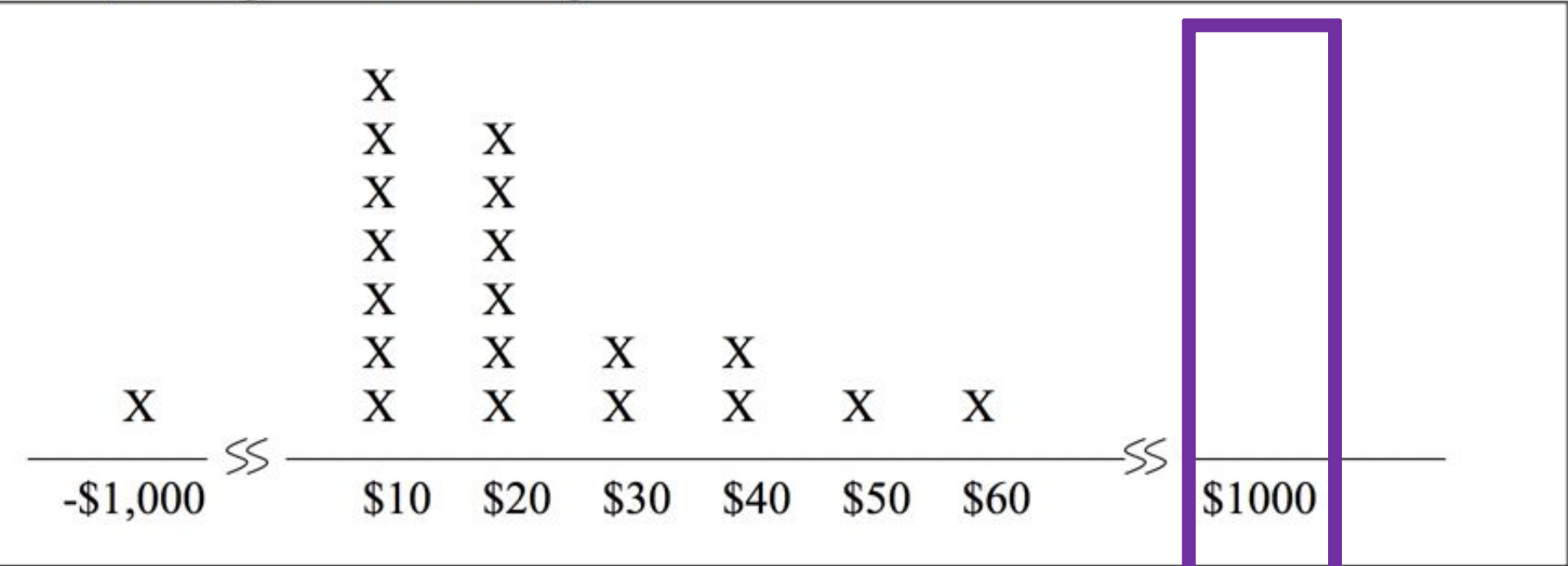


Null:
Shown bag is **Bag A**

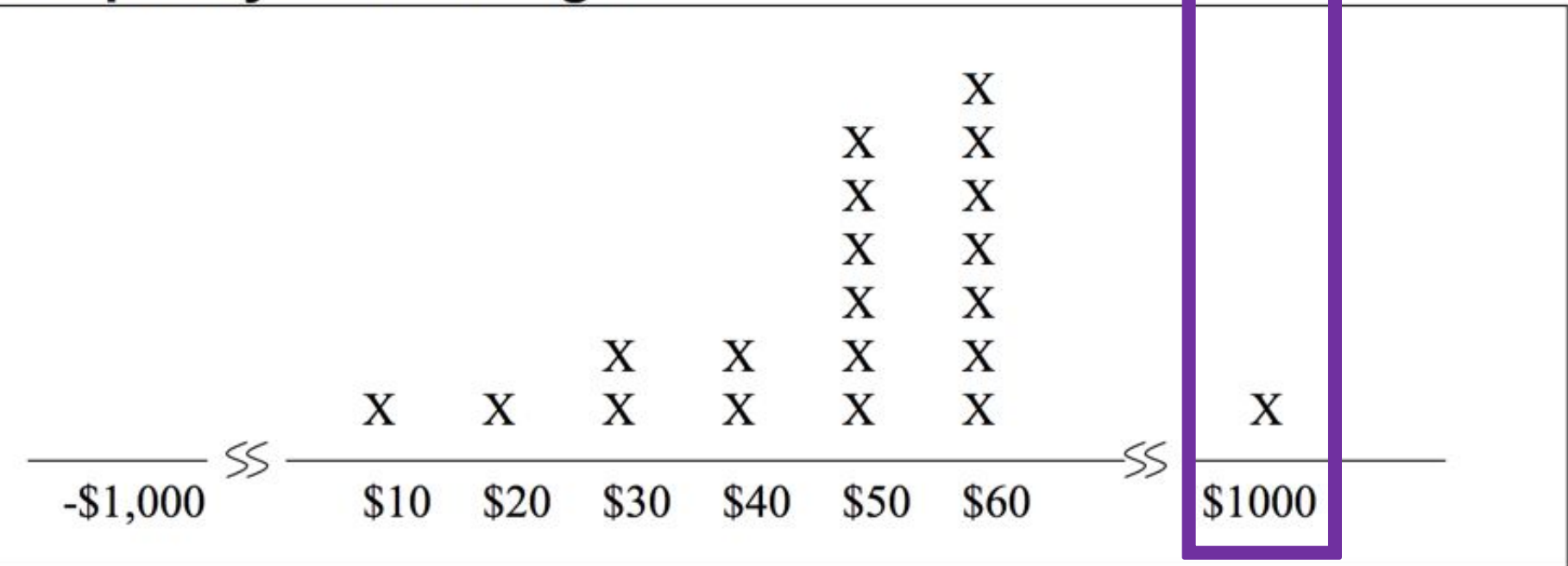
Alternative:
Shown bag is **Bag B**

What if select -\$1000?

Frequency Plot for Bag A:



Frequency Plot for Bag B:

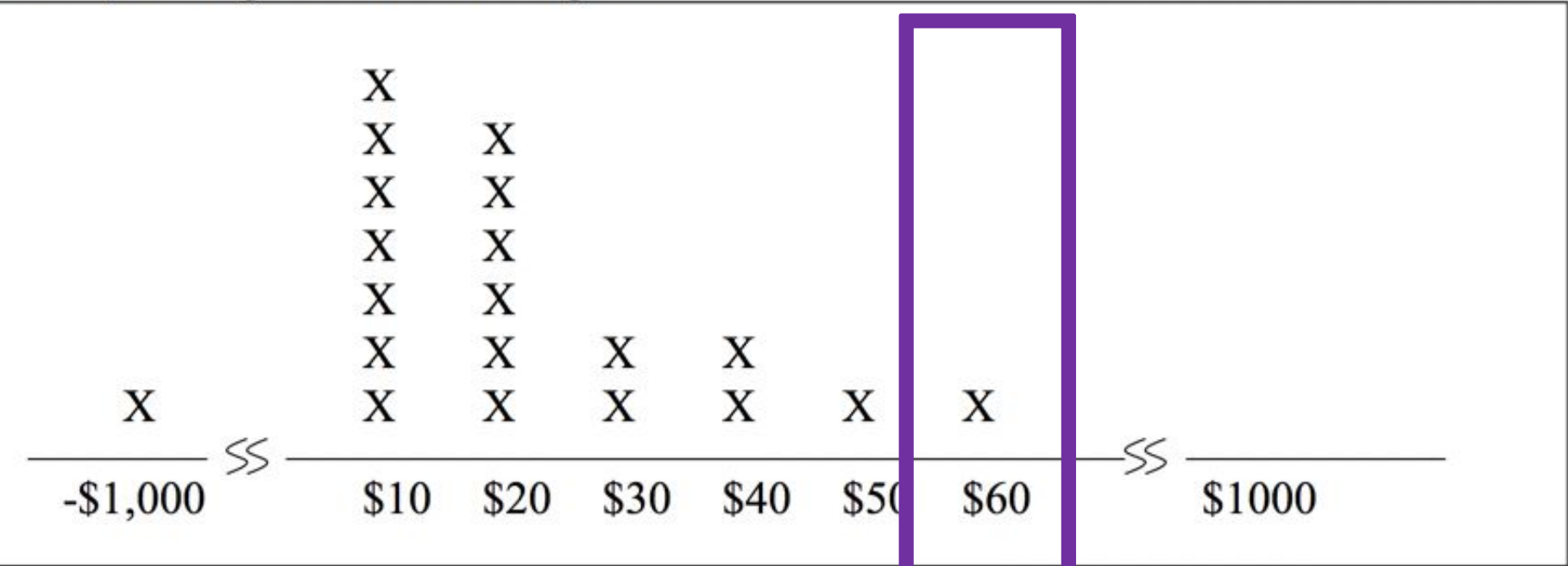


Null:
Shown bag is **Bag A**

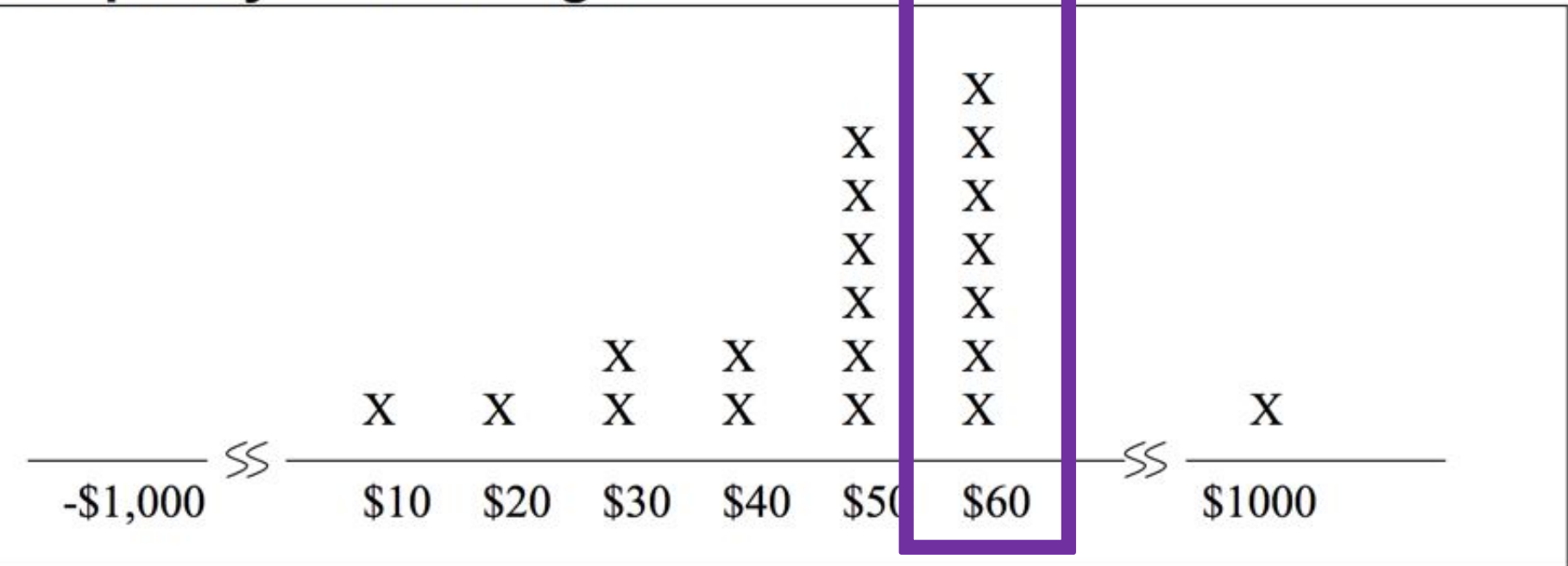
Alternative:
Shown bag is **Bag B**

What if select \$1000?

Frequency Plot for Bag A:



Frequency Plot for Bag B:

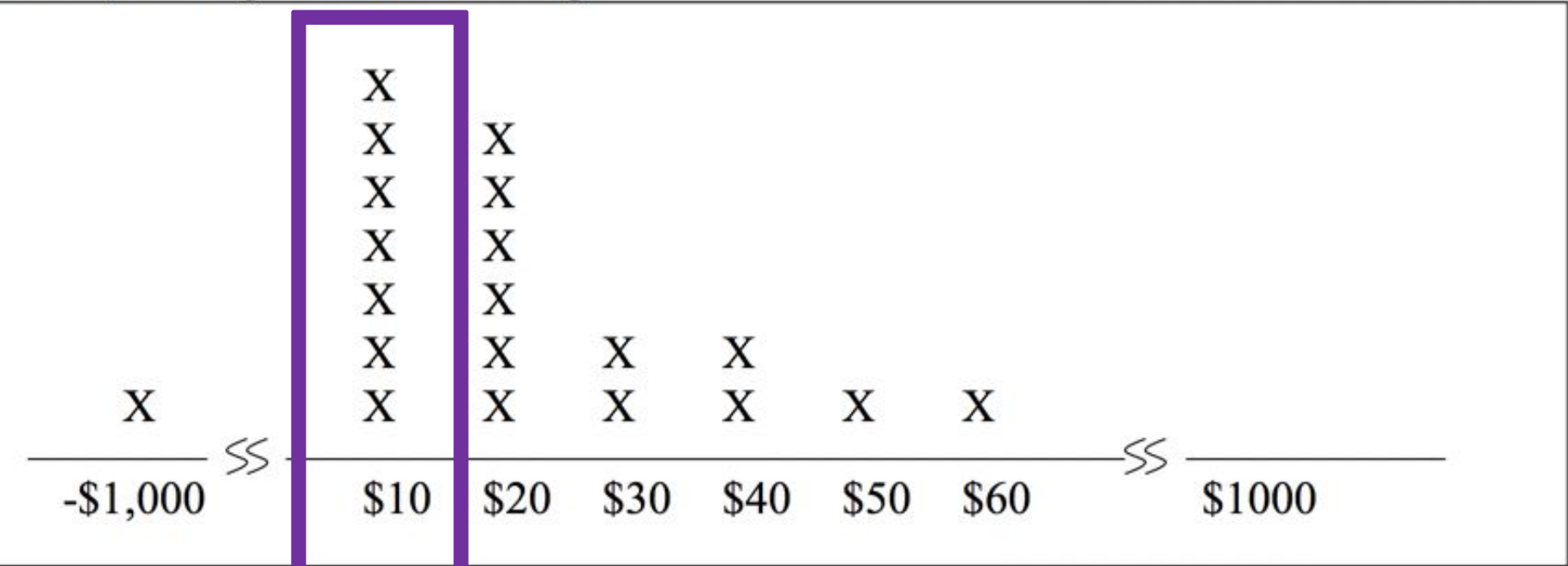


Null:
Shown bag is **Bag A**

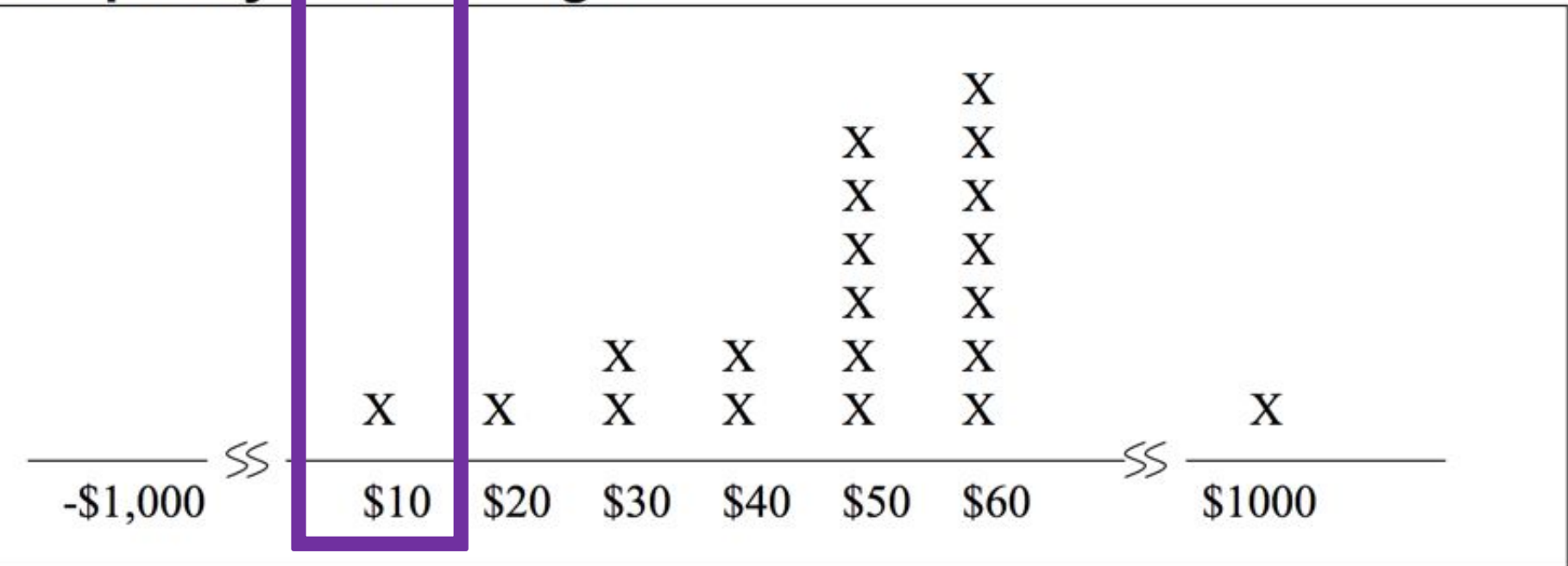
Alternative:
Shown bag is **Bag B**

What if select \$60?

Frequency Plot for Bag A:



Frequency Plot for Bag B:



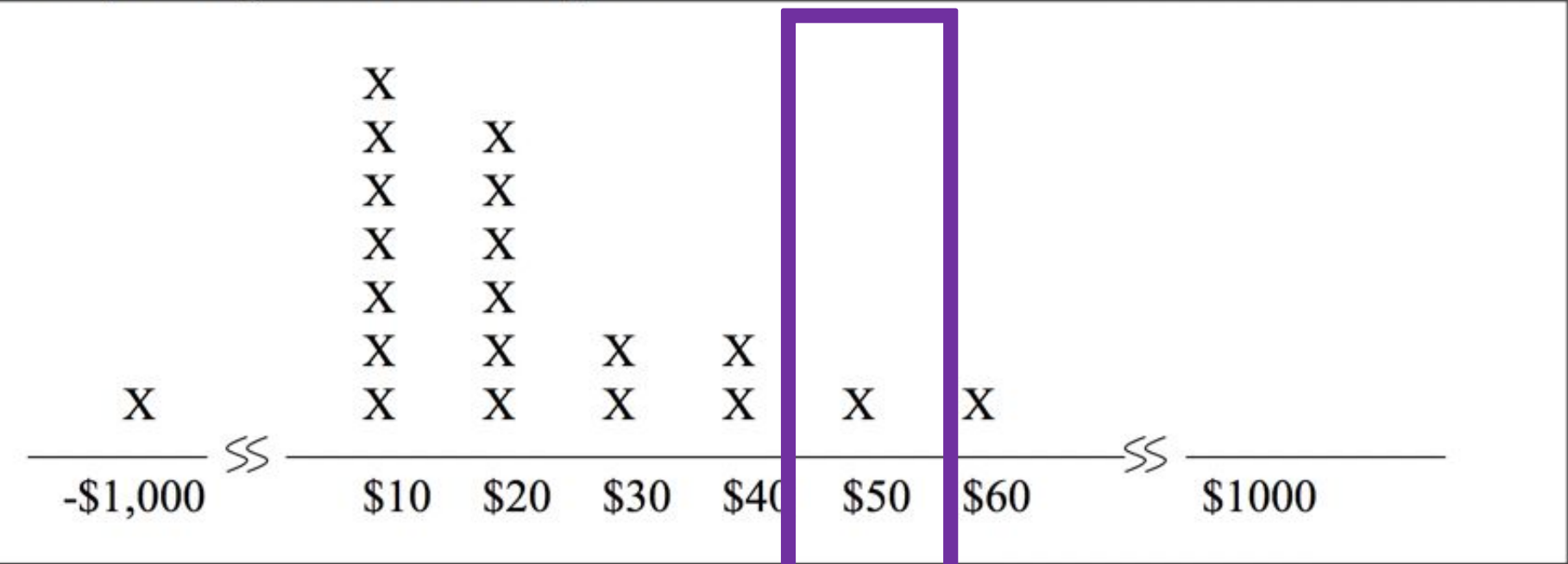
Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

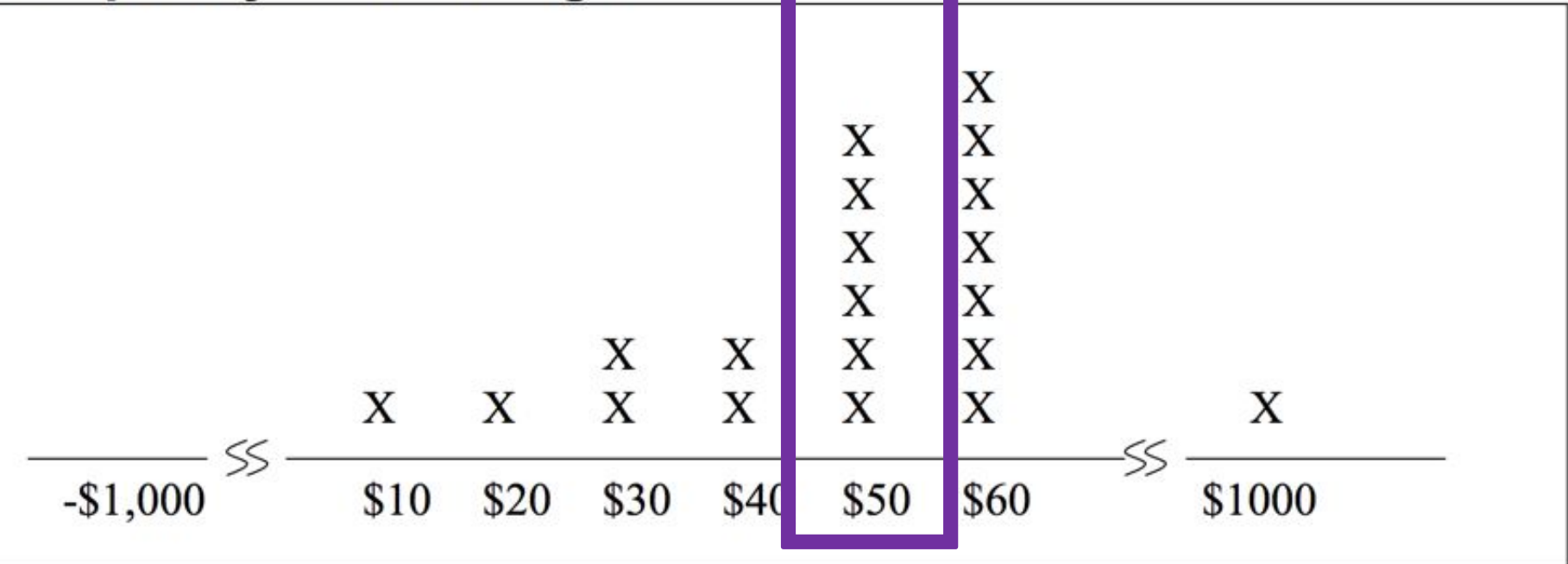
What if select \$10?

Starting for form
a **decision rule**

Frequency Plot for Bag A:



Frequency Plot for Bag B:



Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

What if select \$50?

Frequency Plot for Bag A:



Frequency Plot for Bag B:

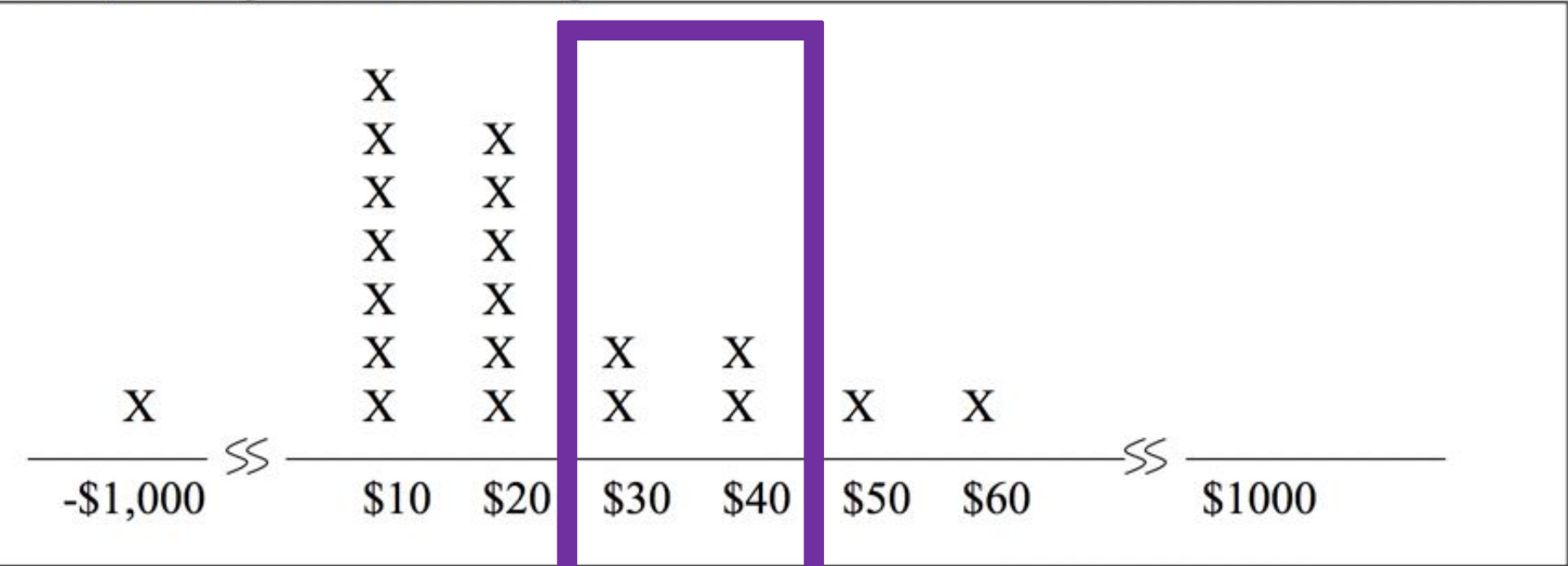


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

What if select \$20?

Frequency Plot for Bag A:



Frequency Plot for Bag B:

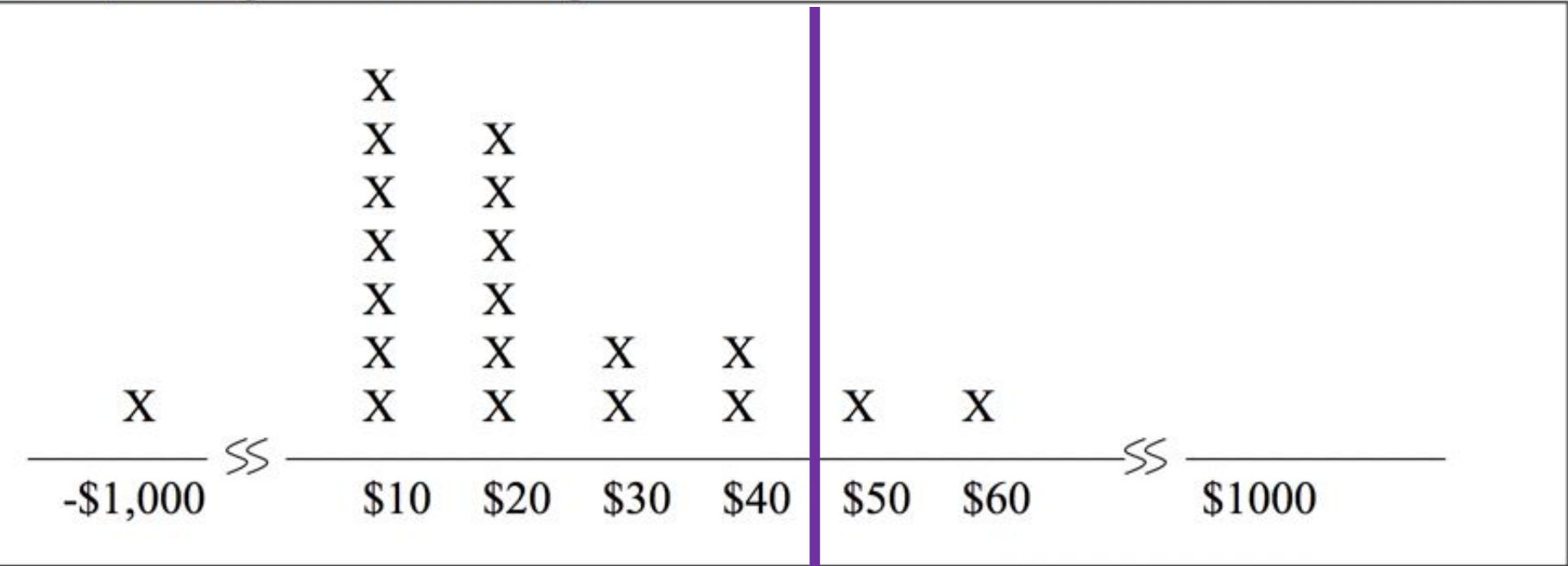


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

What if select \$40 or \$30?

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:

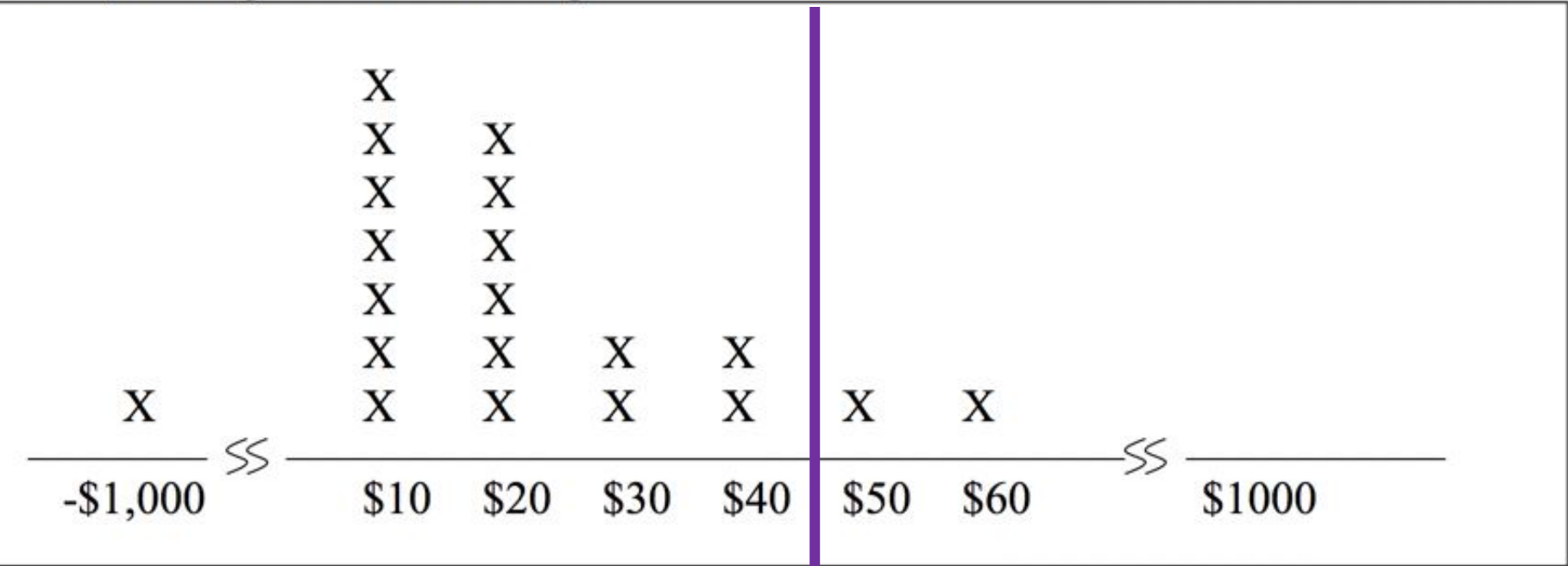


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

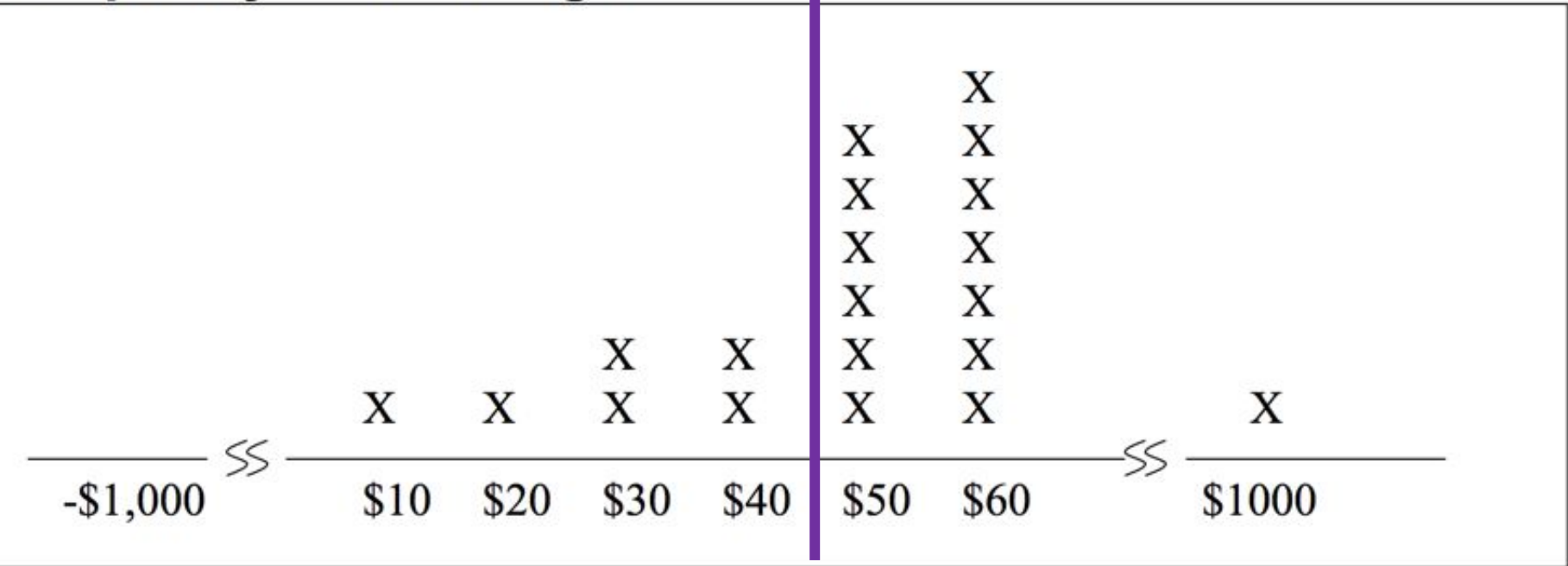
Decision Rule:
Reject the Null if
voucher is
\$50 or higher

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:



Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
voucher is
\$50 or higher

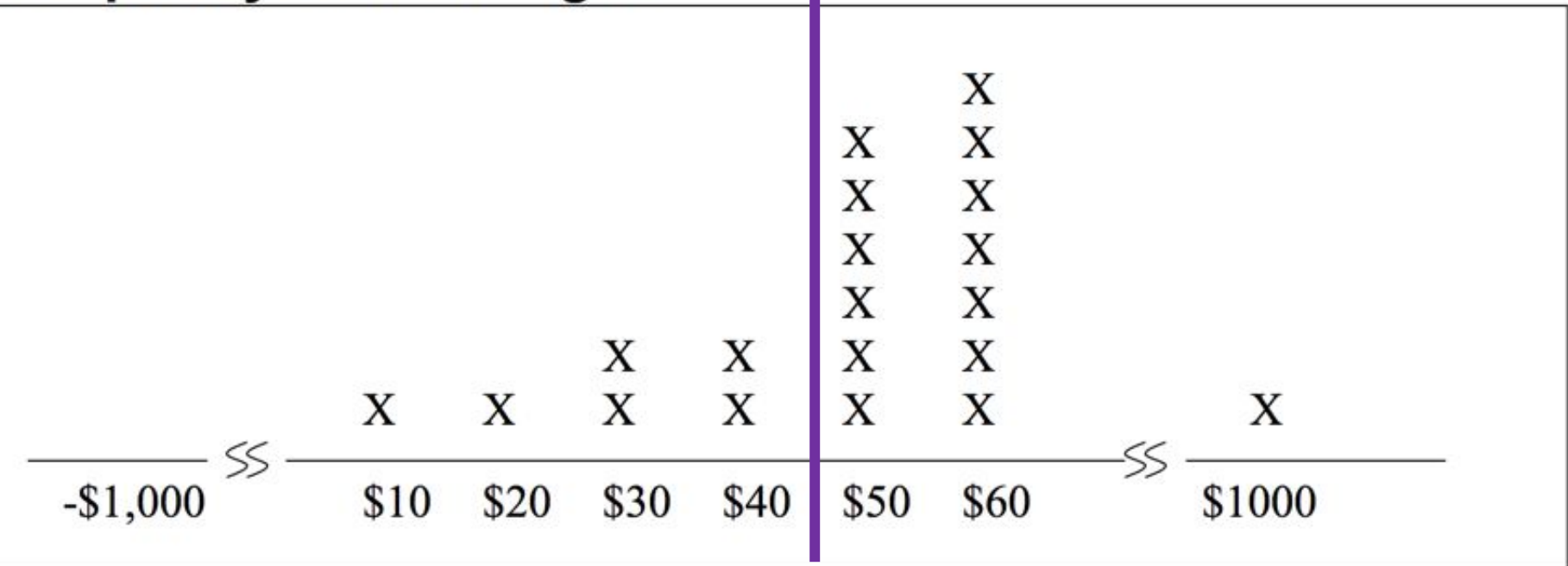
Error: Reject Null when Null True

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:



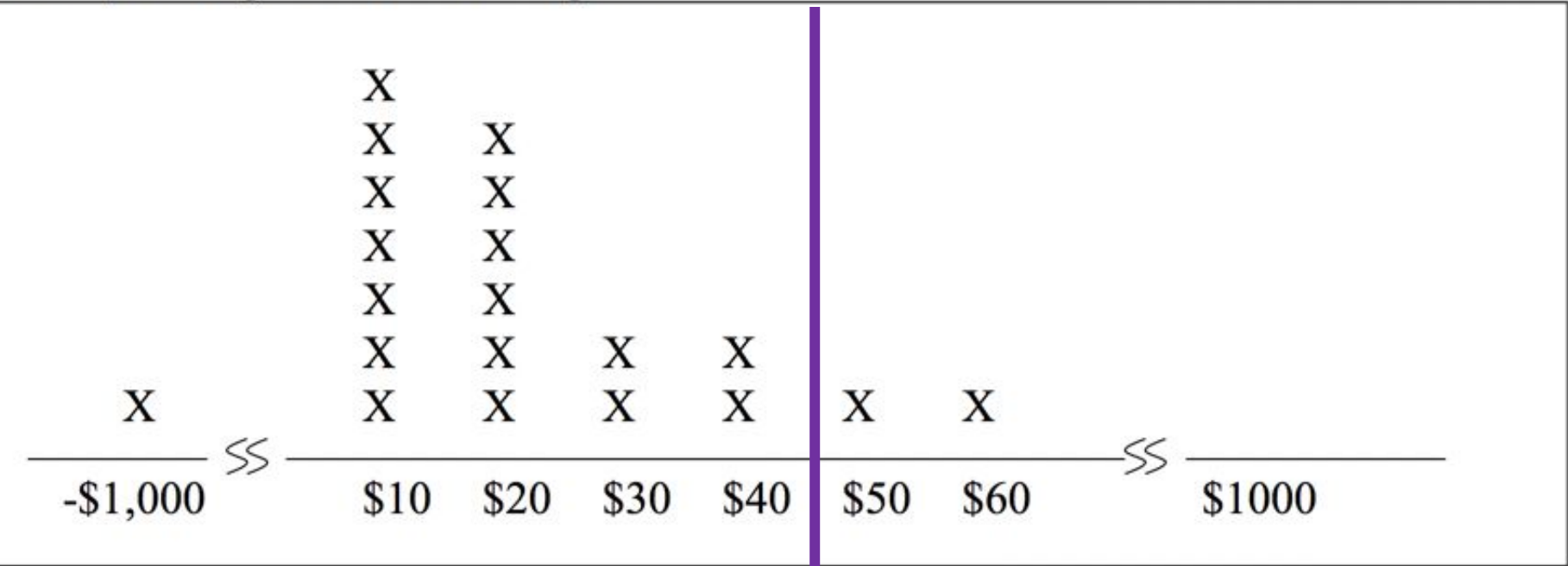
Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
voucher is
\$50 or higher

Error: Reject Null when Null True

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:



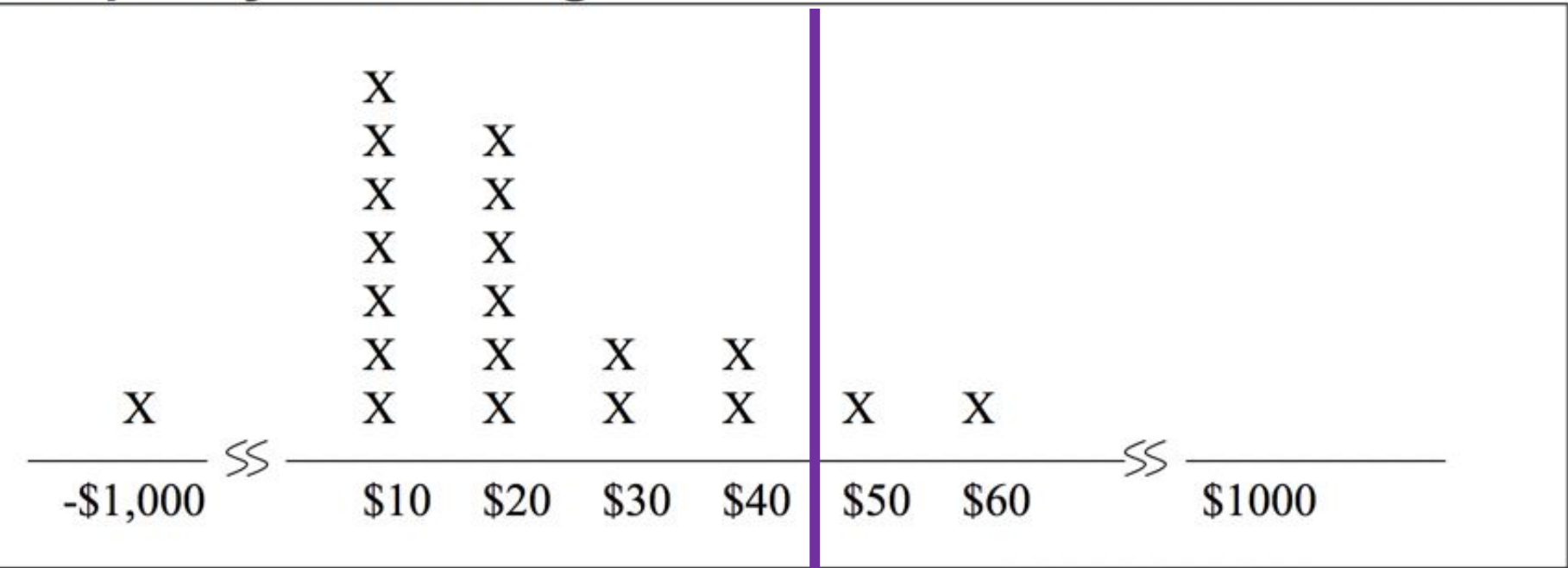
Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
voucher is
\$50 or higher

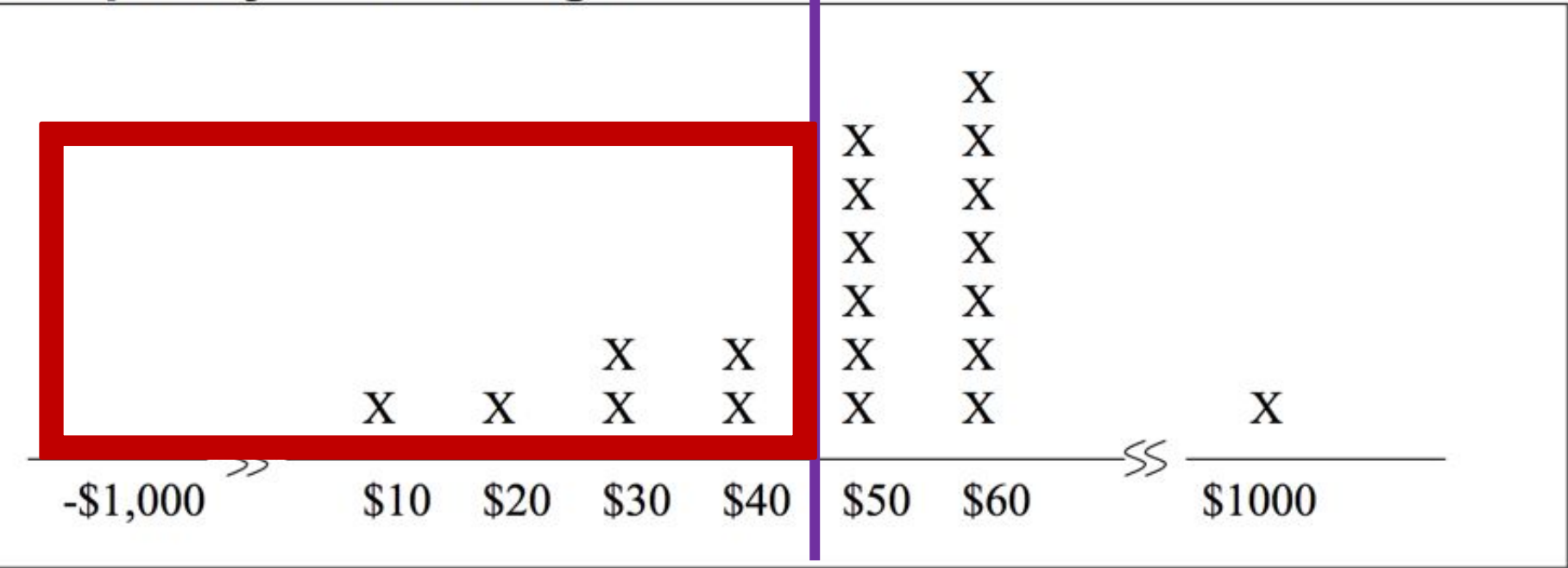
**Other Error: Do not Reject Null
when Alternative True**

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:



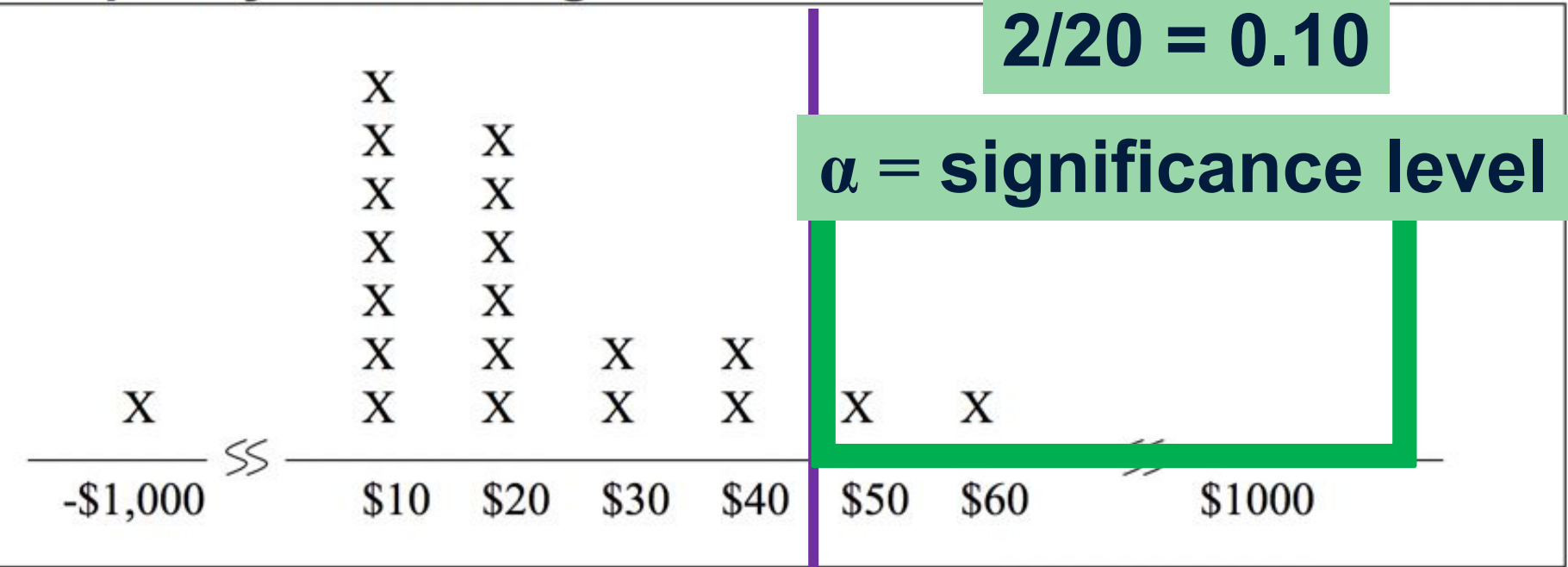
Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

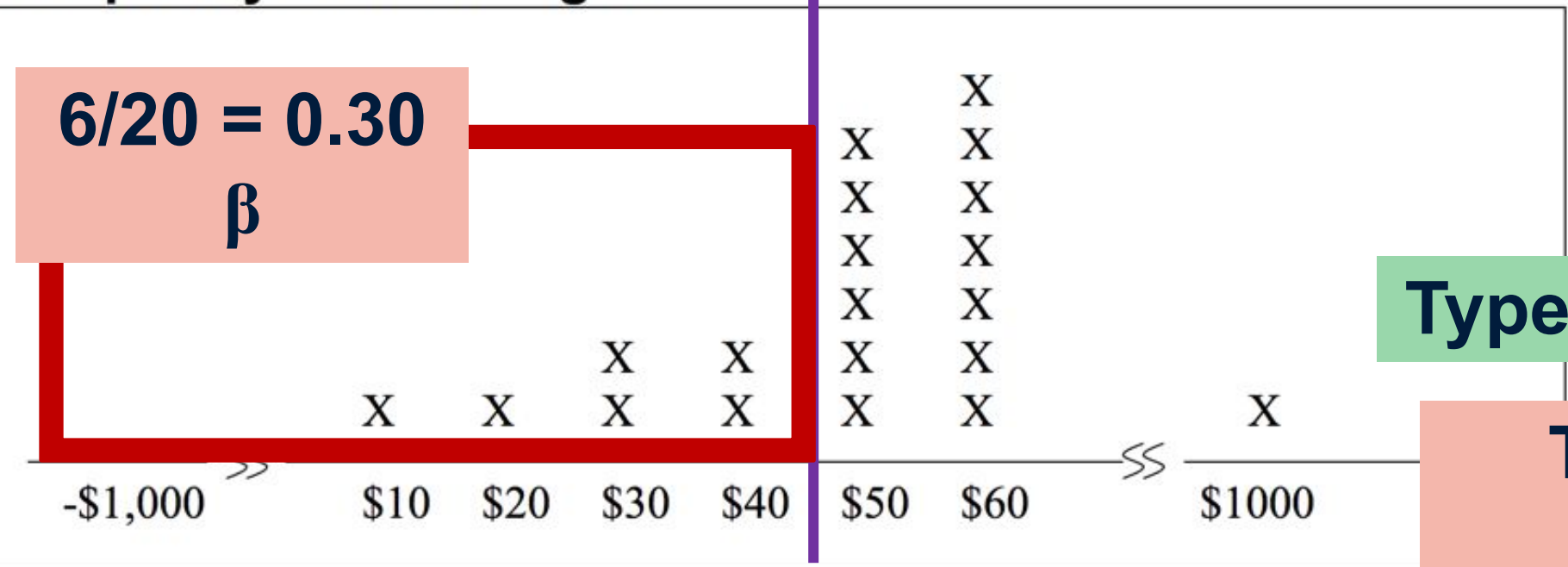
Decision Rule:
Reject the Null if
voucher is
\$50 or higher

**Other Error: Do not Reject Null
when Alternative True**

Frequency Plot for Bag A:



Frequency Plot for Bag B:



Null:
Shown bag is **Bag A**

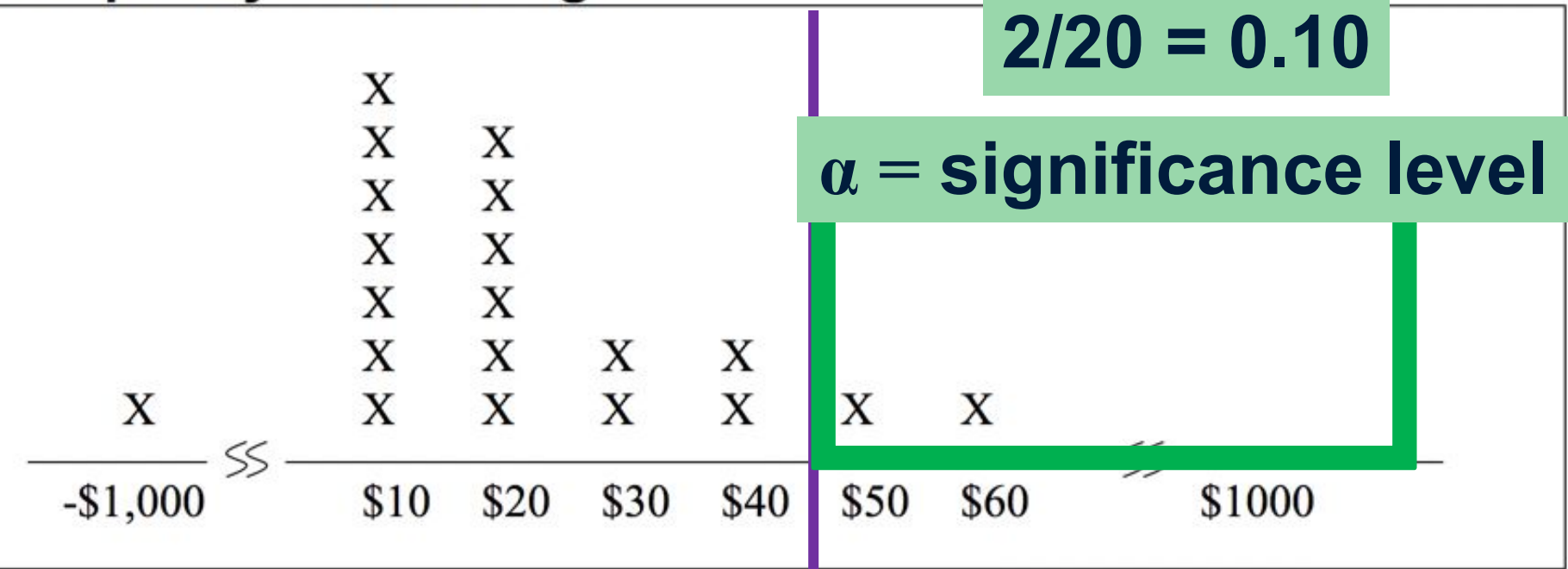
Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
voucher is
\$50 or higher

Type 1 Error: Reject Null when Null True

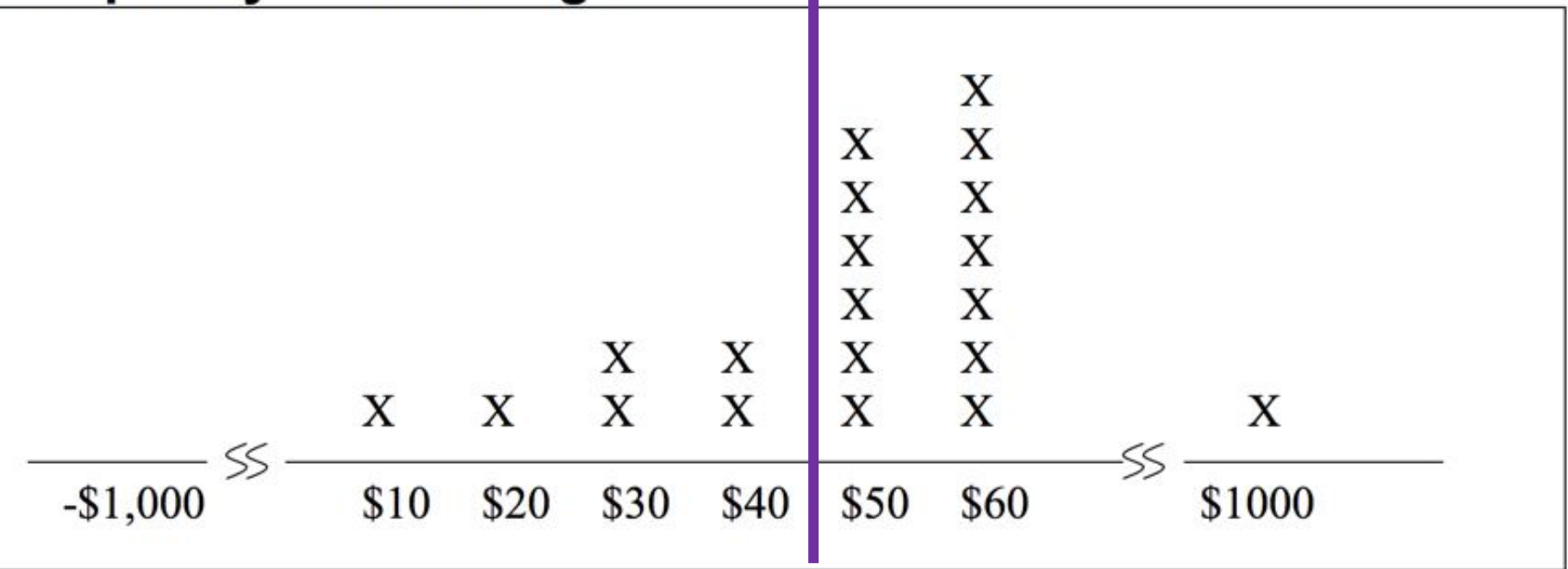
**Type 2 Error: Do not Reject Null
when Alternative True**

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:

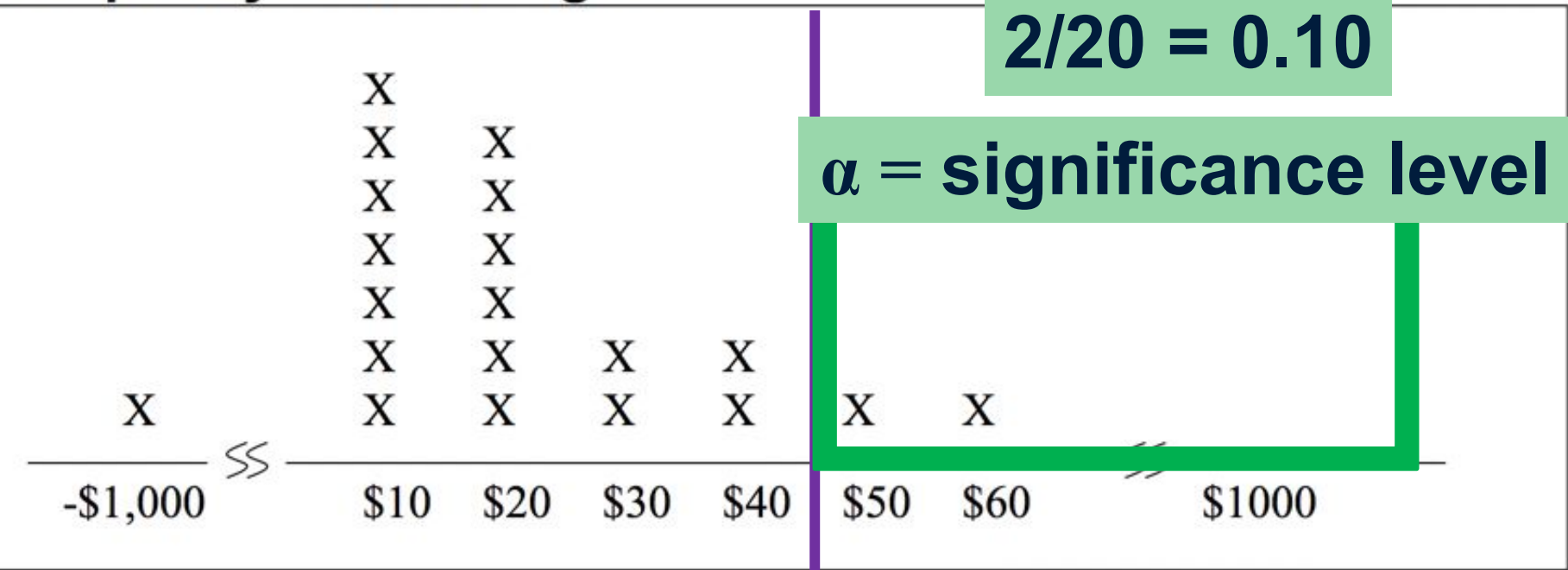


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

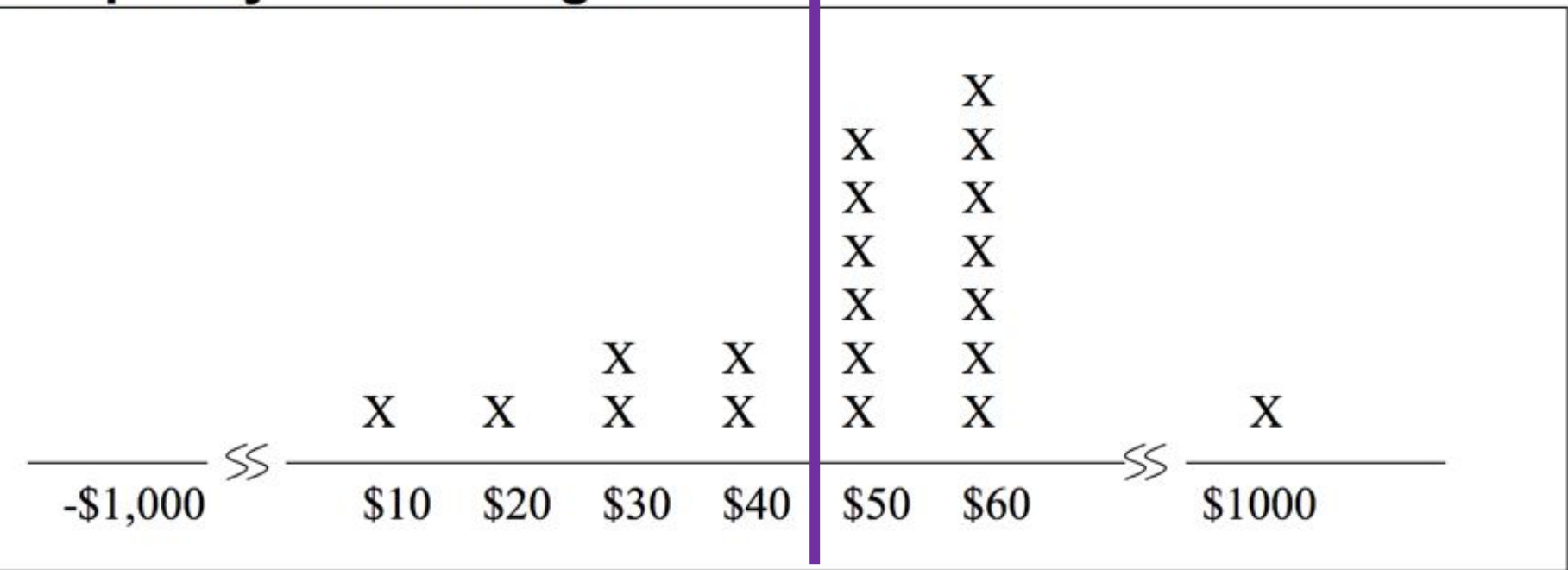
Decision Rule:
Reject the Null if
voucher is
\$50 or higher

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:

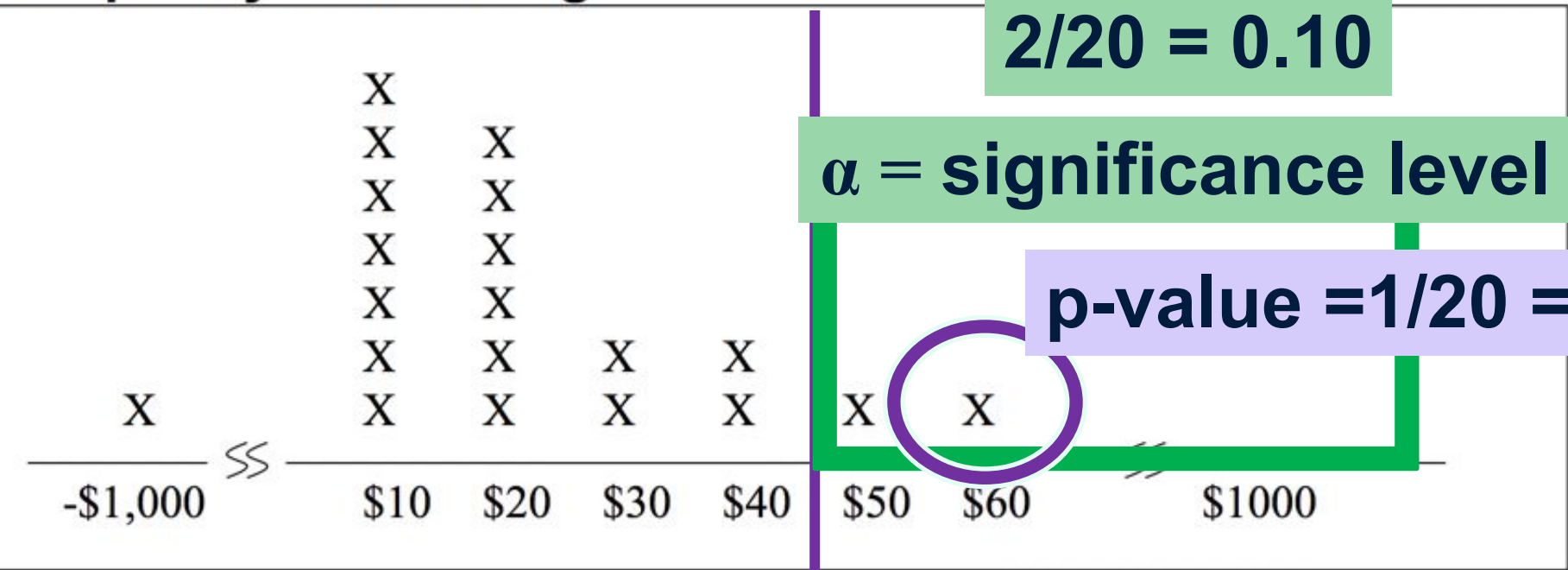


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

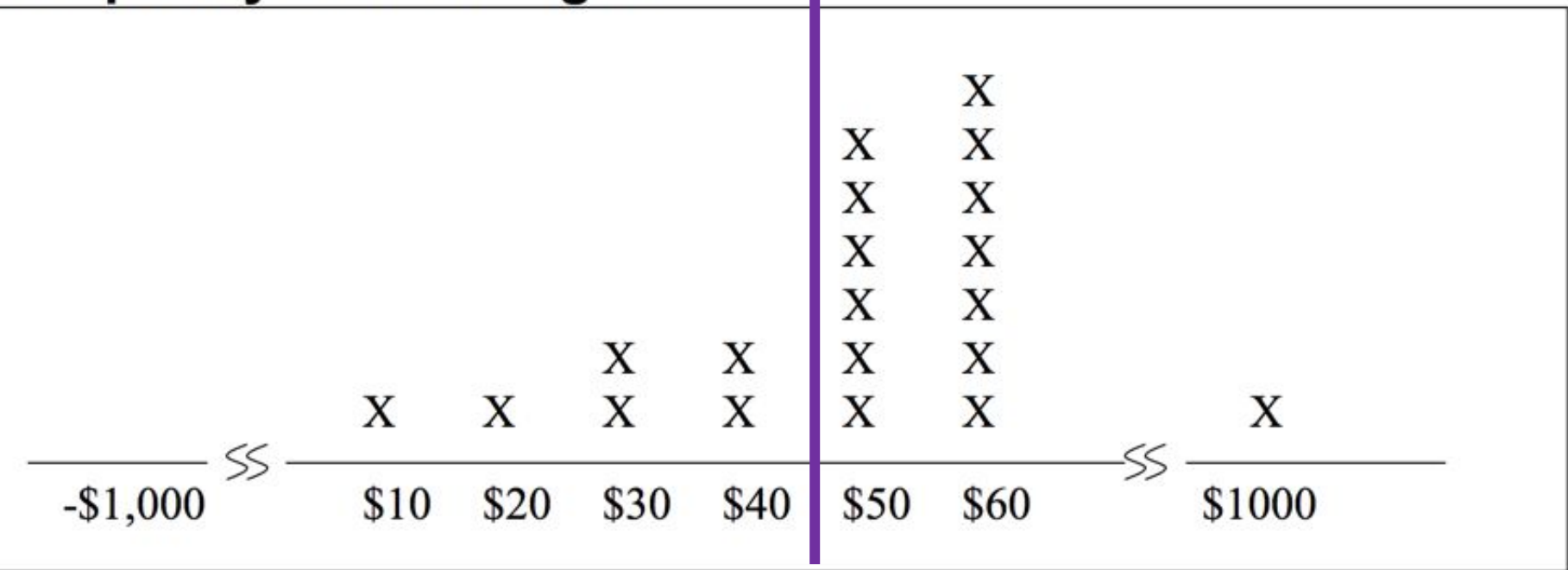
Decision Rule:
Reject the Null if
 $p\text{-value} \leq \alpha$

Frequency Plot for Bag A:



Reject the Null

Frequency Plot for Bag B:

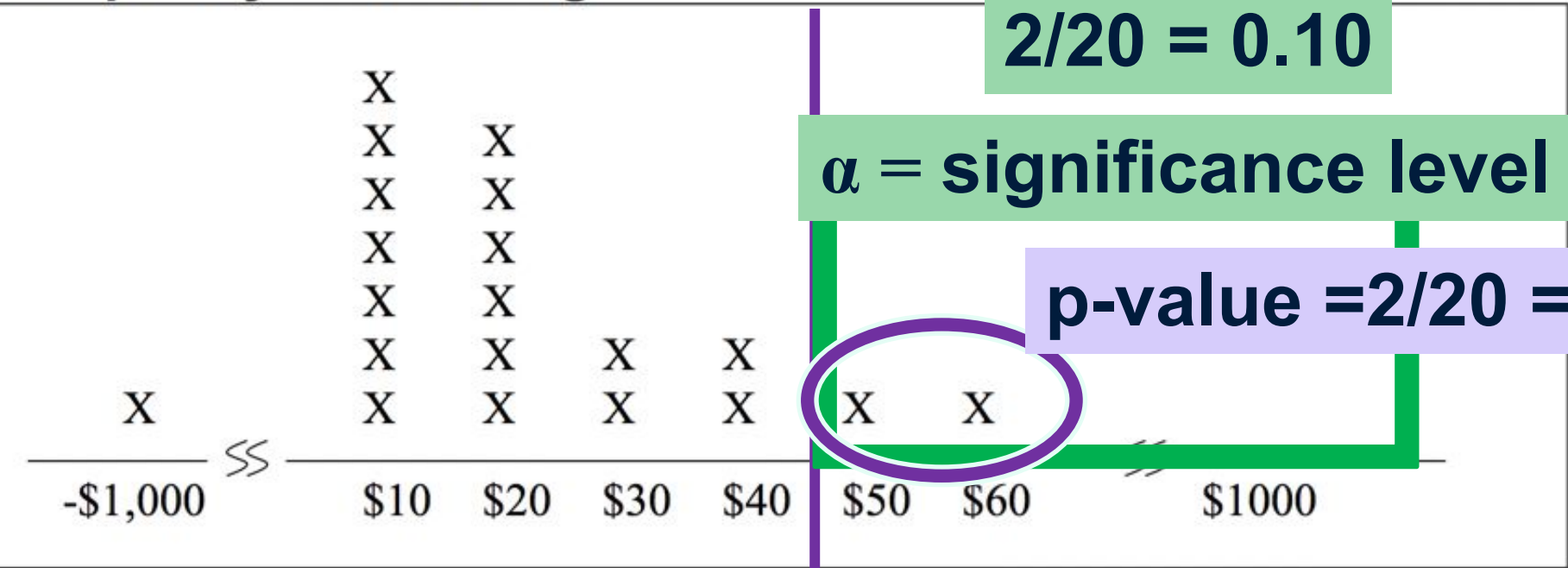


Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
 $p\text{-value} \leq \alpha$

Frequency Plot for Bag A:



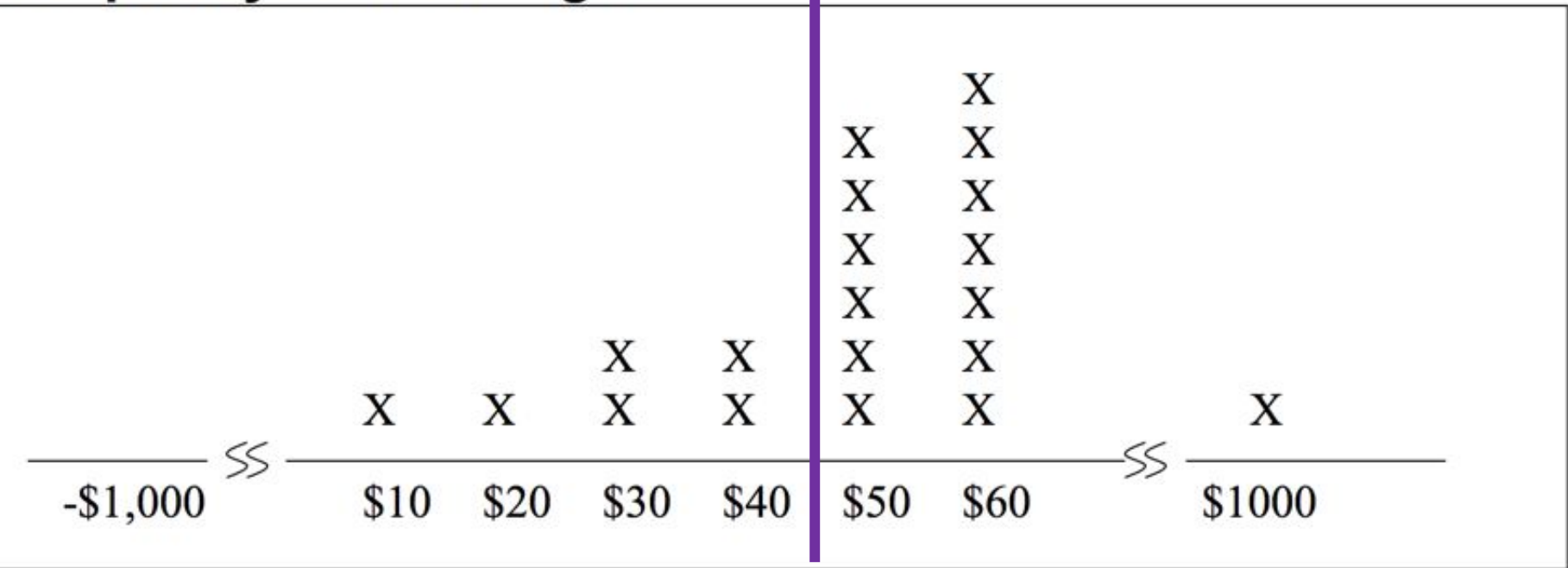
$2/20 = 0.10$

$\alpha = \text{significance level}$

$p\text{-value} = 2/20 = 0.10$

Reject the Null

Frequency Plot for Bag B:



Null:

Shown bag is **Bag A**

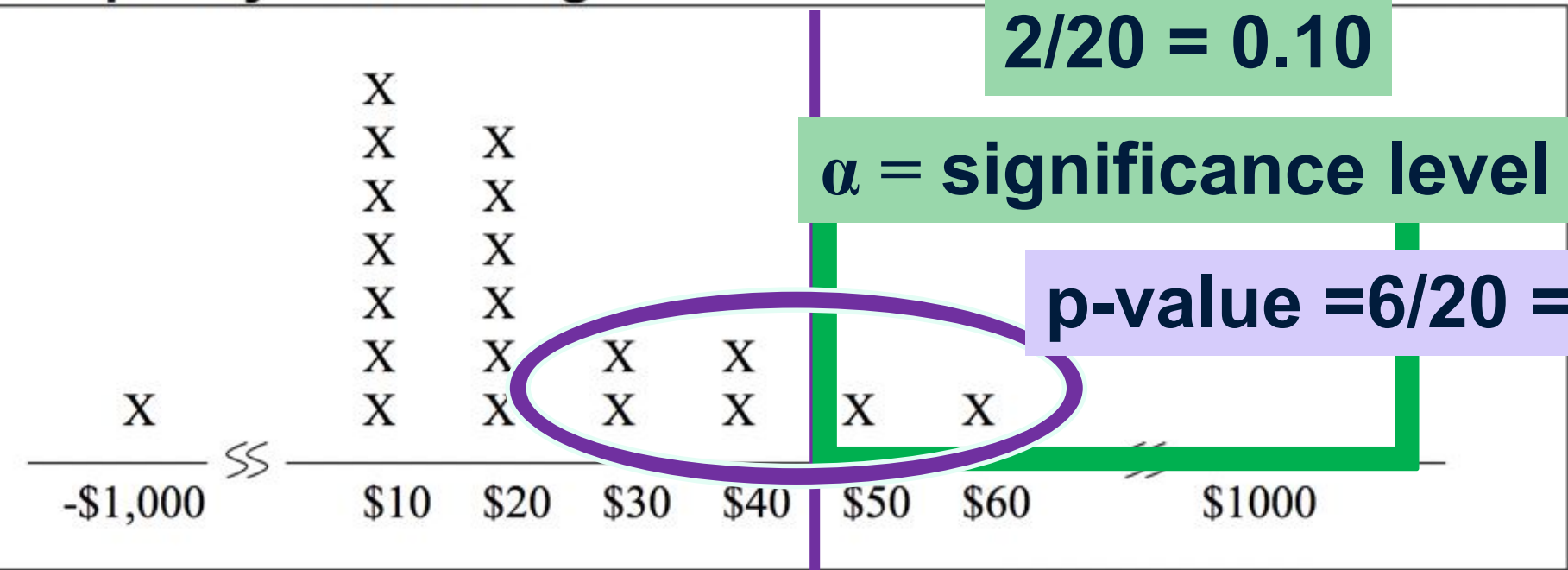
Alternative:

Shown bag is **Bag B**

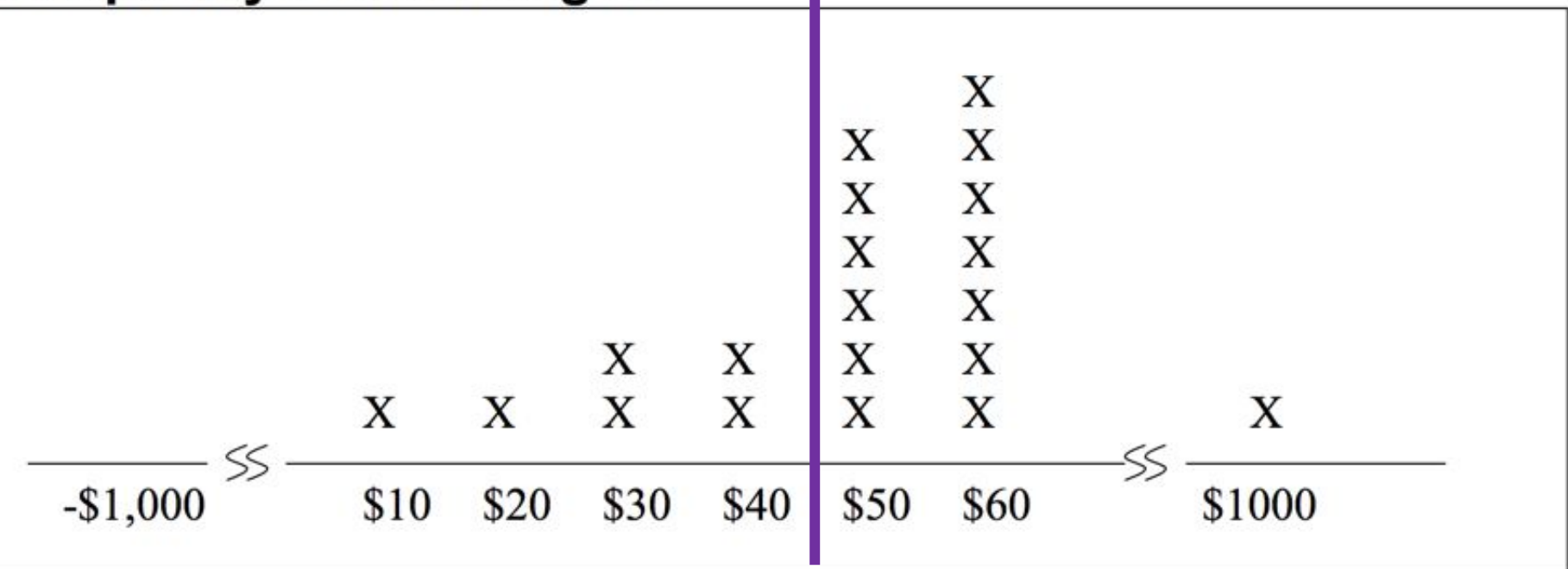
Decision Rule:

Reject the Null if
 $p\text{-value} \leq \alpha$

Frequency Plot for Bag A:



Frequency Plot for Bag B:



Null:
Shown bag is **Bag A**

Alternative:
Shown bag is **Bag B**

Decision Rule:
Reject the Null if
 $p\text{-value} \leq \alpha$

Hypothesis Testing

- Stating Hypotheses
- Selecting a Significance Level
- Using data to make our decision (via p-value)

More details about making inferences ahead!