

ARE THESE COINS FAIR?

We will use this Desmos graph to investigate 3 different coins being tossed:

<https://www.desmos.com/calculator/coyygd5jor>

It is suspected that at least one of these coins may not be fair. Our job is to identify the unfair coins.

In this scenario, appropriate null and alternate hypotheses are:

$$H_0: p = 0.5 \text{ and } H_a: p \neq 0.5$$

where p is the true proportion of heads for the given coin.

To investigate, we will look at different sample sizes, record P-values using our graphing calculator, and reach a statistical conclusion about each coin. Use a significance level of 5% for each situation.

COIN A:

Sample Size = 10	Sample Size = 25	Sample Size = 100
P-Value =	P-Value =	P-Value =
Circle the correct conclusion	Circle the correct conclusion	Circle the correct conclusion
Conclude that the coin is not fair	Conclude that the coin is not fair	Conclude that the coin is not fair
Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair

Group Talk: Share out your results. Based on your findings, do you believe that coin A is an un-fair coin? What evidence was strongest in helping make your decision?

COIN B:

Sample Size = 10	Sample Size = 25	Sample Size = 100
P-Value =	P-Value =	P-Value =
Circle the correct conclusion	Circle the correct conclusion	Circle the correct conclusion
Conclude that the coin is not fair	Conclude that the coin is not fair	Conclude that the coin is not fair
Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair

Group Talk: Share out your results. Based on your findings, do you believe that coin B is an un-fair coin? What evidence was strongest in helping make your decision?

COIN C:

Sample Size = 10	Sample Size = 25	Sample Size = 100
P-Value =	P-Value =	P-Value =
Circle the correct conclusion	Circle the correct conclusion	Circle the correct conclusion
Conclude that the coin is not fair	Conclude that the coin is not fair	Conclude that the coin is not fair
Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair	Fail to conclude that the coin is not fair

Group Talk: Share out your results. Based on your findings, do you believe that coin C is an un-fair coin? What evidence was strongest in helping make your decision?

THE TRUTH: Here is the truth about all 3 coins!

COIN A:

COIN B:

COIN C:

Your job in this activity was to try to gather evidence to determine the fairness of virtual coins. Which factors made it easier, or more likely, that you would correctly identify an unfair coin?