Relationships and Functions

- Algebra, Lesson 1.1 -

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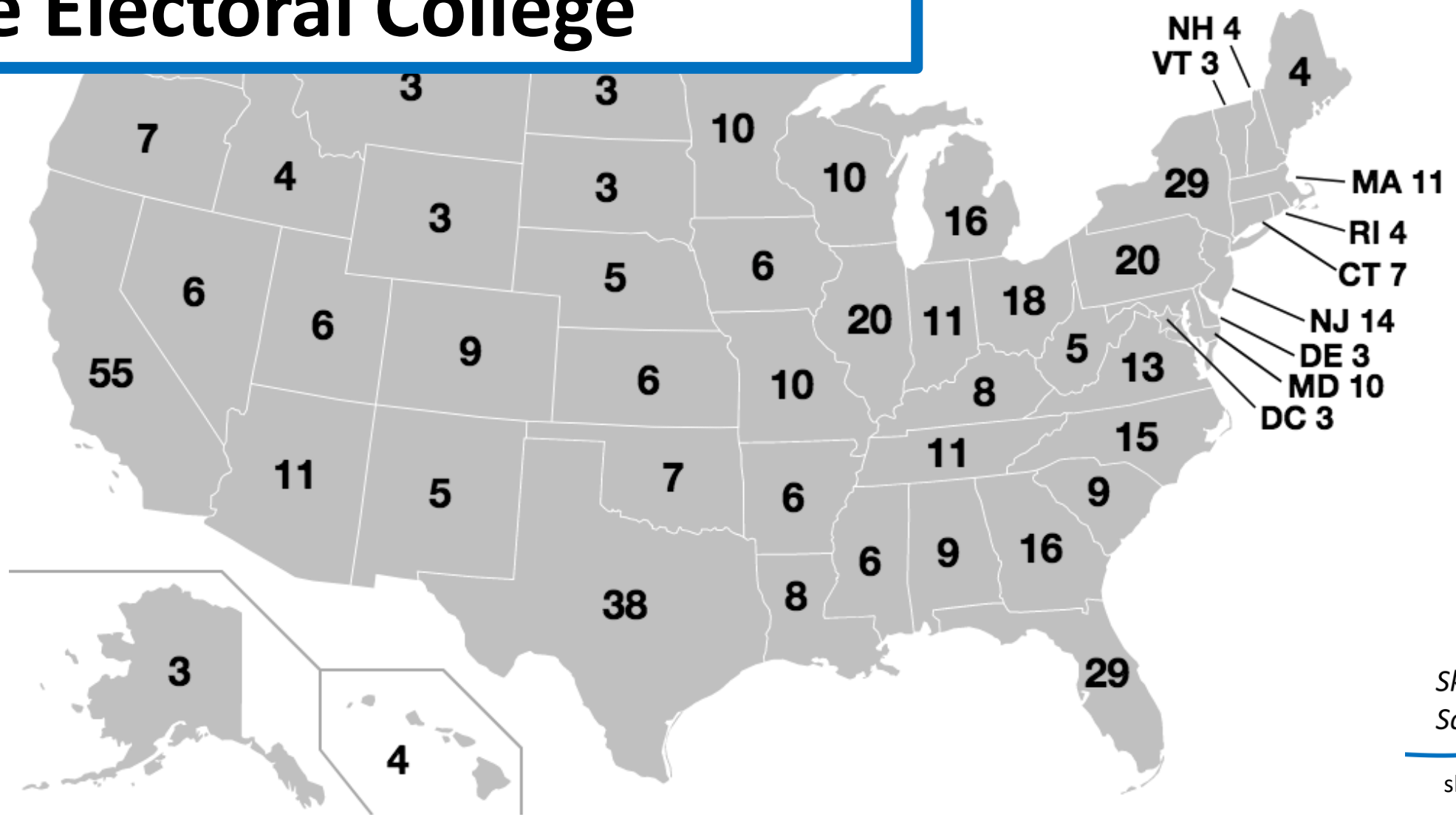
How we elect our president:
The Electoral College



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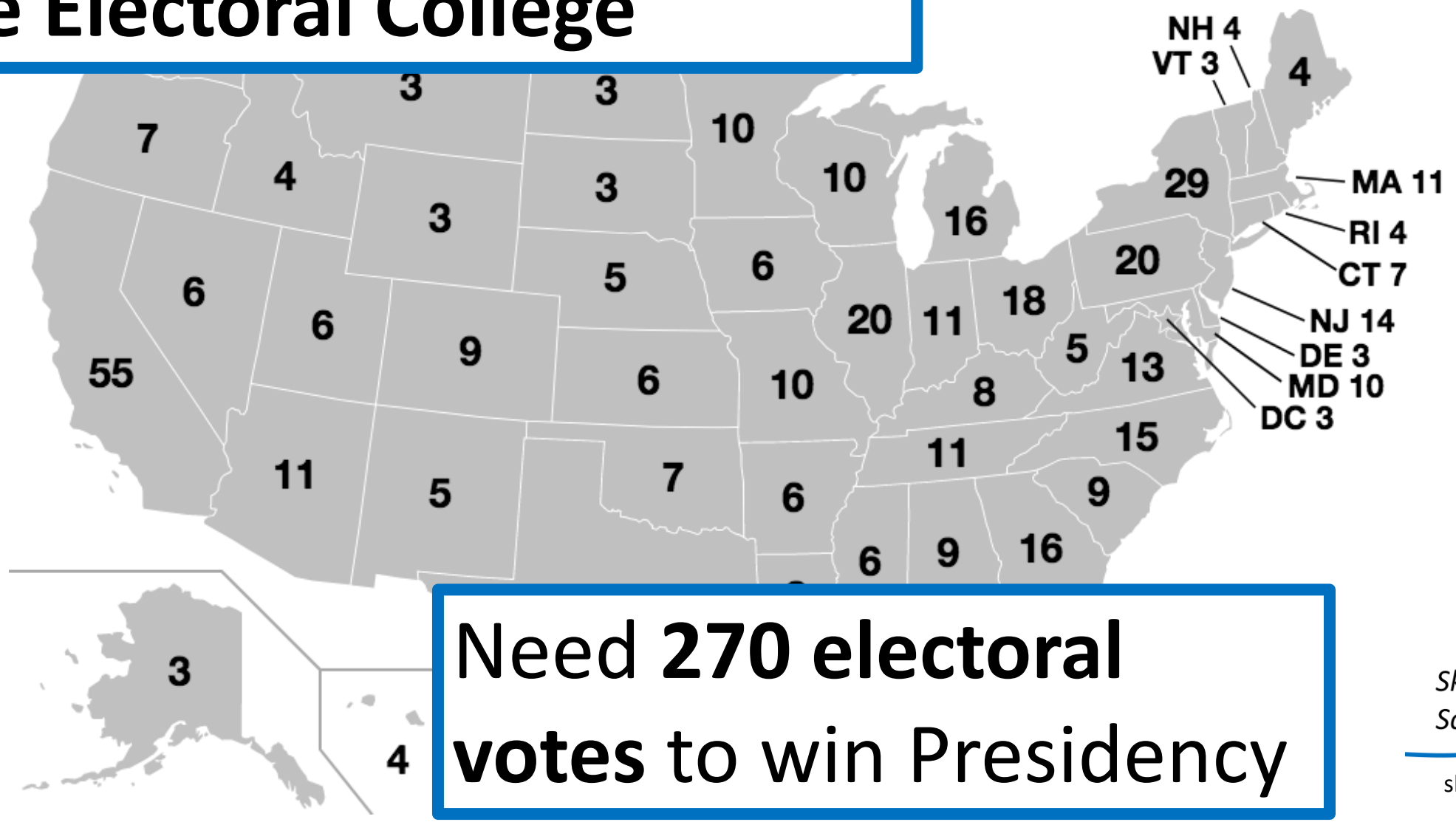

Need **270 electoral votes** to win Presidency

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46.1% **48.2%**

Popular Vote

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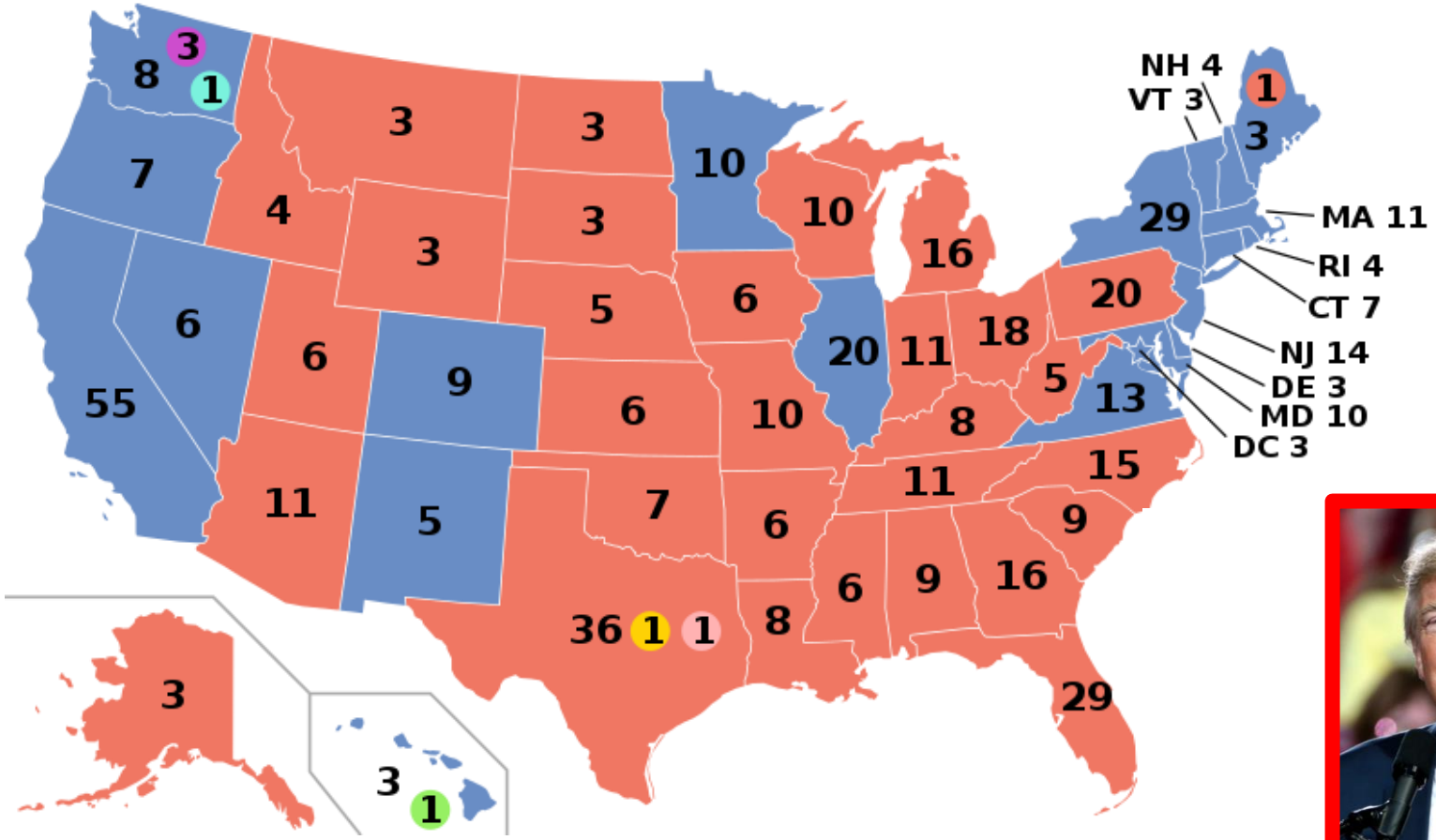

304

227

Electoral College

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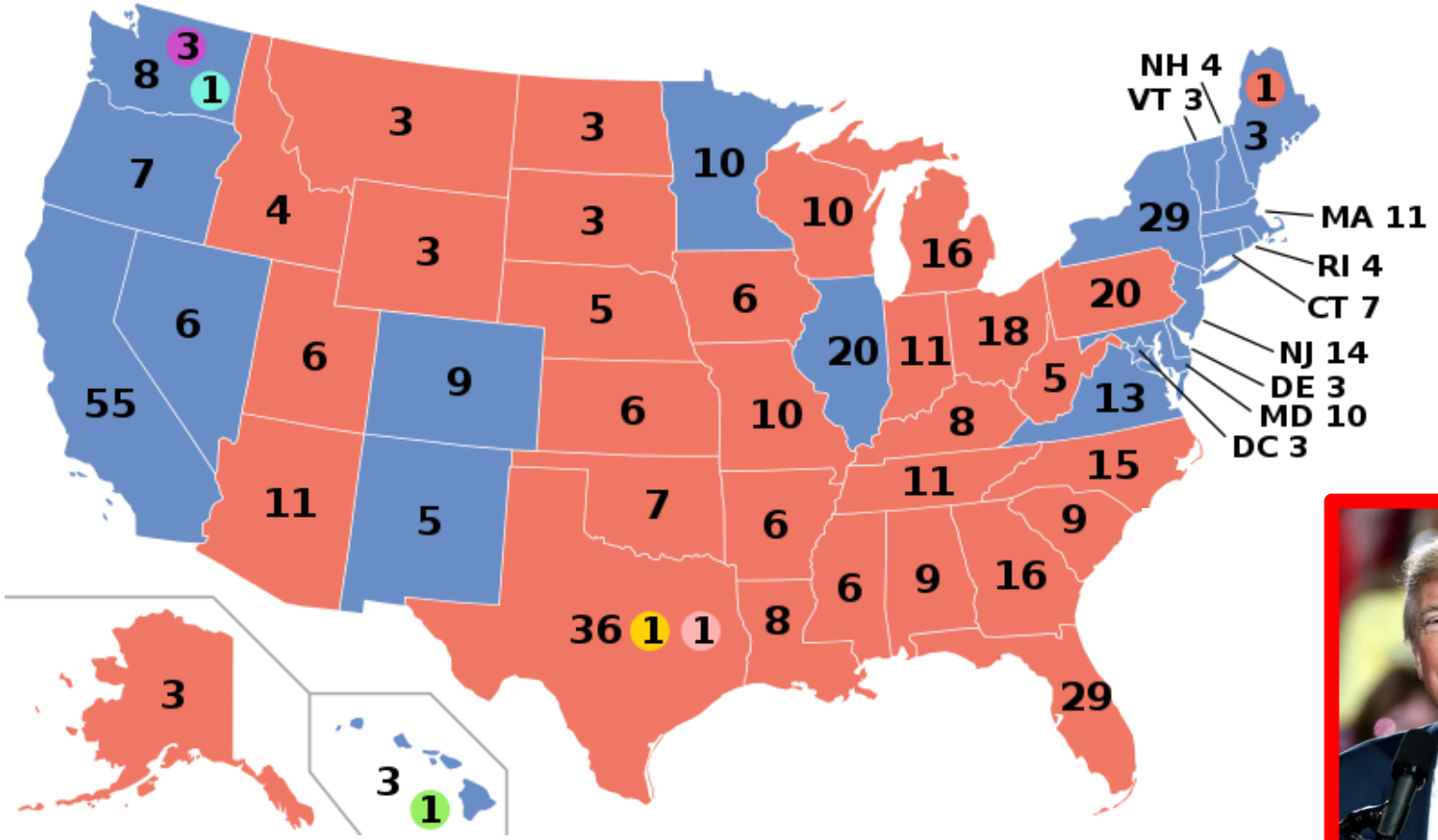

304

227

Electoral College

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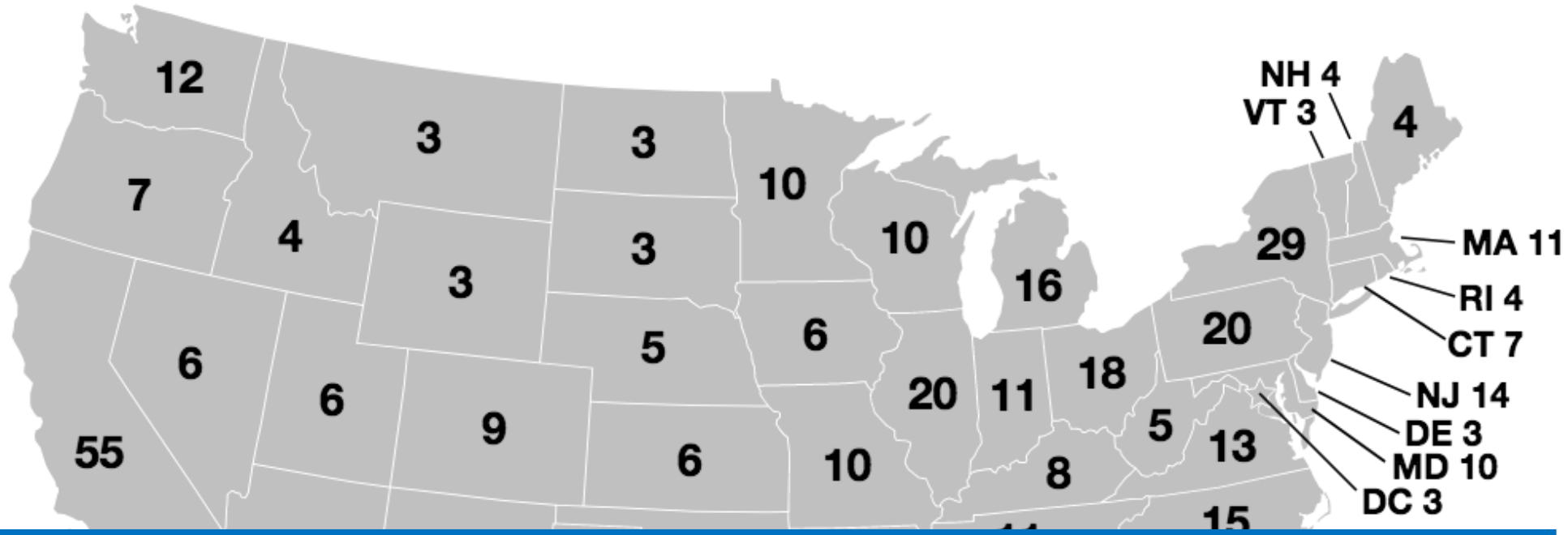

Today's Key Analysis

Are electoral votes a function of people's votes?

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Algebra, Lesson 1.1
Guided Notes

Handout: *skewthescript.org/algebra/1-1*

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Topics

1. Functions as Maps
2. Non-Functions

Topics

1. **Functions as Maps**
2. Non-Functions

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Different kind of map:

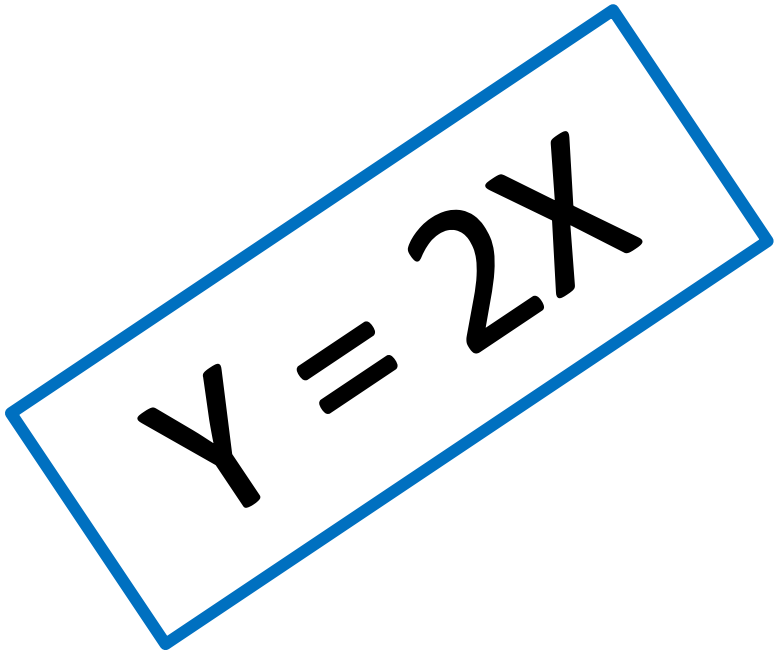
X	Y
-2	-4
-1	-2
0	0
1	2
2	4
3	6

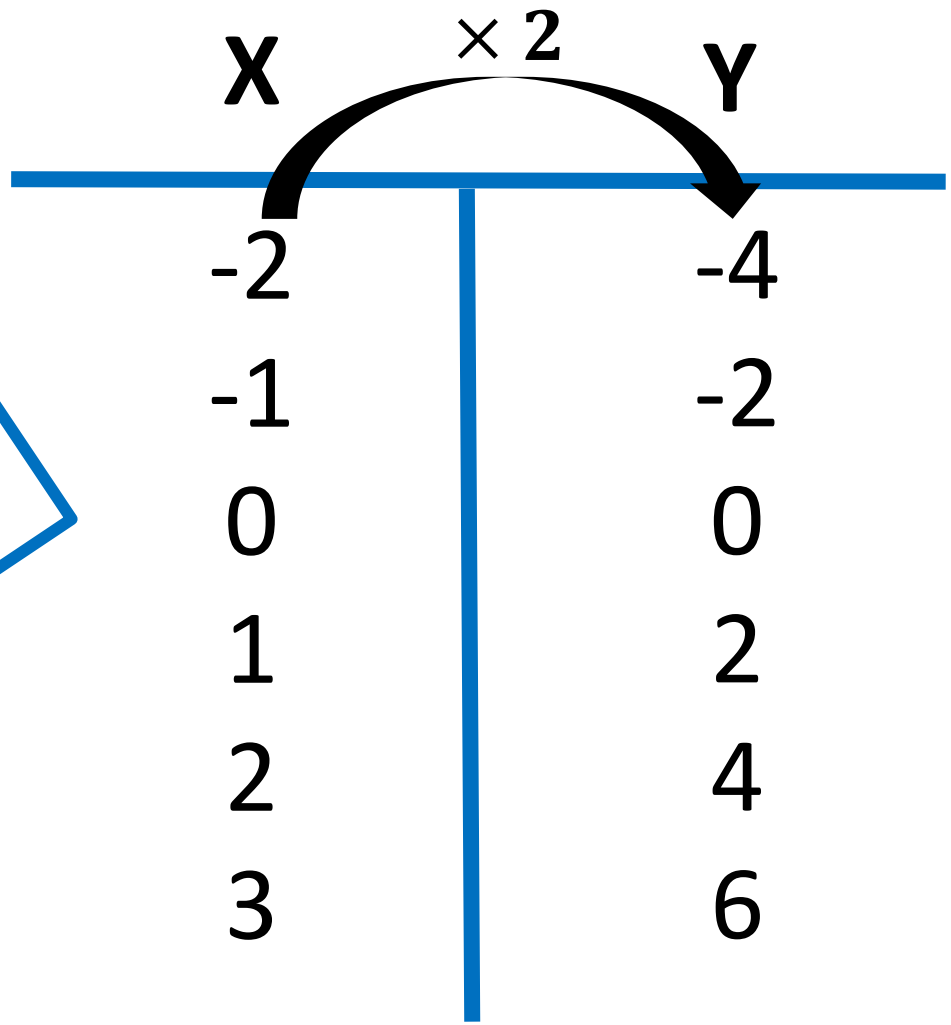
Different kind of map:

$Y = 2X$

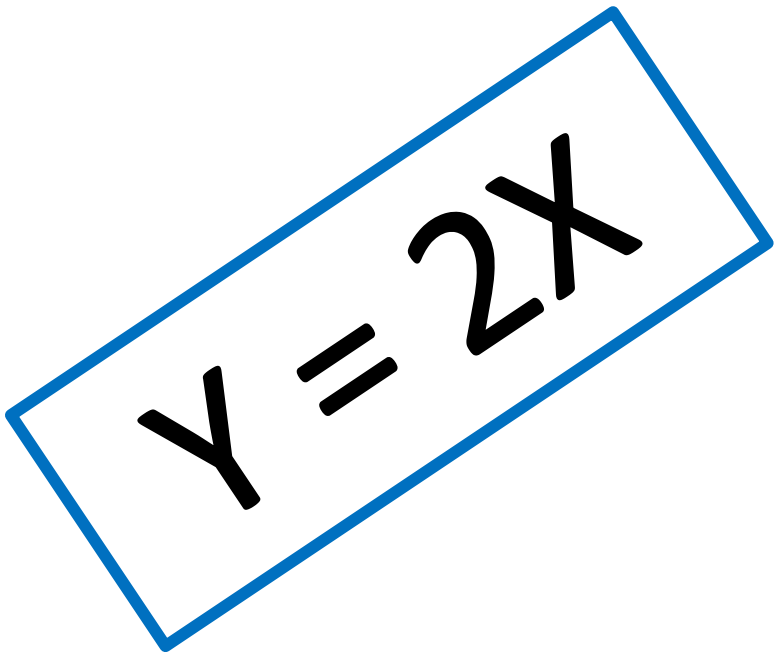
X	Y
-2	-4
-1	-2
0	0
1	2
2	4
3	6

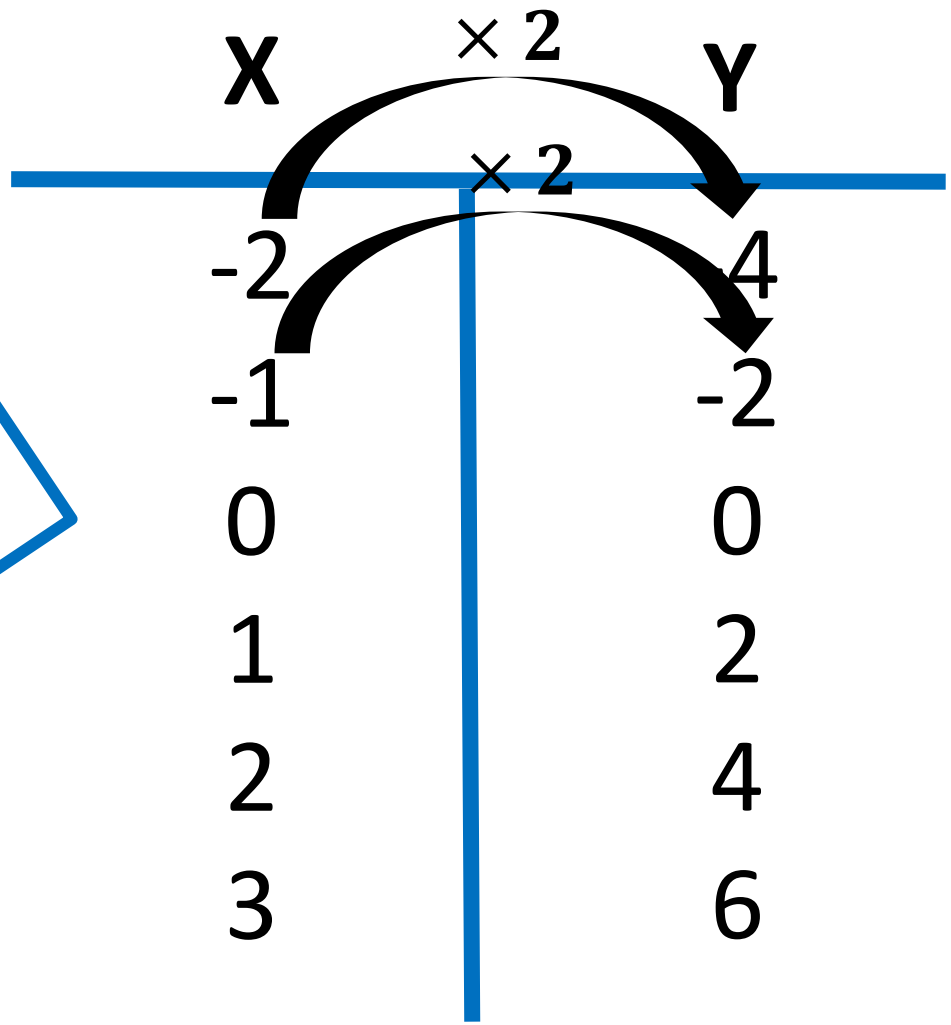
Different kind of map:





Different kind of map:





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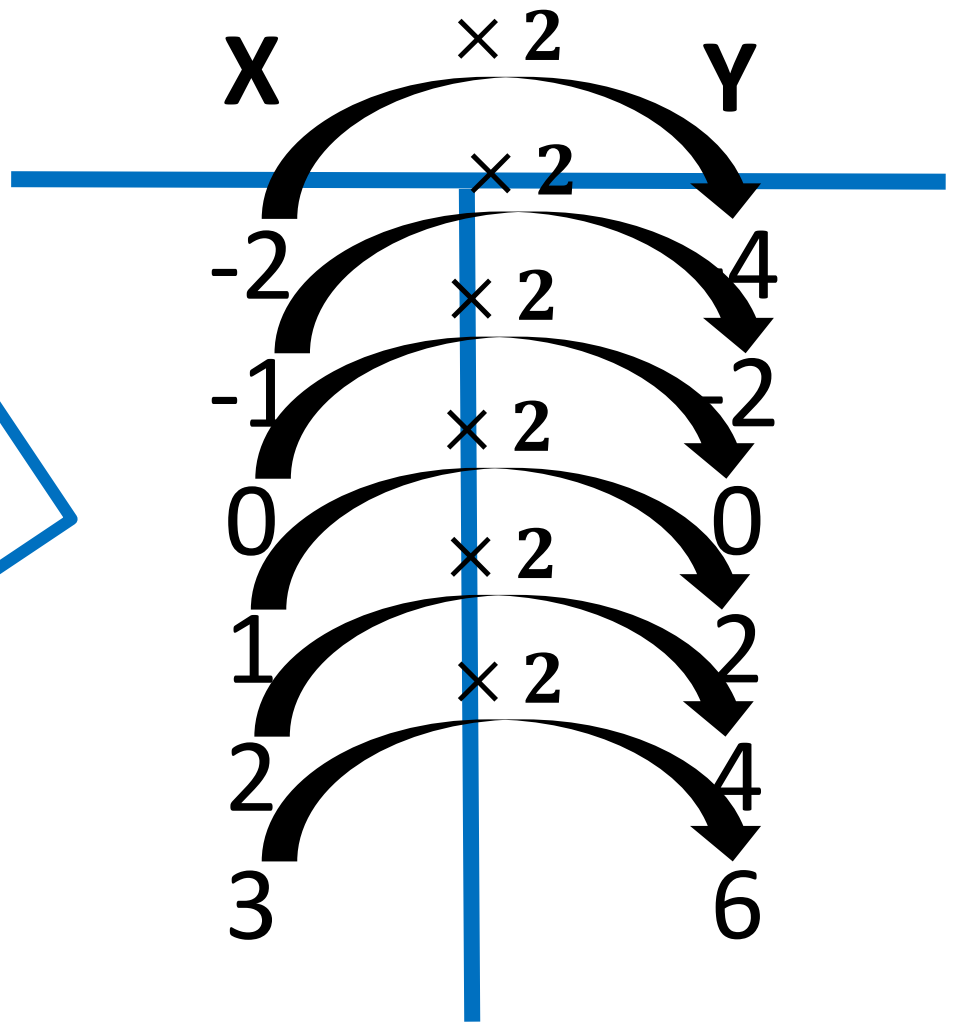
Different kind of map:

$Y = 2X$



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Different kind of map:

X	Y
-2	-4
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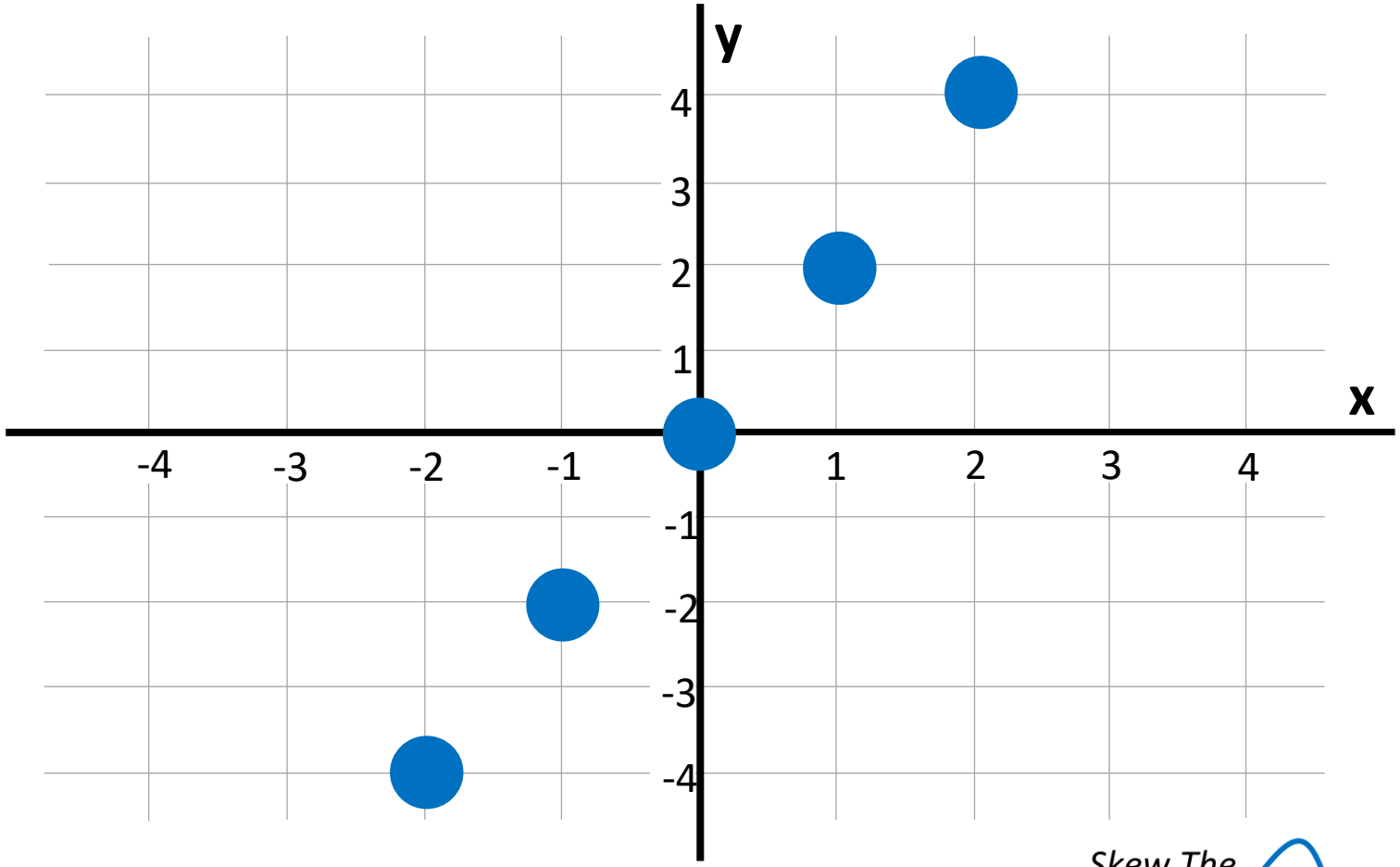

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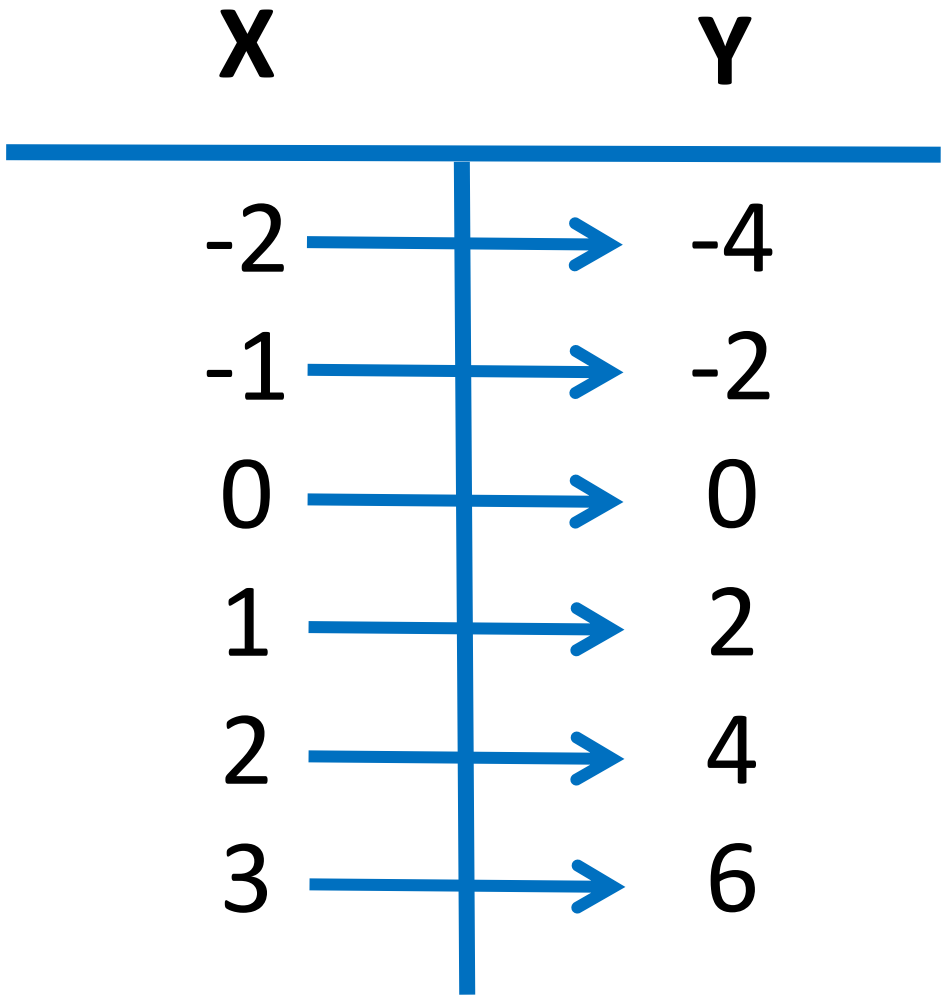
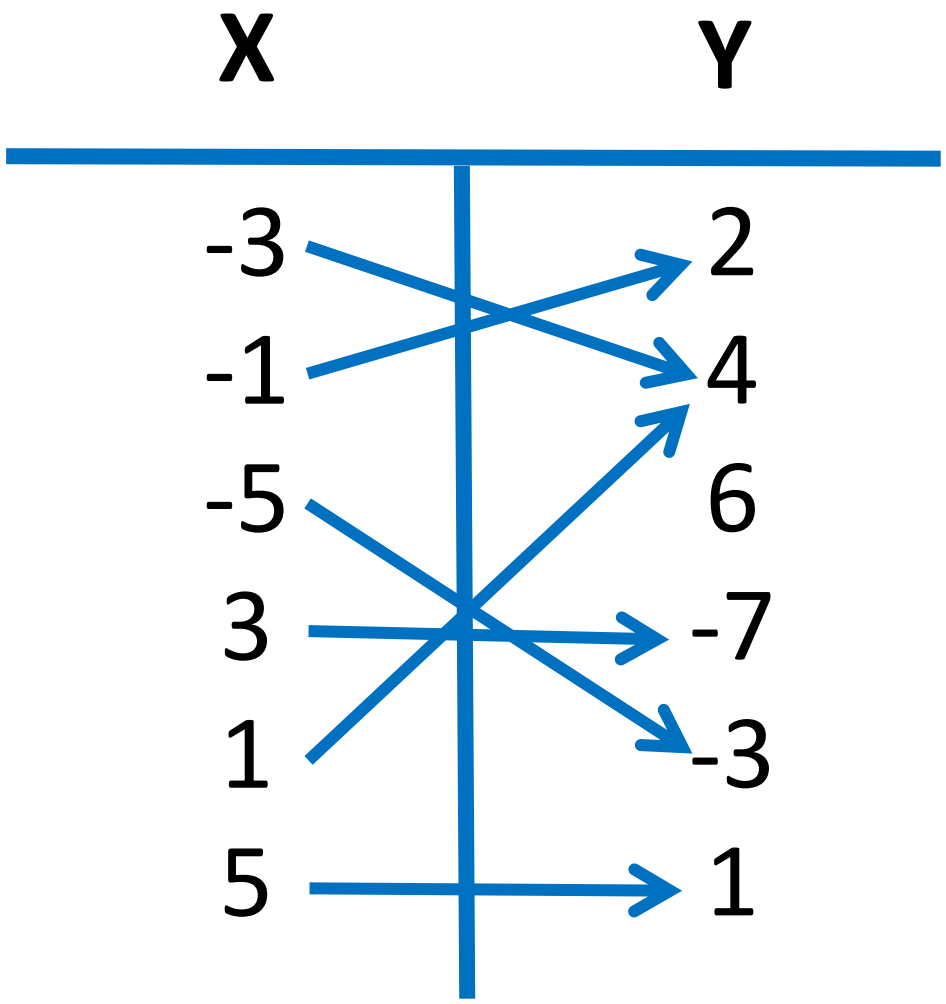
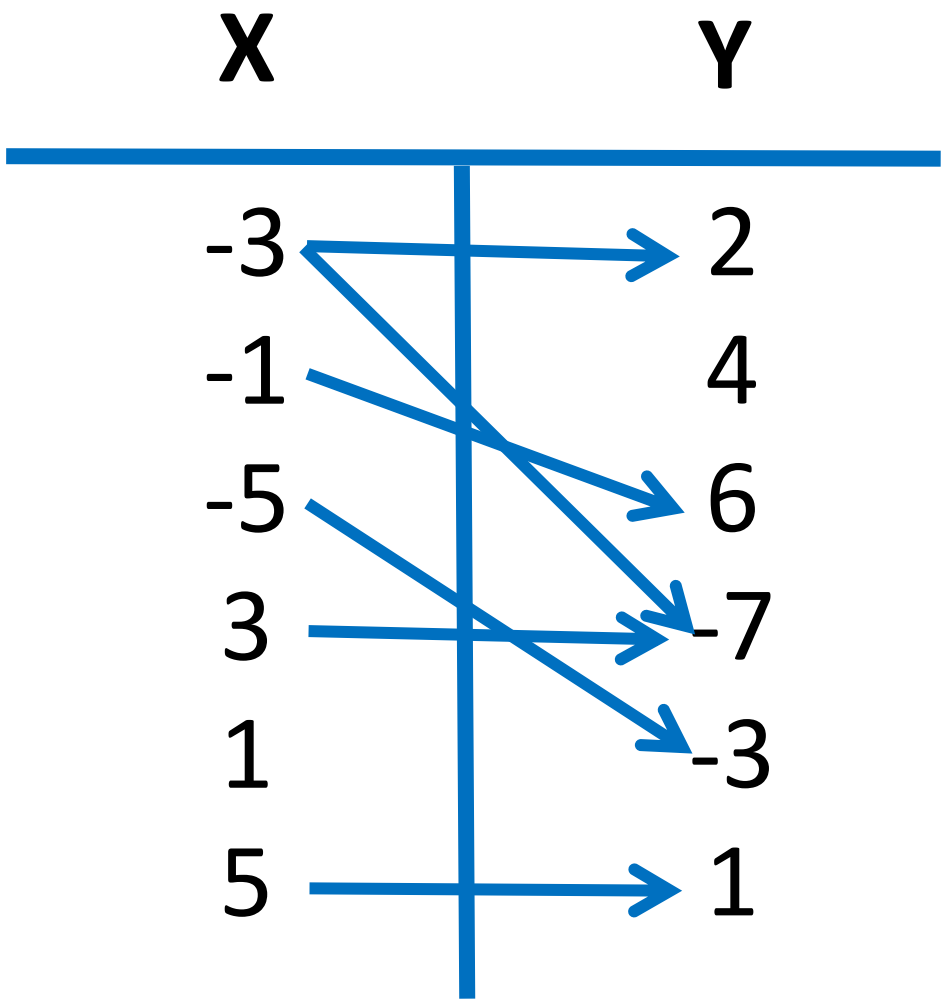
This map is a function, because each X is connected to exactly one Y



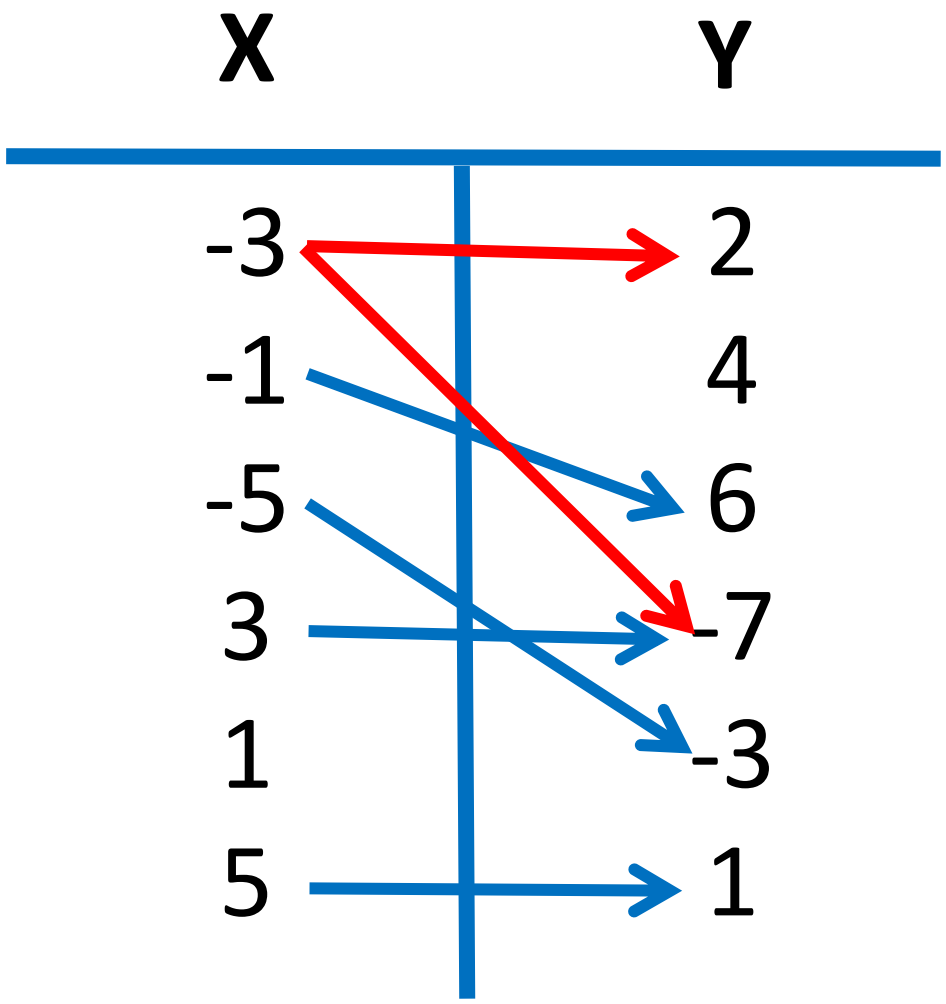
Even this jumbled map is a function, because each X is connected to exactly one Y



Is this a function?



This map is **not** a function, because X = -3 is connected Y = 2 and Y = -7

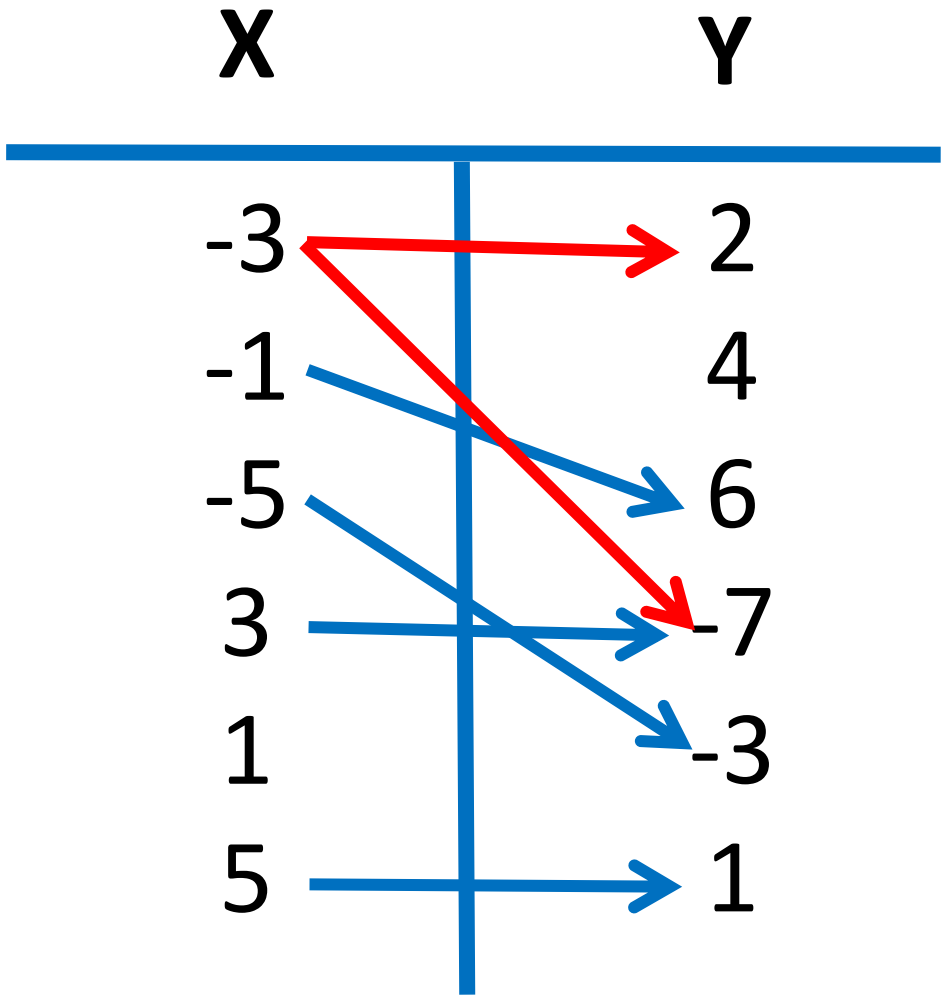


This is a **good** map.
Each *name* is connected to exactly one *place.* It's clear where 'Maine' is!

This is a **bad** map.
What would you do if you were told to go to Connecticut?

This is a **bad** map.
What would you do if you were told to go to Connecticut?

If you were given that X = -3, you wouldn't know which Y to go to!



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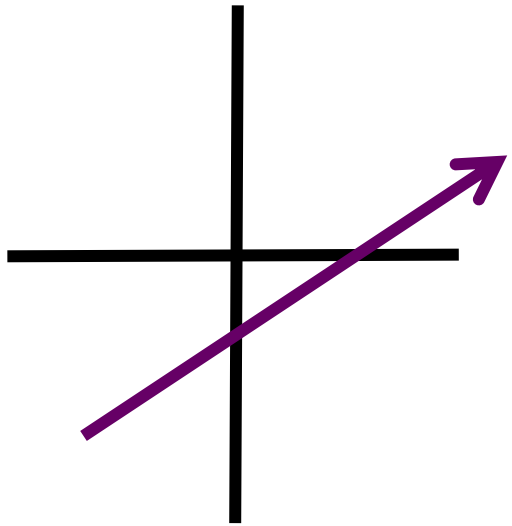
Topics

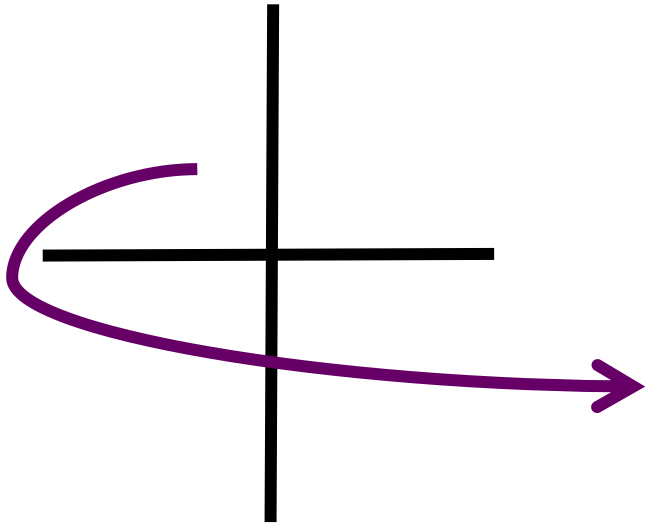
1. Functions as Maps
2. **Non-Functions**

Are these functions?

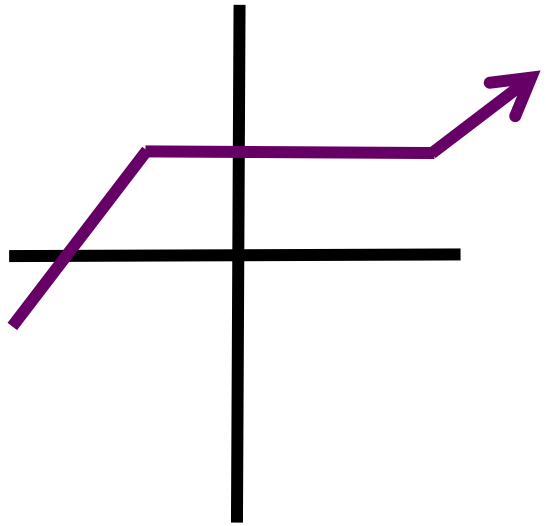
1.



2.

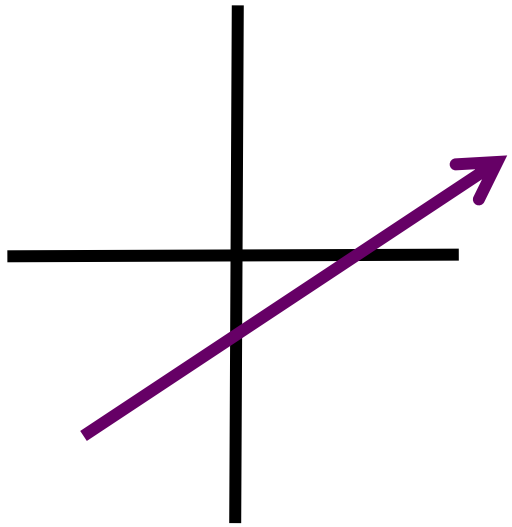


3.



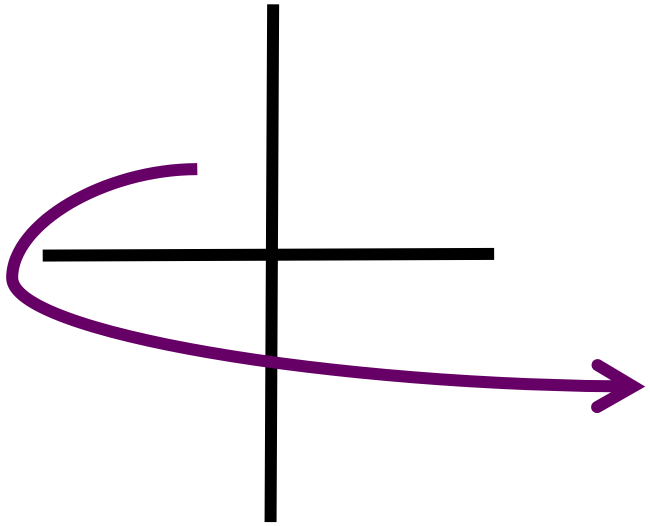
Are these functions?

1.



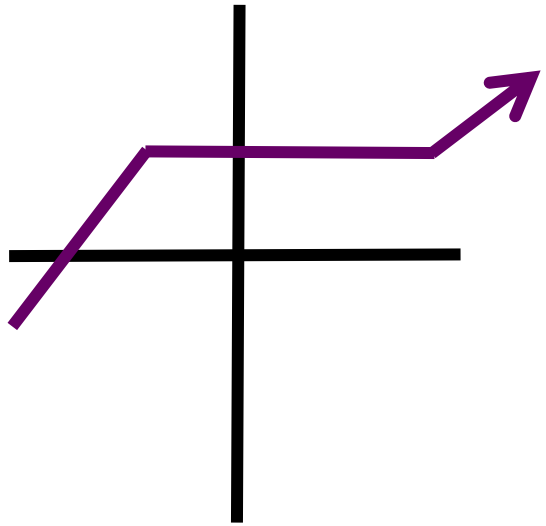
Yes

2.



No

3.



Yes

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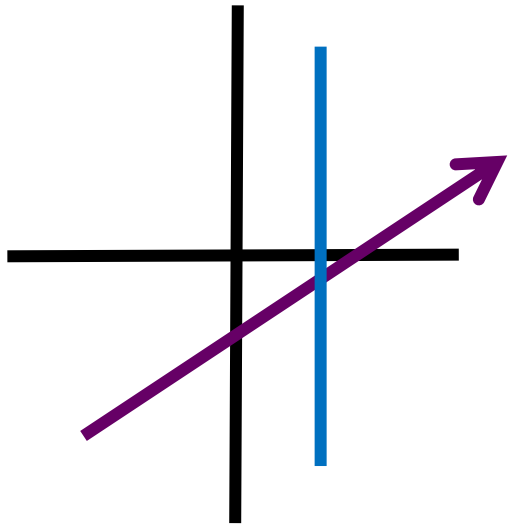
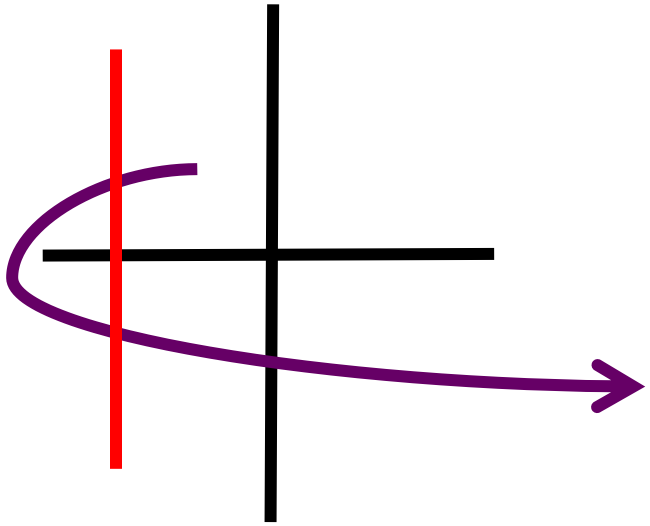
Are these functions?

1.



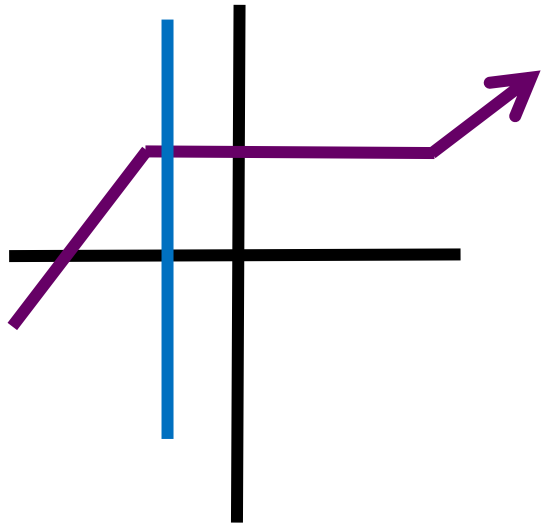
Yes

2.



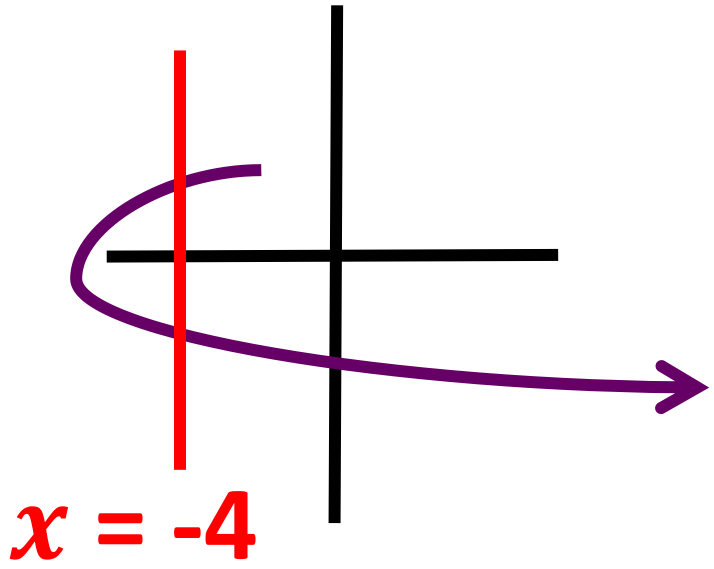
No

3.

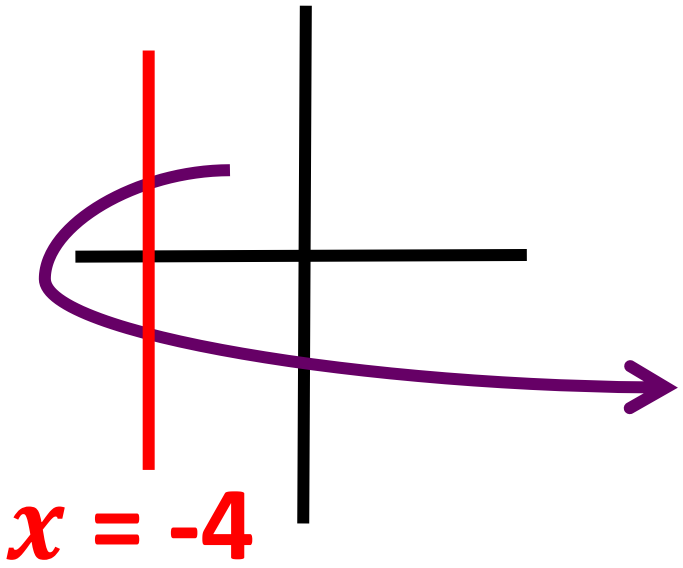


Yes

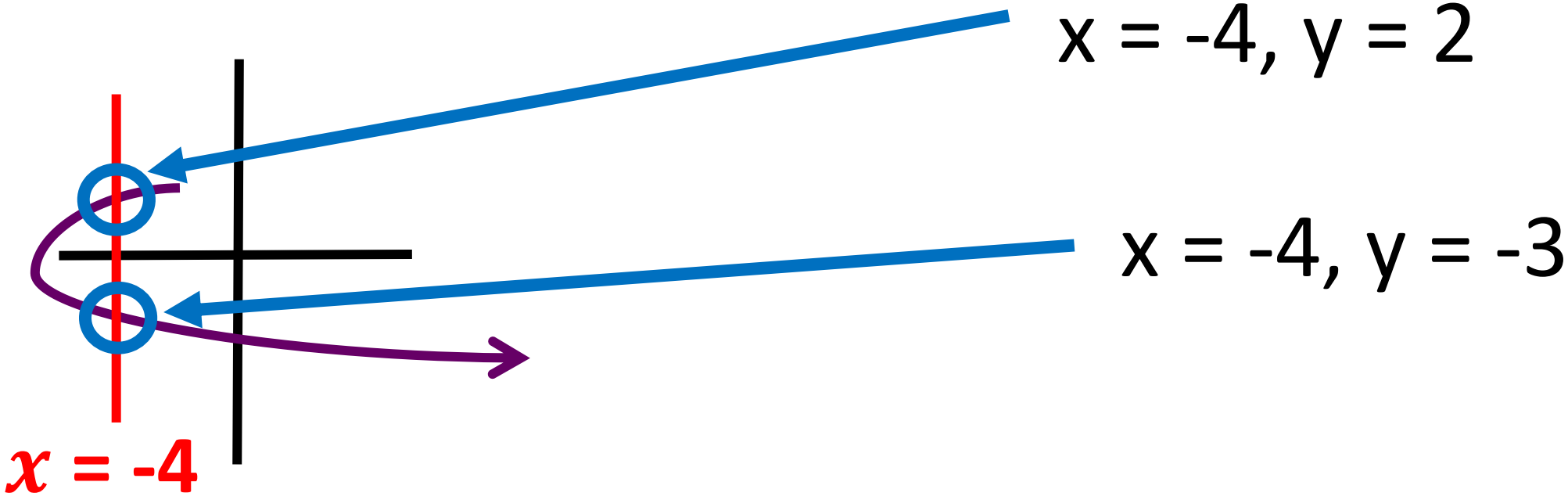
Are these functions?



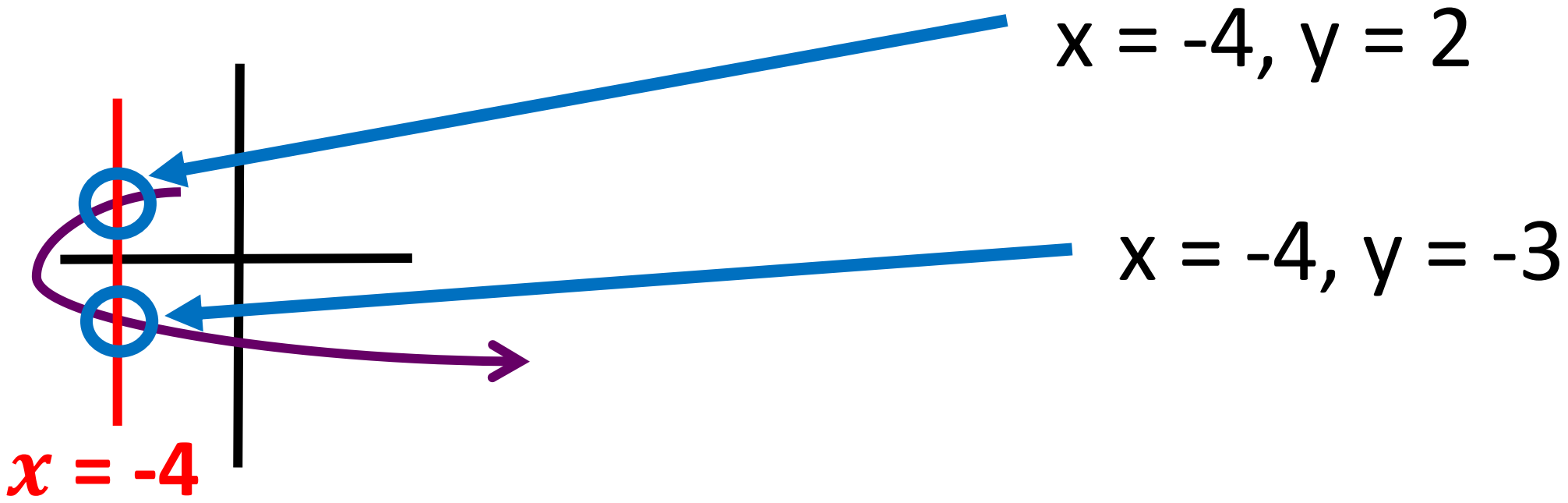
Are these functions?



Are these functions?



Are these functions?



At this x-value (-4), there are **two possible y-values**! It's a confusing map.

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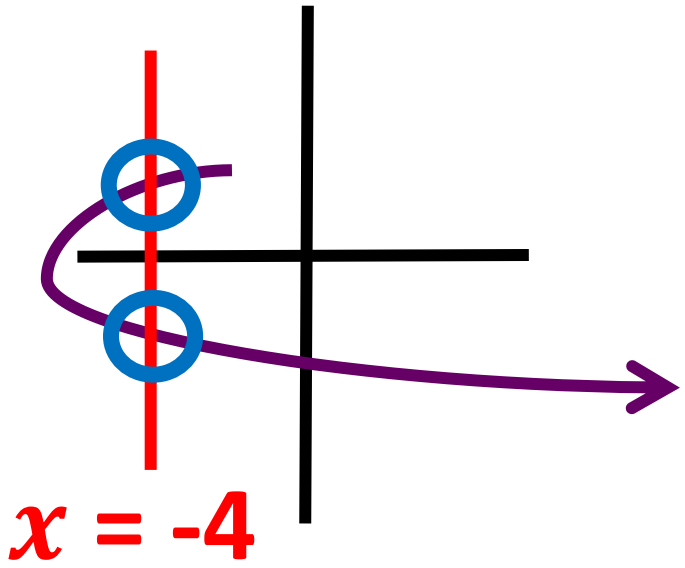
Are these functions?



This is called the **vertical line test**. It shows you if one x-value maps to multiple y-values.

At this x-value (-4), there are **two possible y-values**! It's a confusing map.

Last review:

X	Y
-2	36
-1	-12
0	7
1	2
2	-8
3	18

Function!

X	Y
-2	24
0	6
	0
1	-2
2	4
	-3

Not a function

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Extreme examples:

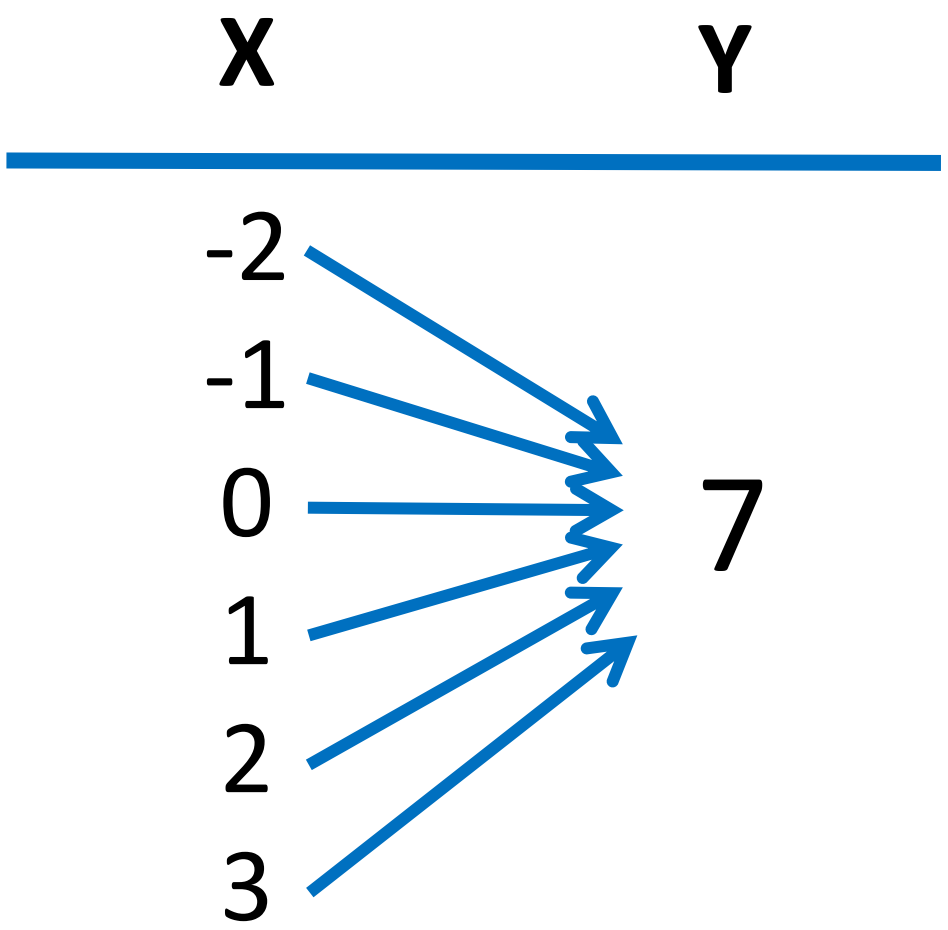
X	Y
-2	7
-1	7
0	7
1	7
2	7
3	7

Function!

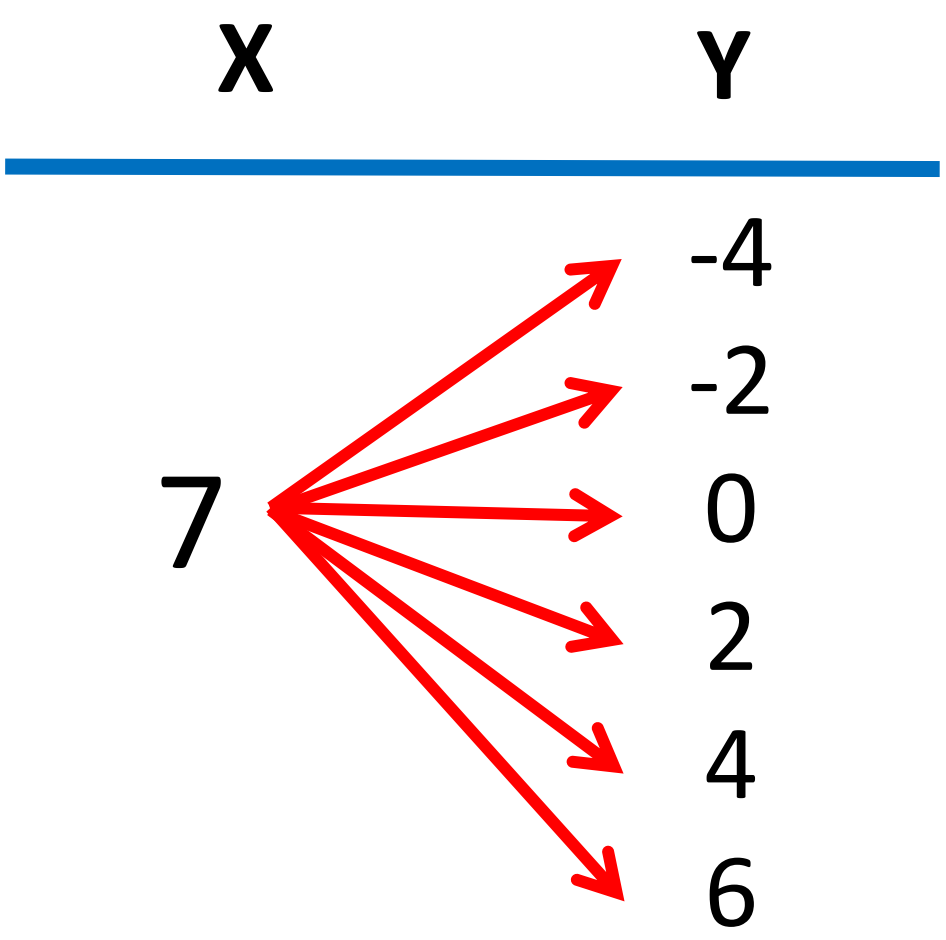
X	Y
7	-4
7	-2
7	0
7	2
7	4
7	6

Not a function

Extreme examples:



Function!



Not a function

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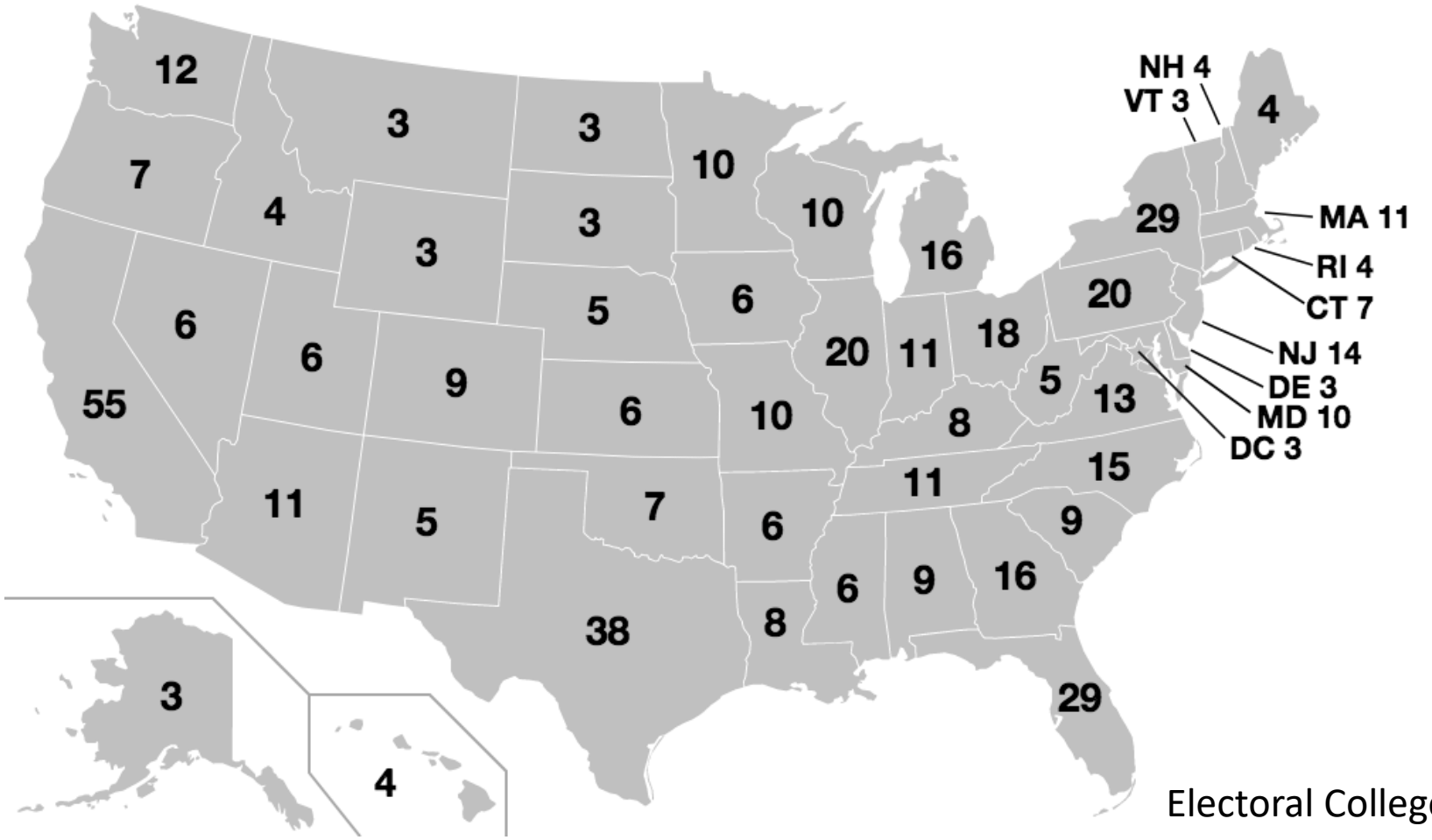
Key Example:

The Electoral College



Electoral College

- In the Presidential Election, candidates win electoral votes for winning states
- If a candidate gets 270 electoral votes, they win!

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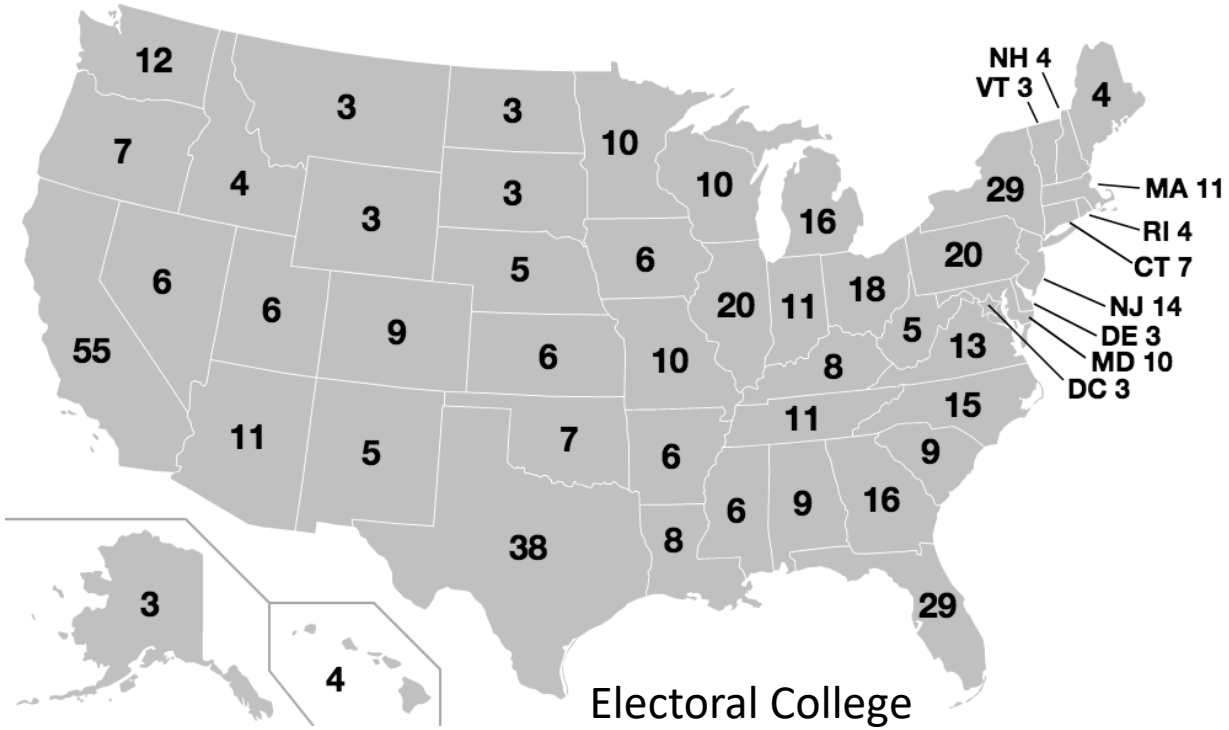

Electoral College

State's number is equal to…

- It's number of Senators (2 per state)
- **Plus** it's number of House Members (depends on size of state)

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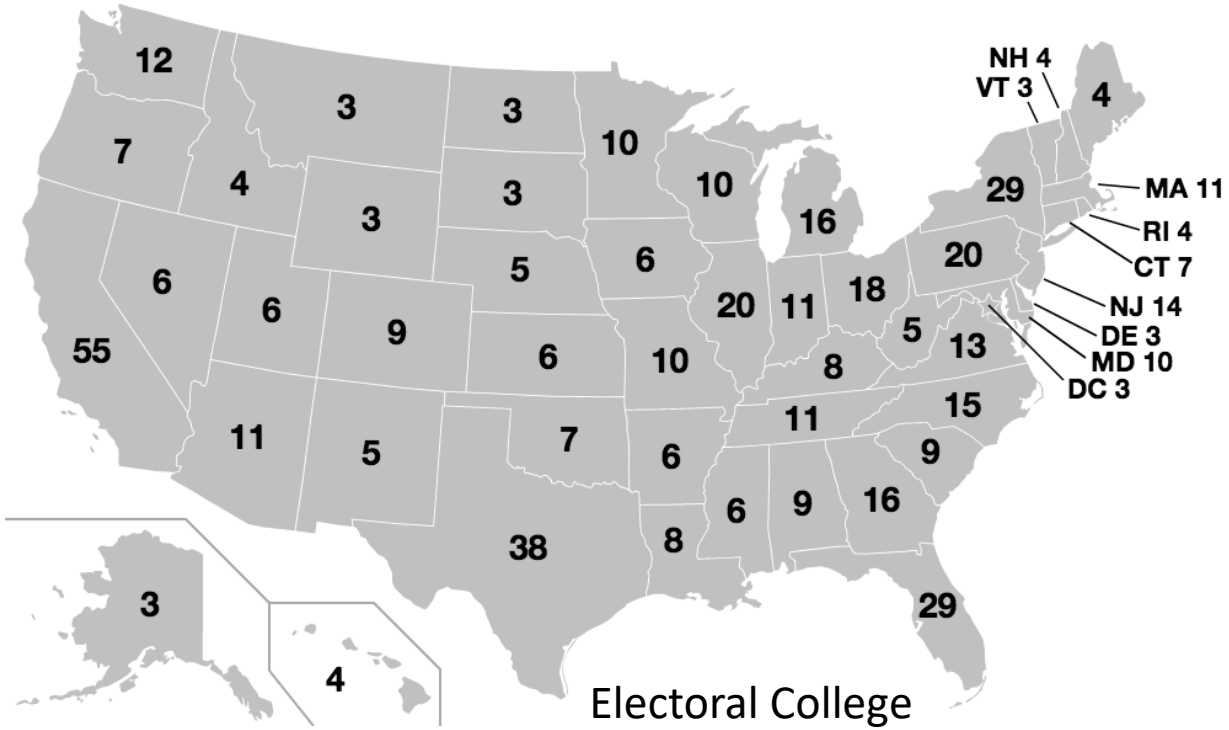

More **populous** states (California, Texas, etc.) have **more electoral votes**.

State's number is equal to…

- It's number of Senators (2 per state)
- **Plus** it's number of House Members (depends on size of state)

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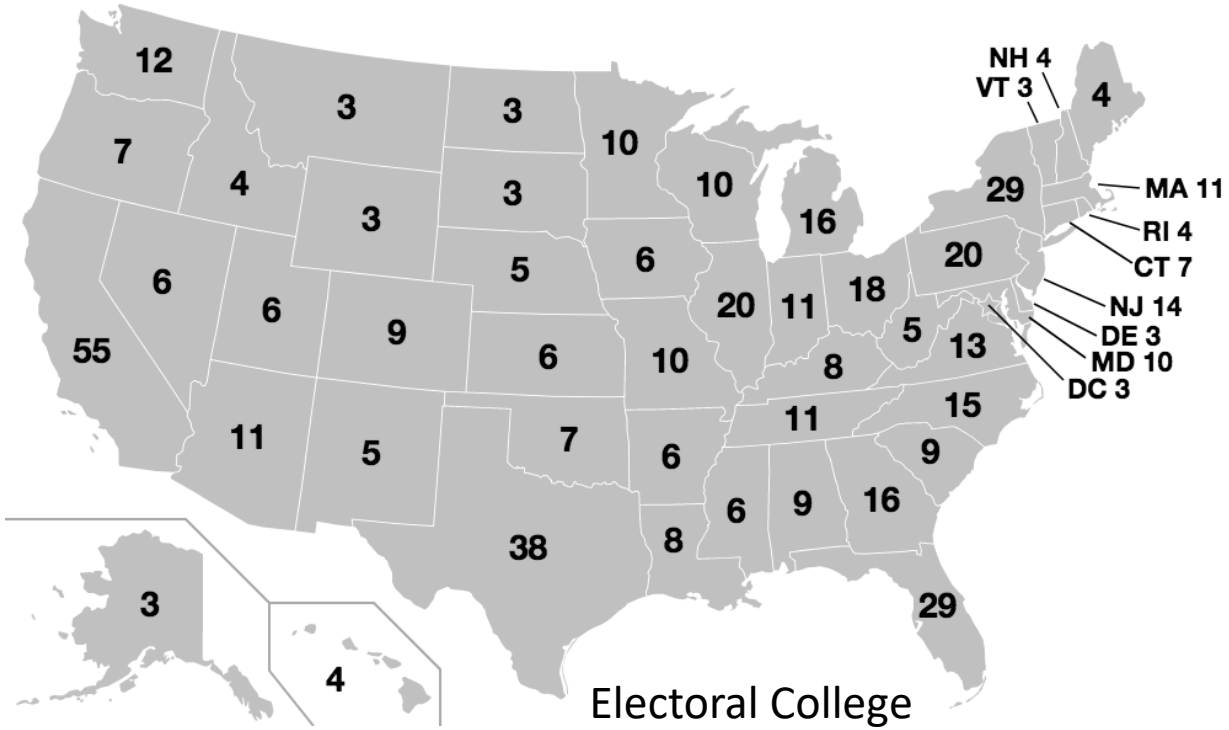

Low-population states get **at least 3** electoral votes (2 senators + 1 House Member).

State's number is equal to…

- It's number of Senators (2 per state)
- **Plus** it's number of House Members (depends on size of state)

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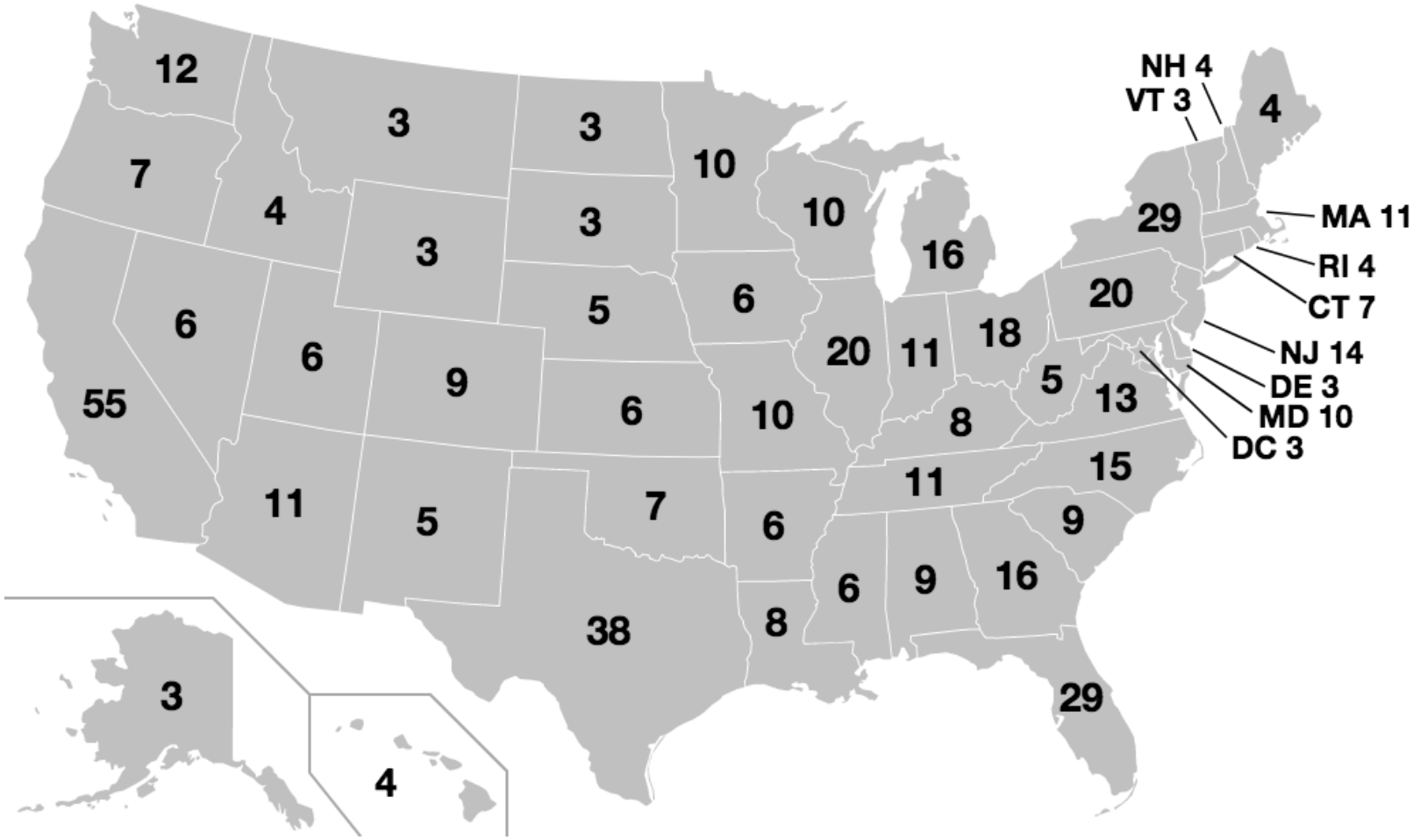

Question: is the number of electoral votes a *function* of **people's votes**?

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Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes	
Trump 2016	46%	304	**Won**

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Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes	
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McCain 2008	46%	173	**Lost**

Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes	
Trump 2016	**46%**	**304**	**Won**
Clinton 2016	48%	227	**Lost**
McCain 2008	**46%**	**173**	**Lost**

Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes
Trump 2016	**46%**	**304**
Clinton 2016	48%	227
McCain 2008	**46%**	**173**

Electoral votes **are not a function** of people's votes.

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Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes
Trump 2016	**46%**	**304**
Clinton 2016	48%	227
McCain 2008	**46%**	**173**

Electoral votes **are not a function** of people's votes. Candidates who won the same share of people's votes had very different outcomes.

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Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes
Trump 2016	**46%**	**304**
Clinton 2016	48%	227
McCain 2008	**46%**	**173**

How could this be? Is that fair?

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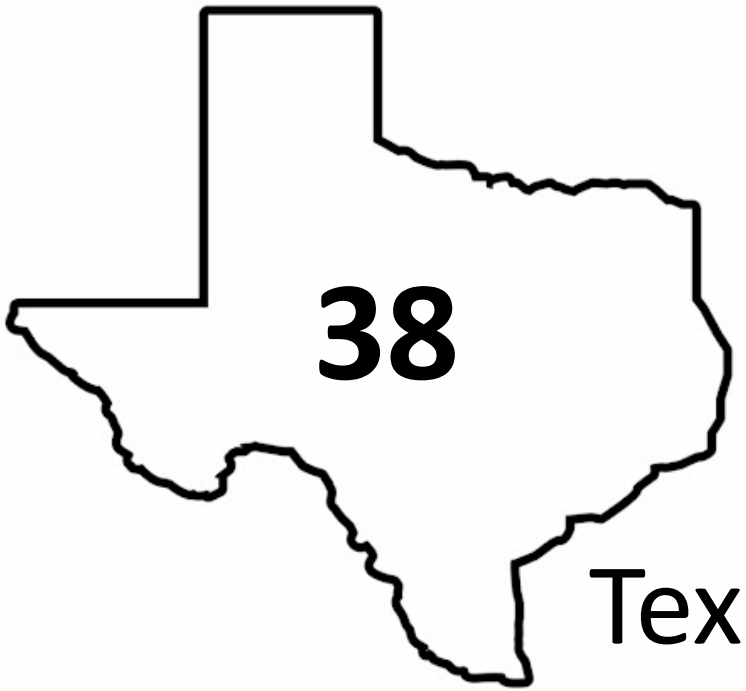
Lesson 1.1
Discussion

California

Ohio



Texas

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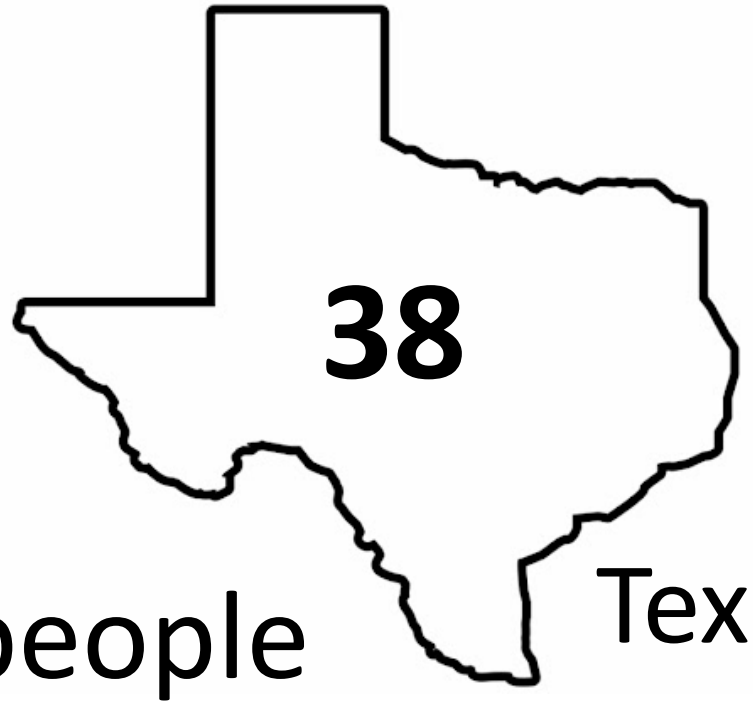
≈ 40 million people

California

Ohio

≈ 12 million people



Texas

≈ 29 million people

(2021)

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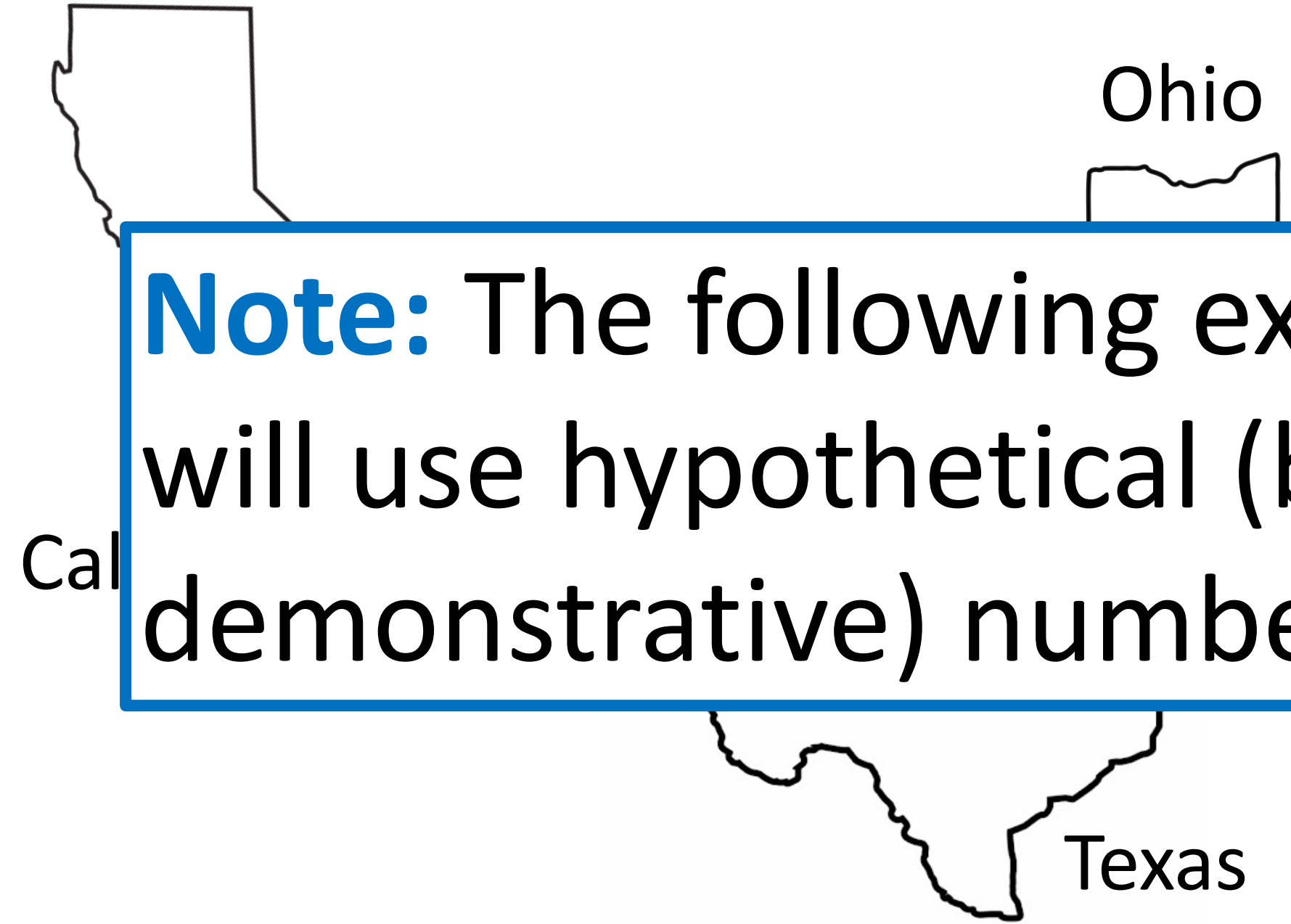

Note: The following examples will use hypothetical (but demonstrative) numbers

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10 million (R)
14 million (D)

California

Ohio

3 million (R)
4 million (D)

10 million (R)
7 million (D)

Texas

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California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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Electoral College:

Winner Take All

California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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10 million (R)

14 million (D)

California

Ohio

3 million (R)

4 million (D)

10 million (R)

7 million (D)

Texas

Popular Vote

23 million (R)

25 million (D)

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14 million (D)

California

Ohio

4 million (D)

10 million (R)

Texas

Popular Vote

23 million (R)

25 million (D)

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California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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California

Electoral Vote

38 votes (R)

73 votes (D)

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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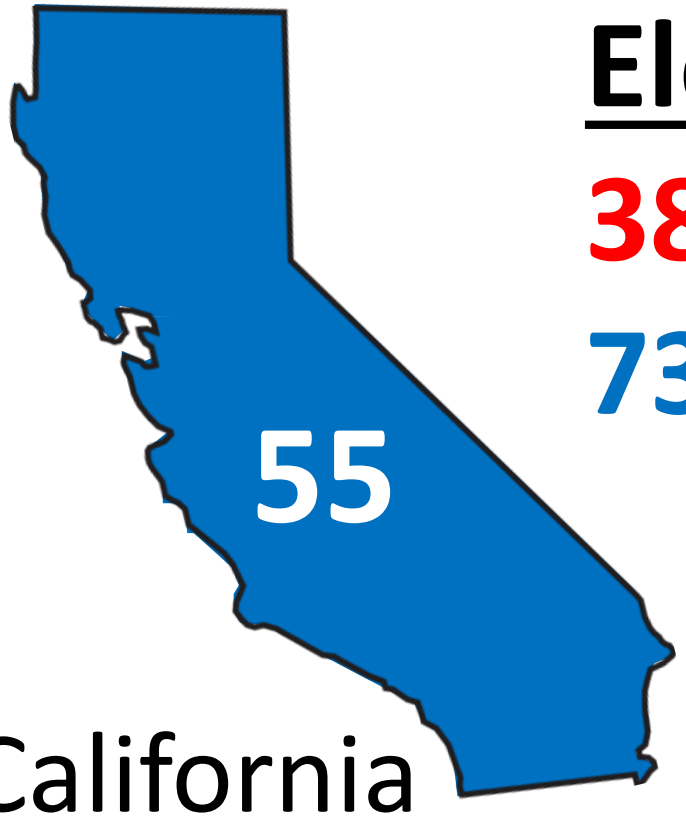

California

Electoral Vote

38 votes (R)

73 votes (D)

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

It's a match!

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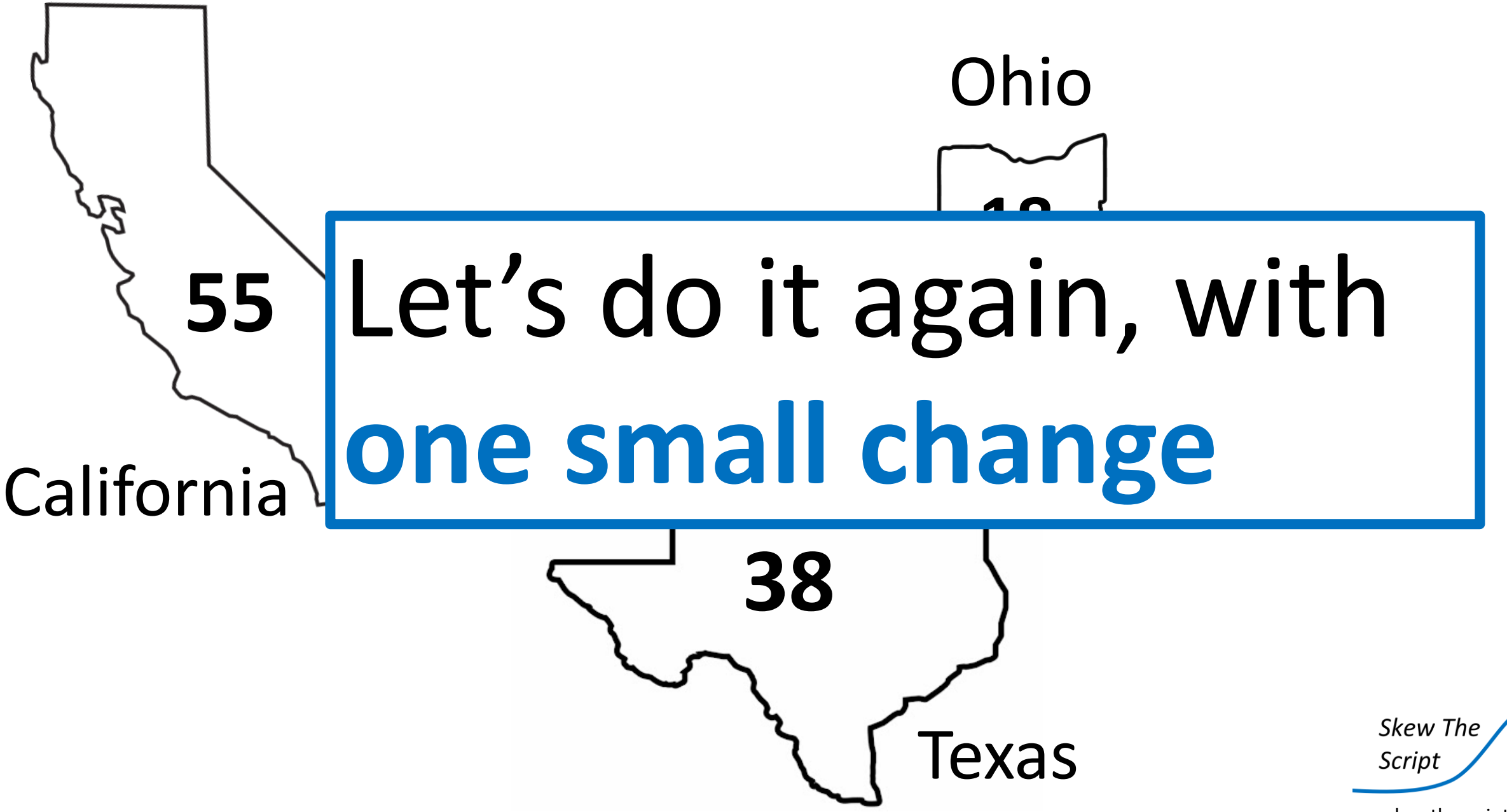

Let’s do it again, with

one small change

Skew The Script

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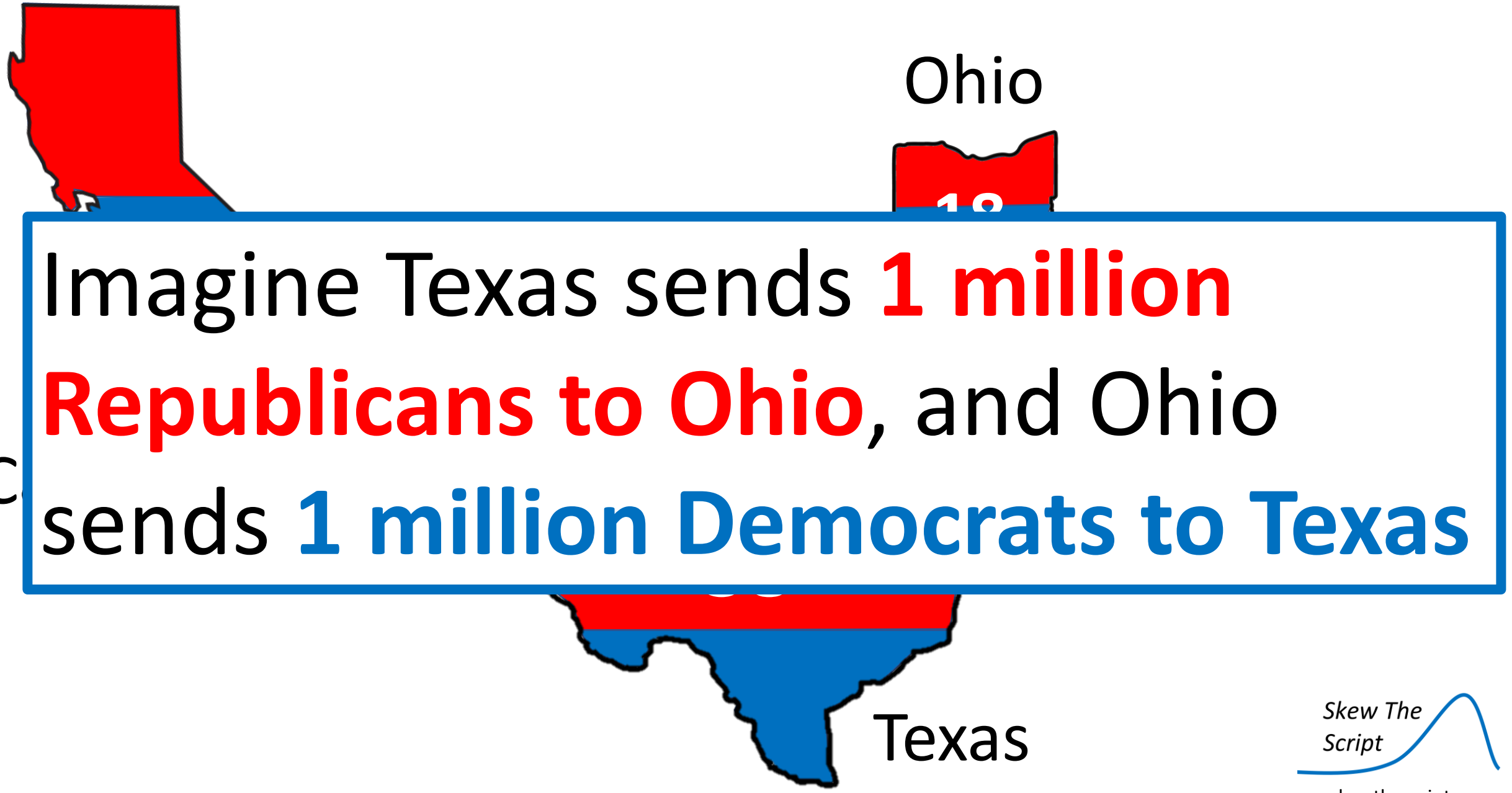

Imagine Texas sends **1 million Republicans to Ohio**, and Ohio sends **1 million Democrats to Texas**

Skew The Script

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10 million (R)
14 million (D)

California

Ohio

3 million (R)
4 million (D)

10 million (R)
7 million (D)

Texas

Original

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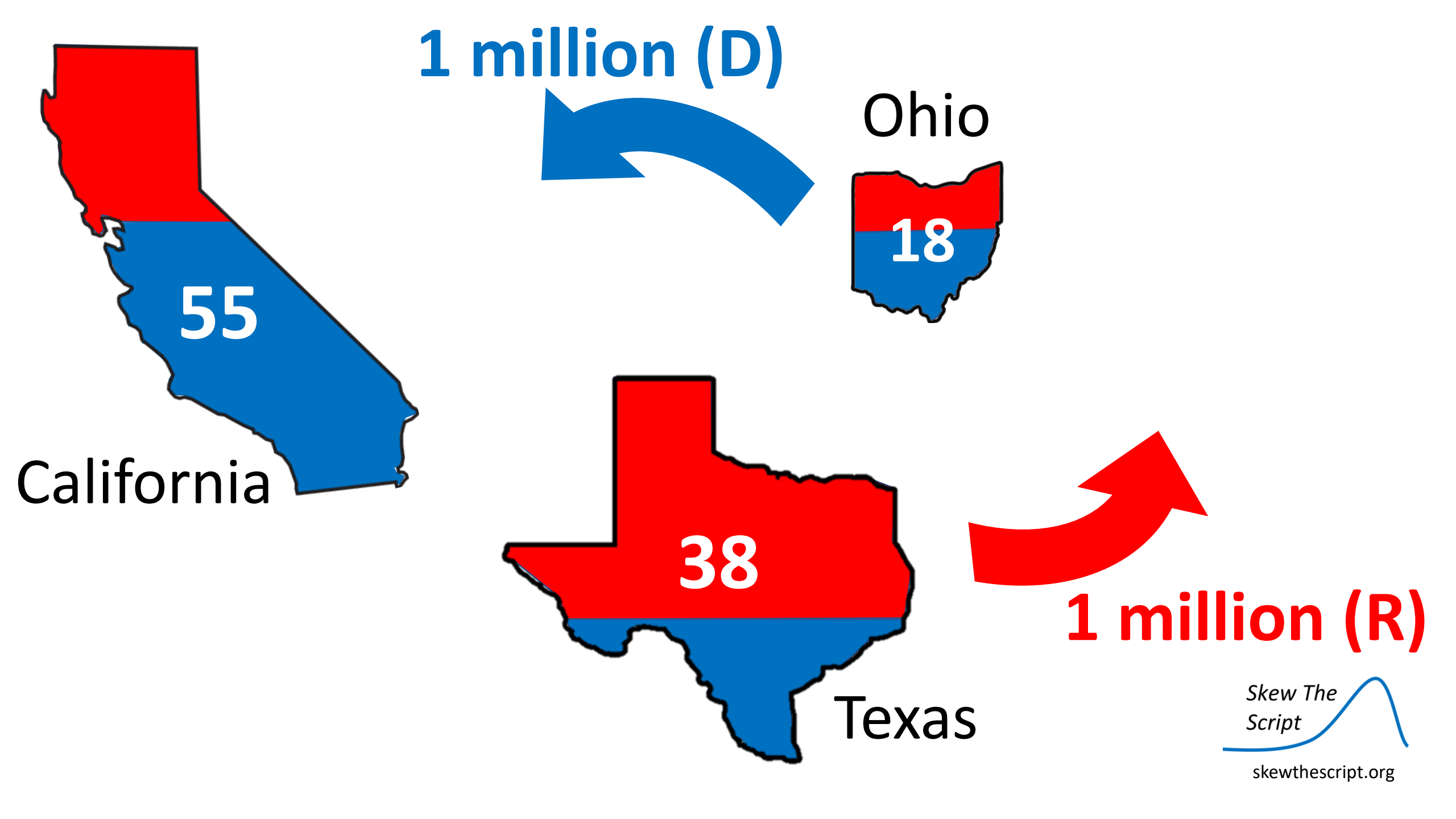
1 million (D)
Ohio
18
55
California
38
Texas
1 million (R)
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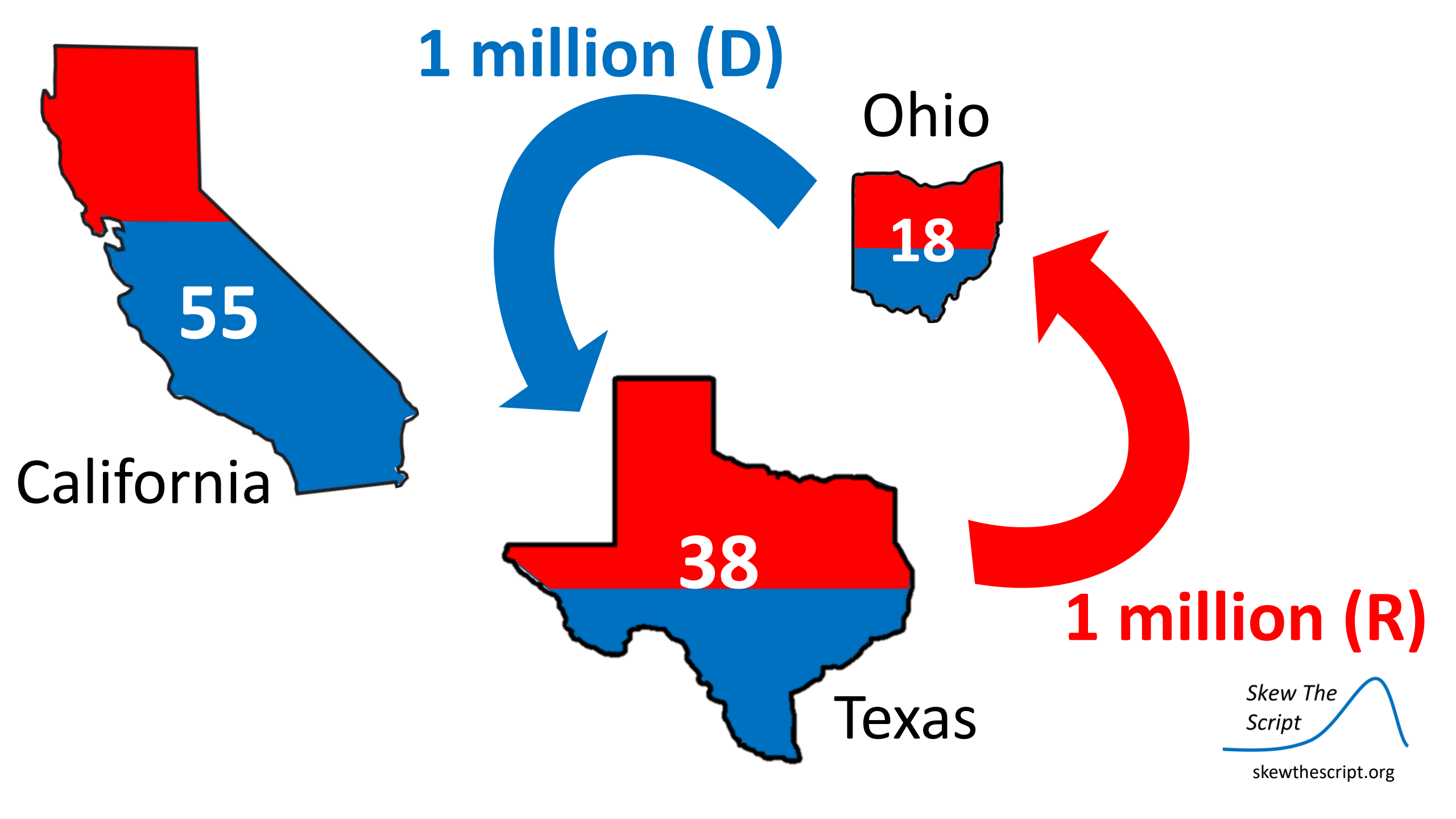
1 million (D)
Ohio
18
55
California
38
Texas
1 million (R)
Skew The Script
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10 million (R)
14 million (D)

California

Ohio

4 million (R)
3 million (D)

9 million (R)
8 million (D)

Texas

New

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California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

Skew The Script

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California

Ohio

Same as before!

Texas

Popular Vote

23 million (R)

25 million (D)

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Electoral College:

Winner Take All

California

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

Skew The Script

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10 million (R)

14 million (D)

California

Ohio

4 million (R)

3 million (D)

9 million (R)

8 million (D)

Texas

Popular Vote

23 million (R)

25 million (D)

Skew The Script

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14 million (D)

California

Ohio

4 million (R)

9 million (R)

Texas

Popular Vote

23 million (R)

25 million (D)

Skew The Script

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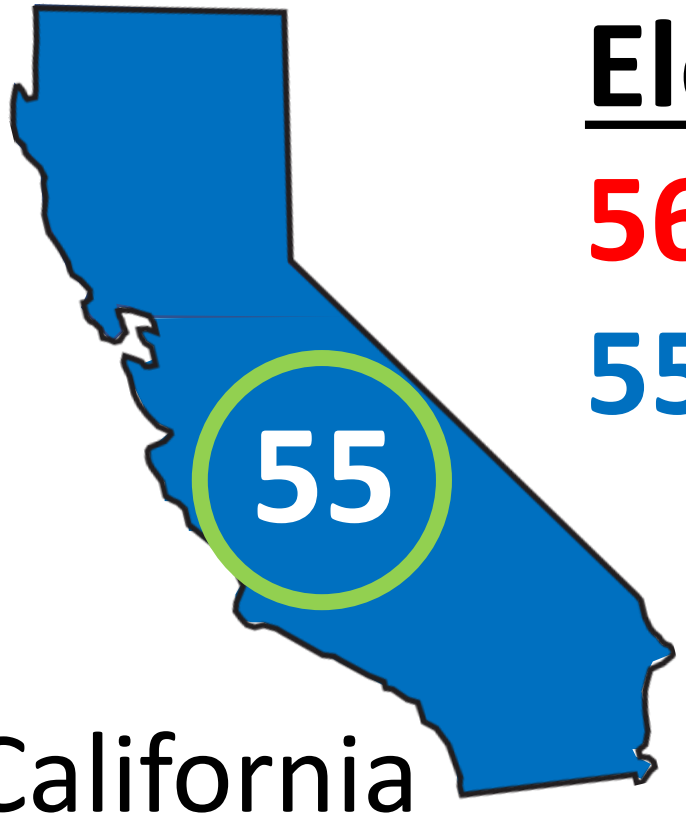

California

Electoral Vote

56 votes (R)

55 votes (D)

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

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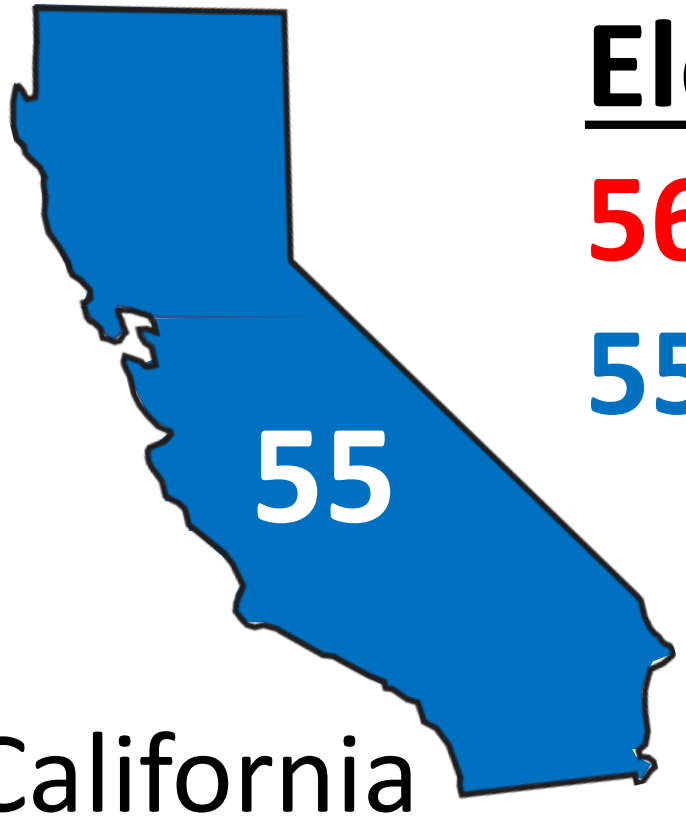

California

Electoral Vote

56 votes (R)

55 votes (D)

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

Conflicting result!

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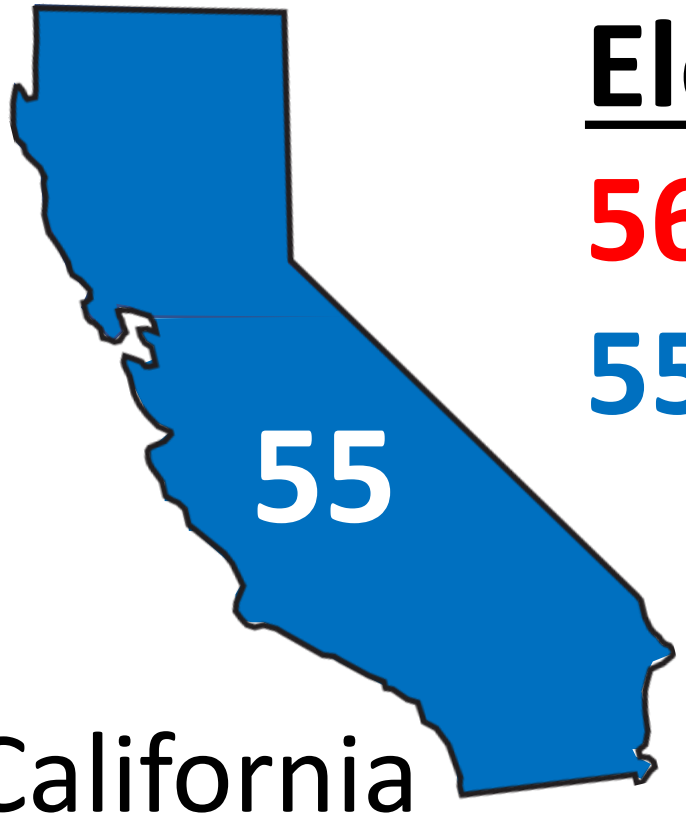

California

Electoral Vote

56 votes (R)

55 votes (D)

Ohio

Texas

Popular Vote

23 million (R)

25 million (D)

Candidate with fewer votes wins!

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California

Ohio

Texas

"Swinging" close states is key

Skew The Script

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Ohio

Ca

Bottom Line: Winning more votes matters less than winning more votes **in close states (swing states)**.

Texas

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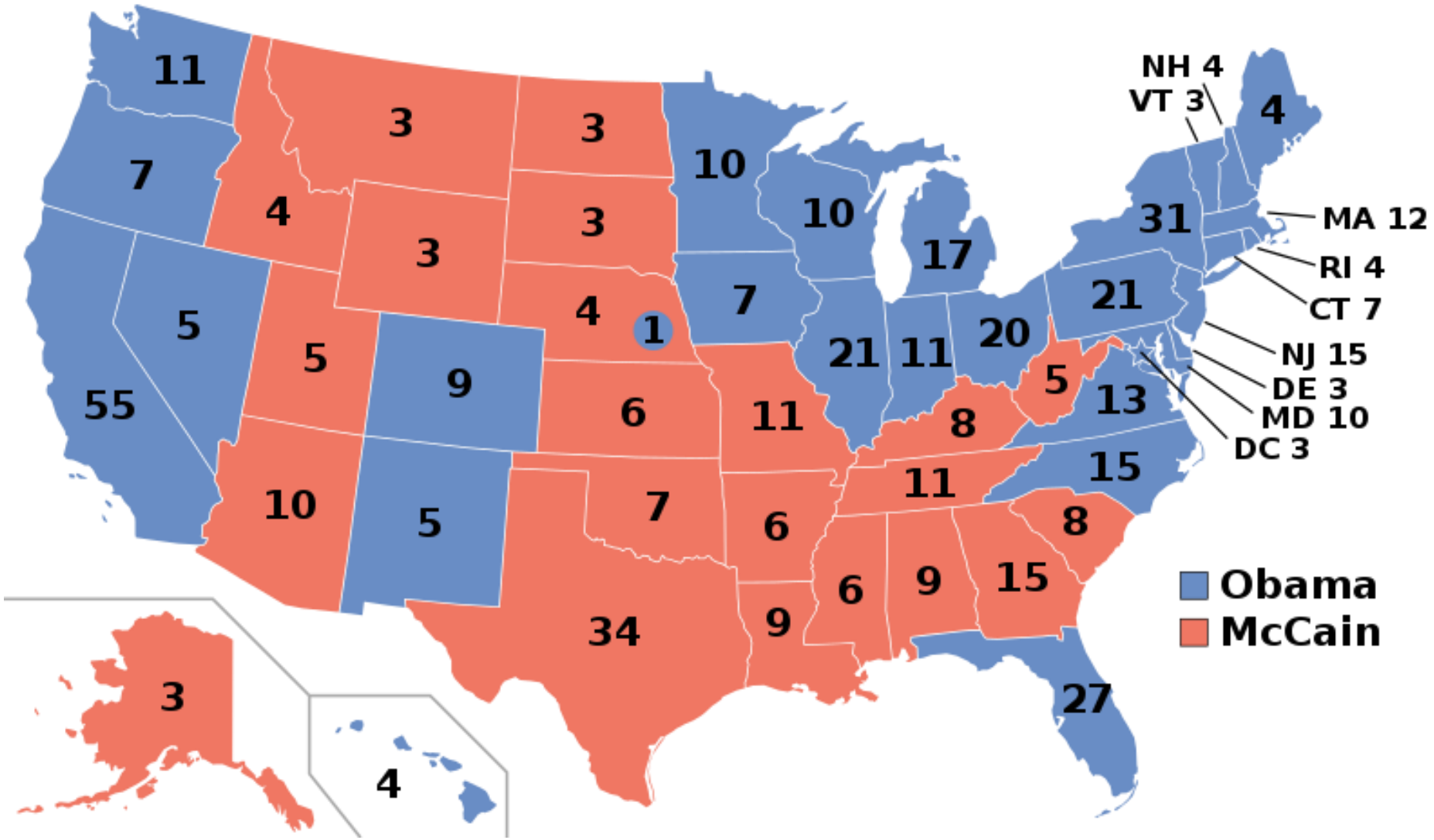
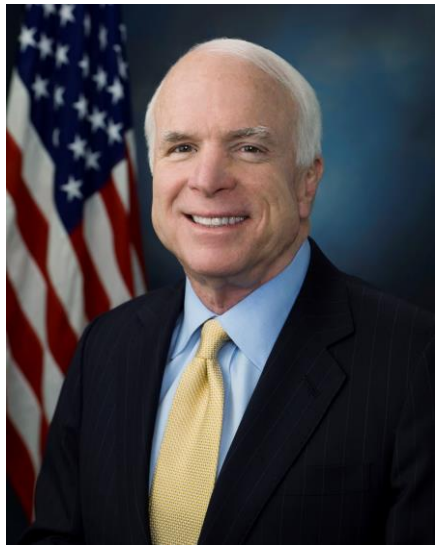
McCain (2008): 46% of popular vote
173 electoral votes





Lost

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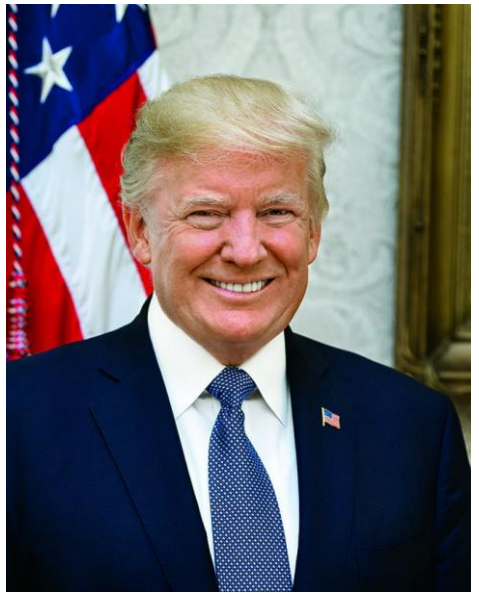
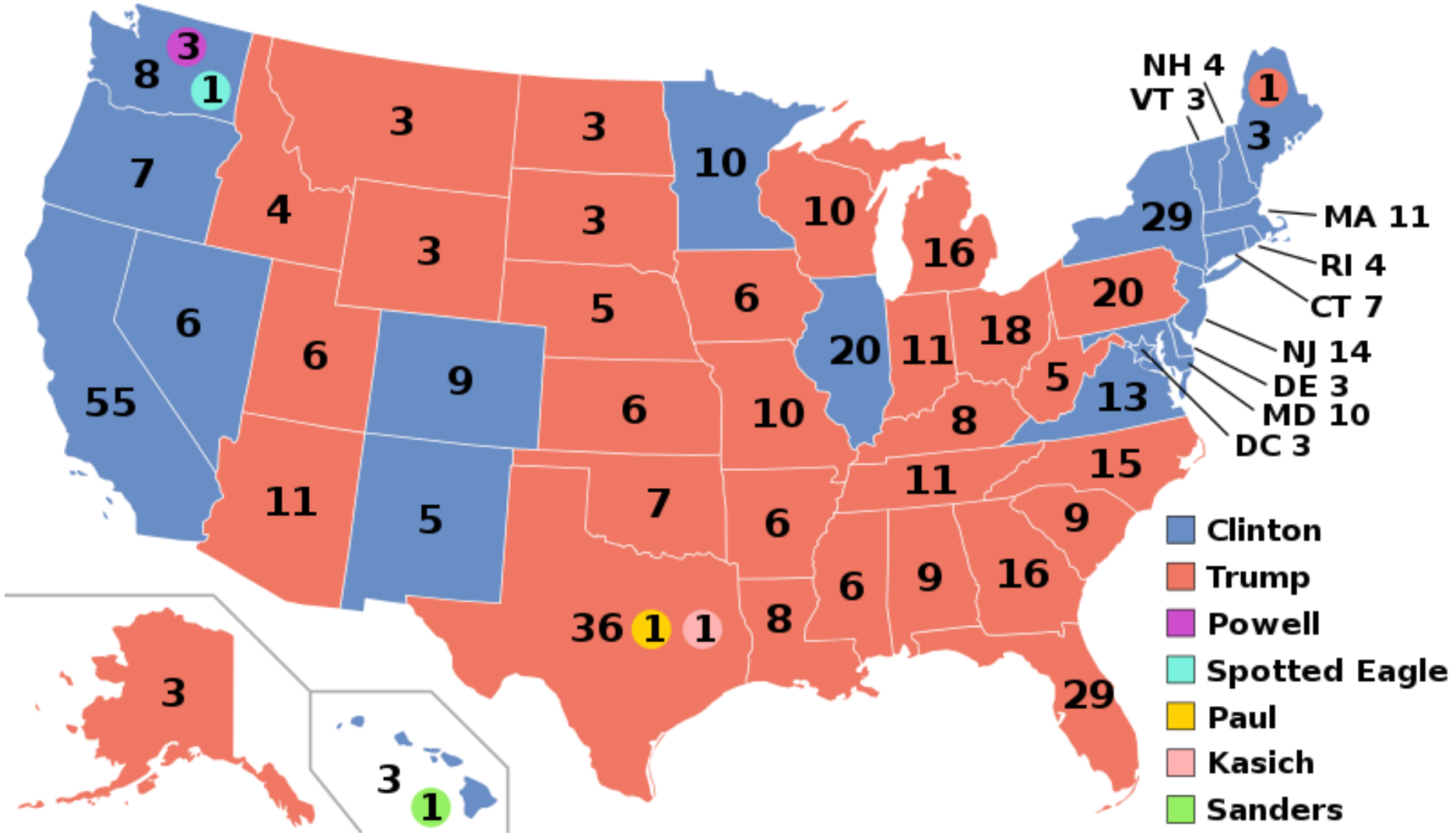
Trump (2016): 46% of popular vote 304 electoral votes





Skew The Script

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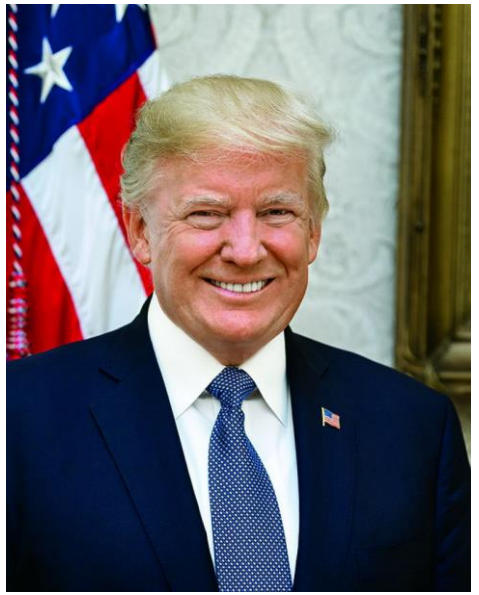
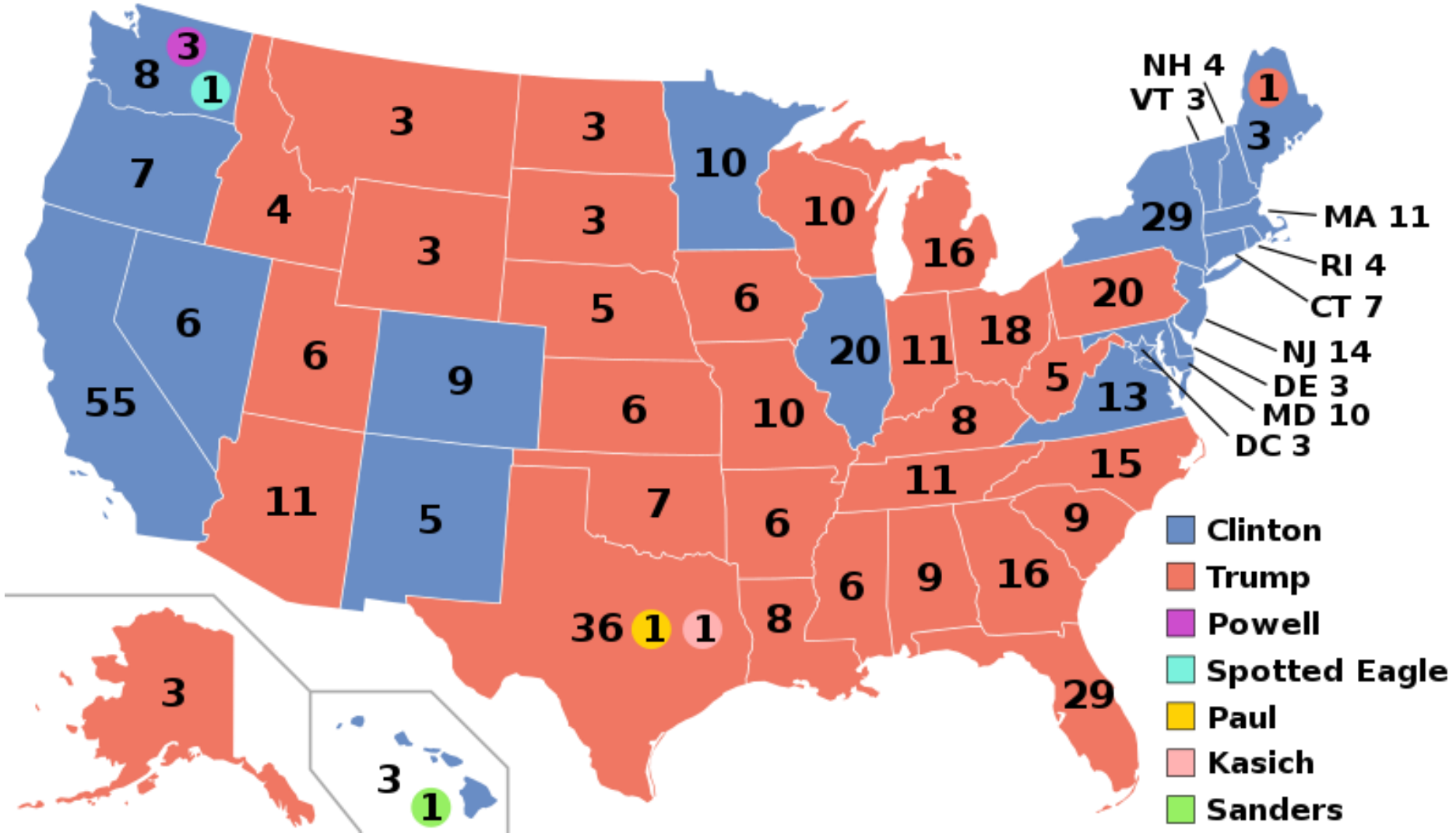
Trump (2016):

46% of popular vote

304 electoral votes

Same vote share





Skew The Script

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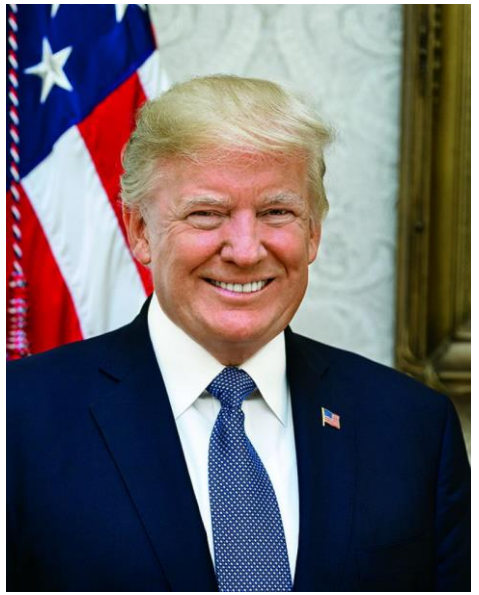
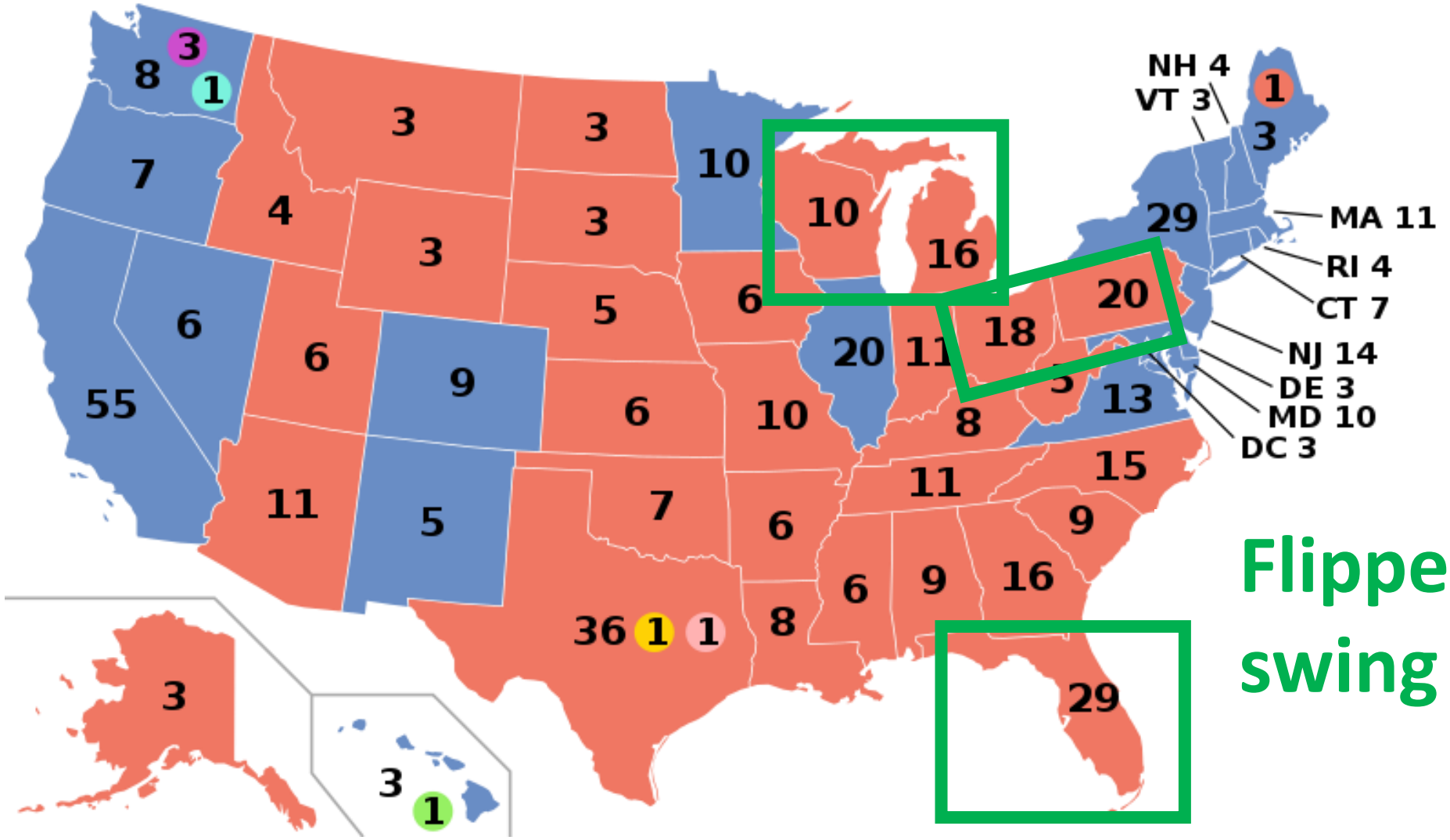
Trump (2016):

46% of popular vote

304 electoral votes

Same vote share





Flipped key swing states

Skew The Script

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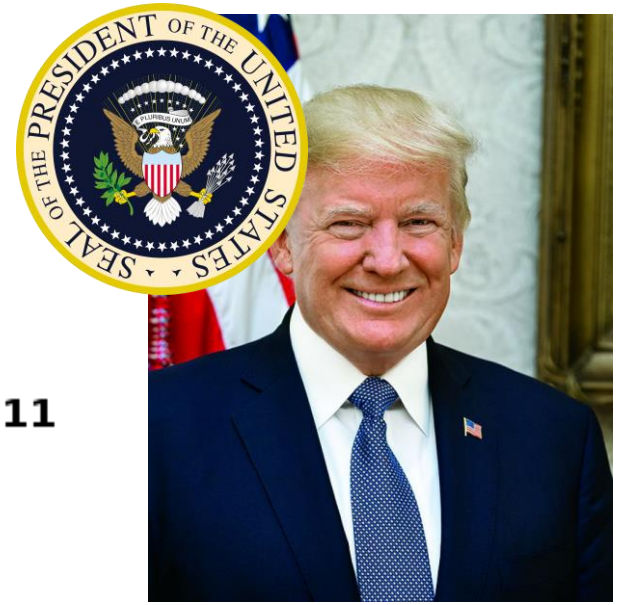
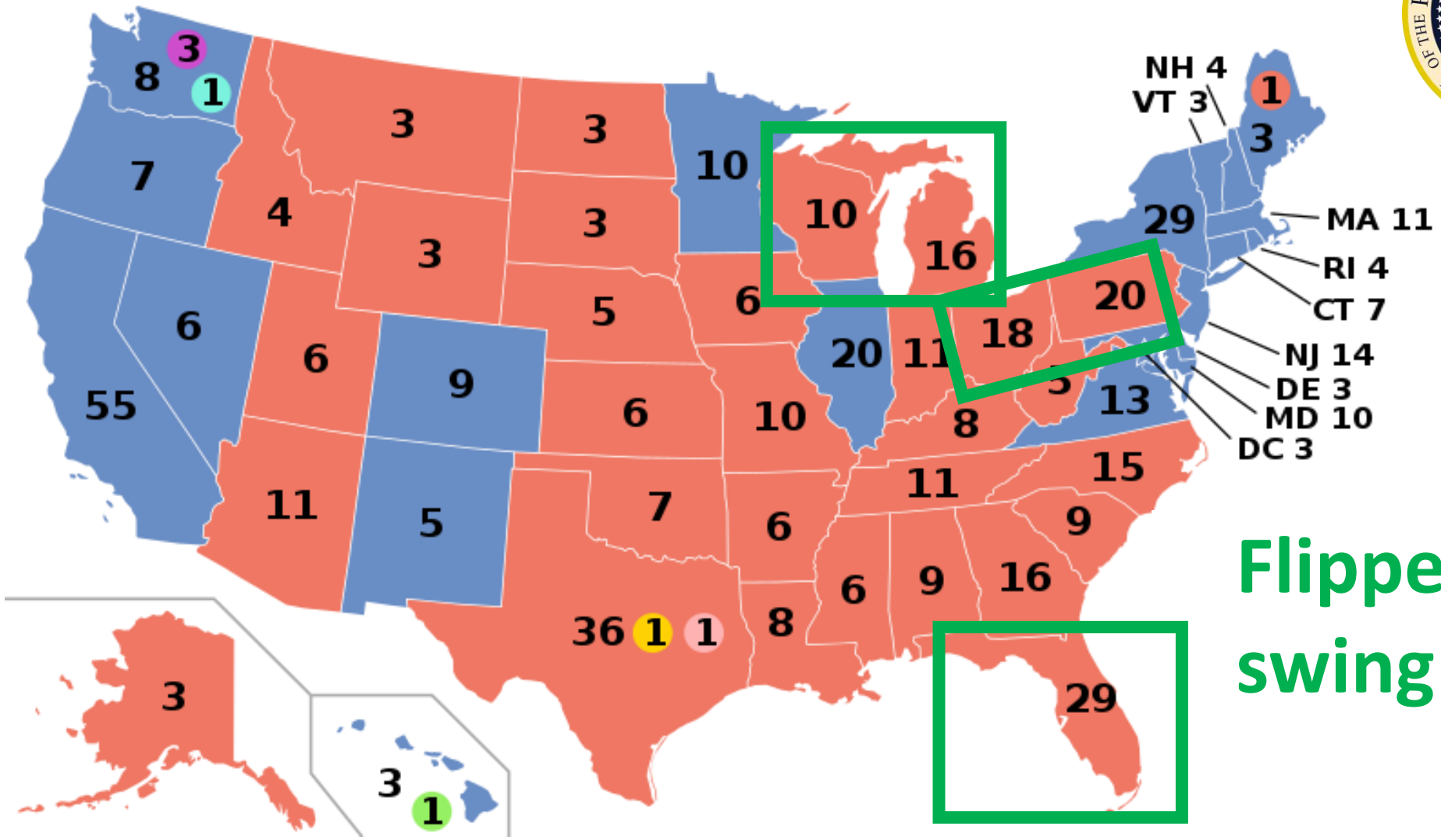
Trump (2016):

46% of popular vote

304 electoral votes

Same vote share





Won

Flipped key swing states

Skew The Script

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Electoral vs. People's votes

Candidate	Voter Share	Electoral Votes
Trump 2016	**46%**	**304**
Clinton 2016	48%	227
McCain 2008	**46%**	**173**

Discussion Question:

Should electoral votes be a function of people's votes (voter share)? Justify your answer.

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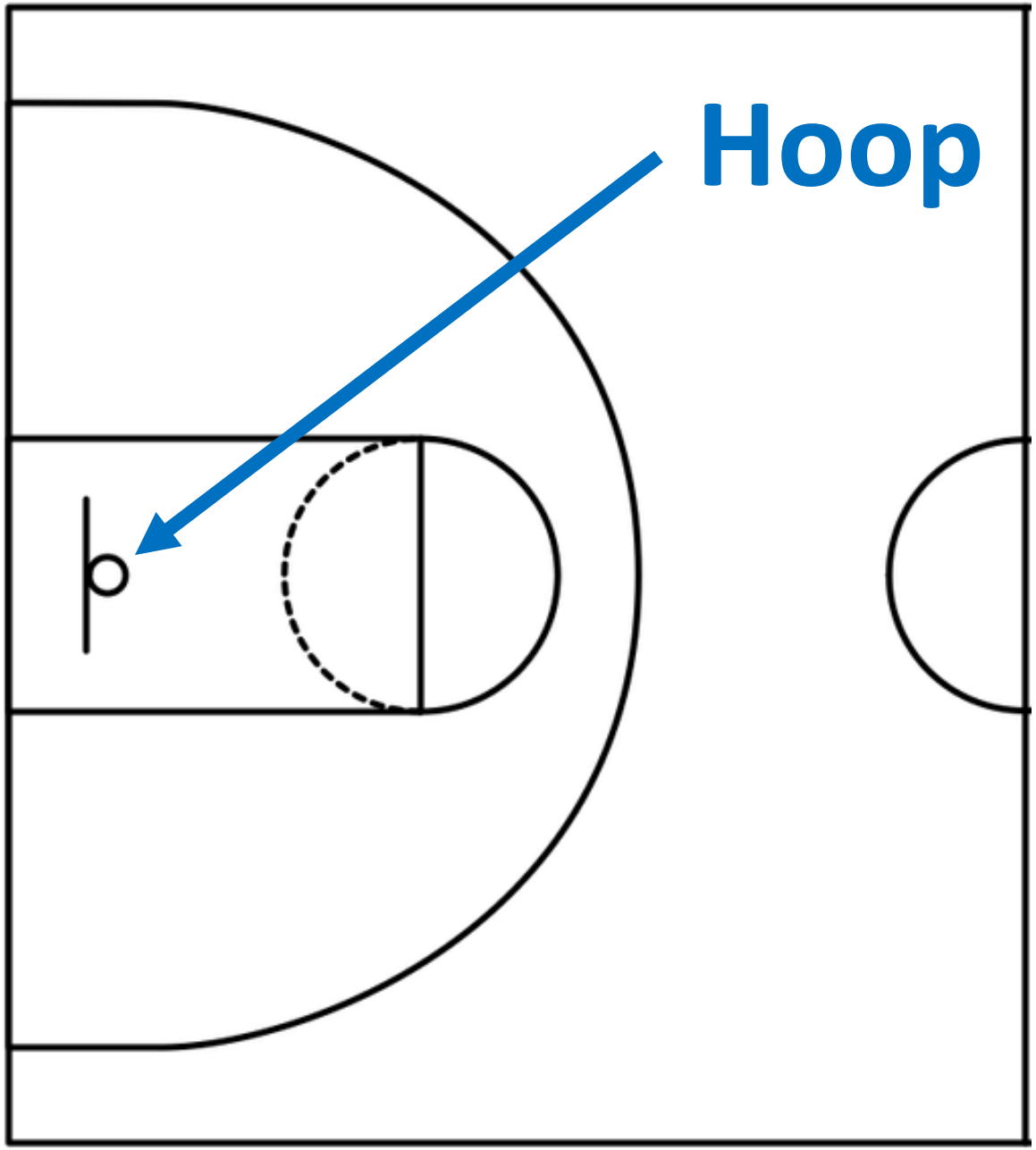
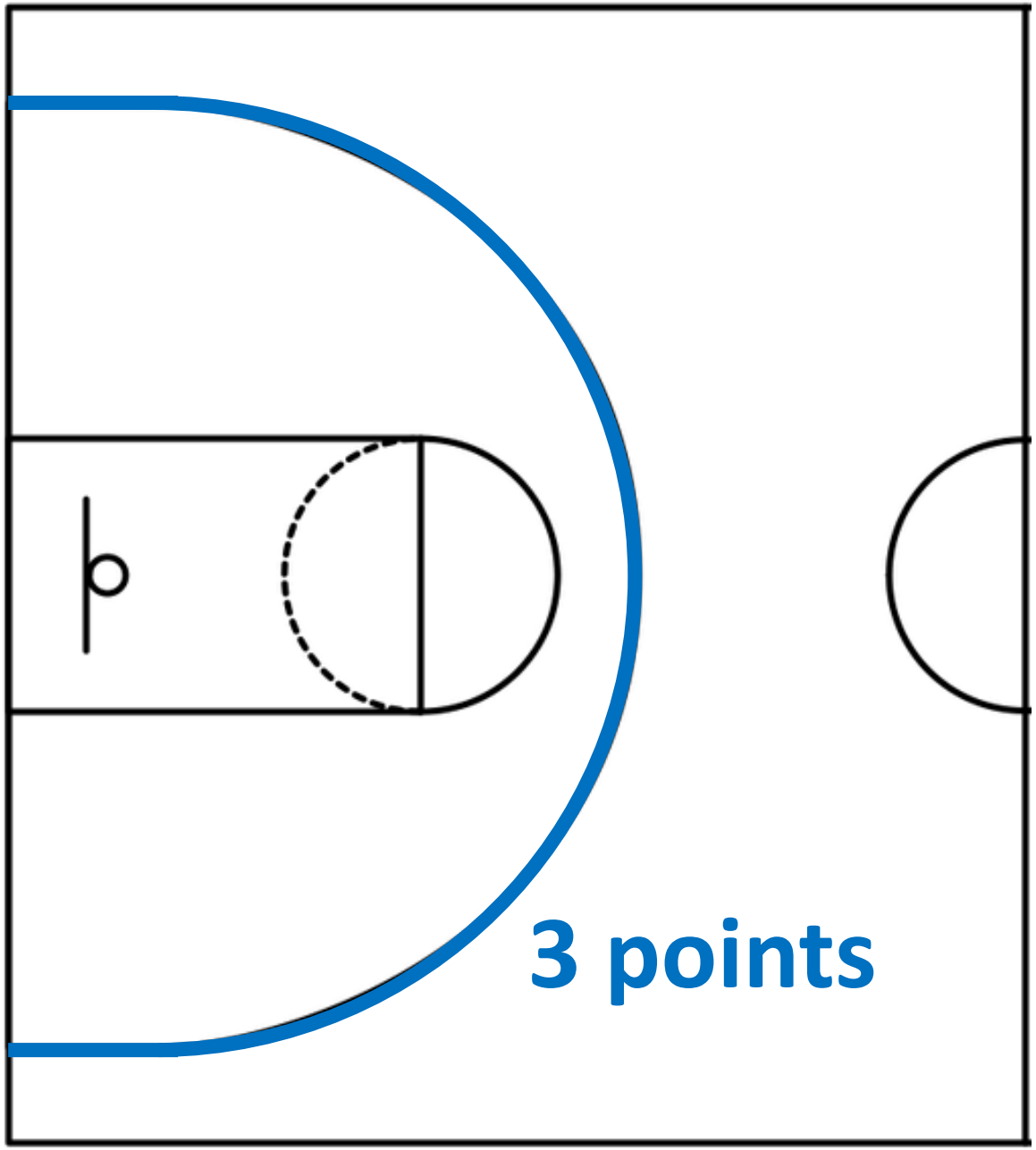
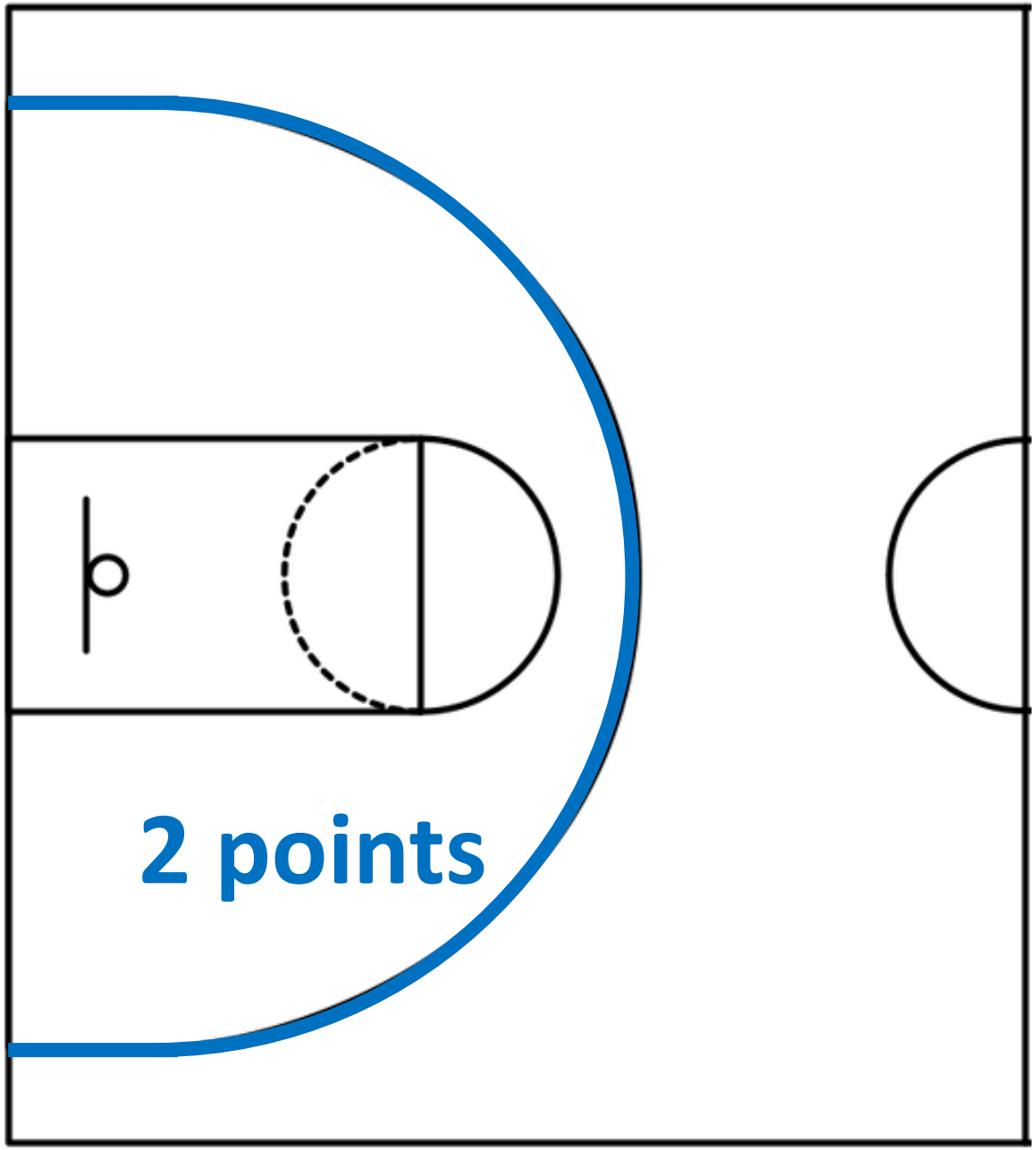
Lesson 1.1
Practice



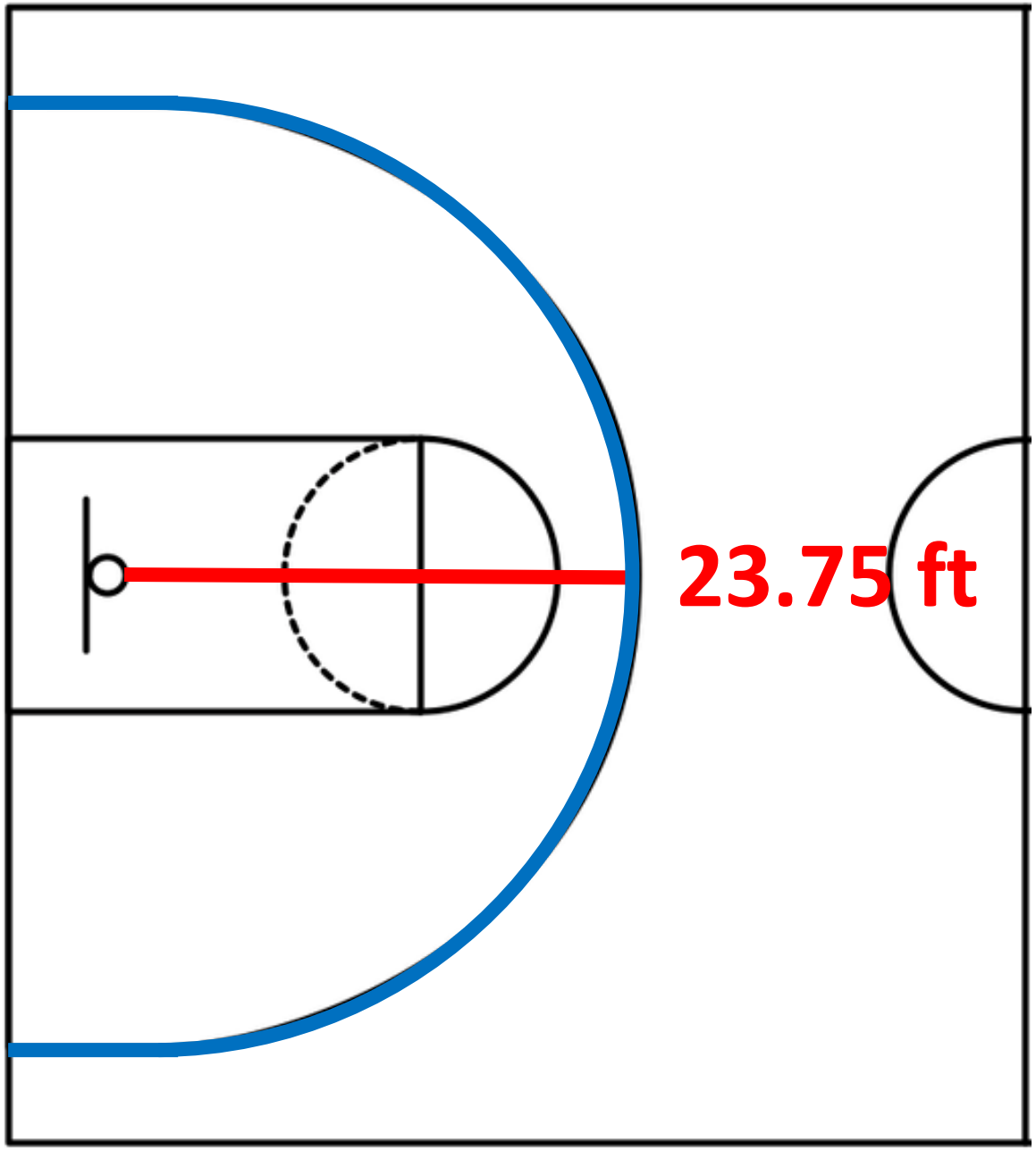
Basketball Court



Basketball Court

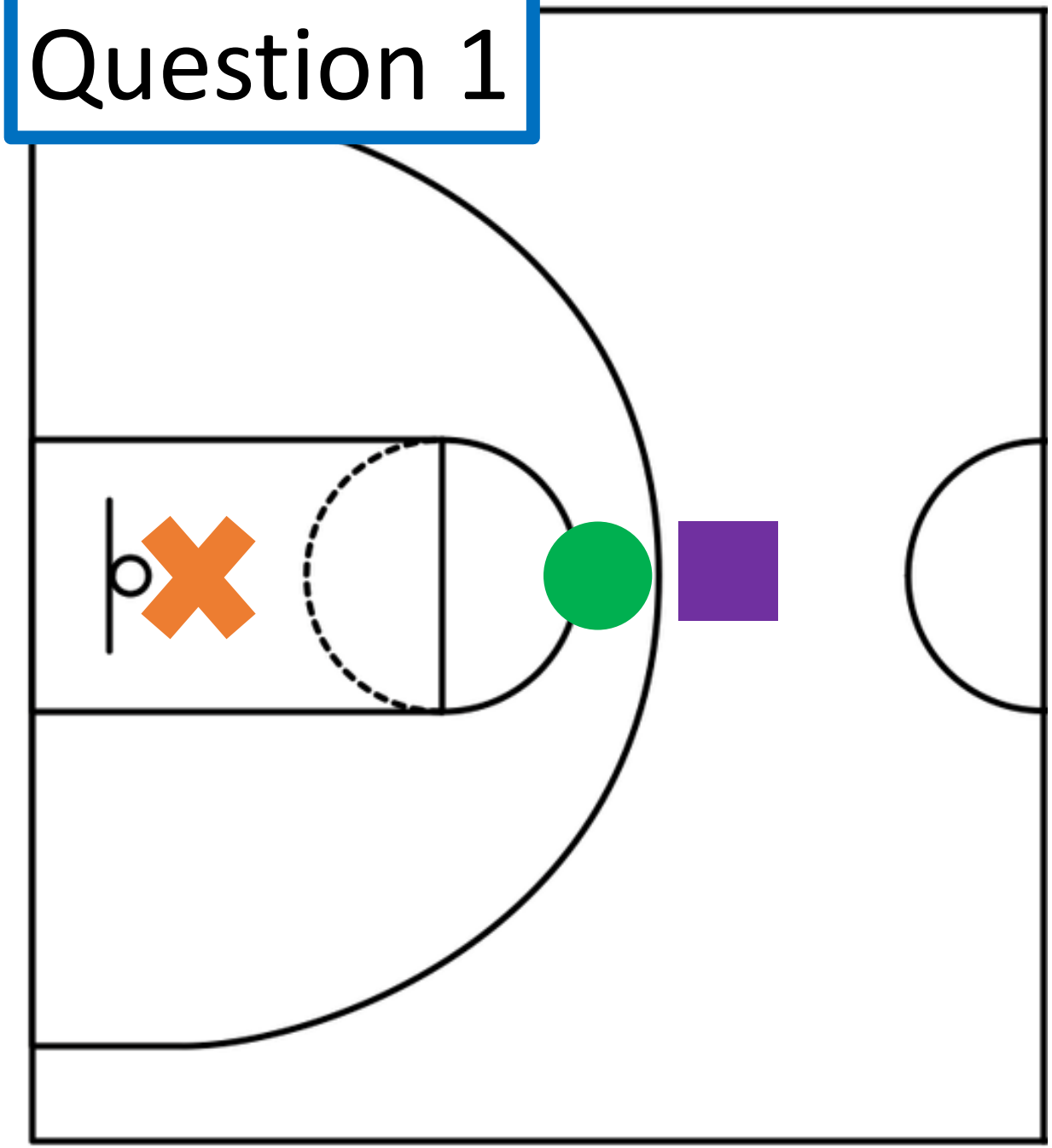


Basketball Court



Basketball Court

Question 1



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3

Skew The Script

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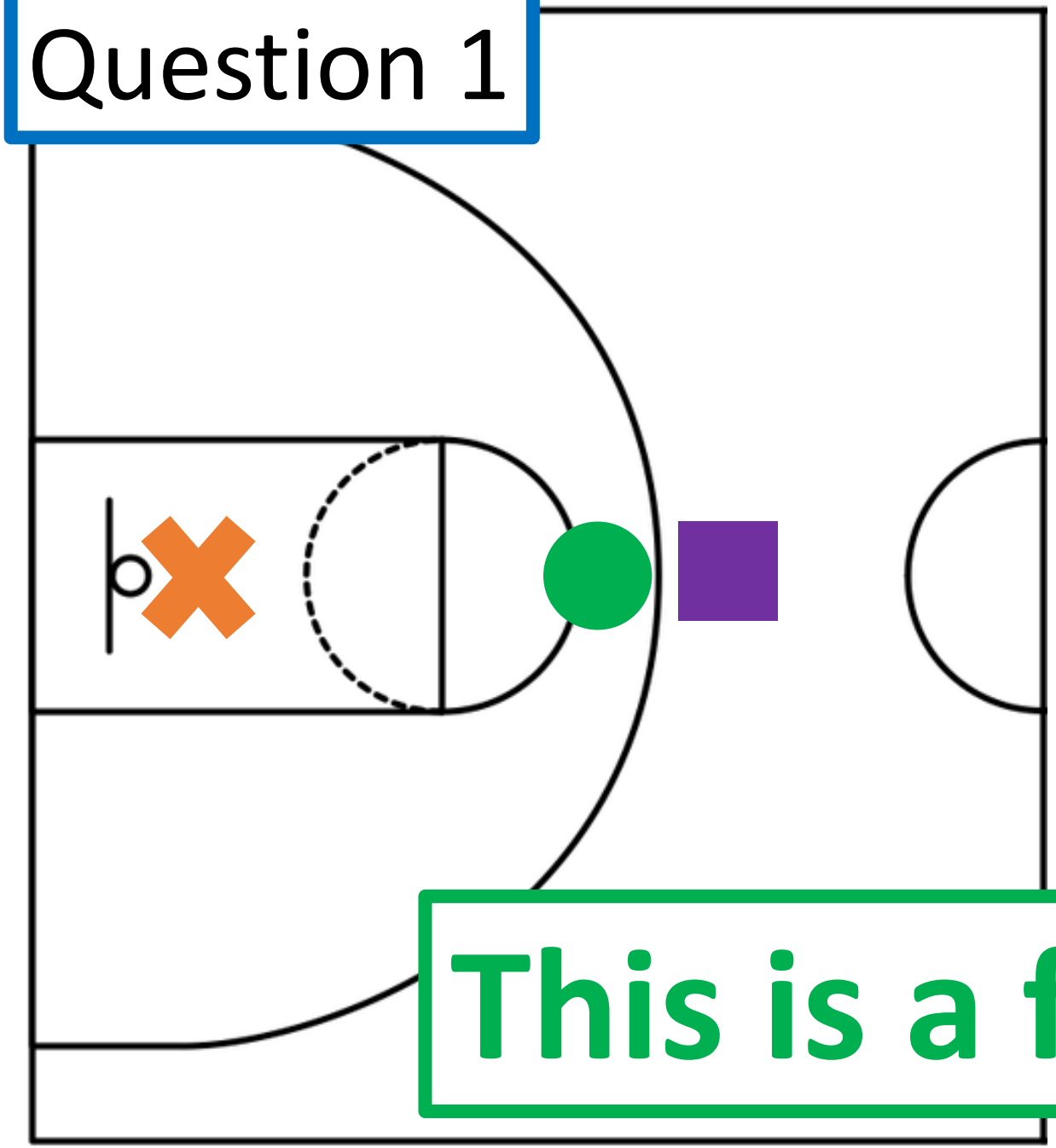
Question 1



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3

This is a function!

Skew The Script

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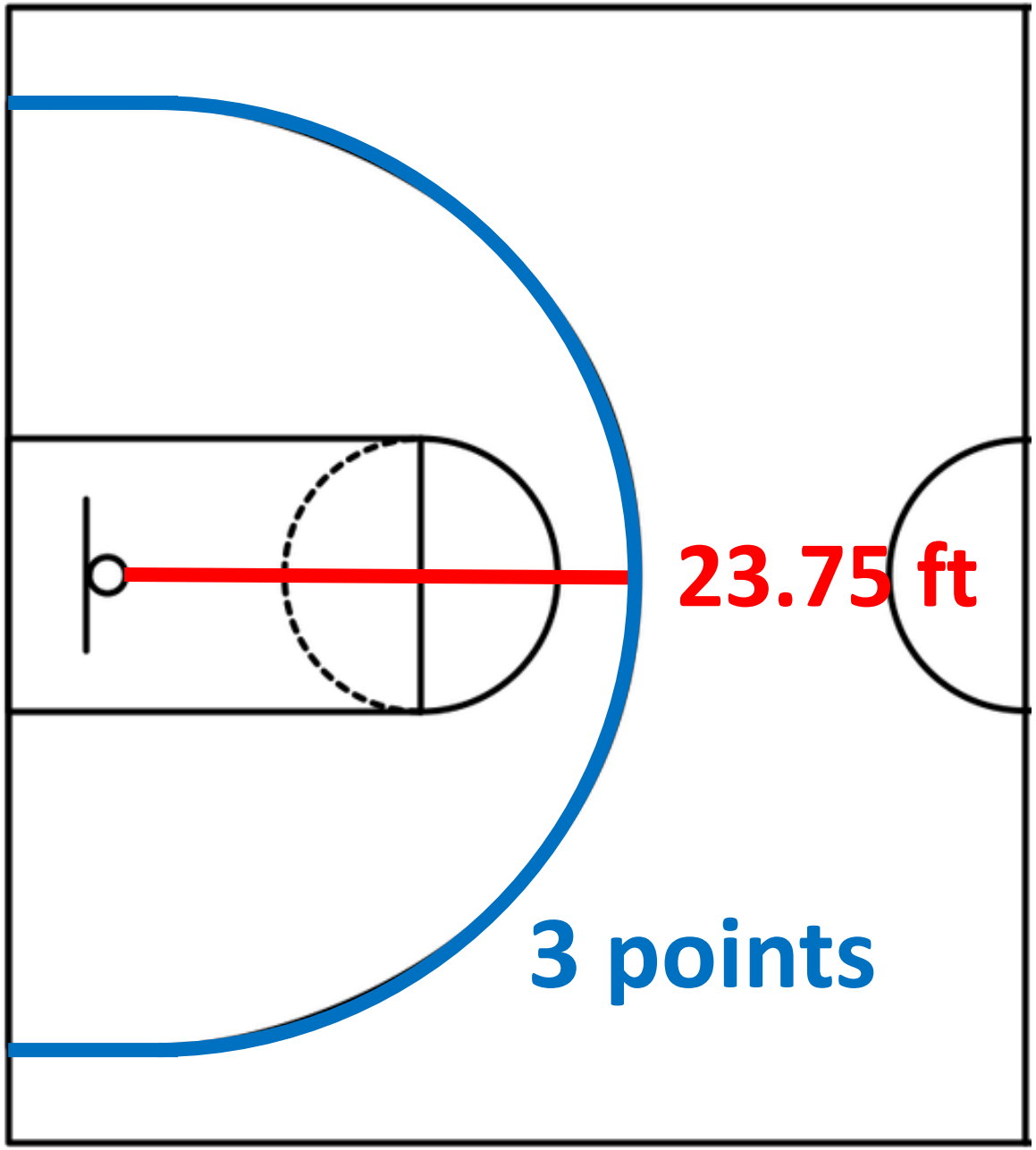
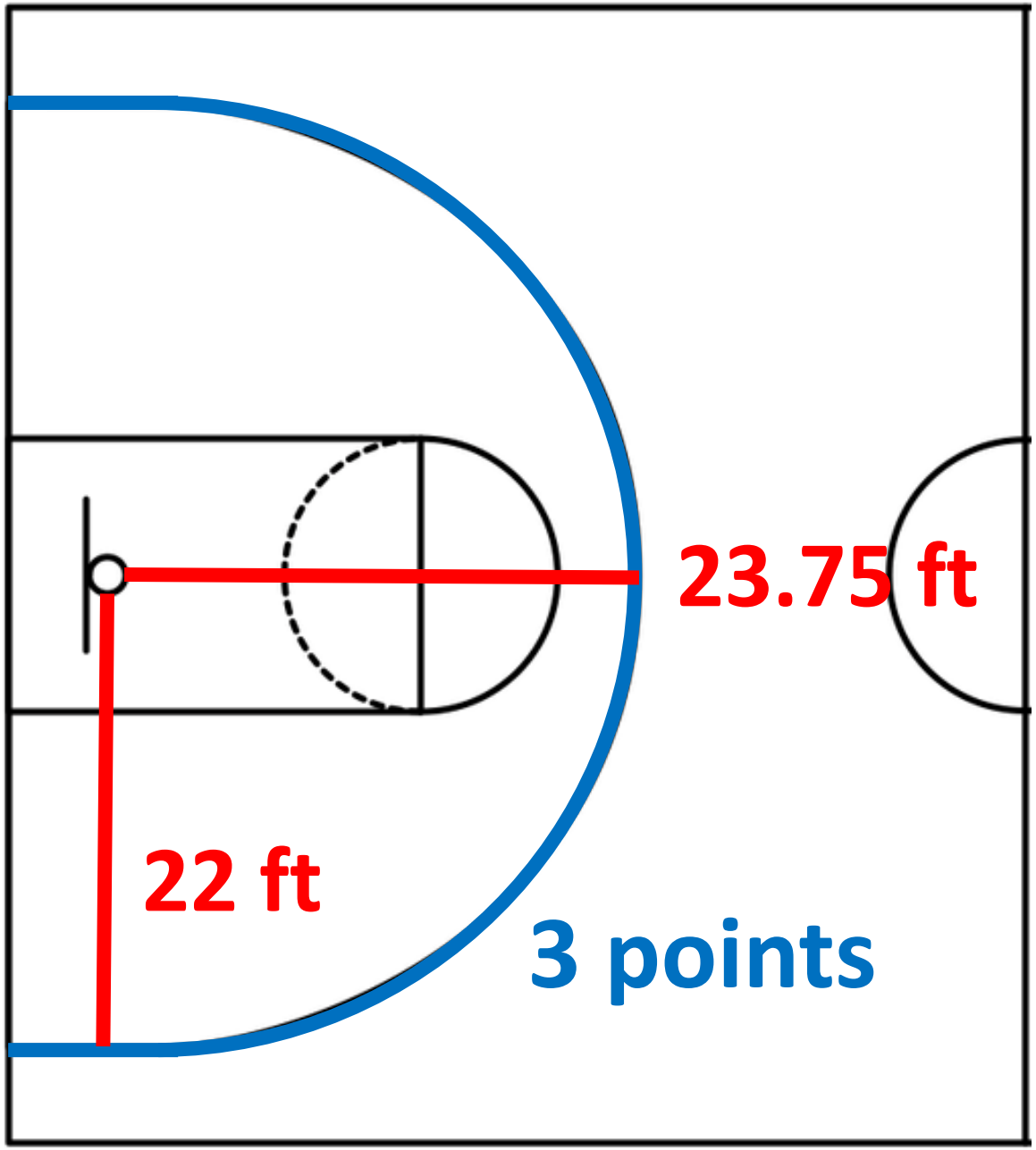
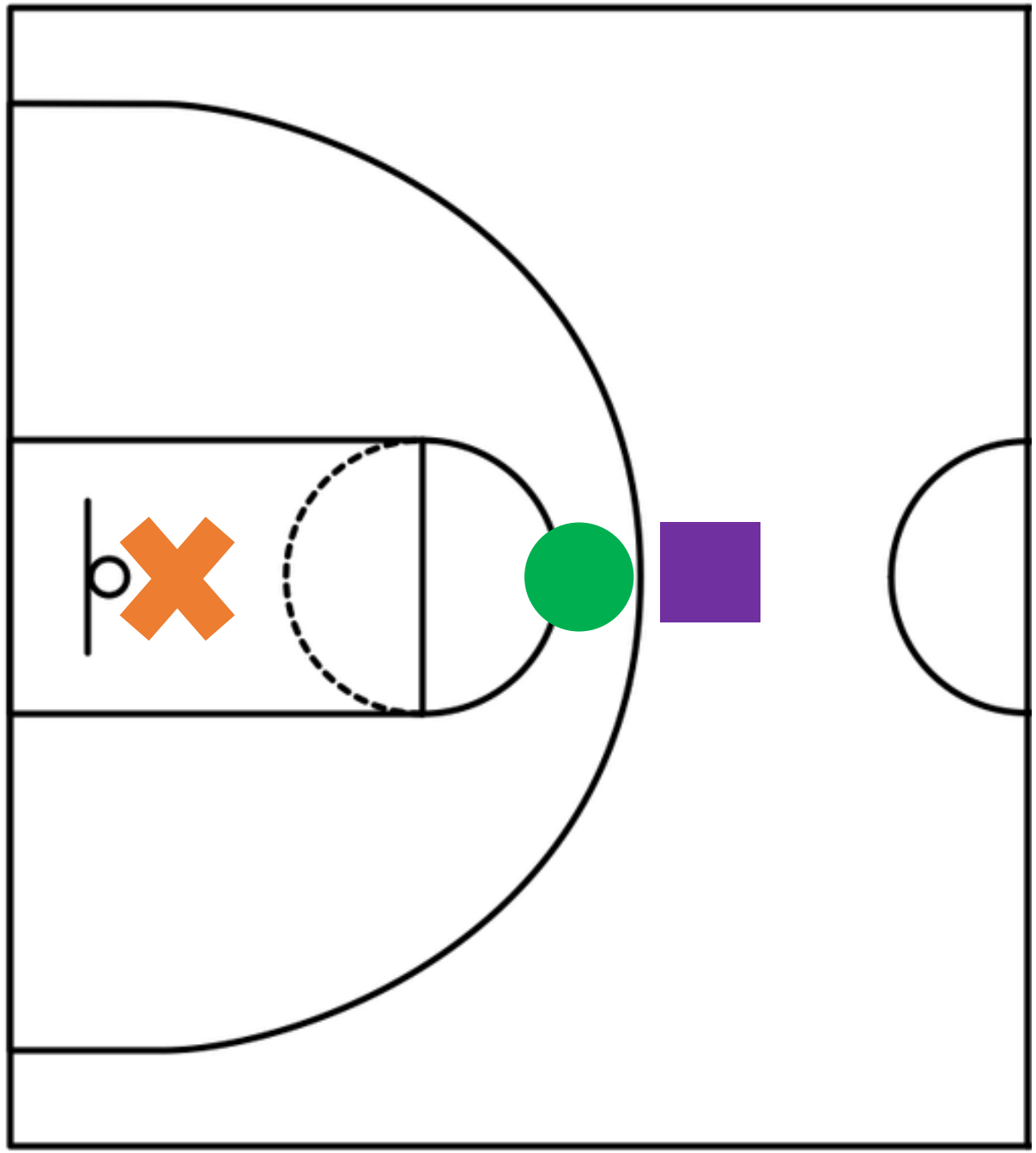


Basketball Court



Basketball Court



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3

Skew The Script

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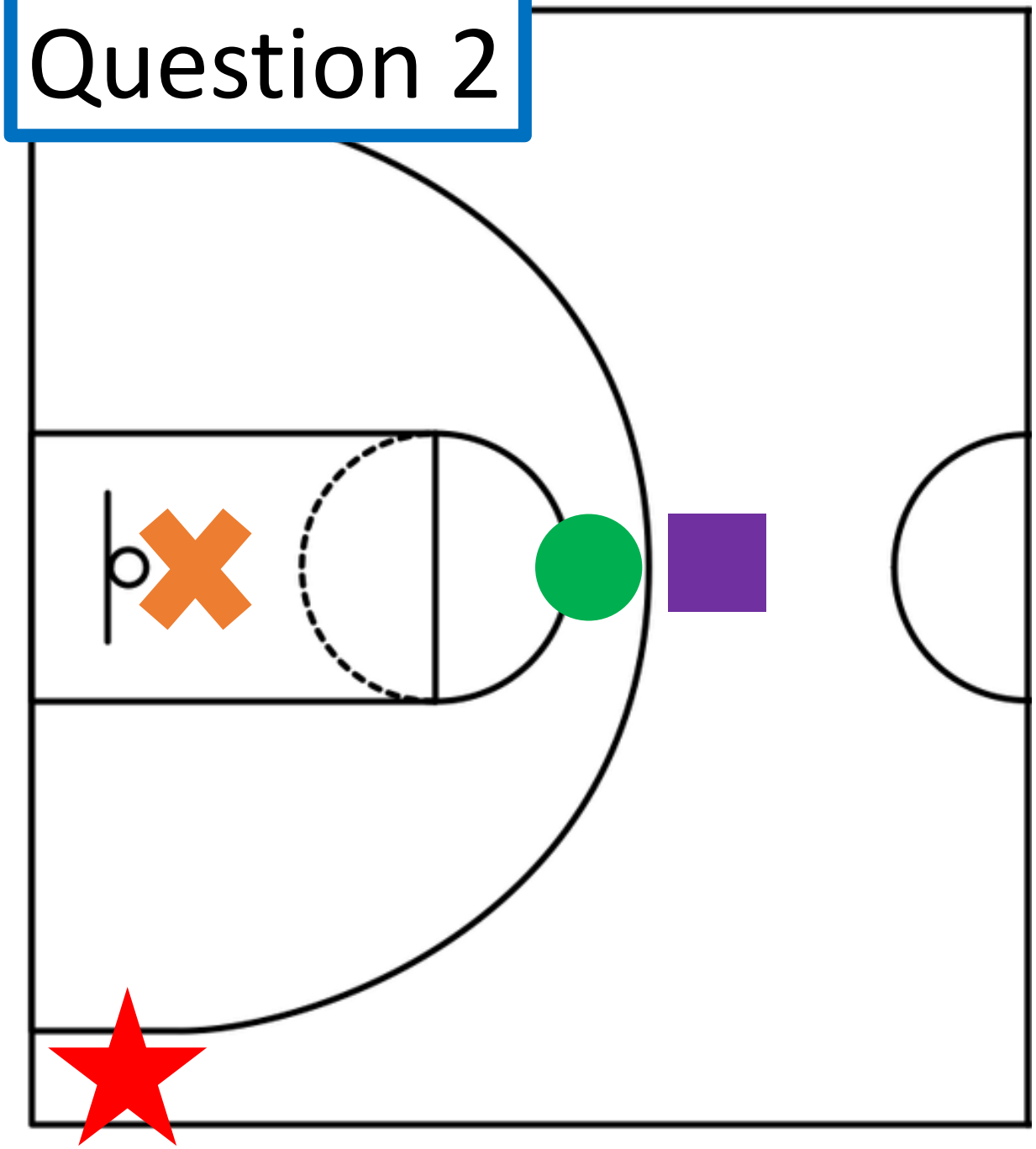
Question 2



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3
★	23	

Skew The Script

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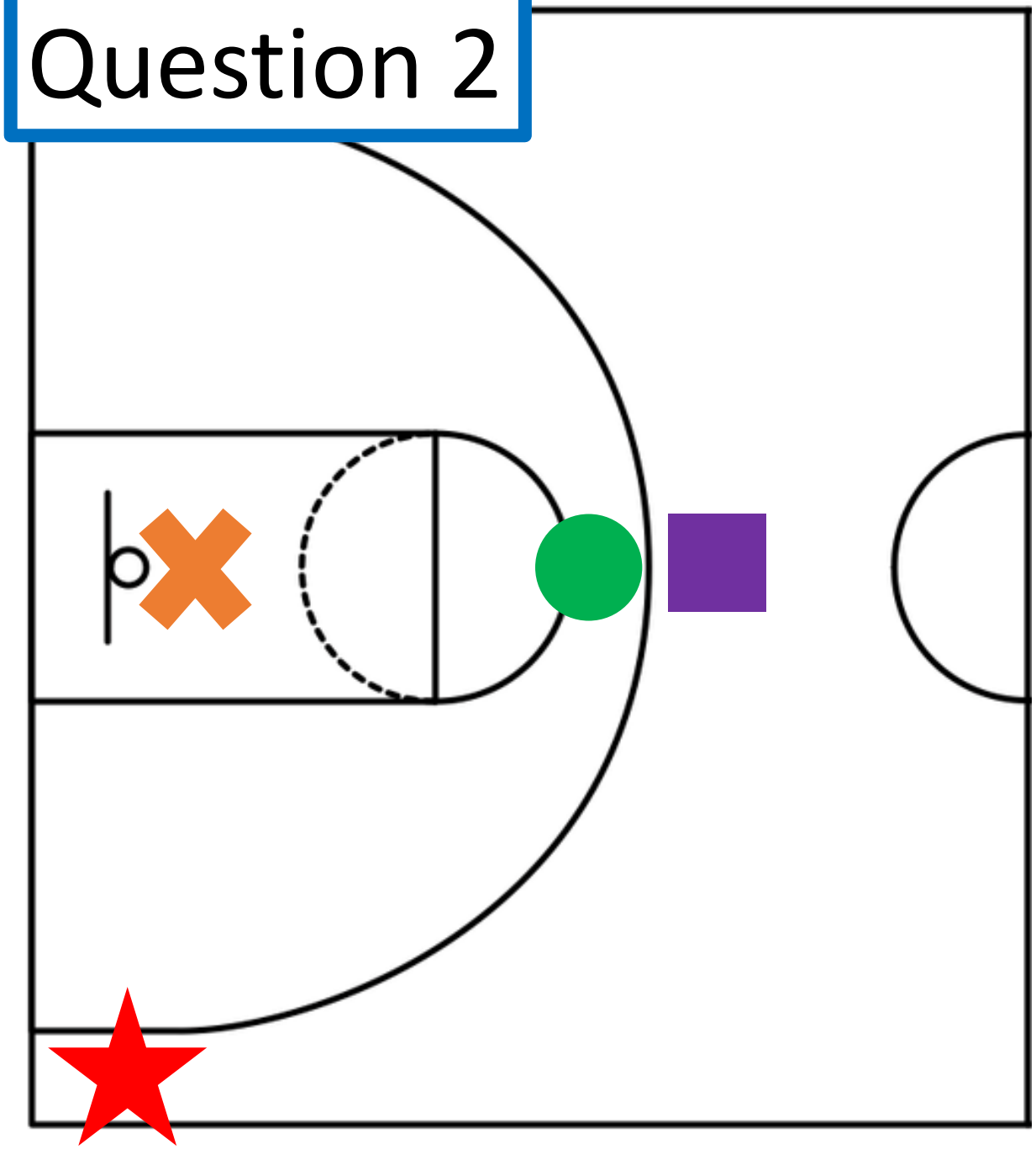
Question 2



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3
★	23	3

Skew The Script

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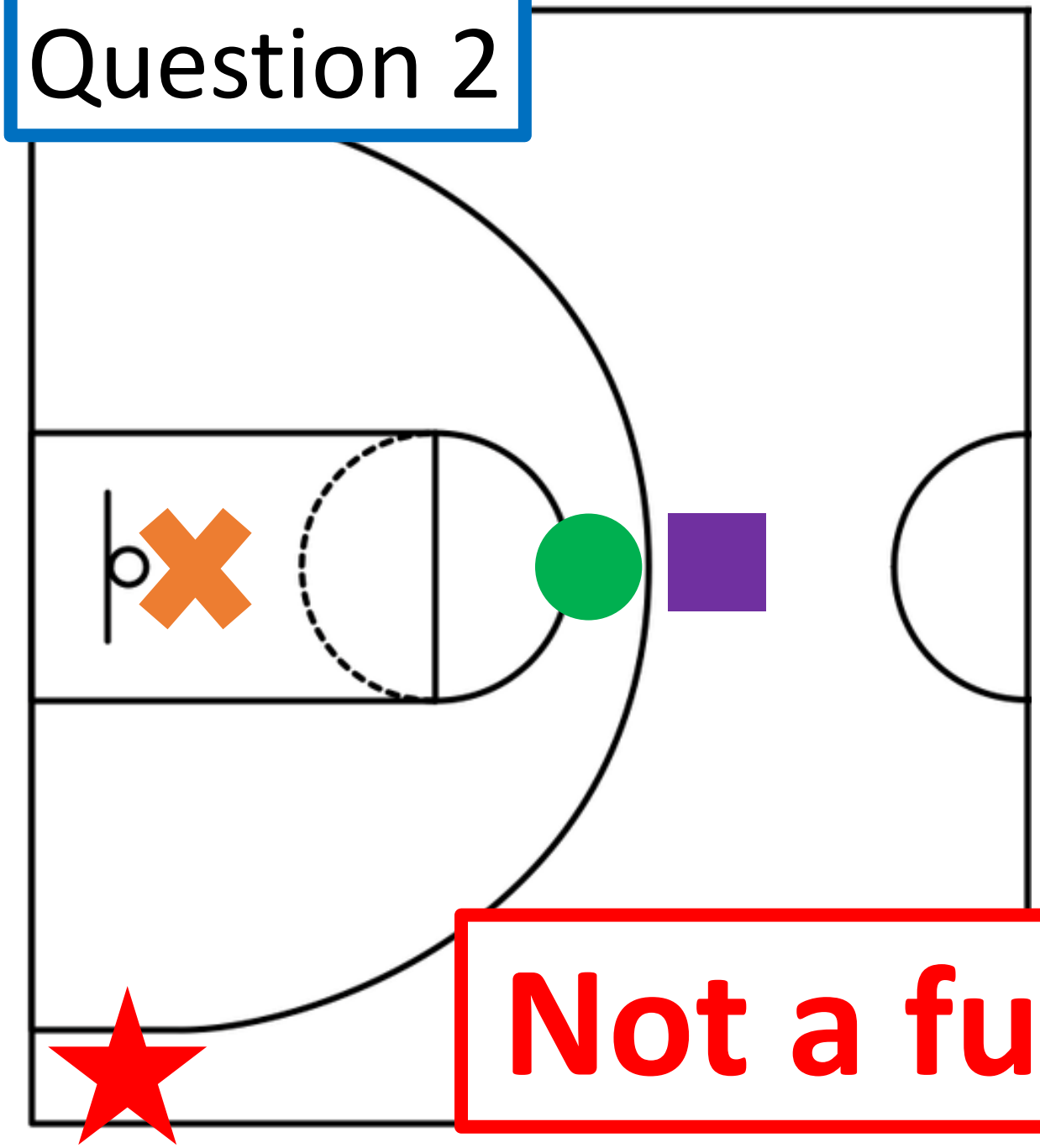
Question 2



Location	Distance from Rim	Points
✕	3	2
●	23	2
■	24	3
★	23	3

Not a function!

Skew The Script

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Question 3

Stephen Curry's 2014-2015 MVP Season

2

1

3

Data from: https://bleacherreport.com/articles/2562997-korver-or-curry-comparing-nbas-most-elite-3-point-snipers

Skew The Script

skewthescript.org

Question 3

Stephen Curry's 2014-2015 MVP Season

Area	% of shots made
1	63.2%
2	42.6%
3	52.3%

Data from: https://bleacherreport.com/articles/2562997-korver-or-curry-comparing-nbas-most-elite-3-point-snipers

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