

All solutions and teacher notes in blue

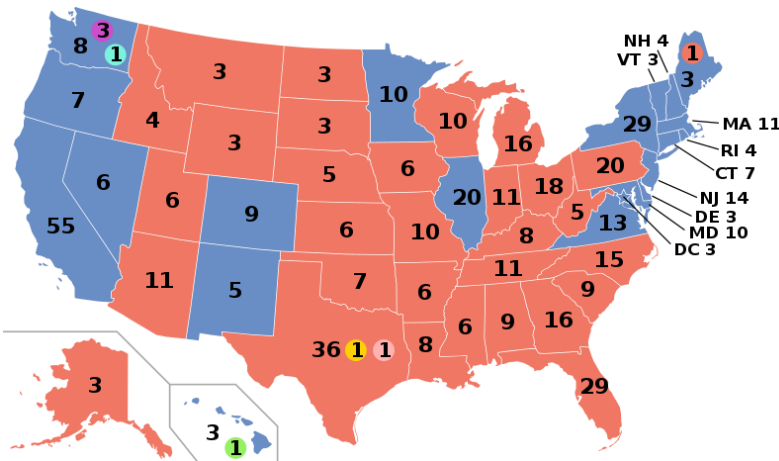
Algebra Handout Key: Lesson 1.1

Topics: functions as maps, non-functions

Lesson 1.1 Guided Notes

We elect our president using the **Electoral College**. The Electoral College requires a candidate to win 270 electoral votes to win the presidency, regardless of popular vote.

2016 Election



Clinton



Trump

48.2%

46.1%

Popular Vote

227

304

Electoral College

Lost

Won

Result

Today's Key Analysis: Are electoral votes a function of people's votes?

Functions as maps

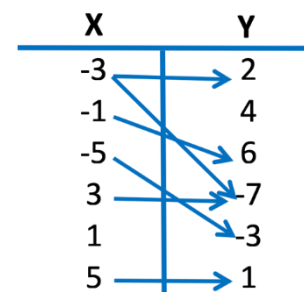
1. Imagine you were asked to find the place associated with the name "Connecticut." The map given to the right would not be helpful. Explain why.

The name Connecticut is labeled on two different places on the map (the yellow and brown areas). We wouldn't know which region to visit based on the input name "Connecticut."



2. Imagine you were asked to find the y-value associated with the x-value of -3. The map given to the right would not be helpful. Explain why.

The x value of -3 has two arrows that point to two different y-values: 2 and -7. It's a confusing map: we don't know which y-value is associated with the x input of -3.



3. For each example, say whether the table of values describes a function. Justify your answer.

a)

X	Y
-3	2
-1	4
-5	6
3	-7
1	-3
5	1

b)

X	Y
-3	2
-1	4
-5	6
3	-7
1	-3
5	1

a. is a function because each x-value maps to exactly one y-value.

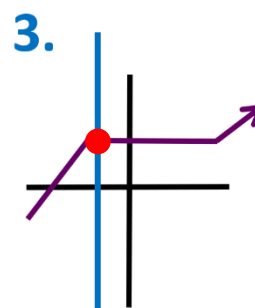
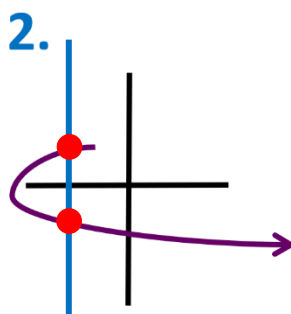
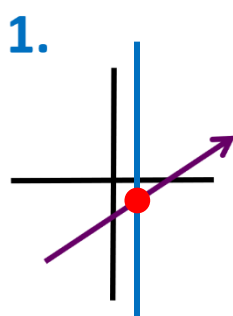
b. is not a function because -3 maps to two y-values: 2 and -7.

4. Describe what needs to be true for a relationship to be considered a **function**:

Every x-value (input) is associated with only **one** possible y-value (output)

Non-functions

Are these functions? Provide an answer and justify.



1. **Yes.** Each input (each x value) has only one output (one possible y value). For every vertical line we could draw (for every x value), there is only one intersection with the graph (one mapped y value).

2. **No.** Certain x-values map to more than one y-value. There are places where a vertical line (one x value) has two intersections (two mapped y-values).

3. **Yes.** Each input (each x value) has only one output (one possible y value). For every vertical line we could draw (for every x value), there is only one intersection with the graph (one mapped y value).

The Electoral College

In the Presidential Election, each state's electoral vote total is equal to its number of senators (two per state) plus its number of Congressional House representatives (number depends on state's population size). Candidates need 270 total electoral votes to win the Presidency.

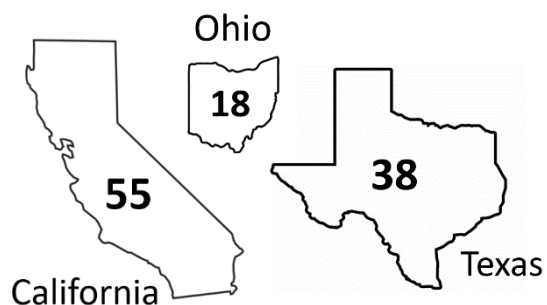
Are electoral votes a function of people's votes (voter share)? Justify your answer using the table to the right.

Electoral votes are **not a function** of people's votes. The voter share value of 46% (input) maps to two possible electoral vote outcomes (outputs): 304 for Trump in 2016 and 173 for McCain in 2008. Interestingly, the same voter share of 46% also mapped to different final results: winning and losing.

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

Lesson 1.1 Discussion

Only consider the three states below. For each of the following vote scenarios, which party (Democrat or Republican) would win the popular vote? Which would win the electoral college? Show your work:



- a) California: 10 million Republican, 14 million Democrat
 Texas: 10 million Republican, 7 million Democrat
 Ohio: 3 million Republican, 4 million Democrat

Popular Vote: $10 + 10 + 3 = 23$ million Republican votes
 $14 + 7 + 4 = 25$ million Democrat votes

Electoral votes: 38 Republican (TX), 73 Democrat (CA + OH)

Democrat wins both popular vote and electoral college

Popular Vote: $10 + 10 + 3 = 23$ million Republican
 $14 + 7 + 4 = 25$ million Democrat

Electoral: 56 Republican (TX+OH), 55 Democrat (CA)

- b) California: 10 million Republican, 14 million Democrat
 Texas: 9 million Republican, 8 million Democrat
 Ohio: 4 million Republican, 3 million Democrat

Democrat wins popular vote, **Republican wins** electoral college

Discussion: Should electoral votes be a function of people's votes?

Answers will vary. Here are some possible responses:

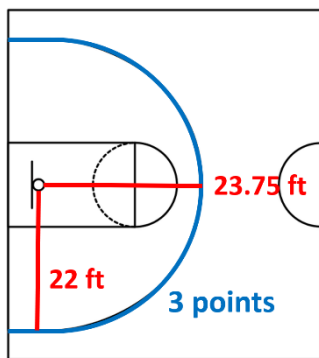
Yes: The state-by-state "winner take all" nature of the Electoral College incentivizes a two-party system, which gives more deciding power to voters in swing states. In a true democracy, everyone's vote should have equal deciding power. Because Presidents represent the entire nation, he or she should be elected through a system in which outcomes are a true function of people's votes (e.g. a popular vote).

No: It can be a good thing that voter share alone doesn't elect a president. For example, more rural states with low population sizes may not receive much attention in a popular vote election. However, the Electoral Colleges gives these citizens relatively elevated power in elections (especially if they're in a swing state). This can protect their voices, which may otherwise get drowned out by majorities from larger states.

Recommended discussion norms:
skewthescript.org/discussion-norms



Lesson 1.1 Practice

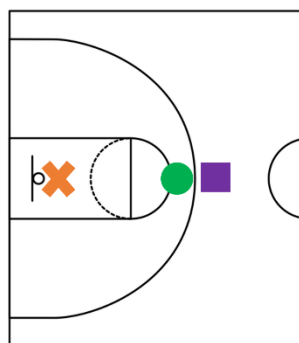


In basketball, the number of points from a basket depends on how far the shooter is from the hoop. Specifically, there is a “three-point line.” If the shot is from beyond the three-point line, the basket counts for three points. Otherwise, the basket counts for two points.

Note: The three-point line is almost a perfect half-circle around the hoop. However, the line is straight in the corners of the court. So, the three-point line is closer to the hoop in the corners of the court.

1. The chart and table to the right show three shot distances (in feet from the hoop’s rim) and their point values. Are the point values a function of distance from the rim? Explain.

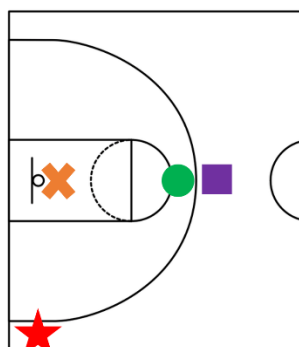
In this case, it is **a function**. Every distance from rim (input) is mapped to exactly one point value (output).



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

2. This chart includes a “corner three” – a three-point shot from the corner of the court. Are the point values still a function of distance from the rim? Explain.

In this case, it is **not a function**. At a distance of 23 feet from the rim, there are two possible point values (outputs): 2 or 3 points.



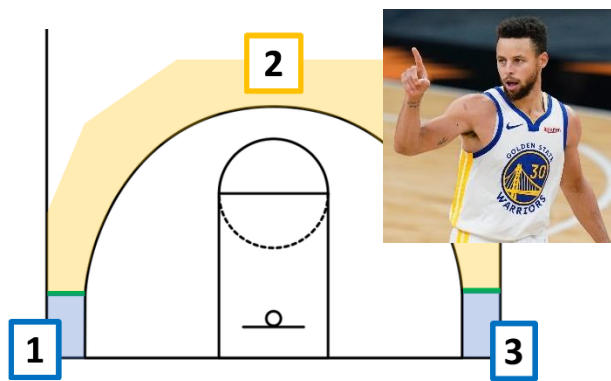
Location	Distance from Rim	Points
✗	3	2
●	23	2
■	24	3
★	23	3

3. In his 2014-2015 MVP season, Stephen Curry had the following shooting stats at these areas on the court:

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

Many coaches discourage players from shooting corner three-pointers, since it’s harder to use the backboard from the corner. Is this wise? Explain your answer.

Corner three-pointers have less distance, so they may actually be easier shots (especially for skilled players who don’t use the backboard when shooting 3-pointers).



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

