

Challenge 1

Question One

Chuck is a shiny new robot on it's first day of work. Chuck's job is to move packages and product around a warehouse that is used by Shopify merchants, keep things neat, tidy, and efficient. At 9:00am sharp Chuck gets its first set of instructions to fetch a package from the warehouse. The instructions are as follows:

Proceed to the charging station and face South.

Move forward 35 yards and then turn 270 degrees counterclockwise.

Move backwards 15 yards and then turn 45 degrees clockwise.

Move forward 5 yards, reverse your direction and move forwards another 40 yards.

Turn 135 degrees anti-clockwise and move forward 90 yards.

Rotate 45 degrees to the robots left and move forward 15 yards.

Raise your robot arms 2 feet and grab the package in front of you

Spin around 180 degrees and move forward 2 feet

Turn 90 degrees to your left and move forward until you see the dotted line on the floor.

After performing these instructions, In which direction will Chuck be facing?

South = 180

Example : 90 clockwise = $180+90 = 270 = \text{west}$.

270 counterclockwise = $180-270 = -90 = 270 = \text{west}$.

2. $180 - 270 = -90 = 270 = \text{west}$.

3. $270 + 45 = 315 = \text{northwest}$

4. Assume that direction is reversed = rotate : $315-180 = 135 = \text{southeast}$

5. $135 - 135 = 0 = \text{North}$

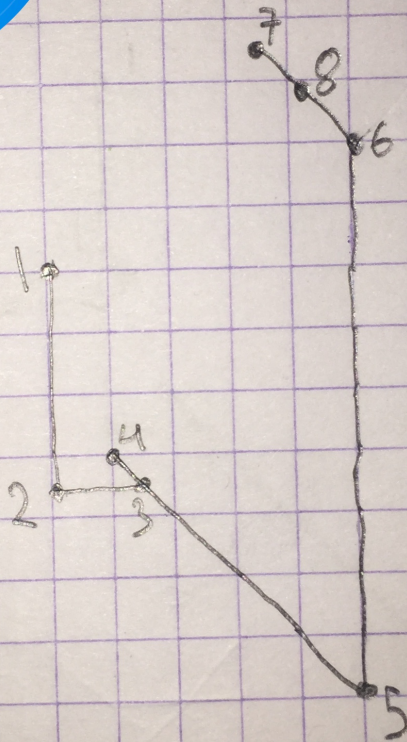
6. $0-45 = -45 = 315 = \text{northwest}$

7. not moving = 315 = northwest

8. $315 - 180 = 135 = \text{southeast}$

9. $135-90 = 45 = \text{northeast}$.

If we do not reverse the direction on the 3rd instruction, it would be
=> $45 + 180 = 225 = \text{Southwest}$.



Challenge 2

Question Two

Two Dev Degree interns are sharing messages that have been encrypted using a Caesar Cipher, one of the oldest forms of encryption that uses basic letter substitution. You need a key to decode the encryption, based on the word **UNICORN**. The value of the key is the sum of the letters in **CORN** subtracted by the sum of the letters in **UNI**, where **C=9** and **I=27**.

Using that key decrypt the following message that the intern sent:

- "Gnwj gfw eaddagf ewjuzsflk sfv ugmflafy."

$$u=21 \times 3=63$$

$$n=14 \times 3=42$$

$$i= 9 \times 3=27$$

$$c= 3 \times 3= 9$$

$$o=15 \times 3=45$$

$$r=18 \times 3=54$$

$$n=14 \times 3=42$$

$$\text{CORN}-\text{UNI} = (9+45+54+42) - (63+42+27) = 18$$

$$18 \text{ right shift} / 8 \text{ left shift (Key} = 18 \text{ or Key} = -8)$$

Using the discovered key, the message would be: Over one million merchants and counting

Challenge 3

Question Three

You have been running a Shopify store leading up to the 2019 Black Friday / Cyber Monday. After a very successful sale you are left with a limited amount of product, so limited in fact that you only have 1 item of each product left.

Below is a list of people who want to purchase a product from you as well as details about what products they are interested in purchasing.

Grant	Headphones	iPhone	PS4	Apple TV	Roku
Henrietta	iPhone	Switch	AirPods		
Ismael	iPhone	Switch	AirPods		
Jacqueline	iPhone	Air Pods			
Leon	Headphones	PS4	Switch	Chromecast	Roku
Robin	iPhone	Switch	Chromecast	AirPods	
Stella	Headphones	PS4	AirPods	Roku	Chromecast

Assuming you only have 1 of each product left in stock, and that everyone needs a product from their own list, which product would you recommend to Robin?

Items identified

- Item 1: Headphones
- Item 2: iPhone
- Item 3: PS4
- Item 4: Apple TV
- Item 5: Roku
- Item 6: Switch
- Item 7: AirPods
- Item 8: Air Pods
- Item 9: Chromecast

Match item with person

g 12345
h 267
i 267
j 28
l 13695
r 2697
s 13759

name	headphones	iphone	ps4	apple tv	roku	switch	airpods	air pods	chromecast
Grant	x	x	x	x	x				
Henrietta		x				x	x		
Ismael		x				x	x		
Jacqueline		x						x	
Leon	x		x		x	x			x
Robin		x				x	x		x
Stella	x		x		x		x		x

Since we are going to use Top Trading Cycles algorithm to solve this, we will have to make the table for it:

name	Grant	Henrietta	Ismael	Jacqueline	Leon	Robin	Stella
1st choice	Headphones	iPhone	iPhone	iPhone	Headphones	iPhone	Headphones
2nd choice	iPhone	Switch	Switch	Air Pods	PS4	Switch	PS4
3rd choice	PS4	Airpods	Airpods		Switch	Chromecast	Airpods
4th choice	Apple TV				Chromecast	Airpods	Roku
5th choice	Roku				Roku		Chromecast

We would then get:

1st Iteration: Jacqueline gets iPhone
2nd Iteration: Grant gets Headphones
3rd Iteration: Henrietta gets AirPods
4th Iteration: Ismael gets Switch
5th Iteration: Leon gets PS4
6th Iteration: Robin gets Chromecast
7th Iteration: Stella gets Roku

Challenge 4

Question Four

Nina is a small business owner who took over their family store in 2003. The store, which was originally opened in 1993, sells all types of clothes and apparel in her hometown. Later, in 2008, Nina joined Shopify as an online merchant. She began selling more products online than in her physical store. Now, many years later, Nina wants to look back on her decision to open an online shop and see exactly how much more product she has been selling.

Products	1993	1998	2003	2008	2013	2019
T-Shirts	7032	9046	14862	29086	48264	94072
Sweatshirts	5023	10865	12654	25433	21371	20745
Pants	12024	19752	25463	36963	29057	21945
Leggings	4362	5349	2753	8072	11864	21308
Jackets	3540	4214	4452	9833	13973	19723
Shoes	5932	6128	4976	7749	10308	15257
Hats	9620	4214	4062	5183	5432	7243

For all products combined, what is the percentage of increased sales between 1993 and 2003? What is the percentage of increased sales between 2008 and 2019? Comparing her increased sales percentages over the two periods, by what percentage did her sales increase by becoming a Shopify merchant? (round all percentage totals to the nearest 5%)

Sum of each year

1993: $7032+5023+12024+4362+3540+5932+9620=47533$
1998: $9046+10865+19752+5349+4214+6128+4214=59568$
2003: $14862+12654+25463+2753+4452+4976+4062=69222$
2008: $29086+25433+36963+8072+9833+7749+5183=122319$
2013: $48264+21371+29057+11864+13973+10308+5432=140269$
2019: $94072+20745+21945+21308+19723+15257+7243=200293$

Comparison with other years / other periods

1998–1993: $59568 - 47533 = 12035 \Rightarrow (12035/47533) * 100 = 25.3192518882 \sim 25\%$

2003–1998: $69222 - 59568 = 9654 \Rightarrow (9654/59568) * 100 = 16.2066881547 \sim 20\%$

2003–1993: $69222 - 47533 = 21689 \Rightarrow (21689/47533) * 100 = 45.6293522395 \sim 50\%$ (Answer to Question 1)

2013–2008: $140269 - 122319 \Rightarrow (17950/122319) * 100 = 14.6747439073 \sim 10\%$

2019–2013: $200293 - 140269 \Rightarrow (60024/140269) * 100 = 42.7920638202 \sim 40\%$

2019–2008: $200293 - 122319 \Rightarrow (77974/122319) * 100 = 63.7464335058 \sim 60\%$ (Answer to Question 2)

2019–2003: $200293 - 69222 \Rightarrow (131071/69222) * 100 = 189.348761954 \sim 190\%$ (Answer to Question 3)