Monday cup #9- Solution

Posted on: May 27, 2019

Due on: June 2, 2019

Problem

Lower Elementary:

Question: Nana takes piano lessons every day. On weekdays, her lessons are 30 minutes long. On Saturdays and Sundays, her lessons are 45 minutes long. How many hours does Amaryllis spend at her piano lessons each week?

Upper Elementary:

Question: Tommy and Gela are playing a game of pool. If all but 7 of the 15 balls have been pocketed and Tommy has pocketed ¾ of them, then how many balls has Gela pocketed?

Middle School:

Question: A marching band includes 76 trombones and 110 cornets. The conductor wants the musicians arranged so that each row has exactly the same number of musicians. He also wants everyone in a row to play the same instrument. What is the greatest number of musicians that can be in each row so that the band is arranged how the conductor wants it?

Logica and Up:

Question:

Mr DaviD and his wife want to take a trip to visit his brother, his parents, and each of their children.
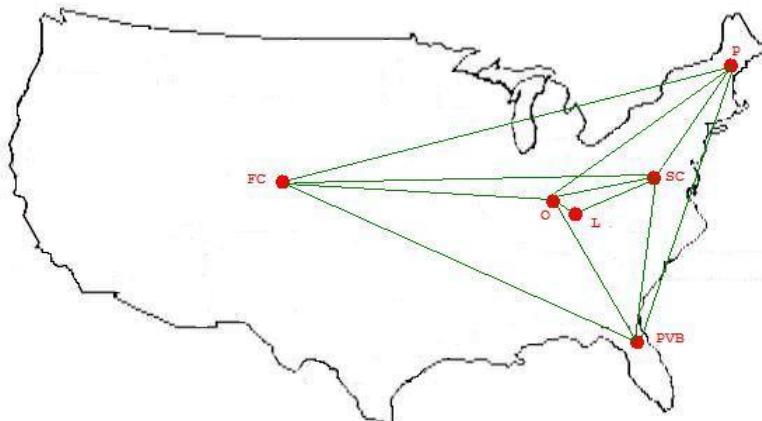Mr. DaviD and his wife live in Stephens City, VA. (SC on the map below)
Mr. DaviD's brother lives in Leitchfield, KY. (L on the map)
Mr. DaviD's parents live in Owensboro, KY. (O on the map)
Mr. DaviD's daughter Elizabeth and her family live in Ponte Vedra Beach, FL. (PVB on the map)
Mr. DaviD's daughter Sarah and her family live in Fort Collins, CO. (FC on the map)
Mr. DaviD's son Michael and his wife live in Portland, ME. (P on the map)

The distances between the cities are given below:

- Stephens City to Portland is 615 km
- Stephens City to Ponte Vedra Beach is 758 km
- Stephens City to Fort Collins 1,639 km
- Stephens City to Leitchfield is 588 km
- Stephens City to Owensboro 651 km
- Owensboro to Ponte Vedra Beach is 744 km
- Owensboro to Fort Collins is 1,111 km
- Owensboro to Leitchfield is 65 km
- Owensboro to Portland is 1,188 km
- Ponte Vedra Beach to Portland is 1,280 km
- Ponte Vedra Beach to Fort Collins is 1,824 km
- Portland to Fort Collins is 2,070 km

Using the data above, help Mr. DaviD and his wife plan a roundtrip to visit each relative without passing through any city more than once (except the return home to Stephens City).
You may use only the routes indicated on the map -- there is only one road into Leitchfield and one road out (you must go through Stephens City or Owensboro to get there).
Find the **shortest path**.

WARNING: ANSWERS AND SOLUTIONS COMING UP!!!!
Lower Elementary:
Question: Nana takes piano lessons every day. On weekdays, her lessons are 30 minutes long. On Saturdays and Sundays, her lessons are 45 minutes long. How many hours does Amaryllis spend at her piano lessons each week?
Answer: 4 hours
Solution: In a week, there are 5 weekdays. So, Nana spends 30, 60, 90, 120, 150 minutes at her piano lessons on weekdays. On the weekend, she spends 45 + 45 = 90 minutes at her piano lessons. So, Nana spends 150 + 90 = 240 minutes at her piano lessons each week. Since there are and 60 minutes in an hour, 240 minutes is the same as 4 hours.

Upper Elementary:
Question: Tommy and Gela are playing a game of pool. If all but 7 of the 15 balls have been pocketed and Tommy has pocketed ¾ of them, then how many balls has Gela pocketed?
Answer: 2 balls
Solution: If all but 7 of the balls have been pocketed, then there are 15 – 7 = 8 pocketed balls in total. If Tommy pocketed ¾ of them, then Gela pocketed ¼ of them. Since ¼ of 8 is 2, Gela pocketed 2 balls.

Middle School:
Question: A marching band includes 76 trombones and 110 cornets. The conductor wants the musicians arranged so that each row has exactly the same number of musicians. He also wants everyone in a row to play the same instrument. What is the greatest number of musicians that can be in each row so that the band is arranged how the conductor wants it?
Answer: 2 musicians
Solution: To find the number of rows there could be so that each row has the same number of people all playing the same instrument, we find the GCF of 76 and 110. The factors of 76 are 1, 2, 4, 19, 38, and 76. The factors of 110 are 1, 2, 5, 10, 11, 22, 55, and 110. The greatest factor they have in common is 2.
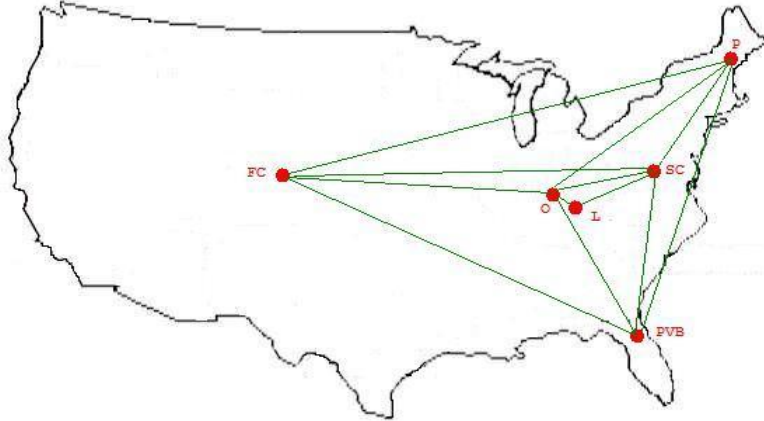
Logica and Up:
Question:

Mr DaviD and his wife want to take a trip to visit his brother, his parents, and each of their children.
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Find the **shortest path**.

Answer: SC - L - O - FC - PVB - P - SC, which are both 5,483 km.
Solution: The shortest paths are:
SC - P - PVB - FC - O - L - SC
and its reverse
SC - L - O - FC - PVB - P - SC, which are both 5,483 km.

I used a tree diagram to examine all possible paths. Then I set up a table to find the shortest path(s).

SC	-	P	-	FC	-	PVB	-	O	-	L	- SC	=	5,906 km
SC	-	P	-	PVB	-	FC	-	O	-	L	- SC	=	5,483 km
SC	-	L	-	O	-	PVB	-	P	-	FC	- SC	=	6,386 km
SC	-	L	-	O	-	PVB	-	FC	-	P	- SC	=	5,906 km
SC	-	L	-	O	-	P	-	PVB	-	FC	- SC	=	6,584 km

SC	-	L	-	O	-	P	-	FC	-	PVB	-	SC	=	**6,493** km
SC	-	L	-	O	-	FC	-	P	-	PVB	-	SC	=	**5,872** km
SC	-	L	-	O	-	FC	-	PVB	-	P	-	SC	=	**5,483** km
SC	-	PVB	-	P	-	FC	-	O	-	L	-	SC	=	**5,872** km
SC	-	PVB	-	FC	-	P	-	O	-	L	-	SC	=	**6,493** km
SC	-	FC	-	P	-	PVB	-	O	-	L	-	SC	=	**6,386** km
SC	-	FC	-	PVB	-	P	-	O	-	L	-	SC	=	**6,584** km

So, paths #2 and #8 above have the least mileage of 5,483 km, a savings of 1,101 km over routes #5 or 12.

There were correct solutions from Gela Tsetskhladze (Georgia, the country).
The prize was split between Tsetskladze

Rules

1.Anyone is eligible to participate. Each solution is to be the work of one individual without any input from faculty or others. An answer must be accompanied by appropriate justifications to be considered correct.
2.The solution is to be submitted with the solver's name, email, year in school (if applicable), local phone number, and local address. If you are submitting this for possible credit in a class, include your class number and instructors name.
3.The solution is to be typed or legibly written. Solutions must be submitted to the by 2 p.m. on the due date.
4.Entries will be graded on clarity of exposition and elegance of solution. An award of GEL10 will be given for the best correct solution. In
the case of a two-way tie, the award will be split. If there are more than two best solutions, a drawing will be held to determine two award winners.
5. Graduate students, faculty, and members of the general public are encouraged to submit solutions, but they will not be considered.

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ორშაბათის თასი, кубок понедельника, **Monday cup, Coppa del lunedì, Coupe du lundi**
Solution for this problem can be submitted proveweek@gmail.com