**Main Problem #6**

Topic: *Add and Subtract Mixed Numbers*

Problem: You and your friend Yarden are studying abroad in Spain next fall and the both of you have planned to travel to different cities in hopes of finding the best *paella* (Spanish rice disd). Yarden decided that it would be best to start and end in Madrid so that you guys can be back before fall-semester classes begin. To prepare for the trip, you calculated the distances, in kilometers, between the cities that you both will be visiting and recorded their distances in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CITIES | Madrid -> Barcelona | Barcelona -> Seville | Seville -> Granada | Granada -> Valencia | Valencia -> Málaga |
| DISTANCE | $$13\frac{4}{10}$$ | $$11\frac{2}{10}$$ | $$8\frac{9}{10}$$ | $$10\frac{7}{10}$$ | $$6\frac{5}{10}$$ |

Q1. What is the total distance, in kilometers, from Madrid to Málaga?

Q2. What is the total distance, in kilometers, from Seville to Valencia?

Q3. How many more kilometers is it from Barcelona to Valencia than from Granada to Málaga?

Q4. What is the total round-trip distance?

Q5. What is the range for these distances? *Range is the difference between greatest and smallest number.*

\*\*Since all mixed numbers have like denominators, we can add them straightforwardly.

A1. Madrid -> Barcelona -> Seville -> Granada -> Valencia -> Malaga

=$ 13\frac{4}{10}+11\frac{2}{10}+8\frac{9}{10}+10\frac{7}{10}+6\frac{5}{10} $

= $\left(13+11+8+10+6\right)+\left(\frac{4}{10}+\frac{2}{10}+\frac{9}{10}+\frac{7}{10}+\frac{5}{10}\right)$

= $48+\frac{27}{10}$

=$ 48+2\frac{7}{10}$

= $50\frac{7}{10}$kilometers

A2. Seville -> Granada -> Malaga

= $8\frac{9}{10}+10\frac{7}{10}+6\frac{5}{10}$

=$(8+10+6)+\left(\frac{9}{10}+\frac{7}{10}+\frac{5}{10}\right)$

= 24+$\frac{21}{10}$

= 24+2$\frac{1}{10}$

= $26\frac{1}{10}$kilometers

A3. [Basic Approach] Let’s find the distance between both pair of cities, and then subtract both distances.

Barcelona -> Seville -> Granada Granada -> Valencia -> Málaga

= $11\frac{2}{10}+8\frac{9}{10}+10\frac{7}{10}$ = $10\frac{7}{10}+6\frac{5}{10}$

= $(11+8+10)+\left(\frac{2}{10}+\frac{9}{10}+\frac{7}{10}\right)$ = $(10+6)+\left(\frac{7}{10}+\frac{5}{10}\right)$

= $29+\frac{18}{10}$ = $16+\frac{12}{10}$

=$ 29+1\frac{8}{10}$ = $16+1\frac{2}{10}$

= $30\frac{8}{10}$ kilometers = $17\frac{2}{10}$

Difference:

$$=30\frac{8}{10}-17\frac{2}{10}$$

= $(30-17)(\frac{8}{10}-\frac{2}{10})$

= 13$\frac{6}{10}$ kilometers

[Students could have also canceled out the distance from Granada to Valencia - both sides contain distance - and then solved for difference in an expression. ]

= ($11\frac{2}{10}+8\frac{9}{10}$)-(6$\frac{5}{10}$)

= $20\frac{1}{10}-6\frac{5}{10}$

= $(20-6)\left(\frac{1}{10}-\frac{5}{10}\right)$

= $14(\frac{-4}{10})$#A negative sign means that you subtract fraction from whole number

= $13\frac{6}{10}$kilometers

A4. Total round-trip distance means multiplying the total one way distance from Madrid to Málaga twice.

Answer: $2⋅50\frac{7}{10}$=$50\frac{7}{10}+50\frac{7}{10}=100+\frac{14}{10}=101\frac{4}{10}$kilometers

A5. Biggest Distance = $13\frac{4}{10}$; Shortest Distance = $6\frac{5}{10}$

Range: $13\frac{4}{10}-6\frac{5}{10}=7(\frac{-1}{10})=6\frac{9}{10}$

The Missing-Addend Method could also be used.

$13\frac{4}{10}-6\frac{5}{10}=x$ becomes $13\frac{4}{10}=6\frac{5}{10}+x$. *x* in this case would be $6\frac{9}{10}$.