Problem Solving in Mathematics

Shape, Space, Measures

Going Up

Solution

Pupils can choose to approach this problem by using the strategy that they feel most comfortable with.

One approach is for pupils to identify the total time through a series of calculations:

- focussing on full lifts first and then any remaining guests second; and
- adding up all the travel times and including the times for the lift stopping to find the total time.

For example:

Floor 7

- 42 ÷ 12 = 3 remainder 6
- A full lift goes to Floor 7 three times with *6 guests left*

Floor 11

- 80 – 42 = 38 guests
- 38 ÷ 12 = 3 remainder 2
- A full lift goes to Floor 11 three times with *2 guests left*

Total time for 6 full lifts to go to the required floor and back to the ground floor:

- (3 × 35 × 2) + (3 × 55 × 2) = 210 + 330 = 540 seconds

Time for stopping at the required floors:

- (3 × 20 × 2) + (3 × 20 × 2) = 120 + 120 = 240 seconds

Total time for all 6 full lifts and lift stopping = 540 + 240 = **780 seconds**

Remaining 8 guests need to stop at both Floor 7 and Floor 11

- 8 guests get in at Ground Floor (*6 F7 guests and 2 F11 guests*) = 20 seconds
- Travel to Floor 7 = 35 seconds
- 6 guests get out at Floor 7 = 20 seconds
- Travel from Floor 7 to Floor 11 = 55 secs – 35 secs = 20 seconds

Total = 20 + 35 + 20 + 20 = **95 seconds**

Total time for all 80 guests to get to their floor = 780 + 95 = **875 seconds**

875 seconds = **14 minutes and 35 seconds**

Another approach is for pupils to work methodically through each lift operation using diagrams, noting the number of guests and time taken along the way. They can choose to move all the guests to Floor 7 first, or Floor 11 first. They should note though that to get the fastest possible time, they need to minimise the number of stops at each floor as this adds 20 seconds each time. An example is shown on the next page.

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Going Up (Continued)

Ground Floor		Floor 7		Floor 11
20 secs	12 guests / **35** secs →			
	← 0 guests / **35** secs	**20** secs		
20 secs	12 guests / **35** secs →			
	← 0 guests / **35** secs	**20** secs		
20 secs	12 guests / **35** secs →			
	← 0 guests / **35** secs	**20** secs		
20 secs	12 guests / **35** secs → (6 guests alight at Floor 7)	**20** secs	6 guests / **20** secs → (6 guests alight at Floor 11)	
	← 0 guests / **55** secs			**20** secs
20 secs	12 guests / **55** secs →			
	← 0 guests / **55** secs			**20** secs
20 secs	12 guests / **55** secs →			
	← 0 guests / **55** secs			**20** secs
20 secs	8 guests / **55** secs →			
Totals				
7 × 20 = **140**	(7 × **35**) + (5 × **20**) + (6 × **55**) = 245 + 100 + 330 = **675**			3 × 20 = **60**
140 + 675 + 60 = **875 seconds**				

875 seconds = **14 minutes and 35 seconds**

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