

Going Up

Teacher Notes

Introduction

Pupils can work on this problem individually or with others.

- They need to be aware of all the conditions given regarding the lift capacity and the set timings.
- They can discuss the pros and cons of having less or more stops at the three given floors (Ground, Floor 7 and Floor 11).
- They can discuss how they will use the given information to determine how long it will take all 80 guests to get to their respective hotel floors.

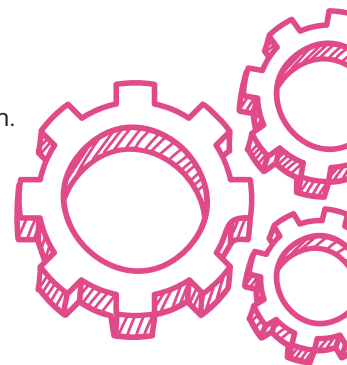
This problem deals with a pupil's ability to:

- manage and plan a situation that requires the least amount of time to complete an activity; and
- use their understanding of time and arithmetic along with their problem-solving skills.

What I know (think)

The pupils should know the following from the given problem:

- 80 guests have arrived at a hotel and are waiting to take the lift to the floor which their rooms are on.
- 42 guests are going to Floor 7 and the rest of the guests are going to Floor 11.
- It takes 35 seconds to travel to Floor 7 and 55 seconds to travel to Floor 11.
- The lift holds a maximum of 12 people and their luggage at a time.
- The lift stops for exactly 20 seconds every time it reaches a selected floor.
- The only people that will be using the lift during this time will be the 80 guests.
- The lift never stops for less or more than 20 seconds.
- The manager has worked out a way of getting all the guests to their floors in the fastest possible time.
- They have to work out what the fastest time is.



What I need to know (identify)

Pupils need to identify:

- how many guests have rooms on Floor 11;
- that the time starts once the doors of the lift **open for the first time** on the ground floor and not when they close for the first time;
- that this is a problem about time and not customer satisfaction so it doesn't matter if all the Floor 7 or all the Floor 11 guests are catered for first;
- that every time the lift stops it takes 20 seconds before it starts again so the less stops the better;
- how long it takes the lift to go from Floor 7 to Floor 11;
- that it is okay to have no guests in the elevator when returning to the ground floor;
- how to minimise the number of stops and maximise the number of guests being brought to both floors;
- that the time stops when the last guests arrive at their floor, not when the lift doors close after they get out at their floor;
- how to plan every lift journey; and
- the time taken to complete every journey, including the times when the lift stops.

Going Up (Continued)

What I need to do (employ)

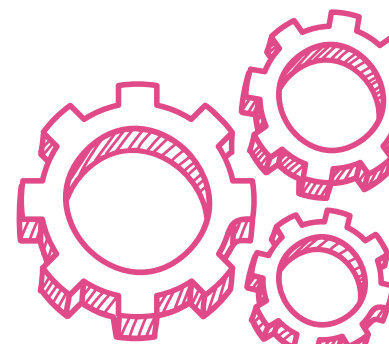
Pupils should use the information they have been given and come up with appropriate steps to help them solve the problem. There are different ways in which pupils can approach the problem: some pupils may use trial and improvement to get started, and refine their approach as they go along. The Solution shows two different types of approach. The following outlines some of the mathematics they should use when working through the problem:

- Pupils need to work out how many guests are going to Floor 11 by subtracting 42 from 80.
- They will also need to work out how long it takes to travel from Floor 7 to Floor 11 using subtraction. Or pupils could recognise that it takes 5 seconds per floor and there are four floors between Floor 7 and Floor 11, so $5 \times 4 = 20$ seconds.
- Pupils should divide the number of guests going to both floors by 12 (lift capacity) to calculate the least number of journeys required for each floor. They should make note of the remainder for each calculation.
- Once they know the least number of journeys required to travel to a floor they can add up all the required times or if they notice repetition they can use multiplication to reduce the amount of operations.
- They should always account for the time it takes for the lift to stop at the required floors and either add this up as they go along or use multiplication if they know the number of stops required.
- Pupils should make and record all their calculations in seconds and avoid using minutes until they have a total time for the whole problem.
- They could make a note of how many journeys they need to make and check them off as they go along ensuring they don't make unnecessary journeys or omit a required journey.
- Once they have the total journey times and stopped times they should add them all together to get the total time in seconds it takes to get all guests to their floor.
- They then calculate how many minutes and seconds are in their total time by dividing their seconds by 60 and working out how many seconds the remainder is.

What I did (review)

Pupils will use self-assessment, peer assessment or teacher feedback to decide whether they have approached the problem as intended.

- Did they recognise that the time started as soon as the lift doors opened on the ground floor for the first time?
- Did they work out how many guests had to go to Floor 11?
- Did they work out how long the lift takes to travel from Floor 7 to Floor 11?
- Did they recognise that to do it in the fastest possible time they need to minimise the number of times the lift was not moving?
- Did they calculate the number of round journeys required for both floors using the maximum capacity for the lift?
- Did they make note of the remaining guests?
- Did they include the number of times the lift would have to stop?
- Did they avoid adding the 20 seconds for the lift stopping when the final guests got to their floor?
- Did they double check they hadn't left out any journeys or made any unnecessary journeys?



Going Up (Continued)

Curriculum Objectives

This problem should enable pupils to demonstrate their knowledge, understanding and skills through:

Developing pupils as Individuals	<p>Demonstrate an ability and willingness to develop logical arguments:</p> <ul style="list-style-type: none"> Pupils demonstrate how they have solved the problem by developing a strategy to get all guests to their rooms in the fastest possible time.
Developing pupils as Contributors to Economy and the Environment	<p>Explore how the skills developed through mathematics will be useful to a range of careers:</p> <ul style="list-style-type: none"> Pupils will engage in a problem similar to those experienced by people employed to plan and manage solutions that are time dependent.

Thinking Skills and Personal Capabilities

This problem can provide an opportunity for pupils to demonstrate a variety of the following Thinking Skills and Personal Capabilities:

Managing Information	<ul style="list-style-type: none"> Ask focused questions Plan and set goals and break task into sub-tasks
Thinking, Problem-Solving and Decision Making	<ul style="list-style-type: none"> Sequence, order, classify and make comparisons Make links between cause and effect Justify methods, opinions and conclusions Generate possible solutions, try out alternative approaches and evaluate outcomes
Being Creative	<ul style="list-style-type: none"> Experiment with ideas and questions Make ideas real by experimenting with different designs, actions and outcomes Learn from and value other people's ideas
Working with Others	<ul style="list-style-type: none"> Listen actively and share opinions Suggest ways of improving their approach and working collaboratively
Self-Management	<ul style="list-style-type: none"> Seek advice when necessary Review learning and some aspect that might be improved Compare their own approach with others' and in different contexts Organise and plan how to go about a task Focus, sustain attention and persist with tasks

Cross-Curricular Skills

This problem should enable pupils to demonstrate a variety of the following Cross-Curriculum Skills:



Using Mathematics

