BOWLAND
MATHS

Narrative

The city is in chaos. Everyone is trying to leave and roads are congested. The green fog seems to be spreading. The Aliens are emerging from their ships and occupying large parts of the centre of Manford. It's essential for the class to meet up quickly in a safe place, avoiding the Aliens.

Problems

- Where should the muster point be?
- What's the shortest route to reach the muster point?
- If everyone walks at the average speed of his or her group how soon could everyone get there?

Mathematics content objectives

- Use the mean, median or mode (level 5)
- Use all four operations with decimals to two places (level 5)
- Solve problems involving direct proportion (levels 5 and 6)

Learning points

- Average speed is *distance travelled ÷ time taken*.
- The median is less affected by extreme values than the mean.
- The mode is only affected by how often values in the data set are repeated, not by what those values actually are.
- The mean gives an indication of all the values but it is more affected by extreme values than either the median or the mode.
- The mid-range (the mean of the smallest and largest values) can be useful as an estimate of the mean, especially when the data is uniformly distributed.

Alien invasion resources

2.1	Video clip: Alien expert interviewed on Globe news and advice for people in the City about avoiding the Aliens; shots of Aliens pouring out of their ships and people's descriptions of Aliens (4 minutes)
2.2	Slides: Maps and tables
2.3	A4 resource sheet of map of city streets (print one per pair)
2.4	Optional A4 resource sheet with a supplementary problem for groups that finish quickly (print several copies)
2.5	Audio clip: Mobile phone voicemail (45 seconds)
2.6	Video clip: Breaking news: 'The Aliens seem to be multiplying. Eye witnesses report the Aliens growing rapidly to twice their size before splitting into two. Press the red button now to vote whether you think this is the end of the world as we know it or text yes to 82255.' (1 minute)
2.7	Optional A4 resource sheet of homework task 2 (print one per pupil)

For pupils: string, ruler, compasses, pencils, calculators and small counters

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Main activity

Either before or at the start of the lesson, show or remind pupils how to estimate average walking speed using data from the homework. Discuss whether to use the mean, median or mode. The decision will probably depend on the size of the group and the distribution of the data. Discuss why an estimated average walking speed of 3.456 km/h is not sensible and why it should be rounded to 3.5 km/h.

Introduce the next stage of the invasion. Play **Resource 2.1**, a 4-minute video clip of a news announcement of Aliens leaving the ships, the green fog spreading, and interview with an alien expert.

Display **Resource 2.2**, **slide 1**, the street map of Manford, showing where the ships have landed. Give each pupil a copy of **Resource 2.3**, the map.

Say that the class has split up to visit different places of interest: King's College, Queen's College, the Art Gallery and the Big Car Factory. Tell each group which one of these places they are visiting, or choose other places if you prefer. Establish in discussion that as there is safety in numbers it would be best to meet up quickly somewhere central. Since it is getting dark, and rough ground will slow progress, it would be best to stick to the roads marked on the map. Pose these problems:

► Where exactly should the muster point be, and why?
► What is the shortest safe route to reach the muster point?
► What is the average walking speed of your group?
► If everyone in your group walks at your group's average walking speed, how long will it take for your group to get there?

Allow time for the groups to establish the circular 'no go' areas with radius half a mile/800 metres around each ship, to agree on their meeting point, and to work out the length of their shortest safe route by measuring and applying the map scale.

Show or remind pupils how to work out time, given a distance and the average speed by using the unitary method for direct proportion. In support, you could if you wish discuss and complete the tables on average walking speeds on **Resource 2.2**, **slides 2**, **3 and 4**.

The groups can now continue to solve the problems. Those that finish quickly could assist another group. *If time allows, they could try the supplementary problem on* **Resource 2.4**.

Differentiation

Allocate the shortest route to a central point such as the Car Park to pupils who would benefit from simpler calculations. They could also use the mid-range (the mean of the smallest and largest values) as an estimate for the average walking speed of their group, or be given an average walking speed to use such as 4 km/h.

For able pupils, mark points along their route with the height above sea level, to be taken into account. For example, it takes 1.2 minutes to walk 100 m at an average speed of 5 km/h. For each 10 m of ascent, add an extra minute, e.g. 300 m with 28 m of ascent will take 3 × 1.2 = 3.6 minutes, plus 2.8 minutes for going uphill.

Able pupils could also work out their time to cover each leg by rearranging the formula
speed = distance ÷ time to time = distance ÷ speed.

Review

Display **Resource 2.2, slide 5**. Bring the whole class together to discuss and compare solutions and justify decisions. Establish that everyone has reached the muster point, and how long the first group had to wait until the last group arrived.

Homework

If the chosen muster point is not the Car Park, say that the whole class is now to go there. On the face of it, this may seem dangerous, but the bus is there and can be used for a speedy get-away before any more spaceships land.

Play **Resource 2.6**, a 1-minute video clip – the Aliens are multiplying!

Give out copies of **Resource 2.7**, choosing from homework Tasks A and B. For Task A, which is similar to the work done in class, pupils will need a copy of the street map. Task B is more challenging. The table can be completed on the sheet.