

## ACTIVITY IA6.10: Interstate Driving Context Notated on the Empty Number Line

**Intended learning:** To add and subtract in the range from 1 to 100 using jump strategies.

**Instructional mode:** Longer, inquiry mode for individuals or groups.

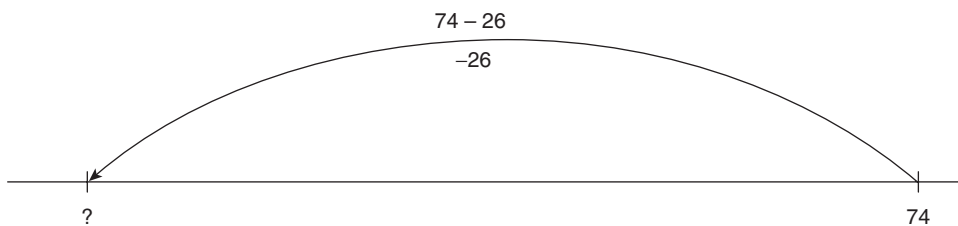
**Materials:** Chart paper and marker or blackboard and chalk.

**Description:** This contextual investigation is intended to draw on students' knowledge of travel to promote linear conceptions of addition and subtraction. While the context is American, similar contexts exist in other countries (see variations below). In the United States there exists an interstate highway system of limited access divided carriageways that cross multiple states. Each interstate carries a two-digit number name prefaced by a capital I for interstate (i.e. I-95 runs north–south along the eastern seaboard) and each exit is numbered. In most states, these exit numbers correspond to the number of miles from the state border (Exit 89 in Maryland is 89 miles north of the Washington, DC border). Since numbers increase as one drives north, driving south constitutes a subtractive task. Even children as young as six years can readily grapple with the context. The investigation can involve exploring several travel scenarios and is quite engaging for the students, particularly when introduced within days of a field trip involving interstate travel.

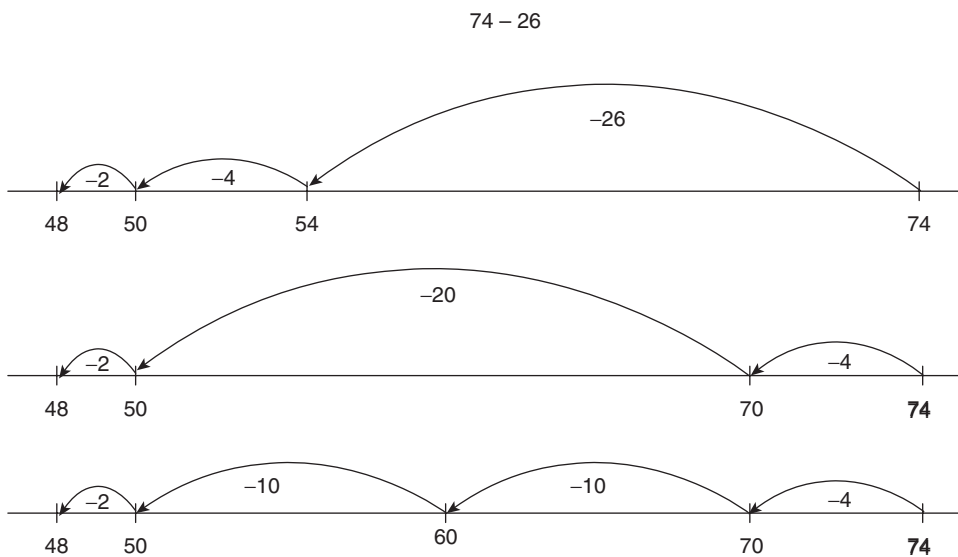
After discussing the exit numbering system and listing several exits by name and number, pose a question to the students. *If I got on the interstate at Riverside which is Exit 80 and drove nine more miles before getting off, where would I exit? How do you know? How about if I got on at White Marsh, Exit 67, and drove 20 more miles. Where would I be then?* Use the ENL to notate students' solutions. When more than one strategy emerges in the discussion, notate each solution on the ENL to facilitate student communication.

**Responses, variations and extensions:**

- Alternate contextual settings that use distance: In Australia, some roads have house numbers that correspond to the distance travelled from the origin of the road; in the Netherlands, some beaches have pylons marking distances in km; construct a timeline of events in an older person's life; in many cities, streets are sequentially numbered and lend themselves to calculating the number of blocks walked from, say, 42nd street to 59th street.
- When introducing this context, use an interstate and local exits (or similar context) familiar to the students. Initially include some destinations of interest to them in the scenario. This will heighten engagement. After students are used to the context, a fictitious interstate with carefully contrived exit numbers may be introduced if needed.
- Through careful selection of exit numbers and distances of travel ( $54 + 10$ ;  $54 + 20$ ;  $54 + 30$ ;  $54 + 32$ ), the jump strategy is likely to emerge in student dialogue.
- This scenario lends itself to straightforward addition ( $85 + 20$ ) and subtraction ( $74 - 26$ ) tasks as well as missing addend ( $52 + ? = 89$ ) and missing subtrahend ( $115 - ? = 89$ ) tasks.



**Figure 6.9** A car got on the interstate at Exit 74 and drove 26 miles south



**Figure 6.10** Notating different solution strategies for  $74 - 26$

- We got on the interstate at Exit 85 and drove 20 miles north. Where did we get off? [missing sum]
- A car got on the interstate at Exit 74 and drove 26 miles south before running out of gas. [See Figure 6.9 for the ENL drawn while this scenario was introduced.] At which mile marker will the tow service find the car? [missing difference]
- I got on the interstate at Exit 52 and got off at Exit 89. How far did I drive on the interstate? [missing addend]
- My sister got on the interstate at Exit 115 and got off at Exit 89 when coming to see me. How far did she drive on the interstate? [missing subtrahend]
- The ENL facilitates student discussion of solution strategies, particularly when multiple strategies are notated (see Figure 6.10).

**Acknowledgement:** This activity is based on the research of Tabor (2008).