

Negative numbers: first encounter

CURRICULUM ALIGNMENT

NUM.PVT.4

investigate how decimals and percentages (and fractions) can be compared, ordered and expressed in related terms.

INTERACTIVES **Number Line · display, explore** **Word Problem · challenge**

WHAT THIS LESSON TEACHES

A number less than zero is written with a minus sign in front, like -3 . On a thermometer or number line these negative numbers sit below zero and mean colder or further down.

→ A reading of -3 C is three degrees below zero and colder than 0 C.

→ A drop from $+4$ C to -2 C is a change of 6 degrees (4 steps down to zero then 2 more).

MODEL THIS ON THE BOARD

DROP FROM $+4$ C TO -2 C

- 1 Start at $+4$ C on the line.
- 2 Count 4 steps down to reach 0 C.
- 3 Keep counting 2 more steps below zero to reach -2 C.
- 4 The full change is $4 + 2 = 6$ degrees.

LESSON ARC

Open with a thermometer reading -3 °C and pull the word 'below' out of the class. Move to the -10 to $+10$ number line: place -7 seven steps left of zero, and settle the zero-in-the-middle idea. Build the cross-zero counting method on a Galway temperature drop — count down to zero, then keep going below. Pupils rehearse two changes at the board, sketch the line in their copy, then work the Class Challenge temperature problems together.

TEACHING MOVES

1. **Getting Started.** Display the -3 °C thermometer as pupils settle and take two or three hands-up answers. Listen specifically for the word 'below' — that's the idea the whole lesson hangs on. Don't explain the minus sign yet; that comes next.
2. **Watch and Notice.** Sweep your finger left to -7 saying 'seven steps to the left of zero' so the direction lands physically. Pause hard on zero — say 'zero is the middle, not the start.' On the Galway change, take a few guesses then count aloud through zero: 'four steps down to zero, then two more below, four and two makes six.'
3. **Try It Together.** A pupil places markers on $+3$ and -1 ; the class counts together 'three down to zero, then one more below, that's four,' with the rest predicting the count on pointed fingers first. Repeat for $+2$ to -5 . Catch pupils who stop counting at zero — that's the one to watch.
4. **Draw the Number Line in Your Copy.** Walk the room checking two things only: is zero in the middle, and do -7 and -2 sit to the left of it. No marking. Correct a misplaced negative by pointing back to the IWB line rather than telling the answer.
5. **Class Challenge.** Keep the board work brisk — pupils take turns, check each answer, class confirms, move on. Before choosing subtract, have the pupil name the action word ('fell', 'dropped', 'colder'). On the final $+2$ to -7 fall, revoice: 'two down to zero, then seven more below, that's nine.'

6. What Did We Notice?. Listen for a real below-zero context — freezer, basement floor, money owed — and revoice a strong one: 'so the minus sign lets us say how far below zero, not just that it's small.' Flag the -7 -is-lower-than- -3 muddle without resolving it; that's next lesson.

COMMON MISCONCEPTIONS

⚠ Counting a change that crosses zero, pupils stop at zero — a fall from $+3$ to -1 gets counted as '3' because they stop at the zero mark.

Rebuild the change on the number line and sweep your finger straight through zero without lifting it. 'Three down to zero — but we haven't got there yet, keep going — one more below, that's four.' Zero is a step passed, not the finish line.

⚠ Pupils treat $+5$ and -7 as the same distance from zero because they're 'both a few steps out.'

Put both markers on the line at once and count each out loud — five steps right, seven steps left. Same idea of stepping from zero, but -7 is clearly further out. Don't let 'opposite directions' blur into 'equal distances.'

⚠ Drawing their own line, pupils put the negatives to the right of zero or bunch zero at the far left end.

Point back to the IWB line and ask 'where does the freezer live — colder side or warmer side?' Have them relabel with zero genuinely in the middle before placing any negative marker.

DIFFERENTIATION

EMERGING

- Stay with changes that stay entirely below zero (or entirely above) so there's no cross-zero carry yet — the count is a single straight run on the line.
- Pre-mark zero in the middle of their copybook line so pupils only place and label the five markers, not build the structure.

DEVELOPING

- After the copybook line, ask which of -7 and -2 is colder and how the line shows it — a preview of tomorrow's comparing question.
- Give a reverse problem: 'the temperature fell 6 degrees and ended at -2°C — where did it start?' They count up through zero this time.

PROFICIENT

- Pose a two-crossing chain at the IWB: rose from -4 to $+1$, then fell to -3 — how many degrees moved in total? Let them reason it out and explain the two separate counts.
- Ask them to write a real bank-statement or lift story of their own where the answer is a change of 8 degrees or floors, then explain why the size is a subtraction.

✚ **Cross-curricular:** Tie to Geography — read winter temperatures for a few Irish towns off a weather map and count how far below zero each frosty morning fell.

ANSWER KEY

c) 18

Q1: 9°C

Q2: $+1^{\circ}\text{C}$ is 3 degrees warmer than -2°C (-2°C is the colder)

Q3: -7°C is 7 degrees below zero (the printed line starts at 0, so pupils extend it to the left)

Q4: 8°C

Q5: 8°C

Q6: 7°C

a) Always : Any negative reading sits below zero so it is colder.

b) Always : Negative numbers are always placed left of zero.

c) Never : -10 is further left and therefore smaller than -2 .

d) Sometimes : They appear only when the air actually drops below zero.

EXTENSION SHEET · STRETCH ANSWERS

S1: $-4.1 < 0.1 < 2.9 < 4.8$

S2: $-4 < -3.2 < -0.6 < 1$

S3: $-3.5 < 2.6 < 8.6 < 8.8$

S4: $-4.7 < 0.1 < 6.7 < 8.3$

S5: $-9 < -6.3 < -0.1 < 5.8$