

Sorting data with Carroll and Venn diagrams

CURRICULUM ALIGNMENT

DAT.DAT.3

pose questions of interest and collect, display and critically analyse data in a range of ways for a range of purposes and communicate the findings.

INTERACTIVES Drag Sort · challenge, display

WHAT THIS LESSON TEACHES

A Carroll diagram sorts items by two yes/no questions into four boxes, so each item lands in exactly one box. A Venn diagram uses overlapping circles, and items that answer yes to both questions go in the middle overlap.

→ 14 is even and more than 10, so it goes in the even and more-than-10 box.

→ 7 is not even and not more than 10, so it goes in the odd and not-more-than-10 box.

MODEL THIS ON THE BOARD

SORTING ON A CARROLL DIAGRAM

- 1 The columns sort even / odd; the rows sort single-digit / two-digit.
- 2 4 is even and single-digit, so it sits in the top-left box; 9 is odd and single-digit, so it sits in the top-right box.
- 3 22 is even and two-digit (bottom-left); 11 is odd and two-digit (bottom-right).

	even	odd
single-digit	4	
two-digit	9	

DISCUSSION STARTER

REFLECT Did the Carroll diagram or the Venn diagram make the groups clearer for you? Why?

LESSON ARC

Draw the empty two-by-two Carroll grid on the board and ask where 14 and 7 land before naming any rule. Demo drives both sorts live at the front — the Carroll number sort by hand, then the Venn shapes on screen pivoting on the red square that fits both. Pupils build a Venn in their copybook (even / more than 10), then sort cards by hand at their seats through three trickier grids. Wrap on maths-talk contrasting separate boxes with a shared overlap.

TEACHING MOVES

1. **Getting Started.** Draw the four-box grid live as you pose the question so the labels appear one at a time. Take two or three hands-up answers only, and send a pupil up to point at the box for 14, then 7. Don't settle the mix-ups — the sorting rule is what the rest of the lesson earns.
2. **Watch and Notice.** Drive both sorts live — these are your demonstrations, not a playable clip. On the Venn, point at the red square and hold out for a pupil to say why it sits in the middle: 'it has a right angle AND it is red.' Then the blue triangle — neither — goes outside both. Watch for pupils trying to drop a both-card into one circle only; revoice 'it fits both, so it sits where the circles cross.'
3. **Try It Together.** Run the Carroll number sort by hand on the drawn grid first — there's no on-screen tool for numbers — asking the class to agree or correct each of 4, 11, 22, 9. Then move to the Venn shapes on

screen for turns at the board. Before every drop ask the two questions aloud: 'does it have a right angle? is it red?' The red rectangle is the trap — right angles AND red, so it's the overlap.

4. **Draw Your Venn in Your Copy.** Pupils draw two overlapping circles labelled 'even' and 'more than 10' and place 8, 15, 14. Walk the room glancing at the overlap — this is practice, not marking. The one to catch: pupils who leave the middle empty when 14 (even and more than 10) belongs there.
5. **Class Challenge.** Grids and circles are pre-laid-out so pupils spend the time sorting cards, not drawing. Keep it brisk and circulate. The never-overlap Venn is the one to watch — some pupils will force a card into the empty middle; head it off with 'if no card fits both, the middle is correctly empty.' Close by asking two or three which card sat in the overlap on the last sort and how they knew.
6. **What Did We Notice?.** Listen for pupils naming the overlap as the place for cards that fit both properties at once, then revoice a strong answer: 'the Carroll grid keeps everything in separate boxes, but the Venn lets two circles share a middle.' Push back gently on the idea that a Venn always needs something in the middle.

COMMON MISCONCEPTIONS

⚠ A pupil drops a both-card — the red square — into just the right-angle circle or just the red circle, treating the overlap as if it isn't a real place.

Stop and ask the two questions separately: 'does it have a right angle? is it red?' Both yes. Point to the crossing region on the two large paper circles — 'both answers are yes, so it can only sit here, where the circles share.'

⚠ On the never-overlap Venn a pupil forces a card into the empty middle because it 'feels wrong' to leave it blank.

Test the forced card aloud against both circle labels — it fails one of them. 'If no card is a red triangle, nothing fits both, and an empty middle is the correct answer.' Leave the middle visibly empty on the paper circles so the class sees blank is allowed.

⚠ For 14 in the copybook Venn, a pupil parks it in only the 'even' circle or only the 'more than 10' circle instead of the overlap.

Check both properties on the spot: 14 is even (yes) and more than 10 (yes). Two yeses means the overlap — have the pupil rub it out and rewrite it in the shared middle.

DIFFERENTIATION

EMERGING

- Pre-label the copybook circles for them (write 'even' and 'more than 10' on their page) so they sort only the three numbers, not build the structure.
- In the seat sort, hand them the two-circle Venn that DOES overlap first and hold back the never-overlap one until they're steady on where both-cards go.

DEVELOPING

- After the copybook Venn, ask which single number could be added that would land outside both circles, and why.
- On the seat sorts, ask them to name a card that would have to go in the empty middle of the triangle/red Venn to make an overlap appear — and why no such card exists here.

PROFICIENT

- Pose: 'design a set of five number-cards so that exactly one lands in the overlap of an even / more-than-10 Venn, and one lands outside both.' They record the set in their copybook and check it against both labels.
- Ask them to explain to the class how a four-box Carroll grid could show the same sort as a two-circle Venn — which region matches which box?

✍ **Cross-curricular:** Link to shape-and-space — pupils sort classroom objects by 'has a right angle' and one colour, naming which real object would sit in the overlap.

ANSWER KEY

Scaffold: visual check on the page

Q1: even, more than 10

Q2:

11: not even, more than 10; 22: even, more than 10; 9: not even, not more than 10

a) Always : Each of the two yes/no questions has one answer, so there is only one box for it.

b) Always : The overlap holds items that answer yes to both questions.

c) Sometimes : Only the numbers in the even column are even; the odd column is not.

d) Never : 22 is even and two-digit while 9 is odd and single-digit, so they are in different boxes.

EXTENSION SHEET · STRETCH ANSWERS

S1: 28

S2: 115

S3: 10

S4: 141

S5: 100