

Pie charts and proportional representation

CURRICULUM ALIGNMENT

DAT.DAT.4a

pose questions, collect, compare, summarise and represent data selectively to answer those questions.

NUM.FRC.4a

explore (model, compare and convert) the relationships between fractions, decimals and percentages.

INTERACTIVES **Pie Chart Builder** · challenge, display, explore

WHAT THIS LESSON TEACHES

The full circle stands for the whole set of data. Every slice is a part of that one whole, so all the slices together must fill the circle.

→ A class of 20 pupils fills the whole pie; a slice for 10 pupils fills exactly half of it.

→ 5 out of 20 is $5/20 = 1/4 = 0.25 = 25\%$.

MODEL THIS ON THE BOARD

BUILDING THE LUNCH SURVEY PIE CHART

- 1 Start with the sandwich slice of 8 out of 20 pupils.
- 2 Divide 8 by 20 to get the fraction $8/20$.
- 3 Multiply by 100 to turn the fraction into a percentage: $8/20 \times 100 = 40\%$.
- 4 Draw a slice that is 40% of the full circle for sandwiches.

LESSON ARC

Open with a fruit-choice pie chart on the IWB and ask which slice is biggest by eye — pupils reason from size, not counts. Watch three model charts, holding the tricky 12/6/2-out-of-20 one for a pupil to name 12/20. Then build a lunch-survey pie together, growing each slice and bridging $8/20 \rightarrow 40\%$ aloud. Pupils record all four slices as fraction/decimal/percentage in their copy and check the column totals 100%. Class Challenge matches four frequency tables to charts.

TEACHING MOVES

1. **Getting Started.** Give five seconds of quiet think-time, then take three hands-up answers only — no open call-outs. Listen for pupils reasoning from slice size ('the half is clearly biggest'), not guessing, and re-voice: 'so the size of the slice tells us the size of the group.'
2. **Watch and Notice.** On the half-quarter-quarter chart, point to the 180° reading on the half and the two 90° quarters. On the equal-halves chart ask 'both fill exactly half — what does that tell us about the two groups?' Hold the 12/6/2-out-of-20 chart until a pupil names 12/20 before you reveal the percentage, then note the three percentages sum to 100%.
3. **Try It Together.** Have individual pupils step each category up to its count on the pie-chart-builder interactive. As each slice grows, pause and ask 'what fraction of 20 is that?' before reading the percentage. Make the sandwich bridge visible: 8 out of 20 $\rightarrow 8/20 \rightarrow 40\%$. Finish by adding all four percentages aloud to reach 100%.
4. **Record Each Slice in Your Copy.** Walk the room glancing at each pupil's percentage-column total — this is copybook practice, not marking. Flag as a good sign any pupil simplifying $8/20$ to $2/5$; you can name it aloud for the class.

5. **Class Challenge.** Brisk board turns — pupils match each table to its chart and the class confirms before moving on; don't re-explain each one. On the fourth table only, prompt 'the 8 and the three 4s — which is exactly one fifth?' (each $4/20 = \text{one fifth}$), and make sure they check all four percentages total 100%.
6. **What Did We Notice?.** Push pupils past 'pie charts look nice' — ask what a pie shows well and what it hides. Re-voice: 'if we care what fraction chose each, the pie is clear; if we care about the exact number, the bars are easier to read.'

COMMON MISCONCEPTIONS

⚠ Pupils read a slice by its angle or eyeballed size but ignore the total — they say a slice is '90°' or 'a big one' without connecting it to count ÷ total.

On the pie-chart-builder, drag the same count (say 5) into two different totals (out of 10, then out of 20) and show the slice shrinks. 'Five pupils, but a different share each time — the whole matters.' Make them state the fraction, not just the angle.

⚠ Pupils turn a slice into a percentage by using the count directly — 8 pupils becomes '8%' instead of $8/20 = 40\%$.

Stop and rebuild the bridge on the board: $8/20$, then ask 'how many twentieths make a hundredth-lot?' Scale $8/20$ to $40/100 = 40\%$ visibly. Anchor every percentage back to count ÷ total, never to the raw count.

⚠ Pupils build all the slices but their percentages don't sum to 100% and they don't notice — the whole-is-one idea hasn't landed.

Use the copybook percentage-column total as the check. If it isn't 100%, point back to the full circle on the interactive: 'the slices fill it exactly, so the numbers must fill 100 exactly.' Find and fix the slice that's off.

DIFFERENTIATION

EMERGING

- Stay with the 5-and-5-out-of-10 and simple-thirds tables where every slice is a half or a friendly fraction; pupils name the fraction before touching percentages.
- Pre-write the three column headings (fraction / decimal / percentage) in the copy so pupils fill values into a ready structure rather than building it.

DEVELOPING

- After the copy rows, ask pupils to simplify each fraction ($8/20 \rightarrow 2/5$, $4/20 \rightarrow 1/5$) and check the decimal still matches.
- Give a slice's percentage and ask them to work backwards to the count out of 20 — e.g. 'a slice is 35%, how many pupils?'

PROFICIENT

- At the IWB during Class Challenge, narrate a harder variant: a survey of 25 where one slice is 7 — ask what percentage that is and why it isn't a whole number of tens.
- Pose: 'could you draw the slice for 12 out of 20 with just a protractor, no interactive? What angle would you turn through?' ($12/20$ of 360°).

↗ **Cross-curricular:** Tie to Geography — pupils turn a class survey of how they travel to school (walk, cycle, car, bus) into a pie chart of the whole class.

ANSWER KEY

Scaffold: visual check on the page

Q1: $3/5$

Q2: $9/25$

Q3: $1/5$

Q4: $1/10$

a) Always : Every slice is a part of one whole, so together they fill the circle.

b) Never : 8 out of 20 is two fifths, not one half.

c) Always : 5 out of 20 equals one quarter, which is 25%.

d) Never : Each slice is only a part of the one whole data set.

EXTENSION SHEET · STRETCH ANSWERS

S1: 164°

S2: 136°

S3: 142°

S4: 216°

S5: 60°