INFOGRAPHHUB SERIES · 8 PARTS · AGES 11–16

Choosing the Right Chart

Eight infographics on picking, drawing and reading charts, from bar charts and histograms to the mistakes that mislead.

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Quiz

Each part is one printable infographic. Work through them in order, or use the part you need. The quiz answers are printed upside down at the foot of the quiz. Sources for every part are listed on its page at infographhub.com.

infographhub.com/series/choosing-the-right-chart/

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CHOOSING THE RIGHT CHART · PART 1 OF 8 · AGES 11–16

Choosing the Right Chart

Decide which question your data answers, then pick the chart built for that job.

Compare categories: bar chart

Which is biggest or smallest? Draw one bar per category, with gaps between bars and a value axis that starts at zero. Sort the bars by size unless the order matters.

Change over time: line graph

How has something changed? Put time along the horizontal axis and join the points in order. Several lines can share a graph, but more than about four gets hard to follow.

Parts of a whole: pie or stacked bar

What share is each part? A pie chart suits one total split into a few parts of clearly different sizes. A stacked bar compares shares across several groups.

A distribution: histogram

How are measurements spread out? Group continuous data, such as times or heights, into class intervals and draw touching bars to show where values bunch up.

A relationship: scatter graph

Does one thing change as another changes? Plot each pair of values as a point. An uphill or downhill pattern suggests a correlation, not proof of a cause.

Sometimes no chart is best

If readers need exact values, a clear table often works better than any chart. And if you cannot sum up your chart's message in a sentence or two, rethink it.

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2. Types of Chart and What Each One Is For

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CHOOSING THE RIGHT CHART · PART 2 OF 8 · AGES 11–16

Types of Chart

Eight common ways to show data, and the one job each does best.

Bar chart

Compares separate categories with bars of equal width and gaps between them. Bars can stand up as columns or lie flat, which suits long labels.

Line graph

Shows how a value changes over time. Points are plotted in time order and joined with straight lines, so rises, falls and trends stand out.

Pie chart

Shows how one total splits into parts. Each sector's angle is its share of 360°, so a quarter of the data fills a 90° sector.

Histogram

Shows how continuous data, such as times or heights, is spread across class intervals. The bars touch because the number scale has no gaps.

Scatter graph

Plots pairs of measurements as points to show whether two variables are related. A line of best fit can show the trend.

Pictogram

Uses rows of identical icons to show counts for each category. A key says what one icon is worth; half an icon shows half that amount.

Stacked bar chart

Splits each bar into coloured segments to compare totals and what they are made of across groups. Only the bottom segment shares a baseline.

Table

Rows and columns of exact numbers. Best when readers need to look up precise values rather than spot a pattern at a glance.

Chart, graph, plot or diagram?

The names overlap. A bar chart is also called a bar graph, and a scatter graph is also a scatter plot or scatter diagram. What matters is what the picture shows.

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3. Bar Chart vs Histogram: What Is the Difference?

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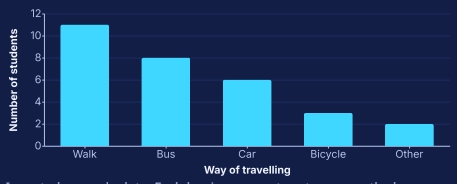
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Bar Chart vs Histogram

They look alike, but one compares categories and the other shows how measurements are spread.

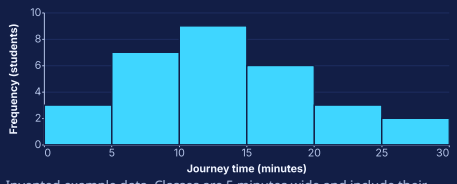
Bar chart	Histogram
QUESTION IT ANSWERS	
Which category is biggest or smallest?	How are the values spread out, and where do most of them fall?
TYPE OF DATA	
Categories, such as bus or car, or discrete counts	Continuous measurements, such as time or height, grouped into classes
HORIZONTAL AXIS	
A label under each bar	A number scale with class boundaries marked
GAPS BETWEEN BARS	
Yes: each bar is a separate category	No: the bars touch because the number scale has no gaps
ORDER OF BARS	
Any order; often sorted largest to smallest	Fixed: classes stay in number order
BAR WIDTH	
All the same; width means nothing	Width is the class interval; unequal widths need frequency density

Bar chart: how 30 students travel to school



Invented example data. Each bar is a separate category, so the bars have gaps and are sorted from largest to smallest.

Histogram: how long the same 30 journeys take



Invented example data. Classes are 5 minutes wide and include their lower bound ($0 \le t < 5$, $5 \le t < 10$ ...), so the bars touch.

Unequal class widths

If classes have different widths, a histogram's bar height is frequency density (frequency ÷ class width), so each bar's area shows its frequency.

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4. How to Read a Graph in 7 Steps

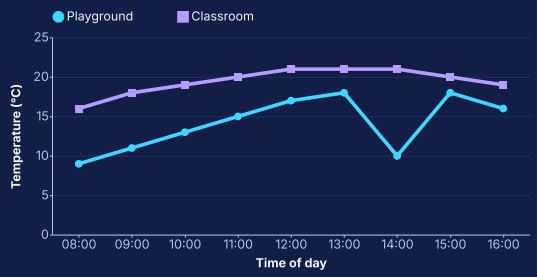
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How to Read a Graph

Seven checks, in order, that turn a graph into a sentence you can trust. Practise on the example below.

Example: temperature on one school day



Invented example data, recorded every hour from 08:00 to 16:00 in a playground and a classroom.

1 Read the title

Find out what was measured, where and when. Here: temperature on one school day, in two places. 'Invented data' warns you this example is for practice only.

2 Check the axes and units

Across: time of day. Up: temperature in degrees Celsius (°C). Without its unit, a number such as 20 could mean minutes, per cent or anything else.

3 Work out the scale

Gridlines go up in steps of 5 °C. Work out what each small step is worth before reading a value between lines, and check whether the axis starts at zero.

4 Use the key

The key shows which line is the playground (circles) and which is the classroom (squares). Match every colour or symbol to the key before you compare.

5 Describe the trend

Say what happens overall, with numbers. The playground warmed from 9 °C at 08:00 to 18 °C at 13:00; the classroom stayed between 16 °C and 21 °C.

6 Spot outliers

Look for points that break the pattern. The playground fell to 10 °C at 14:00, then rose to 18 °C at 15:00. Ask why: a rain shower, or a reading error?

7 Write a conclusion

Answer the question with numbers and claim only what the data shows: 'The playground varied far more than the classroom.' One day cannot prove what always happens.

Inside or outside the data?

Estimating a value between plotted points (interpolation) is fairly safe. Predicting beyond the last point (extrapolation) assumes the pattern carries on, and it may not.

NEXT IN THE SERIES
5. Common Chart Mistakes and How to Fix Them

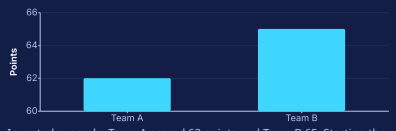
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Common Chart Mistakes

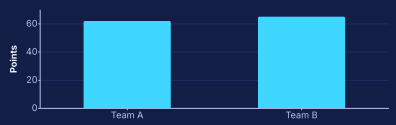
Six ways charts mislead, often by accident, with the fix for each one.

Mistake: the axis starts at 60



Invented example: Team A scored 62 points and Team B 65. Starting the axis at 60 makes B's bar look 2.5 times as tall as A's.

Fixed: the axis starts at 0



The same scores with a zero baseline. Team B scored about 5% more than Team A, and the bars now show that honestly.

1 Bar chart axis not starting at zero

✕ WRONG

~~Bars for 62 and 65 points on an axis that starts at 60~~

✓ RIGHT

Start the value axis at 0 so bar lengths are in proportion to the values

Readers compare bar lengths. A cut-off axis turns a 5% difference into a bar 2.5 times as tall. Line graphs may start above zero if clearly labelled.

2 Overloaded 3D pie chart

✕ WRONG

~~A tilted 3D pie with nine thin slices and a legend to decode~~

✓ RIGHT

A flat pie with up to five or six labelled slices, or a sorted bar chart

Tilting makes front slices look bigger than equal ones at the back, and thin slices are hard to compare. Merge small ones into 'Other'.

3 Uneven time intervals

✕ WRONG

~~2000, 2010, 2015, 2016 and 2017 spaced evenly along the axis~~

✓ RIGHT

Space the years in proportion to time and mark the actual data points

Evenly spacing uneven gaps squashes ten years into the space of one, so a slow change can look sudden.

4 Two y-axes on one chart

✕ WRONG

~~Rainfall on a left axis and umbrella sales on a right axis, stretched until the lines match~~

✓ RIGHT

Draw two charts side by side, each with its own axis

Either scale can be stretched or squashed, so the lines can be made to meet, cross or move together. Statisticians advise avoiding dual axes.

5 Missing units and labels

✕ WRONG

~~An axis numbered 0 to 50 with no title and no unit~~

✓ RIGHT

Label each axis with what it measures and its unit, such as 'Rainfall (mm)'

50 could be millimetres, minutes or per cent. Without labels, readers have to guess, and different readers guess differently.

6 Reading correlation as cause

✕ WRONG

~~'Ice cream sales and sunburn rise together, so ice cream causes sunburn.'~~

✓ RIGHT

'They rise together; hot, sunny weather may be causing both.'

A correlation shows two things change together. Proving a cause needs more evidence, such as a scientific explanation or a fair test.

Check before you share

Does every bar start from zero? Are the axes, units and source labelled? Would someone who has never seen the data read it the way you intend?

NEXT IN THE SERIES
6. Charts and Graphs Key Terms

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Chart Key Terms

The words you need to draw, read and describe charts, each with a one-line meaning.

Parts of a chart

Axis	One of the two reference lines of a graph. The x-axis runs across and the y-axis runs up. Each needs a title and a unit.
Scale	The numbers marked along an axis at equal steps, such as 0, 5, 10, 15. Equal distances must stand for equal amounts.
Key (legend)	Explains what each colour, line style, symbol or icon stands for. In a pictogram it states what one icon is worth.
False origin	An axis that starts above zero, often marked with a zigzag. Acceptable on many line and scatter graphs; misleading on bar charts.

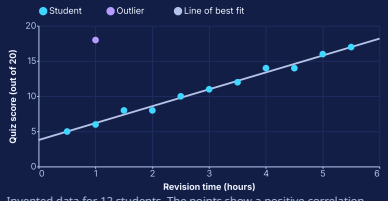
Types of data

Categorical data	Data in words or labels, such as eye colour or favourite sport. Shown with bar charts, pie charts and pictograms.
Discrete data	Numbers that can only take certain values, usually counts, such as siblings or goals. You cannot have 2.5 siblings.
Continuous data	Measurements that can take any value in a range, such as time, height or mass. Grouped into classes for a histogram.
Frequency	How many times a value or category occurs. A frequency table lists each value or class beside its count.
Class interval	A group that continuous data is sorted into, such as $10 \le t < 15$ minutes. Classes must not overlap.

Patterns in data

Distribution	How the values in a data set are spread out: where most of them bunch, how wide the spread is and whether it is lopsided.
Trend	The general direction of data over time, such as rising, falling or level, ignoring small ups and downs.
Correlation	A relationship between two variables. Positive: both rise together. Negative: one rises as the other falls. None: no pattern.
Outlier	A value well away from the rest, or one that breaks the pattern. Check it: it may be a mistake or a real, unusual result.
Line of best fit	A straight line through the middle of the points on a scatter graph, showing the trend. Use it to estimate values.

Example: revision time and quiz score



Invented data for 12 students. The points show a positive correlation. The student with 1 hour and 18 marks is an outlier and was left out when drawing the line of best fit.

Counted or measured?

Counted data, such as people or goals, is discrete. Measured data, such as time, length or mass, is continuous. Shoe sizes are discrete even though they include halves.

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7. Charts in Everyday Life

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Charts in Everyday Life

You read charts every day, often without noticing. Here is where they hide and what to check.

Weather forecasts

A line shows temperature through the day; bars show expected rain in mm. A percentage is the chance of rain, not how much will fall.

Fitness and step counters

A bar for each day's steps or active minutes, with a goal line across. A ring that fills up shows how much of today's goal is done.

Screen-time reports

Stacked bars split each day by type of app, so you see the total and where the time went. Check: daily average or weekly total?

News and elections

Bars compare votes or prices, lines track change over months and shaded maps show results by region. Check the source, the date and the axis.

School reports

Marks or attendance shown as bars or a line across terms. Read the scale: a percentage, a grade and a target can look alike.

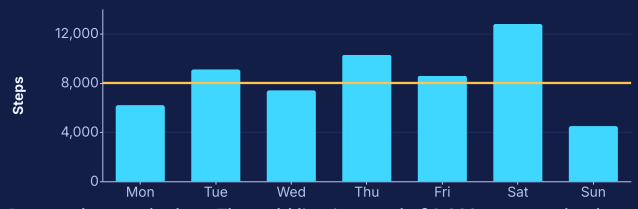
Sports statistics

League tables are tables. Possession is often a split bar or pie, as the shares make 100%. Heat maps show where a player spent time.

Energy bills

Bars show energy used each month in kilowatt-hours (kWh). Comparing with the same month last year allows for the seasons.

Example: one week of steps from a fitness app



Invented example data. The gold line is a goal of 8,000 steps set by the user. It was met on 4 of the 7 days.

Three questions for any chart

What is being measured, and in what units? Where did the data come from, and when? Does the picture match the numbers, or does it exaggerate?

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8. Charts Quiz: Test Yourself

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CHOOSING THE RIGHT CHART · PART 8 OF 8 · AGES 11–16

Charts Quiz

Ten questions on the whole series. Answer them all, then turn the page round to check.

1 **You want to compare how many students chose each of five sports. Which chart fits best?**

- A Line graph
- B Bar chart
- C Scatter graph
- D Histogram

2 **Which chart is best for showing how a town's average temperature changed month by month over a year?**

- A Pie chart
- B Pictogram
- C Line graph
- D Stacked bar chart

3 **Why do the bars of a histogram touch?**

- A To save space
- B The data is on a continuous scale
- C There are too many classes
- D Every bar is the same height

4 **A pie chart shows the answers of 24 students. How many degrees stand for one student?**

- A 10°
- B 15°
- C 24°
- D 36°

5 **A journey takes exactly 10 minutes. Which class does it belong in?**

- A $5 \le t < 10$
- B $10 \le t < 15$
- C Both classes
- D Neither class

6 **On a scatter graph, as one value increases the other decreases. What is this called?**

- A Positive correlation
- B Negative correlation
- C No correlation
- D An outlier

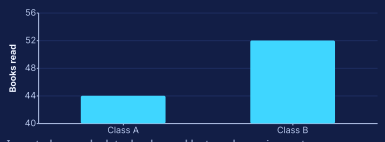
7 **Which of these is continuous data?**

- A Number of pets
- B Shoe size
- C Favourite colour
- D Time to run 100 m

8 **Why does an energy bill compare this January with last January, not with last July?**

- A January bills are cheaper
- B July has no data
- C It allows for the seasons
- D Bills must use 12 bars

Use this chart for questions 9 and 10



Invented example data: books read by two classes in one term.

9 **Using the chart, how many more books did Class B read than Class A?**

.....

10 **Class B's bar looks three times as tall as Class A's. Explain why this is misleading and how to fix it.**

.....

ANSWERS

1. B: Bar chart (separate categories)
2. C: Line graph (change over time)
3. B: The data is on a continuous scale
4. B: 15° (360 ÷ 24)
5. B: $10 \le t < 15$
6. B: Negative correlation
7. D: Time to run 100 m (it is measured)
8. C: It allows for the seasons
9. 8 books (52 − 44)
10. The axis starts at 40, so the bars show only 4 and 12. B read about 18% more, not 3 times as many. Start the axis at 0.

SERIES COMPLETE

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