Scatter Plots and Correlation

Students describe scatter plots by direction, form, and strength, interpret the correlation coefficient r as the direction and strength of a linear relationship, match r values to plots, and read the graphing window as the domain and range of the data.

TIME	40 minutes (one student with a parent or tutor, or a small group)
WHO	Math 1 (algebra readiness), about age 12. Follows Unit 9. Opens Unit 10; read the family-of-graphs note first.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 interactive page for this lesson (the scatter plot builder needs a screen), pencil. A graphing calculator is optional.
PRIOR KNOWLEDGE	Scatter plots and association (8th grade). Lines and slope (Unit 3). Domain and range (Unit 2). Adds or multiplies (Units 7 and 9).
STANDARDS	NC.M1.S-ID.8, NC.M1.S-ID.6a.
KEEP OUT	Computing r by hand. The line of best fit (Lesson 2). Residuals (Lesson 3).

Learning goals

1. Describe a scatter plot by direction, form, and strength.
2. Interpret r: the sign as direction and the size as strength, from –1 to 1.
3. Match values of r to scatter plots with a two-look habit.
4. Read the graphing window as roughly the domain and range of the data.

Vocabulary: say both, every time

The rule for the whole lesson: whenever the adult or the student says a math word, they follow it with the plain-English version. Proper term first, plain English second, until the student does it without being asked.

TERM	LOOKS LIKE	PLAIN ENGLISH
Scatter plot	one dot per case	Input across, output up.
Association	a pattern	Positive or negative.
Correlation coefficient	r, from –1 to 1	Direction and strength of a linear relationship.
Window	domain and range	Read it first.

> THE ONE SENTENCE TO SAY OUT LOUD
>
> Direction, form, strength. The sign of r is the direction, the size is the strength, and r is only about lines.

Lesson timeline (40 minutes)

0:00 to 0:05	**Warm-up: exact or messy?** Show 3, 5, 7, 9 and then 3, 5.2, 6.8, 9.1. Ask: what is the rule for the second one? There is no exact rule. That is this unit.
0:05 to 0:15	**Mini-lesson: three ways to describe.** Direction, form, strength, with quick sketches. Read a window: what is measured, between what values.
0:15 to 0:25	**r.** The number line from –1 to 1. Sign and size. What r = 0.97 tells you. Then the scatter plot builder: make r near 1, near –1, near 0. Give the warning that r is only about lines.
0:25 to 0:36	**Match and practice.** Match r to the six plots with two looks, then the practice problems or Worksheet Parts A to D. Same buttons: Hint, Show next step, Reveal answer, Hide help.
0:36 to 0:40	**Exit ticket.** Worksheet Part E. Success looks like three correct statements about r = 0.97.

Misconceptions to listen for

- **A negative r is weak.** The sign is direction; –0.9 is strong.
- **r near 0 means nothing is going on.** It means no straight-line pattern; there could be a curve.
- **r can be bigger than 1.** Never.
- **A big r proves a line is right.** Not by itself: see Lesson 3.
- **A big r shows cause.** It does not: see Lesson 5.

Support and stretch

Support

Use hand gestures for direction (arm rising or falling) and for strength (hands close together or far apart). Let the student build three plots in the tool before reading any r value.

Stretch

Ask the student to build a plot with r close to 0 that still has a clear pattern (a U shape). Ask what one far-away point does to r.

Where this goes next

Lesson 2: the line of best fit. Technology finds the line that comes closest to all the points, and you read its slope and y-intercept in the story.

> THE HABIT TO BUILD
>
> Read the window, then direction, form, and strength, then let r confirm what you see.