MATHEMATICS · GRADES 7-9

Misleading Graphs and Data Displays

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you spot a graph that is trying to trick you, like bars that do not start at zero making a small change look huge. A graph can be honest or misleading depending on its scale, its starting point, and what it leaves out, and the tricks are the same ones used in ads and news every day. Knowing how to spot them keeps you from being fooled by a chart in a news story, an ad for a product, or a graph in a report that is trying to sell you a conclusion.



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Rule

Misleading graphs: a graph misleads when its axis does not start at zero, so small differences look huge, or when pictures of different sizes stand for counts, so the area exaggerates the difference.

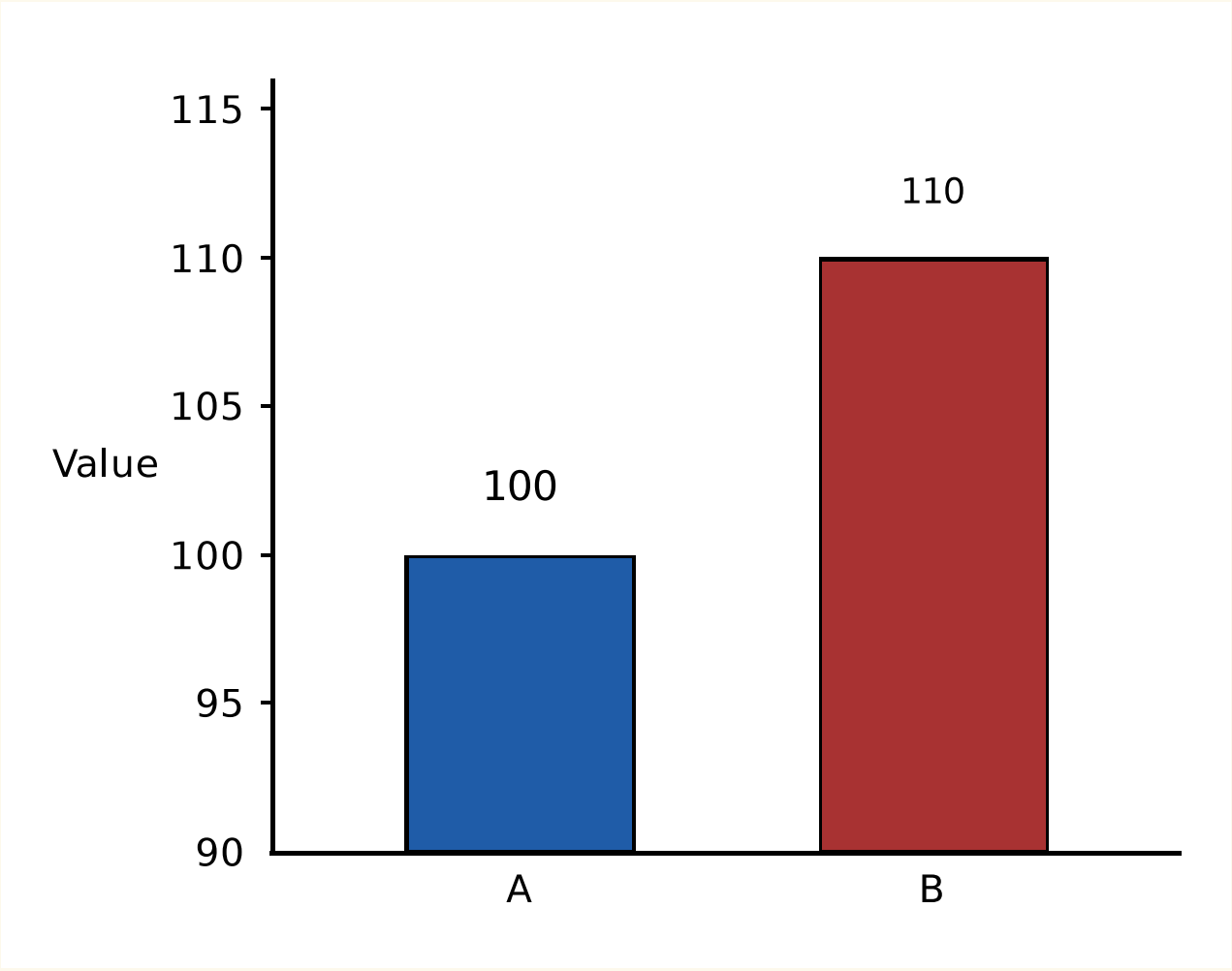
Check the axis first: it should start at zero. Check the pictures: doubling the height and the width makes the area four times bigger, not twice as big.

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Worked examples

EXAMPLE 1

Q A bar chart starts at 90 instead of 0, making a rise from 100 to 110 look huge. Why is it misleading?



SOLUTION

Check the axis: it starts at 90, not 0.

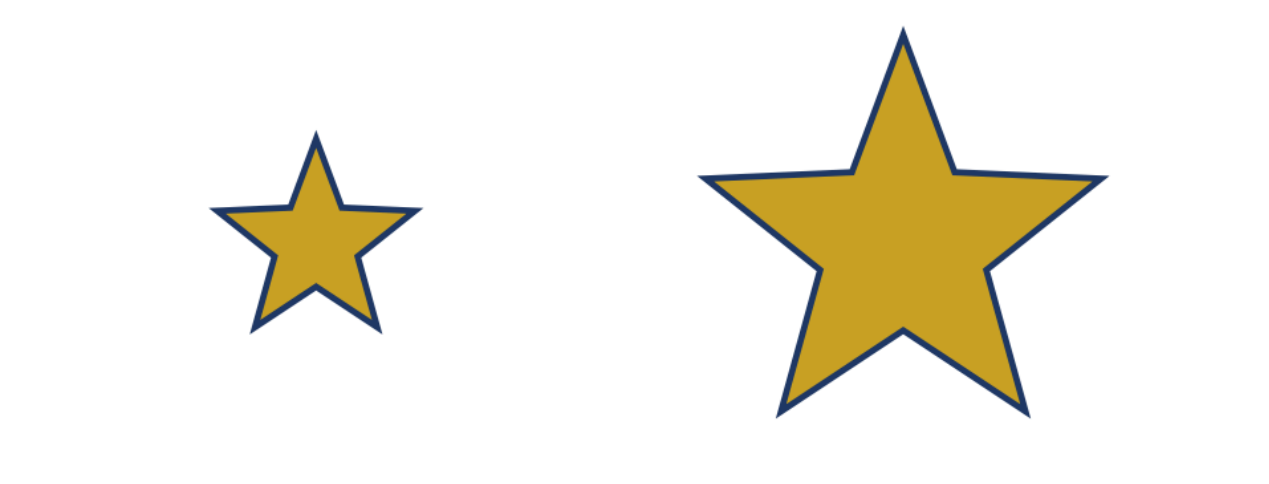
Bars are cut off, so the taller bar looks many times taller, not just 10 percent taller.

It is misleading because the axis does not start at zero.

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EXAMPLE 2

Q A graph uses pictures of different sizes to show counts. Why can that mislead?



SOLUTION

Bigger pictures look much bigger in area, not just in height.

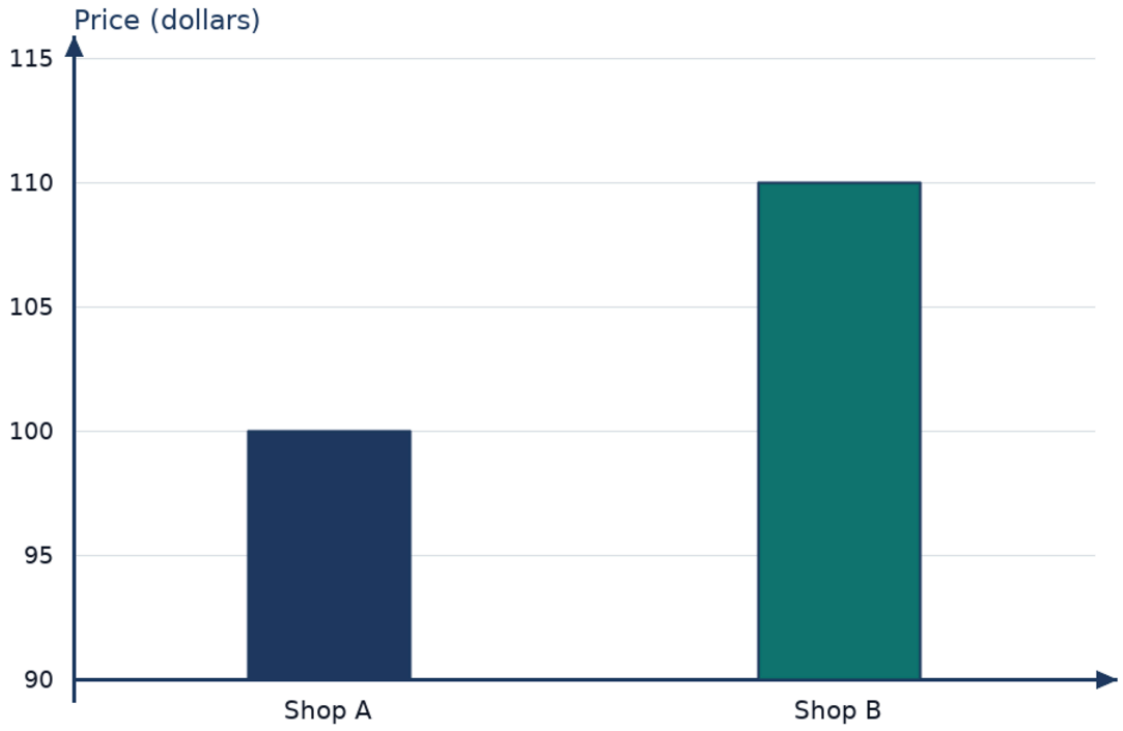
Doubling height and width: 2 × 2 = 4 times bigger in area.

It exaggerates the difference.

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Practice questions

1 The bar chart shows what two shops charge for the same bike. Shop A charges $100 and Shop B charges $110, but the axis starts at $90. How much more does Shop B charge than Shop A?



A $10

B $20

C $110

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2 **The pictograph shows cats and dogs at a shelter. It shows 10 cats and 20 dogs, but the dog picture is drawn much bigger than the cat picture. What is misleading about it?**



10 cats



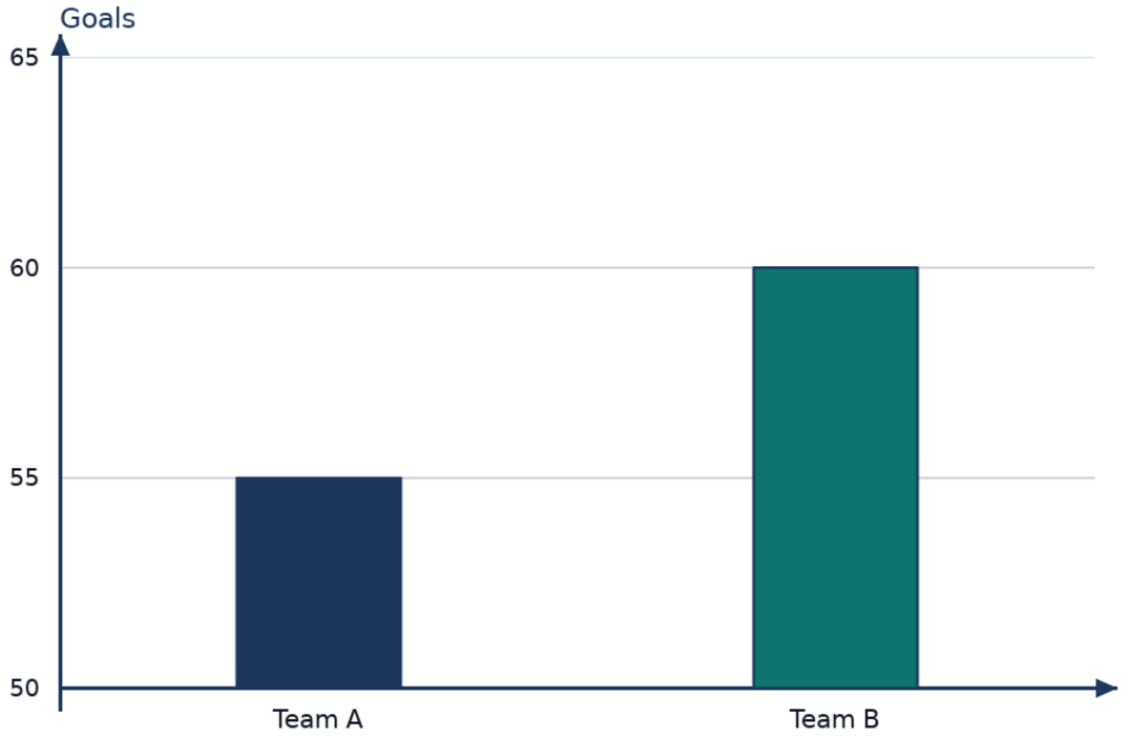
20 dogs

- **A** The dog picture looks far more than twice as big as the cat picture.
- **B** The pictograph shows more dogs than cats.
- **C** The pictograph uses pictures instead of bars.

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3 Two teams scored goals, and the axis starts at 50. Is it misleading? Answer yes or no.



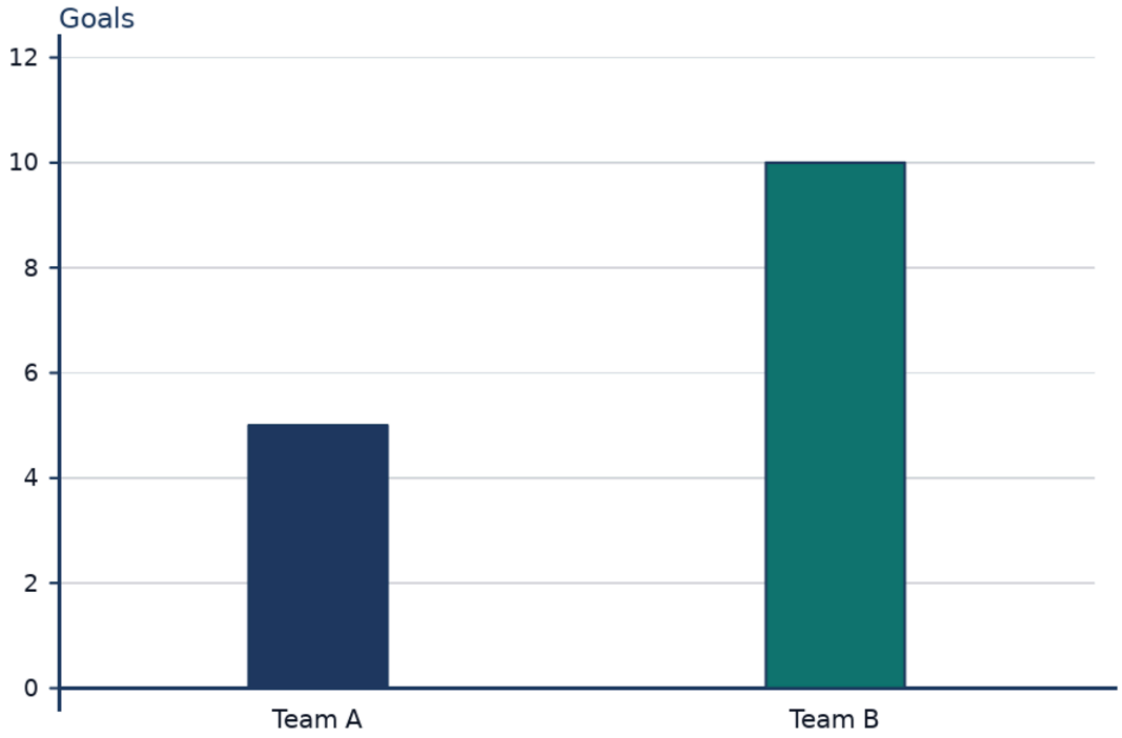
A No

B Yes

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4 Two teams scored goals, and the axis starts at 0. Is that fair? Answer yes or no.



A Yes

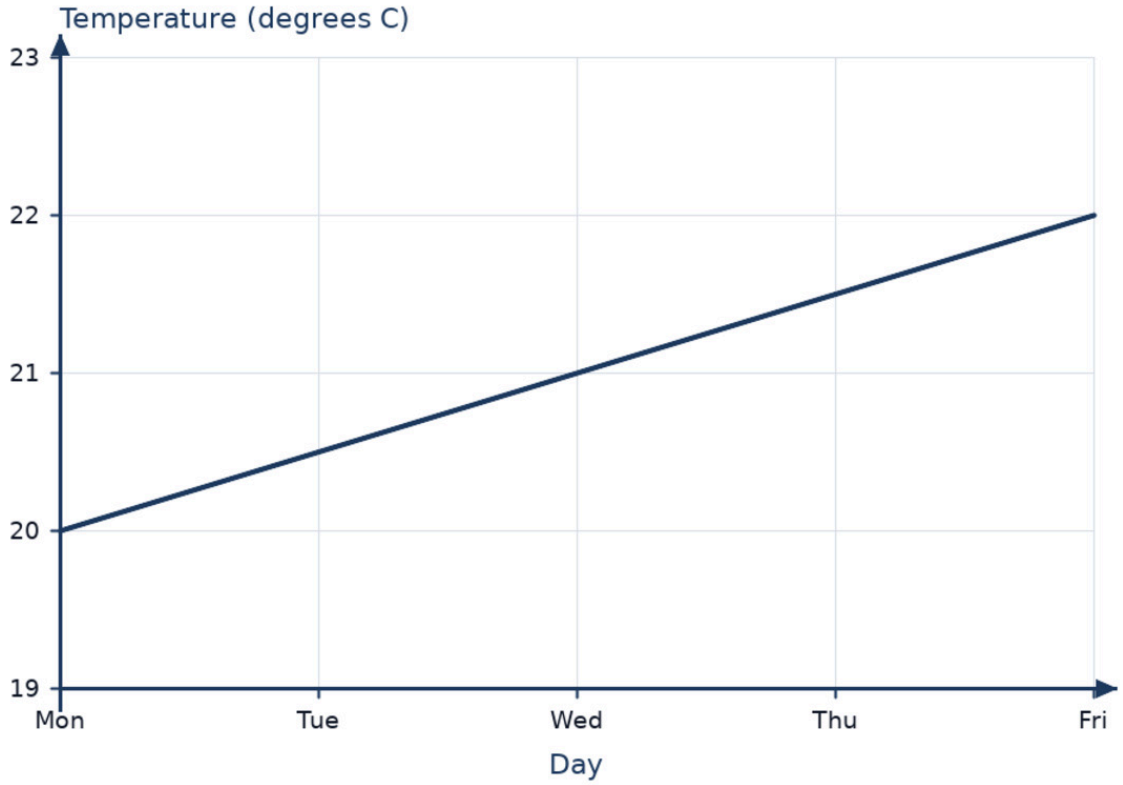
B No

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5 The temperature over a week is shown with the temperature axis stretched. Is it misleading? Answer yes or no.



A No

B Yes

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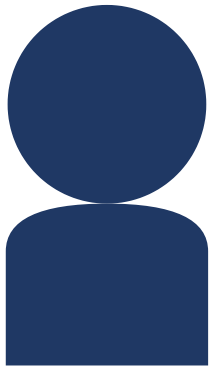
6 **A shop reports its weekly sales but leaves out Wednesday's sales. Is that misleading? Answer yes or no.**

A No

B Yes

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7 **The pictograph shows the people in two rooms. Is it fair? Answer yes or no.**



10 people



5 people

A No

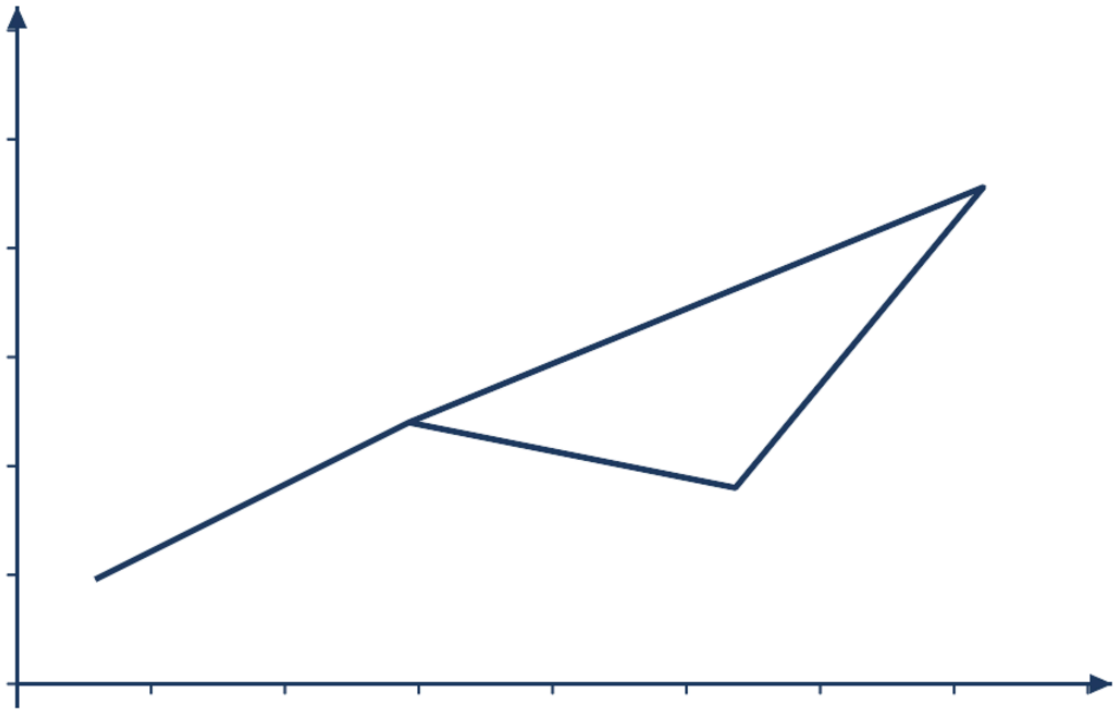
B Yes

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8

The graph has no labels on its axes. What is the problem?



A You cannot read the values.

B The bars are too tall.

C The graph has too many colours.

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9 **The two graphs show the same sales data with different scales. Can they look different? Answer yes or no.**



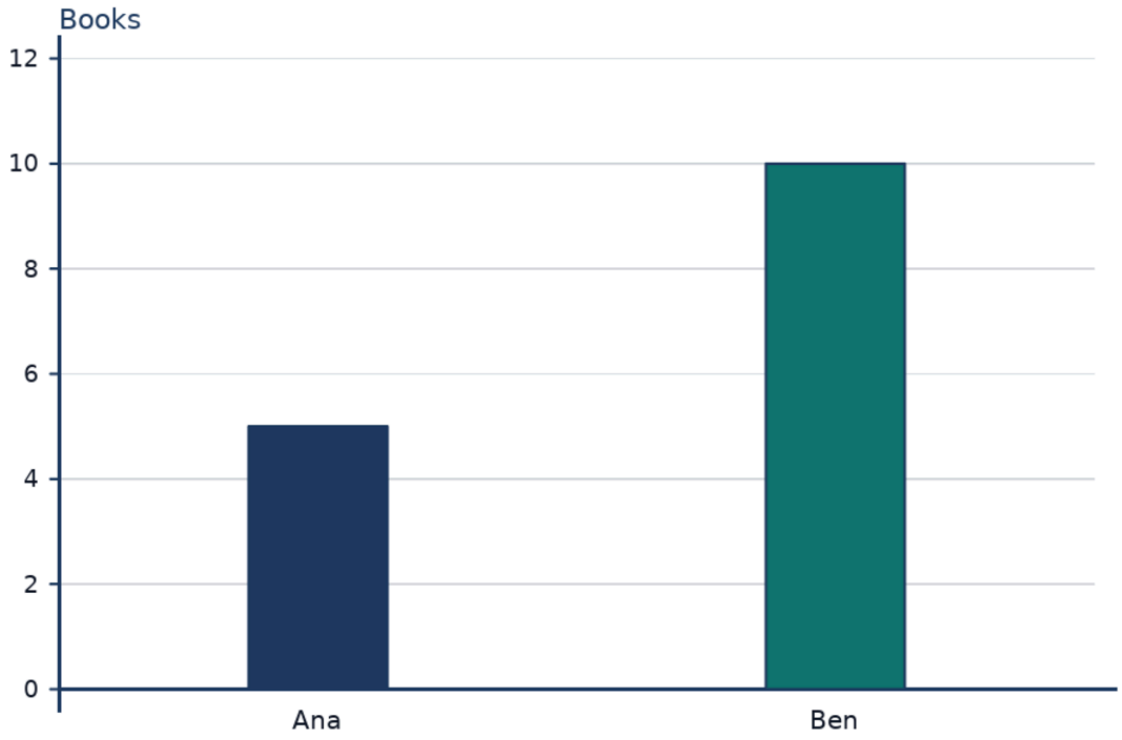
A Yes

B No

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10 The bar chart shows the books read by Ana and Ben, and the axis starts at 0. How many times as many books did Ben read as Ana?



A Twice

B Three times

C Four times

D Half as many

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ANSWER KEY

1. $10

2. The dog picture looks far more than twice as big as the cat picture.

3. Yes

4. Yes

5. Yes

6. Yes

7. Yes

8. You cannot read the values.

9. Yes

10. Twice

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