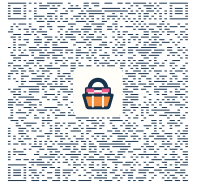


Algebra 1 Linear Functions Workbook

4 lessons · printable · answer key at the back



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Intercepts

WORKED EXAMPLE

$$2x - 5y = 10 \quad x = \underline{5}$$

$$2x - 5y = 10, y = 0$$

$$2x = 10$$

$$x = 5$$

1. Intercepts of a line

Find the x-intercept of each line.

1 $2x + y = 6$ $x = \underline{\quad}$

2 $8x + y = 8$ $x = \underline{\quad}$

3 $x + y = -3$ $x = \underline{\quad}$

4 $9x + 4y = 36$ $x = \underline{\quad}$

5 $x - y = 5$ $x = \underline{\quad}$

6 $4x + y = -8$ $x = \underline{\quad}$

7 $3x - 5y = 15$ $x = \underline{\quad}$

8 $x - 4y = 8$ $x = \underline{\quad}$

9 $6x - 7y = -42$ $x = \underline{\quad}$

10 $x + 5y = 5$ $x = \underline{\quad}$

11 $5x - 3y = -15$ $x = \underline{\quad}$

12 $3x - y = 6$ $x = \underline{\quad}$

13 $x + 3y = 3$ $x = \underline{\quad}$

14 $x - y = -5$ $x = \underline{\quad}$

15 $9x + 2y = 18$ $x = \underline{\quad}$

16 $7x - 2y = 14$ $x = \underline{\quad}$

2. Absolute value

Work out each one. The bars ask how far the number is from zero.

17 $|3 - 9| = \underline{\quad}$ 18 $|15 - 17| = \underline{\quad}$ 19 $|3| + |-9| = \underline{\quad}$ 20 $|10| = \underline{\quad}$

21 $|3 - 7| = \underline{\quad}$ 22 $|5| + |-8| = \underline{\quad}$ 23 $|5 - 12| = \underline{\quad}$ 24 $|2| + |-1| = \underline{\quad}$

25 $|8| + |-7| = \underline{\quad}$ 26 $|-1| + |2| = \underline{\quad}$

Writing the Equation of a Line

WORKED EXAMPLE

through (2, 5) and (4, 11)

$$\text{slope} = (11 - 5) \div (4 - 2)$$

$$6 \div 2 = 3$$

$$b = 5 - (3)(2) = -1$$

$$y = 3x - 1$$

3. Write the equation of a line

Write the equation of each line through the two points.

1 through (-2, 7) and (1, 10)

2 through (1, 2) and (3, 10)

3 through (-2, -1) and (1, 8)

4 through (2, 2) and (4, 4)

5 through (-3, 7) and (-1, -1)

6 through (-3, -10) and (-1, -8)

7 through (-3, -4) and (-1, -2)

8 through (-2, 5) and (1, 8)

9 through (1, 1) and (2, 5)

10 through (-2, 12) and (1, 6)

11 through (1, 7) and (3, 15)

12 through (-3, -11) and (-1, -5)

3. Write the equation of a line (continued)

Write the equation of each line through the two points.

13 through (1, 2) and (2, -1)

14 through (-3, 4) and (-1, -4)

15 through (-3, 9) and (-1, 5)

16 through (1, 5) and (2, 4)

4. Absolute value equations

Solve each equation. Each has two answers.

17 $|x - 2| = 2$

18 $|x - 2| = 5$

19 $|x + 6| = 2$

20 $|x - 3| = 2$

21 $|x - 4| = 8$

22 $|x - 2| = 6$

23 $|x - 1| = 4$

24 $|x - 2| = 4$

25 $|x - 3| = 5$

26 $|x + 1| = 9$

WORKED EXAMPLE

$$f(x) = x + 3 \quad f(3) = \underline{6}$$

5. Function notation and composition

Work out the value each function asks for.

1 $f(x) = -x + 5 \quad f(11) = \underline{\hspace{2cm}}$

2 $f(x) = -x - 16 \quad f(7) = \underline{\hspace{2cm}}$

3 $f(x) = 9x - 14 \quad f(2) = \underline{\hspace{2cm}}$

4 $f(x) = 7x + 10 \quad f(5) = \underline{\hspace{2cm}}$

5 $f(x) = -2x + 10 \quad f(-3) = \underline{\hspace{2cm}}$

6 $f(x) = x - 1 \quad f(6) = \underline{\hspace{2cm}}$

7 $f(x) = -6x + 7 \quad f(9) = \underline{\hspace{2cm}}$

8 $f(x) = 7x + 7 \quad f(-3) = \underline{\hspace{2cm}}$

9 $f(x) = -5x - 4 \quad f(3) = \underline{\hspace{2cm}}$

10 $f(x) = 7x + 2 \quad f(8) = \underline{\hspace{2cm}}$

11 $f(x) = 4x + 11 \quad f(3) = \underline{\hspace{2cm}}$

12 $f(x) = x + 7 \quad f(-1) = \underline{\hspace{2cm}}$

13 $f(x) = 9x + 18 \quad f(9) = \underline{\hspace{2cm}}$

14 $f(x) = -2x - 12 \quad f(6) = \underline{\hspace{2cm}}$

15 $f(x) = 4x + 7 \quad f(10) = \underline{\hspace{2cm}}$

16 $f(x) = -x + 7 \quad f(3) = \underline{\hspace{2cm}}$

17 $f(x) = -3x + 15 \quad f(-5) = \underline{\hspace{2cm}}$

18 $f(x) = -6x + 11 \quad f(-2) = \underline{\hspace{2cm}}$

19 $f(x) = 9x - 10 \quad f(3) = \underline{\hspace{2cm}}$

20 $f(x) = -8x - 9 \quad f(-5) = \underline{\hspace{2cm}}$

6. Inequalities

Solve each one, then write $>$, $<$, $\geq$ or $\leq$ in the box.

21 $9x + 7 \geq -2 \quad x \boxed{} -1$

22 $-7x < 28 \quad x \boxed{} -4$

23 $7x + 4 \geq -94 \quad x \boxed{} -14$

24 $-5x > 75 \quad x \boxed{} -15$

25 $2x \geq -96 \quad x \boxed{} -48$

26 $6x + 4 \leq 64 \quad x \boxed{} 10$

27 $-2x + 8 \geq 68 \quad x \boxed{} -30$

28 $x - 8 > 33 \quad x \boxed{} 41$

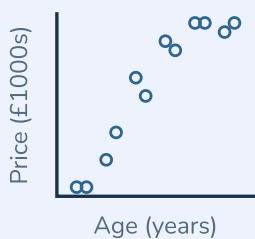
29 $6x < -60 \quad x \boxed{} -10$

30 $x + 7 > 99 \quad x \boxed{} 92$

Scatter Plots and Trend Lines

WORKED EXAMPLE

Age and price of a used car



Is the association positive, negative or none?

positive

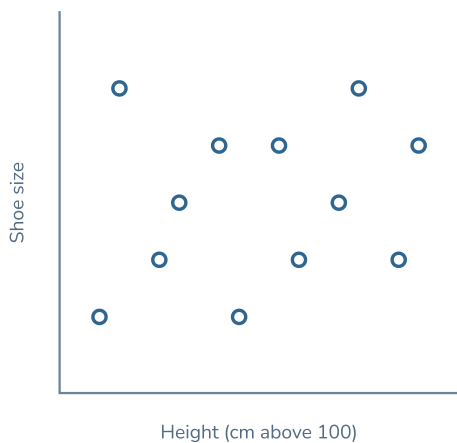
negative

none

7. Scatter plots

Read each scatter plot and circle the answer.

Height and shoe size



Walking and steps taken



1 Is there a point well away from the rest?

yes no

3 Is the association positive, negative or none?

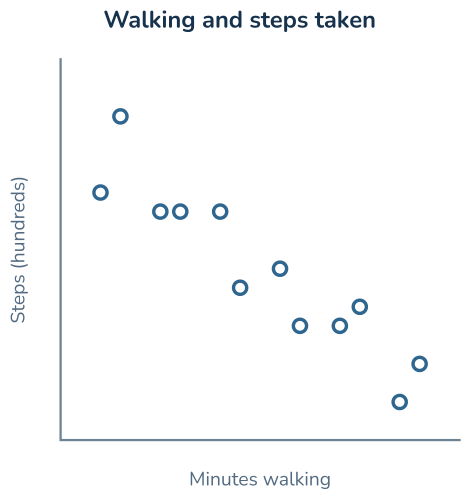
positive negative none

2 Do the points cluster along a line, or spread out?

along a line spread out

7. Scatter plots (continued)

Read each scatter plot and circle the answer.



4 Is there a point well away from the rest?
yes no

6 Is the association positive, negative or none?
positive negative none

5 Do the points cluster along a line, or spread out?
along a line spread out

8. Intercepts of a line

Find the x-intercept of each line.

7 $7x + 8y = 56$ $x =$ ____

8 $x - 6y = 6$ $x =$ ____

9 $2x + 3y = -12$ $x =$ ____

10 $5x - 6y = 30$ $x =$ ____

11 $7x + 8y = -56$ $x =$ ____

12 $8x - 7y = 56$ $x =$ ____

Answer Key (1 of 2)

Intercepts

Intercepts of a line

1. $2x + y = 6$ the x-intercept = 3
2. $8x + y = 8$ the x-intercept = 1
3. $x + y = -3$ the x-intercept = -3
4. $9x + 4y = 36$ the x-intercept = 4
5. $x - y = 5$ the x-intercept = 5
6. $4x + y = -8$ the x-intercept = -2
7. $3x - 5y = 15$ the x-intercept = 5
8. $x - 4y = 8$ the x-intercept = 8
9. $6x - 7y = -42$ the x-intercept = -7
10. $x + 5y = 5$ the x-intercept = 5
11. $5x - 3y = -15$ the x-intercept = -3
12. $3x - y = 6$ the x-intercept = 2
13. $x + 3y = 3$ the x-intercept = 3
14. $x - y = -5$ the x-intercept = -5
15. $9x + 2y = 18$ the x-intercept = 2
16. $7x - 2y = 14$ the x-intercept = 2

Absolute value

17. $|3 - 9| \rightarrow 6$
18. $|15 - 17| \rightarrow 2$
19. $|3| + |-9| \rightarrow 12$
20. $|10| \rightarrow 10$
21. $|3 - 7| \rightarrow 4$
22. $|5| + |-8| \rightarrow 13$
23. $|5 - 12| \rightarrow 7$
24. $|2| + |-1| \rightarrow 3$
25. $|8| + |-7| \rightarrow 15$
26. $|-1| + |2| \rightarrow 3$

Writing the Equation of a Line

Write the equation of a line

1. through $(-2, 7)$ and $(1, 10) \rightarrow y = x + 9$
2. through $(1, 2)$ and $(3, 10) \rightarrow y = 4x - 2$
3. through $(-2, -1)$ and $(1, 8) \rightarrow y = 3x + 5$
4. through $(2, 2)$ and $(4, 4) \rightarrow y = x$
5. through $(-3, 7)$ and $(-1, -1) \rightarrow y = -4x - 5$
6. through $(-3, -10)$ and $(-1, -8) \rightarrow y = x - 7$
7. through $(-3, -4)$ and $(-1, -2) \rightarrow y = x - 1$
8. through $(-2, 5)$ and $(1, 8) \rightarrow y = x + 7$
9. through $(1, 1)$ and $(2, 5) \rightarrow y = 4x - 3$
10. through $(-2, 12)$ and $(1, 6) \rightarrow y = -2x + 8$
11. through $(1, 7)$ and $(3, 15) \rightarrow y = 4x + 3$
12. through $(-3, -11)$ and $(-1, -5) \rightarrow y = 3x - 2$
13. through $(1, 2)$ and $(2, -1) \rightarrow y = -3x + 5$
14. through $(-3, 4)$ and $(-1, -4) \rightarrow y = -4x - 8$
15. through $(-3, 9)$ and $(-1, 5) \rightarrow y = -2x + 3$
16. through $(1, 5)$ and $(2, 4) \rightarrow y = -x + 6$

Writing the Equation of a Line (continued)

Absolute value equations

17. $|x - 2| = 2 \rightarrow x = 0$ or $x = 4$
18. $|x - 2| = 5 \rightarrow x = -3$ or $x = 7$
19. $|x + 6| = 2 \rightarrow x = -8$ or $x = -4$
20. $|x - 3| = 2 \rightarrow x = 1$ or $x = 5$
21. $|x - 4| = 8 \rightarrow x = -4$ or $x = 12$
22. $|x - 2| = 6 \rightarrow x = -4$ or $x = 8$
23. $|x - 1| = 4 \rightarrow x = -3$ or $x = 5$
24. $|x - 2| = 4 \rightarrow x = -2$ or $x = 6$
25. $|x - 3| = 5 \rightarrow x = -2$ or $x = 8$
26. $|x + 1| = 9 \rightarrow x = -10$ or $x = 8$

Function Notation

Function notation and composition

1. $f(x) = -x + 5$ $f(11) = -6$
2. $f(x) = -x - 16$ $f(7) = -23$
3. $f(x) = 9x - 14$ $f(2) = 4$
4. $f(x) = 7x + 10$ $f(5) = 45$
5. $f(x) = -2x + 10$ $f(-3) = 16$
6. $f(x) = x - 1$ $f(6) = 5$
7. $f(x) = -6x + 7$ $f(9) = -47$
8. $f(x) = 7x + 7$ $f(-3) = -14$
9. $f(x) = -5x - 4$ $f(3) = -19$
10. $f(x) = 7x + 2$ $f(8) = 58$
11. $f(x) = 4x + 11$ $f(3) = 23$
12. $f(x) = x + 7$ $f(-1) = 6$
13. $f(x) = 9x + 18$ $f(9) = 99$
14. $f(x) = -2x - 12$ $f(6) = -24$
15. $f(x) = 4x + 7$ $f(10) = 47$
16. $f(x) = -x + 7$ $f(3) = 4$
17. $f(x) = -3x + 15$ $f(-5) = 30$
18. $f(x) = -6x + 11$ $f(-2) = 23$
19. $f(x) = 9x - 10$ $f(3) = 17$
20. $f(x) = -8x - 9$ $f(-5) = 31$

Inequalities

21. $9x + 7 \geq -2 \rightarrow x \geq -1$
22. $-7x < 28 \rightarrow x > -4$
23. $7x + 4 \geq -94 \rightarrow x \geq -14$
24. $-5x > 75 \rightarrow x < -15$
25. $2x \geq -96 \rightarrow x \geq -48$
26. $6x + 4 \leq 64 \rightarrow x \leq 10$
27. $-2x + 8 \geq 68 \rightarrow x \leq -30$
28. $x - 8 > 33 \rightarrow x > 41$
29. $6x < -60 \rightarrow x < -10$
30. $x + 7 > 99 \rightarrow x > 92$

Answer Key (2 of 2)

Scatter Plots and Trend Lines

Scatter plots

1. Shoe size against Height (cm above 100) — Is there a point well away from the rest? no
2. Shoe size against Height (cm above 100) — Do the points cluster along a line, or spread out? spread out
3. Steps (hundreds) against Minutes walking — Is the association positive, negative or none? none
4. Steps (hundreds) against Minutes walking — Is there a point well away from the rest? no
5. Steps (hundreds) against Minutes walking — Do the points cluster along a line, or spread out? along a line
6. Score against Hours practiced — Is the association positive, negative or none? none

Intercepts of a line

7. $7x + 8y = 56$ the x-intercept = 8
8. $x - 6y = 6$ the x-intercept = 6
9. $2x + 3y = -12$ the x-intercept = -6
10. $5x - 6y = 30$ the x-intercept = 6
11. $7x + 8y = -56$ the x-intercept = -8
12. $8x - 7y = 56$ the x-intercept = 7

Solutions (1 of 7)

Intercepts

Intercepts of a line

1. $2x + y = 6$ $x =$

$$2x + y = 6 \quad y = 0$$

$$2x = 6$$

$$x = 3$$

The x-intercept is where the line crosses the x-axis, and there $y = 0$. Put $y = 0$ into $2x + y = 6$.

The y-term disappears, leaving $2x = 6$.

Divide by 2: $6 \div 2 = 3$ — so the x-intercept is 3.

2. $8x + y = 8$ $x =$

$$8x + y = 8 \quad y = 0$$

$$8x = 8$$

$$x = 1$$

The x-intercept is where the line crosses the x-axis, and there $y = 0$. Put $y = 0$ into $8x + y = 8$.

The y-term disappears, leaving $8x = 8$.

Divide by 8: $8 \div 8 = 1$ — so the x-intercept is 1.

Absolute value

17. $|3 - 9| =$

$$|3 - 9|$$

$$3 - 9 = -6$$

$$|3 - 9| = 6$$

The two bars ask for a DISTANCE: how far the thing between them is from zero. A distance is never negative, and that is a fact about distance rather than a rule about minus signs.

The bars work like brackets: everything inside gets worked out BEFORE the distance is taken. $3 - 9 = -6$.

Now the distance of that from zero: 6. Which is also how far apart 3 and 9 are — the same question read the other way round.

Solutions (2 of 7)

Intercepts (continued)

Absolute value (continued)

18. $|15 - 17| = \underline{\hspace{1cm}}$

$$\begin{array}{rcl} & |15 - 17| & \\ 15 & - & 17 = -2 \\ |15 - 17| & = & 2 \end{array}$$

The two bars ask for a DISTANCE: how far the thing between them is from zero. A distance is never negative, and that is a fact about distance rather than a rule about minus signs.

The bars work like brackets: everything inside gets worked out BEFORE the distance is taken. $15 - 17 = -2$.

Now the distance of that from zero: 2. Which is also how far apart 15 and 17 are — the same question read the other way round.

Writing the Equation of a Line

Write the equation of a line

1. through $(-2, 7)$ and $(1, 10)$

$$\text{slope} = (10 - 7) \div (1 - (-2))$$

$$3 \div 3 = 1$$

$$b = 7 - (1)(-2) = 9$$

$$y = x + 9$$

Find the slope first: rise over run, $(10 - 7) \div (1 - (-2)) = 1$.

Put a point back in to find b: $b = y - mx = 7 - (1)(-2) = 9$.

Write it as $y = mx + b$: $y = x + 9$.

2. through $(1, 2)$ and $(3, 10)$

$$\text{slope} = (10 - 2) \div (3 - 1)$$

$$8 \div 2 = 4$$

$$b = 2 - (4)(1) = -2$$

$$y = 4x - 2$$

Find the slope first: rise over run, $(10 - 2) \div (3 - 1) = 4$.

Put a point back in to find b: $b = y - mx = 2 - (4)(1) = -2$.

Write it as $y = mx + b$: $y = 4x - 2$.

Solutions (3 of 7)

Writing the Equation of a Line (continued)

Absolute value equations

17. $|x - 2| = 2$

$$x - 2 = 2 \quad \text{or} \quad x - 2 = -2$$

$$x - 2 = 2 \quad \rightarrow \quad x = 4$$

$$x - 2 = -2 \quad \rightarrow \quad x = 0$$

$$x = 0 \quad \text{or} \quad x = 4$$

The bars mean the inside is 2 away from zero — so it is 2 OR it is -2 . Split into two equations.

Solve the first, $x - 2 = 2$: add 2 to both sides: $x = 4$.

Solve the second, $x - 2 = -2$: add 2 to both sides: $x = 0$.

So $x = 0$ or $x = 4$ — both answers.

18. $|x - 2| = 5$

$$x - 2 = 5 \quad \text{or} \quad x - 2 = -5$$

$$x - 2 = 5 \quad \rightarrow \quad x = 7$$

$$x - 2 = -5 \quad \rightarrow \quad x = -3$$

$$x = -3 \quad \text{or} \quad x = 7$$

The bars mean the inside is 5 away from zero — so it is 5 OR it is -5 . Split into two equations.

Solve the first, $x - 2 = 5$: add 2 to both sides: $x = 7$.

Solve the second, $x - 2 = -5$: add 2 to both sides: $x = -3$.

So $x = -3$ or $x = 7$ — both answers.

Function Notation

Function notation and composition

1. $f(x) = -x + 5$ $f(11) =$ ____

$$f(x) = -x + 5 \quad \text{at} \quad x = 11$$

$$-1 \times 11 = -11$$

$$-11 + 5 = -6$$

$$f(11) = -6$$

$f(11)$ is a name for the value of the rule when $x = 11$. Put 11 where the x is — it is not f times 11.

Multiply first, sign and all: $-1 \times 11 = -11$.

Then add 5: $-11 + 5 = -6$.

So $f(11) = -6$.

Solutions (4 of 7)

Function Notation (continued)

Function notation and composition (continued)

2. $f(x) = -x - 16$ $f(7) =$ _____

$$f(x) = -x - 16 \quad \text{at} \quad x = 7$$

$$-1 \times 7 = -7$$

$$-7 - 16 = -23$$

$$f(7) = -23$$

$f(7)$ is a name for the value of the rule when $x = 7$. Put 7 where the x is — it is not f times 7.

Multiply first, sign and all: $-1 \times 7 = -7$.

Then subtract 16: $-7 - 16 = -23$.

So $f(7) = -23$.

Inequalities

21. $9x + 7 \geq -2$ $x \geq -1$

$$x \geq -1$$

An inequality comes apart exactly like an equation — the same moves, done to both sides. There is one extra rule and it arrives at the end, so start by ignoring the sign and solving for x .

7 was added last, so it comes off first — off BOTH sides: $-2 - 7 = -9$.

Now divide both sides by 9: $-9 \div 9 = -1$.

Nothing was divided by a negative here, so the sign has not moved: it is still $\geq$. That is the one thing to check on every one of these before writing the answer down.

So $x \geq -1$. That is a whole RANGE of numbers rather than one, which is what makes this different from an equation — and why the sign is half the answer.

Solutions (5 of 7)

Function Notation (continued)

Inequalities (continued)

22. $-7x < 28$ x -4

$$x > -4$$

An inequality comes apart exactly like an equation — the same moves, done to both sides. There is one extra rule and it arrives at the end, so start by ignoring the sign and solving for x .

Now divide both sides by -7 : $28 \div -7 = -4$.

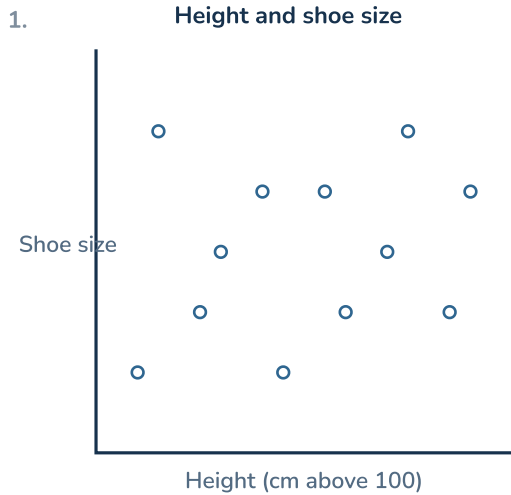
Here is the extra rule, and it is the only one: dividing both sides by a **NEGATIVE** turns the sign round, so $<$ becomes $>$. Do not take that on trust — put a number from the answer back into the question and see which way it has to face.

So $x > -4$. That is a whole **RANGE** of numbers rather than one, which is what makes this different from an equation — and why the sign is half the answer.

Solutions (6 of 7)

Scatter Plots and Trend Lines

Scatter plots



Is there a point well away from the rest?

yes no

no

A scatter plot puts two measurements against each other: Height (cm above 100) along the bottom, Shoe size up the side, and one dot for each thing measured. There is no single dot to read off — every question here is about what the whole cloud is doing.

An outlier is one point standing well away from all the others — not merely the highest or the lowest, which every set has, but one that has left the crowd.

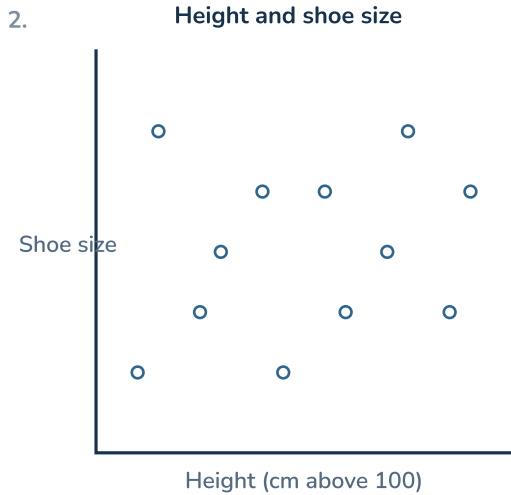
Every point is part of the same crowd. The end ones are further along, but none of them has left it — so no, there is no outlier here.

So the answer is "no". Say what that means for the two things rather than for the graph — and remember it is not a claim that one CAUSES the other. Two measurements can move together for a reason that is nothing to do with either of them.

Solutions (7 of 7)

Scatter Plots and Trend Lines (continued)

Scatter plots (continued)



Do the points cluster along a line, or spread out?

along a line spread out

spread out

A scatter plot puts two measurements against each other: Height (cm above 100) along the bottom, Shoe size up the side, and one dot for each thing measured. There is no single dot to read off — every question here is about what the whole cloud is doing.

This one is about how TIGHTLY the points hold to a line, which is a different question from which way they lean. A cloud can lean clearly and still be scattered wide.

They are scattered widely rather than hugging any line, so they SPREAD OUT.

So the answer is "spread out". Say what that means for the two things rather than for the graph — and remember it is not a claim that one CAUSES the other. Two measurements can move together for a reason that is nothing to do with either of them.