Algebra 1 Math Review Workbook

6 lessons · printable · answer key at the back

Name _____ Date _____

Contents

1-1

Absolute Value

WORKED EXAMPLE $|2 - 10| = 8$

1. Absolute value

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

1 $|17| =$ ___

2 $|7 - 19| =$ ___

3 $|-4| + |2| =$ ___

4 $|7 - 15| =$ ___

5 $|3 - 9| =$ ___

6 $|-3| + |8| =$ ___

7 $|3 - 11| =$ ___

8 $|13 - 14| =$ ___

9 How far apart are -12 and 1 on the number line? ___

10 $|8 - 10| =$ ___

11 $|-5| + |7| =$ ___

12 $|-8| =$ ___

13 $|7 - 11| =$ ___

14 $|11| + |-2| =$ ___

15 $|-5| =$ ___

16 $|4 - 9| =$ ___

17 $|2| + |-3| =$ ___

18 $|12 - 14| =$ ___

19 $|7 - 13| =$ ___

20 $|3| + |-11| =$ ___

21 $|8| =$ ___

22 $|11| + |-8| =$ ___

23 $|1 - 8| =$ ___

24 $|3| + |-8| =$ ___

2. Evaluate expressions

Put the number in place of the letter, then work each one out.

25 $x = 8$ $2x - 14 =$ ___

26 $x = 6$ $6x - 18 =$ ___

27 $a = 2, b = 7$ $3a + b =$ ___

28 $x = 3$ $4x - 5 =$ ___

29 $x = 6$ $3x - 17 =$ ___

30 $x = 7$ $2x + 18 =$ ___

31 $x = 4$ $5x - 3 =$ ___

32 $x = 8$ $4x - 18 =$ ___

33 $x = 6$ $7x - 4 =$ ___

34 $x = 2$ $7x + 9 =$ ___

Solving Inequalities

WORKED EXAMPLE

$x + 11 \leq 25 \quad x \boxed{\leq} 14$

$25 - 11 = 14$

$x \leq 14$

3. Inequalities

Solve each one, then write >, <, ≥ or ≤ in the box.

1 $6x + 9 > -39 \quad x \boxed{} -8$

2 $3x + 2 < -79 \quad x \boxed{} -27$

3 $x - 1 > 19 \quad x \boxed{} 20$

4 $2x \geq -2 \quad x \boxed{} -1$

5 $x + 8 \geq 65 \quad x \boxed{} 57$

6 $2x + 10 < 36 \quad x \boxed{} 13$

7 $2x > 64 \quad x \boxed{} 32$

8 $6x + 7 \geq -71 \quad x \boxed{} -13$

9 $3x + 4 > 22 \quad x \boxed{} 6$

10 $-4x + 12 > 44 \quad x \boxed{} -8$

11 $2x + 10 \leq 18 \quad x \boxed{} 4$

12 $x + 4 < 91 \quad x \boxed{} 87$

13 $4x + 6 < 18 \quad x \boxed{} 3$

14 $-3x \leq -30 \quad x \boxed{} 10$

15 $9x + 7 < -2 \quad x \boxed{} -1$

16 $3x + 7 \geq -86 \quad x \boxed{} -31$

17 $2x + 9 \leq -17 \quad x \boxed{} -13$

18 $-2x > 66 \quad x \boxed{} -33$

19 $2x + 4 \geq 48 \quad x \boxed{} 22$

20 $-6x \leq 48 \quad x \boxed{} -8$

4. Multiply out brackets

Multiply out each bracket.

21 $7(4x + 2)$

22 $4(2 + 5x)$

23 $3(4x + 12)$

24 $5(2x - 2)$

25 $6(5 + 3x)$

26 $4(7x + 3)$

27 $4(9x + 4)$

28 $4(x + 3)$

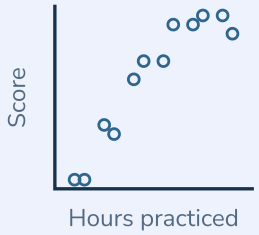
29 $2(4x + 9)$

30 $3(7x - 11)$

Scatter Plots and Trend Lines

WORKED EXAMPLE

Practice and test scores



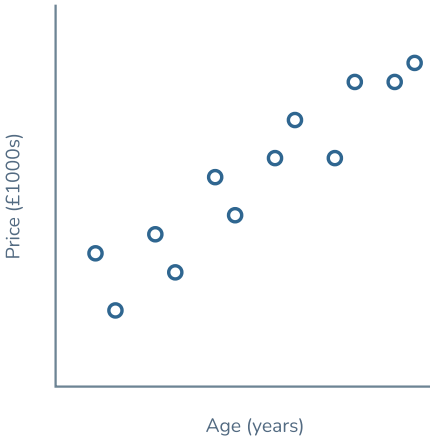
Do the points cluster along a line, or spread out?

(along a line) spread out

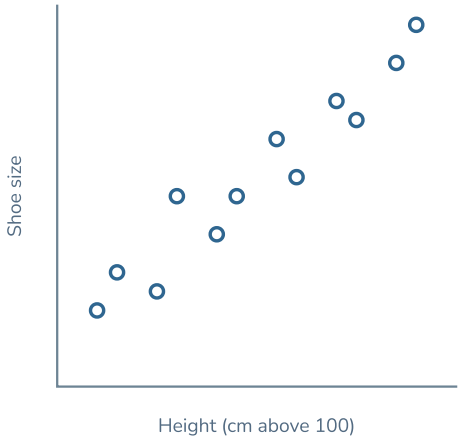
5. Scatter plots

Read each scatter plot and circle the answer.

Age and price of a used car



Height and shoe size



1 **Is there a point well away from the rest?**

yes no

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

along a line spread out

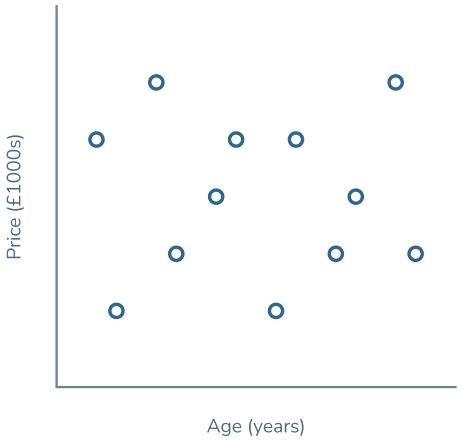
3 **Is the association positive, negative or none?**

positive negative none

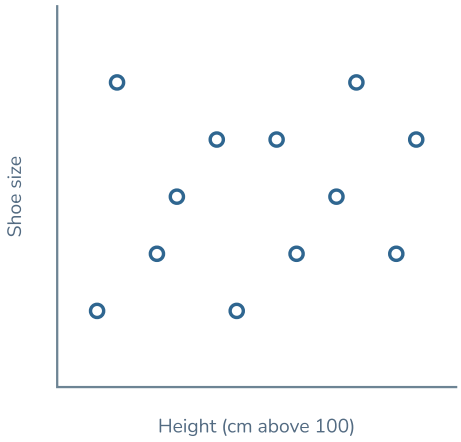
5. Scatter plots (continued)

Read each scatter plot and circle the answer.

Age and price of a used car



Height and shoe size



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

along a line spread out

5 **Is the association positive, negative or none?**

positive negative none

6 **Is the pattern linear or nonlinear?**

linear nonlinear

6. Intercepts of a line

Find the x-intercept of each line.

7 $x - y = -1$ **x =** ___

8 $5x - 6y = 30$ **x =** ___

9 $3x + 2y = 18$ **x =** ___

10 $7x + 8y = -56$ **x =** ___

11 $2x - y = 6$ **x =** ___

12 $3x + 2y = -12$ **x =** ___

Factoring Quadratics

WORKED EXAMPLE

$x^2 + 18x + 32$

multiply to 32 · add to 18
16 and 2
= (x + 16)(x + 2)

7. Factoring $x^2 + bx + c$

Factor each one.

1 $x^2 + 18x + 65$

2 $x^2 + 23x + 112$

3 $x^2 + 38x + 361$

4 $x^2 + 26x + 120$

5 $x^2 + 24x + 95$

6 $x^2 + 29x + 154$

7 $x^2 + 13x + 22$

8 $x^2 + 28x + 147$

9 $x^2 + 21x + 108$

10 $x^2 + 21x + 20$

11 $x^2 + 35x + 304$

12 $x^2 + 7x + 6$

13 $x^2 + 32x + 231$

14 $x^2 + 22x + 121$

15 $x^2 + 11x + 24$

16 $x^2 + 8x + 7$

17 $x^2 + 24x + 108$

18 $x^2 + 20x + 19$

19 $x^2 + 37x + 336$

20 $x^2 + 34x + 289$

8. Evaluate expressions

Put the number in place of the letter, then work each one out.

21 $x = 10$ $4x - 20 =$ ___

22 $x = 7$ $5x - 9 =$ ___

23 $x = 11$ $2x - 16 =$ ___

24 $a = 7, b = 5$ $6a + b =$ ___

25 $x = 7$ $3x + 7 =$ ___

26 $x = 2$ $8x + 2 =$ ___

27 $a = 10, b = 6$ $4a + b =$ ___

28 $a = 2, b = 4$ $3a + b =$ ___

29 $x = 10$ $5x - 17 =$ ___

30 $x = 12$ $4x - 13 =$ ___

How Many Solutions?

WORKED EXAMPLE

10x − 31 = 10x − 27

x is gone
−31 = −27 is false
no solution

9. How many solutions?

How many solutions does each equation have? Show how you know.

1 **−14x + 35 = −14x + 34**

2 **11x + 49 = 11x + 55**

3 **−15x − 23 = −23 − 15x**

4 **x − 44 = −44 + x**

5 **15x − 37 = −12x + 4**

6 **−12x + 49 = −12x + 51**

7 **20x + 25 = 20x + 28**

8 **2x − 24 = −7x + 1**

9 **17x + 25 = 25 + 17x**

10 **−2x + 12 = −2x + 14**

11 **5x − 15 = 11x**

12 **18x − 27 = −2x + 45**

13 **7x + 40 = 40 + 7x**

14 **16x + 23 = −6x + 55**

15 **5x − 50 = 12x + 24**

16 **12x + 58 = 58 + 12x**

17 **−16x + 26 = 8x + 54**

18 **7x − 49 = −10x − 44**

19 **−9x = −9x + 5**

20 **17x + 7 = 14x + 10**

10. Factoring $x^2 + bx + c$

Factor each one.

21 $x^2 + 28x + 171$

22 $x^2 + 25x + 150$

23 $x^2 + 24x + 63$

24 $x^2 + 36x + 315$

25 $x^2 + 24x + 23$

26 $x^2 + 41x + 414$

27 $x^2 + 39x + 360$

28 $x^2 + 4x + 4$

29 $x^2 + 26x + 105$

30 $x^2 + 6x + 8$

Check the Expansion

11. Check the expansion

Read each line of working and choose the answer that is correct.

1 **On Sam's paper: $(x + 6)^2 - 36 = 2x - 24$. Which line should replace it?**

$x^2 + 12x + 36$ | $2x - 24$ | $x^2 + 12x$ | $x^2 + 6x$

Why? .....

2 **Theo wrote $(x + 12)^2 - 144 = 2x - 120$. Which is correct?**

$2x - 120$ | $x^2 + 24x + 144$ | $x^2 + 24x$ | $x^2 + 12x$

Why? .....

3 **Imani says $(x + 10)^2 - 100$ comes to $x^2 + 10x$. Which is correct?**

$x^2 + 20x$ | x^2 | $x^2 + 10x$ | $x^2 + 20x + 100$

Why? .....

4 **Sam says $(x + 3)^2 - 9$ comes to $x^2 + 6x$. Which is correct?**

$x^2 + 6x$ | $x^2 + 6x + 9$ | $x^2 + 3x$ | x^2

Why? .....

5 **Ana wrote $(x + 5)^2 - 25 = x^2 + 10x + 25$. Which is correct?**

$x^2 + 10x + 25$ | x^2 | $x^2 + 5x$ | $x^2 + 10x$

Why? .....

6 **Noor says $(x + 7)^2 - 49$ comes to $x^2 + 14x$. Which is correct?**

$x^2 + 14x$ | x^2 | $x^2 + 7x$ | $x^2 + 14x + 49$

Why? .....

7 **Check this line: $(x + 8)^2 - 64 = x^2 + 8x$. Which is correct?**

x^2 | $x^2 + 16x + 64$ | $x^2 + 8x$ | $x^2 + 16x$

Why? .....

8 **$(x + 11)^2 - 121 = x^2 + 22x + 121$ is wrong. Which is right?**

$x^2 + 22x + 121$ | x^2 | $x^2 + 11x$ | $x^2 + 22x$

Why? .....

Answer Key (1 of 2)

Absolute Value

Absolute value

1. $|17| \rightarrow 17$
2. $|7 - 19| \rightarrow 12$
3. $|-4| + |2| \rightarrow 6$
4. $|7 - 15| \rightarrow 8$
5. $|3 - 9| \rightarrow 6$
6. $|-3| + |8| \rightarrow 11$
7. $|3 - 11| \rightarrow 8$
8. $|13 - 14| \rightarrow 1$
9. How far apart are -12 and 1 on the number line? $\rightarrow 13$
10. $|8 - 10| \rightarrow 2$
11. $|-5| + |7| \rightarrow 12$
12. $|-8| \rightarrow 8$
13. $|7 - 11| \rightarrow 4$
14. $|11| + |-2| \rightarrow 13$
15. $|-5| \rightarrow 5$
16. $|4 - 9| \rightarrow 5$
17. $|2| + |-3| \rightarrow 5$
18. $|12 - 14| \rightarrow 2$
19. $|7 - 13| \rightarrow 6$
20. $|3| + |-11| \rightarrow 14$
21. $|8| \rightarrow 8$
22. $|11| + |-8| \rightarrow 19$
23. $|1 - 8| \rightarrow 7$
24. $|3| + |-8| \rightarrow 11$

Evaluate expressions

25. $2x - 14$ $(x = 8) \rightarrow 2$
26. $6x - 18$ $(x = 6) \rightarrow 18$
27. $3a + b$ $(a = 2, b = 7) \rightarrow 13$
28. $4x - 5$ $(x = 3) \rightarrow 7$
29. $3x - 17$ $(x = 6) \rightarrow 1$
30. $2x + 18$ $(x = 7) \rightarrow 32$
31. $5x - 3$ $(x = 4) \rightarrow 17$
32. $4x - 18$ $(x = 8) \rightarrow 14$
33. $7x - 4$ $(x = 6) \rightarrow 38$
34. $7x + 9$ $(x = 2) \rightarrow 23$

Solving Inequalities

Inequalities

1. $6x + 9 > -39 \rightarrow x > -8$
2. $3x + 2 < -79 \rightarrow x < -27$
3. $x - 1 > 19 \rightarrow x > 20$
4. $2x \geq -2 \rightarrow x \geq -1$
5. $x + 8 \geq 65 \rightarrow x \geq 57$
6. $2x + 10 < 36 \rightarrow x < 13$
7. $2x > 64 \rightarrow x > 32$
8. $6x + 7 \geq -71 \rightarrow x \geq -13$
9. $3x + 4 > 22 \rightarrow x > 6$

Solving Inequalities (continued)

Inequalities (continued)

10. $-4x + 12 > 44 \rightarrow x < -8$
11. $2x + 10 \leq 18 \rightarrow x \leq 4$
12. $x + 4 < 91 \rightarrow x < 87$
13. $4x + 6 < 18 \rightarrow x < 3$
14. $-3x \leq -30 \rightarrow x \geq 10$
15. $9x + 7 < -2 \rightarrow x < -1$
16. $3x + 7 \geq -86 \rightarrow x \geq -31$
17. $2x + 9 \leq -17 \rightarrow x \leq -13$
18. $-2x > 66 \rightarrow x < -33$
19. $2x + 4 \geq 48 \rightarrow x \geq 22$
20. $-6x \leq 48 \rightarrow x \geq -8$

Multiply out brackets

21. $7(4x + 2) \rightarrow 28x + 14$
22. $4(2 + 5x) \rightarrow 20x + 8$
23. $3(4x + 12) \rightarrow 12x + 36$
24. $5(2x - 2) \rightarrow 10x - 10$
25. $6(5 + 3x) \rightarrow 18x + 30$
26. $4(7x + 3) \rightarrow 28x + 12$
27. $4(9x + 4) \rightarrow 36x + 16$
28. $4(x + 3) \rightarrow 4x + 12$
29. $2(4x + 9) \rightarrow 8x + 18$
30. $3(7x - 11) \rightarrow 21x - 33$

Scatter Plots and Trend Lines

Scatter plots

1. Price (£1000s) against Age (years) — Is there a point well away from the rest? no
2. Price (£1000s) against Age (years) — Do the points cluster along a line, or spread out? along a line
3. Shoe size against Height (cm above 100) — Is the association positive, negative or none? positive
4. Price (£1000s) against Age (years) — Do the points cluster along a line, or spread out? spread out
5. Shoe size against Height (cm above 100) — Is the association positive, negative or none? none
6. Shoe size against Height (cm above 100) — Is the pattern linear or nonlinear? nonlinear

Intercepts of a line

7. $x - y = -1$ the x-intercept $= -1$
8. $5x - 6y = 30$ the x-intercept $= 6$
9. $3x + 2y = 18$ the x-intercept $= 6$
10. $7x + 8y = -56$ the x-intercept $= -8$
11. $2x - y = 6$ the x-intercept $= 3$
12. $3x + 2y = -12$ the x-intercept $= -4$

Factoring Quadratics

Factoring $x^2 + bx + c$

1. $x^2 + 18x + 65 = (x + 13)(x + 5)$ (13 and 5)

Answer Key (2 of 2)

Factoring Quadratics (continued)

Factoring $x^2 + bx + c$ (continued)

2. $x^2 + 23x + 112 = (x + 7)(x + 16)$ (7 and 16)
3. $x^2 + 38x + 361 = (x + 19)(x + 19)$ (19 and 19)
4. $x^2 + 26x + 120 = (x + 20)(x + 6)$ (20 and 6)
5. $x^2 + 24x + 95 = (x + 5)(x + 19)$ (5 and 19)
6. $x^2 + 29x + 154 = (x + 7)(x + 22)$ (7 and 22)
7. $x^2 + 13x + 22 = (x + 11)(x + 2)$ (11 and 2)
8. $x^2 + 28x + 147 = (x + 21)(x + 7)$ (21 and 7)
9. $x^2 + 21x + 108 = (x + 9)(x + 12)$ (9 and 12)
10. $x^2 + 21x + 20 = (x + 20)(x + 1)$ (20 and 1)
11. $x^2 + 35x + 304 = (x + 16)(x + 19)$ (16 and 19)
12. $x^2 + 7x + 6 = (x + 1)(x + 6)$ (1 and 6)
13. $x^2 + 32x + 231 = (x + 21)(x + 11)$ (21 and 11)
14. $x^2 + 22x + 121 = (x + 11)(x + 11)$ (11 and 11)
15. $x^2 + 11x + 24 = (x + 3)(x + 8)$ (3 and 8)
16. $x^2 + 8x + 7 = (x + 7)(x + 1)$ (7 and 1)
17. $x^2 + 24x + 108 = (x + 18)(x + 6)$ (18 and 6)
18. $x^2 + 20x + 19 = (x + 19)(x + 1)$ (19 and 1)
19. $x^2 + 37x + 336 = (x + 16)(x + 21)$ (16 and 21)
20. $x^2 + 34x + 289 = (x + 17)(x + 17)$ (17 and 17)

Evaluate expressions

21. $4x - 20$ $(x = 10) \rightarrow 20$
22. $5x - 9$ $(x = 7) \rightarrow 26$
23. $2x - 16$ $(x = 11) \rightarrow 6$
24. $6a + b$ $(a = 7, b = 5) \rightarrow 47$
25. $3x + 7$ $(x = 7) \rightarrow 28$
26. $8x + 2$ $(x = 2) \rightarrow 18$
27. $4a + b$ $(a = 10, b = 6) \rightarrow 46$
28. $3a + b$ $(a = 2, b = 4) \rightarrow 10$
29. $5x - 17$ $(x = 10) \rightarrow 33$
30. $4x - 13$ $(x = 12) \rightarrow 35$

How Many Solutions?

How many solutions?

1. $-14x + 35 = -14x + 34$: no solution
2. $11x + 49 = 11x + 55$: no solution
3. $-15x - 23 = -23 - 15x$: infinitely many
4. $x - 44 = -44 + x$: infinitely many
5. $15x - 37 = -12x + 4$: one solution
6. $-12x + 49 = -12x + 51$: no solution
7. $20x + 25 = 20x + 28$: no solution
8. $2x - 24 = -7x + 1$: one solution
9. $17x + 25 = 25 + 17x$: infinitely many
10. $-2x + 12 = -2x + 14$: no solution
11. $5x - 15 = 11x$: one solution
12. $18x - 27 = -2x + 45$: one solution

How Many Solutions? (continued)

How many solutions? (continued)

13. $7x + 40 = 40 + 7x$: infinitely many
14. $16x + 23 = -6x + 55$: one solution
15. $5x - 50 = 12x + 24$: one solution
16. $12x + 58 = 58 + 12x$: infinitely many
17. $-16x + 26 = 8x + 54$: one solution
18. $7x - 49 = -10x - 44$: one solution
19. $-9x = -9x + 5$: no solution
20. $17x + 7 = 14x + 10$: one solution

Factoring $x^2 + bx + c$

21. $x^2 + 28x + 171 = (x + 19)(x + 9)$ (19 and 9)
22. $x^2 + 25x + 150 = (x + 15)(x + 10)$ (15 and 10)
23. $x^2 + 24x + 63 = (x + 21)(x + 3)$ (21 and 3)
24. $x^2 + 36x + 315 = (x + 21)(x + 15)$ (21 and 15)
25. $x^2 + 24x + 23 = (x + 1)(x + 23)$ (1 and 23)
26. $x^2 + 41x + 414 = (x + 18)(x + 23)$ (18 and 23)
27. $x^2 + 39x + 360 = (x + 24)(x + 15)$ (24 and 15)
28. $x^2 + 4x + 4 = (x + 2)(x + 2)$ (2 and 2)
29. $x^2 + 26x + 105 = (x + 5)(x + 21)$ (5 and 21)
30. $x^2 + 6x + 8 = (x + 4)(x + 2)$ (4 and 2)

Check the Expansion

Check the expansion

1. $(x + 6)^2 - 36 = x^2 + 12x$, not $2x - 24$ (the bracket was doubled instead of squared)
2. $(x + 12)^2 - 144 = x^2 + 24x$, not $2x - 120$ (the bracket was doubled instead of squared)
3. $(x + 10)^2 - 100 = x^2 + 20x$, not $x^2 + 10x$ (the middle term was not doubled when the bracket was squared)
4. $(x + 3)^2 - 9 = x^2 + 6x$, which is what was written — this line is correct
5. $(x + 5)^2 - 25 = x^2 + 10x$, not $x^2 + 10x + 25$ (the squared constant was never taken away again)
6. $(x + 7)^2 - 49 = x^2 + 14x$, which is what was written — this line is correct
7. $(x + 8)^2 - 64 = x^2 + 16x$, not $x^2 + 8x$ (the middle term was not doubled when the bracket was squared)
8. $(x + 11)^2 - 121 = x^2 + 22x$, not $x^2 + 22x + 121$ (the squared constant was never taken away again)

Solutions (1 of 10)

Absolute Value

Absolute value

1. **$|17| =$ ___**

$$|17| = 17$$

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.

17 sits 17 steps from zero already, so there is nothing for the bars to change: |17| = 17. Half of these have no sign to remove, which is why "drop the minus" is not the lesson.

2. **$|7 - 19| =$ ___**

$$|7 - 19|$$
$$7 - 19 = -12$$
$$|7 - 19| = 12$$

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. 7 − 19 = −12.

Now the distance of that from zero: 12. Which is also how far apart 7 and 19 are — the same question read the other way round.

Evaluate expressions

25. $x = 8$ **$2x - 14 =$ ___**

$$2x - 14 \text{ with } x = 8$$
$$2 \times 8 = 16$$
$$16 - 14 = 2$$
$$2x - 14 = 2$$

A letter is a number that has not been written down yet, and this question writes it down: x = 8. So put the value in where the letter is — in BRACKETS, which keeps whatever was being done to the letter being done to the number.

2x means 2 TIMES x, and multiplying happens before adding or taking away however the line is written. So this multiplication comes first: 2 × 8 = 16.

Now the last bit: 16 − 14 = 2. Doing it the other way round — taking away first and multiplying after — gives -12, which is why the order is the whole of this question.

So 2x − 14 is 2 when x = 8.

Solutions (2 of 10)

Absolute Value (continued)

Evaluate expressions (continued)

26. $x = 6$ $6x - 18 =$ ___

$6x - 18$ with **$x = 6$**

$6 \times 6 =$ **36**

$36 - 18 =$ **18**

$6x - 18 =$ **18**

A letter is a number that has not been written down yet, and this question writes it down: x = 6. So put the value in where the letter is — in BRACKETS, which keeps whatever was being done to the letter being done to the number.

6x means 6 TIMES x, and multiplying happens before adding or taking away however the line is written. So this multiplication comes first: 6 × 6 = 36.

Now the last bit: 36 – 18 = 18. Doing it the other way round — taking away first and multiplying after — gives -72, which is why the order is the whole of this question.

So 6x – 18 is 18 when x = 6.

Solving Inequalities

Inequalities

1. $6x + 9 > -39$ x ☐ -8

x **$>$** -8

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.

9 was added last, so it comes off first — off BOTH sides: -39 – 9 = -48.

Now divide both sides by 6: -48 ÷ 6 = –8.

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

So x > –8. 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 (3 of 10)

Solving Inequalities (continued)

Inequalities (continued)

2. **$3x + 2 < -79$ x ☐ -27**

$$x < -27$$

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.

2 was added last, so it comes off first — off BOTH sides: -79 − 2 = -81.

Now divide both sides by 3: -81 ÷ 3 = −27.

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

So x < −27. 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.

Multiply out brackets

21. **$7(4x + 2)$**

$$7(4x + 2)$$
$$7 \times 4x = 28x$$
$$7 \times 2 = 14$$
$$28x + 14$$

The 7 outside multiplies EVERYTHING inside the bracket, not just the thing next to it. Draw an arrow from the 7 to each of the two terms before working anything out — that is what stops one of them being left behind.

First arrow: 7 × 4x = 28x.

Second arrow: 7 × 2 = 14.

Put the two together: 28x + 14. Check it by putting a small number in for x on both forms — they should agree, because they are the same amount written two ways.

Solutions (4 of 10)

Solving Inequalities (continued)

Multiply out brackets (continued)

22. **4(2 + 5x)**

$$4(2 + 5x)$$
$$4 \times 2 = 8$$
$$4 \times 5x = 20x$$
$$20x + 8$$

The 4 outside multiplies EVERYTHING inside the bracket, not just the thing next to it. Draw an arrow from the 4 to each of the two terms before working anything out — that is what stops one of them being left behind.

First arrow: $4 \times 2 = 8$.

Second arrow: $4 \times 5x = 20x$.

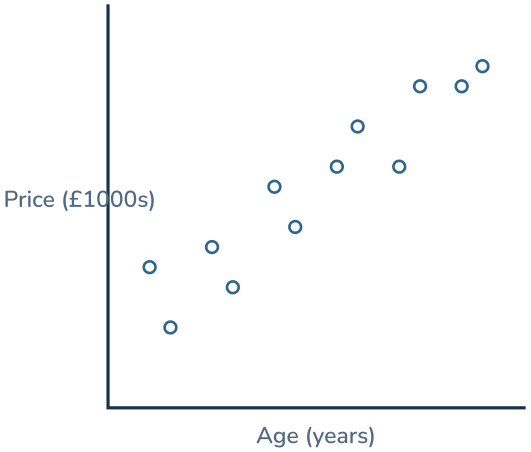
Put the two together: $20x + 8$. Check it by putting a small number in for x on both forms — they should agree, because they are the same amount written two ways.

Solutions (5 of 10)

Scatter Plots and Trend Lines

Scatter plots

1. **Age and price of a used car**



Is there a point well away from the rest?

yes no

no

A scatter plot puts two measurements against each other: Age (years) along the bottom, Price (£1000s) 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.

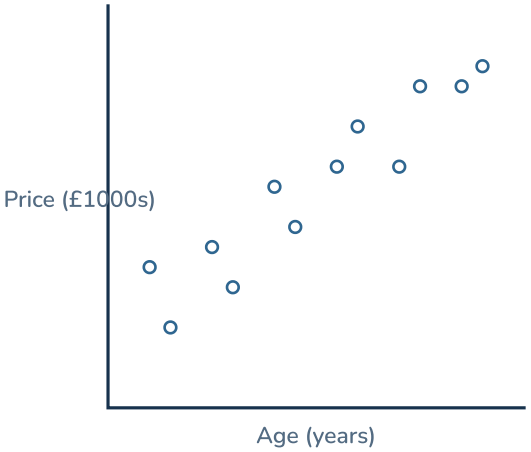
So the answer is "no". Say what that means for the two things rather than for the graph — and remember it is not a claim that one CAUSES the other. Two measurements can move together for a reason that is nothing to do with either of them.

Solutions (6 of 10)

Scatter Plots and Trend Lines (continued)

Scatter plots (continued)

2. **Age and price of a used car**



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

along a line spread out

along a line

A scatter plot puts two measurements against each other: Age (years) along the bottom, Price (£1000s) 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 sit in a narrow band, close to one line, so they cluster ALONG A LINE.

So the answer is "along a line". 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.

Intercepts of a line

7. $x - y = -1$ **x =** ___

$x - y = -1$ **$y = 0$**

$x = -1$

$x = -1$

The x-intercept is where the line crosses the x-axis, and there y = 0. Put y = 0 into $x - y = -1$.

The y-term disappears, leaving $x = -1$.

So the x-intercept is −1.

Solutions (7 of 10)

Scatter Plots and Trend Lines (continued)

Intercepts of a line (continued)

8. $5x - 6y = 30$ **x =** ___

$5x - 6y = 30$ **y = 0**

5x = 30

x = 6

The x-intercept is where the line crosses the x-axis, and there y = 0. Put y = 0 into 5x – 6y = 30.

The y-term disappears, leaving 5x = 30.

Divide by 5: 30 ÷ 5 = 6 — so the x-intercept is 6.

Factoring Quadratics

Factoring $x^2 + bx + c$

1. **$x^2 + 18x + 65$**

$x^2 + 18x + 65$ =

(x + 13)(x + 5)

Factoring this means finding two numbers to put in (x + □)(x + □). Two conditions decide them, and both have to hold: they MULTIPLY to 65, the last term, and they ADD to 18, the number in front of x.

Now list the pairs that multiply to 65. There are only 2, so this is a short search rather than a guess: 1 and 65, 5 and 13.

Which of them adds to 18? 13 × 5 = 65 and 13 + 5 = 18. So the two numbers are 13 and 5.

Put them in the brackets: $x^2 + 18x + 65 = (x + 13)(x + 5)$. Multiply it back out if you want to check — the x terms should add up to 18x again.

Solutions (8 of 10)

Factoring Quadratics (continued)

Factoring $x^2 + bx + c$ (continued)

2. **$x^2 + 23x + 112$**

$x^2 + 23x + 112 =$

$(x + 7)(x + 16)$

Factoring this means finding two numbers to put in $(x + \square)(x + \square)$. Two conditions decide them, and both have to hold: they MULTIPLY to 112, the last term, and they ADD to 23, the number in front of x.

Now list the pairs that multiply to 112. There are only 5, so this is a short search rather than a guess: 1 and 112, 2 and 56, 4 and 28, 7 and 16, 8 and 14.

Which of them adds to 23? $7 \times 16 = 112$ and $7 + 16 = 23$. So the two numbers are 7 and 16.

Put them in the brackets: $x^2 + 23x + 112 = (x + 7)(x + 16)$. Multiply it back out if you want to check — the x terms should add up to 23x again.

How Many Solutions?

How many solutions?

1. **$-14x + 35 = -14x + 34$**

$35 = 34$ **is false**

no solution

Do not start by hunting for x. Ask a smaller question first: what is left when the x terms are collected on one side?

Both sides have the SAME number of x, so taking it off both sides removes x completely. That is not a mistake — it is the answer arriving early.

What is left is $35 = 34$, which is never true, whatever x is. So there is no solution.

Solutions (9 of 10)

How Many Solutions? (continued)

How many solutions? (continued)

2. **$11x + 49 = 11x + 55$**

49 = 55 **is false**

no solution

Do not start by hunting for x. Ask a smaller question first: what is left when the x terms are collected on one side?

Both sides have the SAME number of x, so taking it off both sides removes x completely. That is not a mistake — it is the answer arriving early.

What is left is 49 = 55, which is never true, whatever x is. So there is no solution.

Check the Expansion

Check the expansion

1. **On Sam's paper: $(x + 6)^2 - 36 = 2x - 24$. Which line should replace it?**

$x^2 + 12x + 36$ | $2x - 24$ | $x^2 + 12x$ | $x^2 + 6x$

Why?

$(x + 6)^2 - 36$ = **$x^2 + 12x$**

they wrote: **$2x - 24$**

Do not check by reading their line. Somebody else's working is the most persuasive thing on the page, and rereading it is how you end up agreeing with it — do the step yourself first, then compare.

On your own, and writing the step nobody writes down: $(x + 6)^2 - 36$ becomes $x^2 + 12x + 36 - 36$.

Tidy that up and it is $x^2 + 12x$.

Now compare. They wrote $2x - 24$, and the bracket was doubled instead of squared — so the correct answer is $x^2 + 12x$.

Solutions (10 of 10)

Check the Expansion (continued)

Check the expansion (continued)

2. **Theo wrote $(x + 12)^2 - 144 = 2x - 120$. Which is correct?**

$2x - 120$ | $x^2 + 24x + 144$ | $x^2 + 24x$ | $x^2 + 12x$

Why?

$(x + 12)^2 - 144$ = **$x^2 + 24x$**

they wrote: **$2x - 120$**

Do not check by reading their line. Somebody else's working is the most persuasive thing on the page, and rereading it is how you end up agreeing with it — do the step yourself first, then compare.

On your own, and writing the step nobody writes down: $(x + 12)^2 - 144$ becomes $x^2 + 24x + 144 - 144$.

Tidy that up and it is $x^2 + 24x$.

Now compare. They wrote $2x - 120$, and the bracket was doubled instead of squared — so the correct answer is $x^2 + 24x$.