

GCSE MATHS

Linear equations and modelling

Worked Solutions

Q1

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$$3x = 18$$

Subtract 7.

$$x = 6$$

Divide by 3.

Q2

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$$3x - 9 = 12$$

Subtract $2x$.

$$3x = 21$$

Add 9.

$$x = 7$$

Divide by 3.

Q3

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$$-4x = -12$$

Subtract 18.

$$x = 3$$

Divide by -4 .**Q4**

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$$4x + 4 = -16$$

Subtract $3x$.

$$4x = -20$$

Subtract 4.

$$x = -5$$

Divide by 4.

Q5

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$$\frac{x}{3} = 4$$

Subtract 5.

$$x = 12$$

Multiply by 3.

Q6

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$$\frac{3x}{2} = 12$$

Add 4.

$$3x = 24$$

Multiply by 2.

$$x = 8$$

Divide by 3.

Q7

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$$3x - 12 = 2x + 2$$

Expand both brackets.

$$x - 12 = 2$$

Subtract $2x$.

$$x = 14$$

Add 12.

Q8

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$$5 - 2x - 6 = 3x + 4$$

Multiply both terms by -2 .

$$-5 = 5x$$

Add $2x$ and subtract 4.

$$x = -1$$

Divide by 5.

Q9

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$$x + 2 = 15$$

Multiply by 3.

$$x = 13$$

Subtract 2.

Q10

$$2(2x - 1) = 3(x + 4)$$

Multiply both sides by 6.

$$4x - 2 = 3x + 12$$

Expand.

$$x = 14$$

Subtract $3x$ and add 2.

Q11

$$3x + 4(x - 1) = 60$$

Multiply every term by 12.

$$7x - 4 = 60$$

Expand and collect.

$$x = \frac{64}{7}$$

Add 4 and divide by 7.

Q12

$$8(x - 3) = 15$$

Multiply both sides by 20.

$$8x = 39$$

Expand and add 24.

$$x = \frac{39}{8}$$

Divide by 8.

Q13

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$$n + (n + 1) + (n + 2) = 72$$

Let the first integer be n .

$$3n + 3 = 72 \Rightarrow n = 23$$

Solve.

$$23, 24, 25$$

State all three integers.

Q14

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$$4 + 2.5d = 29$$

Let d be the distance in kilometres.

$$2.5d = 25 \Rightarrow d = 10$$

Subtract the fixed charge, then divide.

Q15

$$2w + 2(w + 5) = 42$$

Use w for the width.

$$4w + 10 = 42 \Rightarrow w = 8$$

Solve the perimeter equation.

$$l = 8 + 5 = 13$$

Find the length.

Q16

$$3d + 12 = 2(d + 12)$$

Add 12 years to both current ages.

$$d = 12$$

Expand and solve.

$$3d = 36$$

Find the mother's age.

Q17

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$$4n + 3 = 17$$

Let n be the notebook price in pounds.

$$n = (17 - 3)/4 = 3.5$$

Remove the pen cost and divide by four.

Q18

$$x + (3x - 8) = 60$$

Represent the two lengths.

$$4x = 68 \Rightarrow x = 17$$

Solve.

$$3x - 8 = 43$$

Find the second piece.

Q19

$$15 + 3n = 39 + n$$

Equate total costs.

$$2n = 24 \Rightarrow n = 12$$

Solve.

Q20

$$8x - 12 = 8x + 1$$

Expand.

$$-12 = 1$$

Subtract $8x$. This contradiction holds whatever x is.

Q21

$$6x + 12 = 6x + 12$$

Both sides expand to the same expression.

$$0 = 0$$

The equation is true for every real x .

Q22

$$9a + 5(14 - a) = 94$$

$$4a + 70 = 94 \Rightarrow a = 6$$

The number of child tickets is $14 - a$.

Expand and solve.

Q23

$$240 + 6(n + 4) = 16(n + 4)$$

$$240 + 6n + 24 = 16n + 64$$

$$200 = 10n \Rightarrow n = 20$$

$$(240 + 6 \times 24)/24 = 16$$

Let n be the original number of pupils. There are now $n + 4$.

Expand both brackets.

Subtract $6n$ and 64, then divide by 10.

Check the new cost per pupil.

Q24

$$\frac{d-1}{d+2} = \frac{3}{4}$$

$$4(d-1) = 3(d+2)$$

$$d = 10$$

$$d - 3 = 7$$

$$\frac{7}{10}$$

The original numerator is $d - 3$.

Cross-multiply.

Solve and return to the original fraction.

State the original fraction.