# Worksheet - Solving one-step and two-step equations

Year: Year 7 · 21

Show your working.

## Question 1

**Question 1 – One-step equations** *(Section A · Skills practice)*

Solve each equation. Show the inverse operation you use.

a. $x + 7 = 15$
b. $y - 9 = 4$
c. $5a = 45$
d. $\frac{m}{4} = 6$
e. $x - 3.5 = 8$
f. $\frac{n}{3} = -5$

## Question 2

**Question 2 – Two-step equations** *(Section A · Skills practice)*

Solve each equation. Check each answer by substituting it back.

a. $3x + 4 = 19$
b. $5y - 2 = 23$
c. $2a + 9 = 3$
d. $\frac{m}{2} + 6 = 11$
e. $4n - 7 = -15$
f. $\frac{x - 3}{4} = 5$

## Question 3

**Question 3 – Equations with brackets** *(Section A · Skills practice)*

Expand the brackets first, then solve.

a. $3(x + 2) = 21$
b. $5(y - 1) = 30$
c. $2(3a + 4) = 26$
d. $4(2m - 3) = 20$
e. $-2(x + 5) = -18$

## Question 4

**Question 4 – Unknowns on both sides** *(Section A · Skills practice)*

Solve each equation with the unknown on both sides.

a. $5x + 3 = 2x + 15$
b. $7y - 4 = 3y + 12$
c. $4a + 1 = 6a - 9$
d. $3(m + 2) = m + 14$

## Question 5

**Question 5 – Forming equations** *(Section A · Skills practice)*

For each statement write an equation and solve it.

a. I think of a number, multiply by 4 and add 5. The answer is 37.
b. I think of a number, subtract 6 and divide by 3. The answer is 8.
c. Three consecutive whole numbers add up to 66. (Let the smallest be n.)
d. A number is doubled, then 9 is subtracted. The result is the same as the number plus 4.

## Question 6

**Question 6 – Checking solutions** *(Section A · Skills practice)*

Zara and Ben both solve $3x - 5 = 16$ and get different answers. Zara says x = 7 and Ben says x = 3.67.

a. Substitute x = 7 to check whether Zara is correct.
b. Substitute x = 3.67 to check Ben's answer.
c. Show how to solve the equation correctly.
d. What mistake could Ben have made?

## Question 7

**Question 7 – Buying tickets** *(Section B · Real-life practice)*

Tickets for the school play cost £3 for children and £5 for adults. The Brown family buys 2 adult tickets and some child tickets and pays £19 altogether.

a. Let c be the number of child tickets. Write an equation for the total cost.
b. Solve the equation.
c. Another family pays £35 for 4 adult tickets and some child tickets. How many child tickets?
d. A group buys the same number of adult and child tickets for £56. How many of each?

## Question 8

**Question 8 – Phone contract** *(Section B · Real-life practice)*

Priya has a phone contract. She pays a fixed £9 per month plus £0.06 for each text. Last month her bill was £15.

a. Write an equation using t for the number of texts.
b. Solve it to find how many texts she sent.
c. This month she wants to spend no more than £12. Write an inequality or solve an equation to find the maximum number of texts.
d. Her friend Ben pays £5 per month plus £0.10 per text. For how many texts is the monthly cost the same as Priya's?

## Question 9

**Question 9 – Weighing bags** *(Section B · Real-life practice)*

A bag of apples and a 500 g box together weigh 2.3 kg. Another bag has twice the weight of apples in the first bag plus the same box, and weighs 4.1 kg. Let a be the weight of the apples in the first bag in kg.

a. Write an equation for the first bag and solve it.
b. Check that the second bag is consistent with your answer.
c. How many kilograms of apples are in 5 bags like the first one?

## Question 10

**Question 10 – Pocket money** *(Section B · Real-life practice)*

Sam saves £4 every week from his pocket money and already has £18 in his money box. He wants to buy a games controller that costs £62.

a. Write an equation for the number of weeks, w, until he has £62.
b. Solve the equation.
c. His sister Mia has £30 and saves £2.50 a week. After how many weeks will they have the same amount?
d. How much do they each have at that time?

## Question 11

**Question 11 – Perimeter equations** *(Section B · Real-life practice)*

A rectangle has length (x + 5) cm and width (x - 1) cm. The perimeter of the rectangle is 36 cm.

a. Write an equation for the perimeter and simplify it.
b. Solve it to find x.
c. Work out the length and the width.

d. Find the area of the rectangle.

## Question 12

**Question 12 – Cycling to school** *(Section B · Real-life practice)*

Kyle cycles to school. He cycles 3 km to the bus stop at a steady speed, then travels the rest on the bus. The total distance is 11 km. The bus travels for 12 minutes at 40 km per hour (that is 8 km). Kyle wonders if the numbers add up.

a. Check that $3 + 8 = 11$ and that 12 minutes at 40 km/h is 8 km.
b. Kyle sets off 25 minutes before school starts. He cycles 3 km at v km/h. Write an equation if the cycling takes 15 minutes: $\frac{3}{v} = 0.25$. Solve for v.
c. What is Kyle's cycling speed in km/h?

## Question 13

**Question 13 – Shopping with a gift card** *(Section B · Real-life practice)*

Amira has a £50 gift card. She buys a jumper and 3 identical T-shirts. The jumper costs £22 and the total spent was £43.

a. Write an equation for the price of one T-shirt, £t.
b. Solve it.
c. She has the gift card balance left. How much is left?
d. She wants to buy one more T-shirt. Does she have enough? Explain.

## Question 14

**Question 14 – Baking for the cake sale** *(Section B · Real-life practice)*

Hana bakes cupcakes for the cake sale. Each tray holds the same number of cupcakes. She bakes 5 trays and then 7 extra cupcakes, making 47 cupcakes altogether.

a. Let n be the number of cupcakes on each tray. Write an equation.
b. Solve the equation.
c. Each cupcake is sold for 60p. How much money will she raise from all 47 cupcakes?
d. She wants to raise £30. How many cupcakes does she need to sell?

## Question 15

**Question 15 – Hiring a bike** *(Section B · Real-life practice)*

A bike hire shop in the Peak District charges £8 for a helmet and lock plus £4 per hour for the bike. Leo pays £28 and Ruby pays £36.

a. Write an equation for Leo's hire and solve it to find how many hours he hired the

bike.
b. Write and solve an equation for Ruby.
c. Who hired the bike for longer and by how long?
d. Another shop charges £4 plus £5 per hour. For how many hours do both shops charge the same?

## Question 16

**Question 16 – Equations from a diagram** *(Section C · Problem solving)*

The sides of a triangle have lengths 2x + 1, x + 6 and 3x - 2 centimetres. The perimeter is 41 cm.

a. Write an equation for the perimeter and solve it.
b. Work out the lengths of the three sides.
c. Is the triangle isosceles? Explain.
d. A second triangle has two equal sides of length 3x - 2 and 2x + 1. Find x and state the lengths.

## Question 17

**Question 17 – The fairground** *(Section C · Problem solving)*

At the fair, rides cost £2.50 each and snacks cost £1.80 each. Eva spends £17.20 and buys 4 rides and some snacks.

a. Write an equation for the number of snacks, s.
b. Solve it. Does your answer make sense?
c. Ravi buys 3 rides and 5 snacks. How much does he spend?
d. Their friend Zoe spends exactly £14. She buys 2 rides. How many snacks did she buy?

## Question 18

**Question 18 – Think of a number** *(Section C · Problem solving)*

Three friends play a number game. Anna says "I think of a number, double it, and subtract 7. I get 15." Ben says "I think of a number, subtract 4 and treble the result. I get 18." Cara says "I think of a number, add 5 and halve it. I get 9."

a. Write and solve an equation for each friend.
b. Who thought of the biggest number?
c. Add the three numbers together.
d. Dev says his number is the sum of the three numbers. Is it a multiple of 4? Explain.

## Question 19

**Question 19 – Spot the mistake** *(Section C · Problem solving)*

Each pupil made one mistake solving an equation. Find the mistake and give the correct solution.

a. Ali: $3x + 6 = 24$, so $3x = 24 + 6 = 30$ and $x = 10$.
b. Beth: $2(x - 3) = 10$, so $2x - 3 = 10$ and $x = 6.5$.
c. Carl: $\frac{x}{5} - 2 = 3$, so $x - 2 = 15$ and $x = 17$.
d. Dina: $5x = 3x + 8$, so $8x = 8$ and $x = 1$.

## Question 20

**Question 20 – The number machine** *(Section C · Problem solving)*

A number machine does these steps in order: multiply by 3, subtract 4, divide by 2. Call the input x.

a. Write an expression for the output.
b. The output is 13. Find x.
c. Draw the reverse machine in words and use it to find the input when the output is 5.
d. Is there an input for which the output equals the input? Form an equation and solve it.

## Question 21

**Question 21 – Challenge: the age puzzle** *(Section D · Challenge)*

Maya is x years old. Her brother is 4 years older and her mother is three times as old as Maya. In 5 years' time the sum of the ages of all three will be 64.

a. Write an expression for each person's age now.
b. Write an equation for the sum of their ages in 5 years' time.
c. Solve the equation and state each person's age now.
d. How old will the mother be when Maya is twice as old as she is now?