Answers - Solving one-step and two-step equations

Year: Year 7

Answer to Question 1

a. Undo “add 7” by subtracting 7 from both sides: $x = 15 - 7 =$**8**. Check: $8 + 7 = 15$.
b. Undo “subtract 9” by adding 9: $y = 4 + 9 =$**13**. Check: $13 - 9 = 4$.
c. Undo “multiply by 5” by dividing by 5: $a = 45 \div 5 =$**9**.
d. Undo “divide by 4” by multiplying by 4: $m = 6 \times 4 =$**24**.
e. Add 3.5 to both sides: $x = 8 + 3.5 =$**11.5**.
f. Multiply both sides by 3: $n = -5 \times 3 = -15$. Check: $-15 \div 3 = -5$.

Answer to Question 2

a. Subtract 4: $3x = 15$. Divide by 3: $x = 5$. Check: $15 + 4 = 19$.
b. Add 2: $5y = 25$. Divide by 5: $y = 5$. Check: $25 - 2 = 23$.
c. Subtract 9: $2a = -6$. Divide by 2: $a = -3$. Check: $-6 + 9 = 3$.
d. Subtract 6: $\frac{m}{2} = 5$. Multiply by 2: $m = 10$. Check: $5 + 6 = 11$.
e. Add 7: $4n = -8$. Divide by 4: $n = -2$. Check: $-8 - 7 = -15$.
f. Multiply by 4: $x - 3 = 20$. Add 3: $x = 23$. Check: $20 \div 4 = 5$.

Answer to Question 3

a. Expand: $3x + 6 = 21$. Subtract 6: $3x = 15$, so $x = 5$.
b. Expand: $5y - 5 = 30$. Add 5: $5y = 35$, so $y = 7$.
c. Expand: $6a + 8 = 26$. Subtract 8: $6a = 18$, so $a = 3$.
d. Expand: $8m - 12 = 20$. Add 12: $8m = 32$, so $m = 4$.
e. Divide both sides by -2: $x + 5 = 9$, so $x = 4$. Check: $-2 \times 9 = -18$.

Expanding first turns each equation into a two-step equation that you already know how to solve.

Answer to Question 4

a. Subtract $2x$: $3x + 3 = 15$. Subtract 3: $3x = 12$, so $x = 4$. Check: $23 = 23$.
b. Subtract $3y$: $4y - 4 = 12$. Add 4: $4y = 16$, so $y = 4$. Check: $24 = 24$.
c. There are more a’s on the right, so subtract $4a$: $1 = 2a - 9$. Add 9: $10 = 2a$, so $a = 5$. Check: $21 = 21$.
d. Expand: $3m + 6 = m + 14$. Subtract m: $2m + 6 = 14$. Subtract 6: $2m = 8$, so

$m = 4$. Check: $18 = 18$.

Answer to Question 5

a. Let the number be n: $4n + 5 = 37$. Subtract 5: $4n = 32$. Divide by 4: $n = 8$.
b. $\frac{n - 6}{3} = 8$. Multiply by 3: $n - 6 = 24$. Add 6: $n = 30$.
c. The numbers are n, $n + 1$, $n + 2$: $3n + 3 = 66$, so $3n = 63$ and $n = 21$. The numbers are **21, 22 and 23**.
d. $2n - 9 = n + 4$. Subtract n: $n - 9 = 4$. Add 9: $n = 13$. Check: $26 - 9 = 17 = 13 + 4$.

Answer to Question 6

a. $3 \times 7 - 5 = 21 - 5 = 16$. The left side equals 16, so Zara is **correct**.
b. $3 \times 3.67 - 5 = 11.01 - 5 = 6.01$, not 16, so Ben is **wrong**.
c. Add 5 to both sides: $3x = 21$. Divide by 3: $x = 7$.
d. Ben seems to have worked out $16 \div 3 - 5$ or similar: he undid the operations in the wrong order. The “subtract 5” must be undone first by adding 5, then the “multiply by 3” by dividing.

Answer to Question 7

a. 2 adult tickets cost $2 \times 5 = £10$ and c child tickets cost $£3c$: $10 + 3c = 19$.
b. Subtract 10: $3c = 9$. Divide by 3: $c = 3$ child tickets.
c. $4 \times 5 + 3c = 35$, so $20 + 3c = 35$, $3c = 15$ and $c = 5$ child tickets.
d. With n of each: $5n + 3n = 56$, so $8n = 56$ and $n = 7$: 7 adults and 7 children.

Answer to Question 8

a. Fixed £9 plus £0.06 per text: $9 + 0.06t = 15$.
b. Subtract 9: $0.06t = 6$. Divide by 0.06: $t = 100$ texts.
c. $9 + 0.06t = 12$ gives $0.06t = 3$ and $t = 50$. She can send at most **50 texts**.
d. $9 + 0.06t = 5 + 0.10t$. Subtract 5 and $0.06t$: $4 = 0.04t$, so $t = 100$ texts (both pay £15).

Answer to Question 9

a. The box weighs 500 g = 0.5 kg: $a + 0.5 = 2.3$. Subtract 0.5: $a = 1.8$ **kg**.
b. Second bag: $2 \times 1.8 + 0.5 = 3.6 + 0.5 = 4.1$ kg, which matches the given weight, so the answer is consistent.

c. Each bag has 1.8 kg of apples: $5 \times 1.8 =$**9 kg**.

Writing every mass in kilograms before forming the equation avoids mixing grams and kilograms.

Answer to Question 10

a. He starts with £18 and adds £4 a week: $18 + 4w = 62$.
b. Subtract 18: $4w = 44$. Divide by 4: $w = 11$ weeks.
c. $18 + 4w = 30 + 2.5w$. Subtract $2.5w$ and 18: $1.5w = 12$, so $w = 8$ weeks.
d. Sam: $18 + 4 \times 8 = 50$; Mia: $30 + 2.5 \times 8 = 50$. Each has **£50**.

Answer to Question 11

a. Perimeter = 2 lengths + 2 widths: $2(x + 5) + 2(x - 1) = 2x + 10 + 2x - 2 = 4x + 8 = 36$.
b. Subtract 8: $4x = 28$. Divide by 4: $x = 7$.
c. Length $7 + 5 =$**12 cm**, width $7 - 1 =$**6 cm**. Check: $2(12 + 6) = 36$.
d. Area = length × width: $12 \times 6 =$**72 cm²**.

Answer to Question 12

a. 12 minutes is $12 \div 60 = 0.2$ hours, and $40 \times 0.2 = 8$ km. Then $3 + 8 = 11$ km, so the numbers add up.
b. 15 minutes is 0.25 hours. Multiply both sides of $\frac{3}{v} = 0.25$ by v: $3 = 0.25v$. Divide by 0.25: $v = 12$.
c. His cycling speed is **12 km/h**: he covers 3 km in a quarter of an hour.

Answer to Question 13

a. Jumper £22 plus 3 T-shirts at £t: $22 + 3t = 43$.
b. Subtract 22: $3t = 21$. Divide by 3: $t = 7$, so each T-shirt costs £7.
c. $50 - 43 =$**£7** is left on the card.
d. **Yes**: one more T-shirt costs £7, exactly the balance left, so she can buy it and the card will then be empty.

Answer to Question 14

a. 5 trays of n plus 7 extra: $5n + 7 = 47$.
b. Subtract 7: $5n = 40$. Divide by 5: $n = 8$ cupcakes per tray.

c. $47 \times 0.60 =$**£28.20**.
d. $0.6c = 30$, so $c = 30 \div 0.6 =$**50 cupcakes**, three more than she has baked.

Checking part (b): $5 \times 8 + 7 = 40 + 7 = 47$, the total number of cupcakes.

Answer to Question 15

a. $8 + 4h = 28$, $4h = 20$, $h =$**5 hours**.
b. $8 + 4h = 36$, $4h = 28$, $h =$**7 hours**.
c. Ruby, by **2 hours**.
d. $8 + 4h = 4 + 5h$, $4 = h$. They are the same for **4 hours** (£24).

In each case the fixed charge is subtracted first, then the total is divided by the price per hour; checking with the original prices confirms the answers.

Answer to Question 16

a. Add the sides: $2x + 1 + x + 6 + 3x - 2 = 6x + 5 = 41$. Subtract 5: $6x = 36$, so $x = 6$.
b. $2 \times 6 + 1 =$**13 cm**, $6 + 6 =$**12 cm**, $3 \times 6 - 2 =$**16 cm**. Check: $13 + 12 + 16 = 41$.
c. **No**: all three sides are different, so the triangle is scalene.
d. Set the equal sides equal: $3x - 2 = 2x + 1$, so $x = 3$. Both sides are $3 \times 3 - 2 =$**7 cm**.

Answer to Question 17

a. 4 rides cost $4 \times 2.50 = £10$, plus $£1.80s$ for snacks: $10 + 1.8s = 17.2$.
b. Subtract 10: $1.8s = 7.2$, so $s = 4$. A whole number of snacks makes sense: **4 snacks**.
c. $3 \times 2.50 + 5 \times 1.80 = 7.50 + 9.00 =$**£16.50**.
d. $2 \times 2.50 + 1.8s = 14$, so $1.8s = 9$ and $s = 5$ snacks.

Check part (b): $10 + 1.8 \times 4 = 10 + 7.2 = 17.2$, which is Eva's total.

Answer to Question 18

a. Anna: $2n - 7 = 15$, $2n = 22$, $n = 11$. Ben: $3(n - 4) = 18$, $n - 4 = 6$, $n = 10$. Cara: $\frac{n + 5}{2} = 9$, $n + 5 = 18$, $n = 13$.
b. Comparing 11, 10 and 13, **Cara** thought of the biggest number.
c. $11 + 10 + 13 =$**34**.
d. $34 \div 4 = 8.5$, not a whole number, so 34 is **not** a multiple of 4 ($4 \times 8 = 32$ and $4 \times 9 = 36$).

Answer to Question 19

a. Ali added 6 instead of subtracting: $3x = 18$, $x = 6$.
b. Beth did not multiply the 3 by 2: $2x - 6 = 10$, $x = 8$.
c. Carl multiplied only the first term by 5: $x - 10 = 15$, $x = 25$.
d. Dina added 3x to the left. She should subtract: $2x = 8$, $x = 4$.

In every case, substituting the wrong answer back into the original equation would have shown that it does not work.

Answer to Question 20

a. $\frac{3x - 4}{2}$.
b. $\frac{3x - 4}{2} = 13$, $3x - 4 = 26$, $x =$**10**.
c. Reverse: multiply by 2, add 4, divide by 3. Output 5: $5 \times 2 = 10$, $10 + 4 = 14$, $14 \div 3 =$**4.67** (4 2/3).
d. $\frac{3x - 4}{2} = x$, $3x - 4 = 2x$, $x =$**4**. Check: $3 \times 4 = 12$, $12 - 4 = 8$, $8 \div 2 = 4$.

The reverse machine undoes each step with the inverse operation, in the opposite order.

Answer to Question 21

a. Maya: x. Brother: $x + 4$. Mother: $3x$.
b. $(x + 5) + (x + 9) + (3x + 5) = 64$, $5x + 19 = 64$.
c. $5x = 45$, $x = 9$. Maya is **9**, her brother is **13** and her mother is **27**.
d. Maya is 18 in 9 years' time. The mother will then be $27 + 9 =$**36**.

Check part (c): in 5 years they will be 14, 18 and 32, and $14 + 18 + 32 = 64$.