Test answers - Expanding brackets and substitution

Year: Year 7 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. Replace x by 5 and y by -3: $4 \times 5 - 2 \times (-3) = 20 - (-6) = 20 + 6 =$**26**. Subtracting a negative number is the same as adding. (1 mark)
b. $x^2 = 25$ and $y^2 = (-3)^2 = 9$, because a negative number squared is positive. So $25 - 9 =$**16**. (1 mark)
c. Work out the bracket first: $5 + (-3) = 2$. Then multiply by 3: $3 \times 2 =$**6**. (1 mark)
d. The top is $xy = 5 \times (-3) = -15$. Dividing by 3 gives $-15 \div 3 = -5$, negative because the signs are different. (1 mark)

Keep negative values in brackets when substituting; writing -3^2 in part (b) would wrongly give -9.

Answer to Question 2 (4 marks)

a. Multiply both terms inside the bracket by 4: $4 \times 3x = 12x$ and $4 \times (-2) = -8$. The answer is $12x - 8$. (1 mark)
b. Expand each bracket: $2(x + 5) = 2x + 10$ and $3(x - 1) = 3x - 3$, giving $2x + 10 + 3x - 3$ (1 mark). Collect like terms: $2x + 3x = 5x$ and $10 - 3 = 7$, so the answer is $5x + 7$ (1 mark).
c. Factorising is the reverse of expanding. The highest common factor of 12 and 18 is 6, so take 6 outside the bracket: $12y \div 6 = 2y$ and $18 \div 6 = 3$. The answer is $6(2y - 3)$. (1 mark)

Check (c) by expanding: $6 \times 2y - 6 \times 3 = 12y - 18$. Writing $2(6y - 9)$ is not fully factorised and scores no mark.

Answer to Question 3 (4 marks)

a. Substitute $h = 4$ into the formula: $C = 5 + 3 \times 4$. Multiplication comes before addition, so $C = 5 + 12 =$**£17**. (1 mark)
b. Put $C = 29$ into the formula to form the equation $5 + 3h = 29$ (1 mark). Subtract 5 from both sides: $3h = 24$. Divide both sides by 3: $h =$**8 hours** (1 mark).
c. The 5 is not multiplied by h, so it does not change with time. It is a fixed charge of £5 that is paid however long the bicycle is hired for, while the 3 is the cost of £3 for each hour. (1 mark)

Check (b): $5 + 3 \times 8 = 5 + 24 = 29$, which matches the cost given.

Answer to Question 4 (4 marks)

a. The area of a rectangle is length × width, which gives $x(x+4)$ (1 mark). Multiply x by each term in the bracket: $x \times x = x^2$ and $x \times 4 = 4x$. The area is $x^2 + 4x$ m² (1 mark).
b. The perimeter is two widths plus two lengths: $2x + 2(x+4) = 2x + 2x + 8 = 4x + 8$ metres. (1 mark)
c. Substitute $x = 5$ into the area: $5^2 + 4 \times 5 = 25 + 20 = 45$. This equals the given area of 45 m², so $x = 5$ works. The flowerbed is then 9 m long and 5 m wide. (1 mark)

With $x = 5$ the perimeter is $4 \times 5 + 8 = 28$ m, and $2(9+5) = 28$ confirms it.

Answer to Question 5 (4 marks)

a. One family pack costs $2a + 3c$ pounds, so 40 packs bring in $40(2a + 3c)$ (1 mark). Multiply each term by 40: $40 \times 2a = 80a$ and $40 \times 3c = 120c$. The expanded expression is $80a + 120c$ (1 mark).
b. Substitute $a = 8$ and $c = 5$: $80 \times 8 + 120 \times 5 = 640 + 600 =$**£1 240**. (1 mark)
c. The target is £1 500, so the shortfall is $1500 - 1240 =$**£260**. (1 mark)

Check (b) with the unexpanded form: one pack costs $2 \times 8 + 3 \times 5 = 31$ pounds, and $40 \times 31 = 1240$. Both forms give the same total, showing the expansion was correct.