Test answers - Algebraic notation and simplifying expressions

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

Answer to Question 1 (4 marks)

a. In algebra we leave out the multiplication signs and write the number first. The two letters a multiply to give a^2, and b stays as it is, so the term is $5a^2b$. (1 mark)
b. Group the like terms: the x terms give $7x - 2x = 5x$ and the y terms give $3y + y = 4y$. Remember that y on its own means $1y$. The simplified expression is $5x + 4y$. (1 mark for each correct term)
c. Write the division as a fraction $\frac{12ab}{4a}$. Divide the numbers, $12 \div 4 = 3$, and cancel the a on the top with the a underneath. Only b is left: $3b$. (1 mark)

Check (c): $4a \times 3b = 12ab$, so the division is correct.

Answer to Question 2 (4 marks)

a. Each notebook costs £n, so four of them cost $4 \times n = 4n$. Three pens at £p each cost $3p$. Add the two amounts: $4n + 3p$ pounds. These are unlike terms, so nothing more can be collected. (1 mark)
b. Multiply every term inside each bracket: $2(x + 3) = 2x + 6$ and $3(x - 1) = 3x - 3$ (1 mark). Now collect: $2x + 3x = 5x$ and $6 - 3 = 3$, giving $5x + 3$ (1 mark).
c. Only x is squared, not the 3. Square first: $(-2)^2 = 4$, because a negative times a negative is positive. Then multiply by 3: $3 \times 4 =$**12**. (1 mark)

A common error in (c) is working out $(3 \times -2)^2 = 36$; the order of operations puts the power before the multiplication.

Answer to Question 3 (4 marks)

a. Collect the a terms: $4a - a = 3a$ (the lonely a counts as $1a$). Collect the b terms: $5b + 2b = 7b$. The simplified expression is $3a + 7b$. Award 1 mark for each correct term.
b. Replace a by 3 and b by -1, keeping the negative number in brackets: $3 \times 3 + 7 \times (-1)$ (1 mark). This gives $9 + (-7) = 9 - 7 =$**2** (1 mark).

Check by substituting into the original expression instead: $4 \times 3 + 5 \times (-1) - 3 + 2 \times (-1) = 12 - 5 - 3 - 2 = 2$. Both routes agree, which confirms that the simplification in part (a) was correct. Simplifying first made the substitution much quicker.

Answer to Question 4 (4 marks)

a. In the morning she sells 12 cups at £c, worth $12c$, and 8 slices at £d, worth $8d$. The morning money is $12c + 8d$ pounds. (1 mark)
b. The afternoon brings $15c + 10d$. Add the two sessions: $(12c + 8d) + (15c + 10d)$ (1 mark). Collect the c terms, $12c + 15c = 27c$, and the d terms, $8d + 10d = 18d$: $27c + 18d$ (1 mark).
c. Work in pounds, so 50p becomes $c = 0.5$ and £1.20 becomes $d = 1.2$. Then $27 \times 0.5 = 13.5$ and $18 \times 1.2 = 21.6$. The total takings are $13.5 + 21.6 =$**£35.10**. (1 mark)

Writing 50 instead of 0.5 would mix pence with pounds and give a silly answer.

Answer to Question 5 (4 marks)

a. A rectangle has two lengths and two widths, so the perimeter is $2(3x + 2) + 2(x + 1)$. Expanding gives $6x + 4 + 2x + 2$ (1 mark). Collecting like terms: $6x + 2x = 8x$ and $4 + 2 = 6$, so the perimeter is $8x + 6$ metres (1 mark).
b. Set the expression equal to the given perimeter: $8x + 6 = 36$ (1 mark). Subtract 6 from both sides to get $8x = 30$, then divide both sides by 8: $x =$**3.75** (1 mark).

Check: the length is $3 \times 3.75 + 2 = 13.25$ m and the width is $3.75 + 1 = 4.75$ m. Then $2(13.25 + 4.75) = 2 \times 18 = 36$ m, exactly the perimeter given in the question.