Answers

Check after each level, not at the end

Level 1

1. $3x + 12$
2. $10y - 15$
3. $-4a + 24$
4. $x^2 + 7x$
5. $6p^2 - 10pq$
6. $7x + 2$
7. $7m + 17$
8. $2x^2 - 17x$

Level 2

1. $x^2 + 8x + 15$
2. $y^2 + 3y - 28$
3. $a^2 - 8a + 12$
4. $x^2 + 10x + 25$
5. $2x^2 + 9x + 4$
6. $6x^2 + 11x - 10$
7. $x^2 - 36$
8. $4a^2 - 12ab + 9b^2$

Level 3

1. $x^3 + 6x^2 + 11x + 6$
2. $12x$ (the x^2 and 9 cancel)
3. $x^3 + 5x^2 + 5x - 3$
4. $8x^3 - 12x^2 + 6x - 1$
5. $x^2 - 3x - 10 - (x^2 - 6x + 9) = 3x - 19$ (the minus applies to all three terms)

Level 4

1. Perimeter $= 2(x + 5) + 2(x - 2) = 4x + 6$; area $= (x + 5)(x - 2) = x^2 + 3x - 10$
2. $(x + 4)^2 - x^2 = x^2 + 8x + 16 - x^2 = 8x + 16$
3. $3x(x + 2) = 3x^2 + 6x$
4. $(n + 1)^2 - n^2 = 2n + 1$, which is even $+1$, so always odd
5. $(n + 3)^2 - (n - 3)^2 = 12n$, so always a multiple of 12

Level 5

1. $a = 4,\ b = 5$ (either order): $ab = 20,\ a + b = 9$
2. $a = 5,\ b = 3$: $a - b = 2,\ ab = 15$
3. $p = 7,\ q = 49$
4. $a = 2,\ b = 5$: $3a = 6, 3b = 15$, check $ab + 9 = 19$
5. With $x = 1$: $(1 + 4)^2 = 25$ but $1 + 16 = 17$. The middle term is missing: $(x + 4)^2 = x^2 + 8x + 16$
6. Middle bricks $x^2 + 4x + 3$ and $x^2 + x - 6$; top $2x^2 + 5x - 3$
7. $103 \times 97 = 100^2 - 3^2 = 9991$; $51^2 = 2500 + 100 + 1 = 2601$; $99^2 = 10000 - 200 + 1 = 9801$
8. $k = \pm 7,\ \pm 8,\ \pm 13$. The factor pairs of 12 are $1 \times 12, 2 \times 6, 3 \times 4$ and their negatives; k is the sum of each pair, so there are exactly six.