YEAR 7 · 7.3 INTRODUCTION TO ALGEBRA

Name: _____

Date: _____ Class: _____

Pack B · Fluency

Answer all questions. Show your working. Questions are grouped by challenge level.

BRONZE Questions 1–10

1. If $a = 6$, find a value of b so that $3a + b = 21$. Justify your answer.

2. Which of these is the correct algebraic convention: $n \times n$ or n^2? Explain why the other form is wrong.

3. Write $\$11x$ in two different ways as a sum of like terms. Show each is equivalent to the original.

4. Make up an equation whose solution is $x = 7$. Solve it to check.

5. A number of chairs n is arranged in 5 equal rows. Write an equation for this and solve it to find n.

6. Expand $5(x + 2)$ and show that your answer gives the same value as the original expression when $x = 3$.

7. Solve $3x + 4 = 19$ and check your answer by substituting back.

8. Write two different expressions that both describe "a number n multiplied by 6, then subtract 5". Explain why they are the same.

9. Decide: are $8y$ and $3y$ like terms? Simplify $8y - 3y$ and justify your step.

10. In the expression $4x + 9$, identify the coefficient of x and the constant. Explain what each part tells you about the expression.

SILVER Questions 11–20

11. Find the value of $2a + 3b$ when $a = 5$ and $b = 2$.

12. Simplify: $7x + 4y + 3x - 2y$.

13. Expand and simplify: $3(x + 5) + 7$.

14. Solve: $5x - 2 = 23$.

15. Tickets to a show cost $£p$ each. 7 friends buy tickets. Write an expression for the total cost, then find the cost when $p = 6$.

16. Find the value of $2x^2$ when $x = 5$.

17. Simplify: $8a + 7b + 1a - 4b$.

18. A rectangle has length $(x + 5)$ cm and width 6 cm. Write a simplified expression for its perimeter.

19. Expand the bracket: $3(4x - 7)$.

20. Solve: $\frac{x}{a} + 3 = 8$.

GOLD Questions 21–30

21. Simplify: $6x + 4x - 3x$.

22. Find the value of $3a^2 + 2a$ when $a = -3$.

23. Expand and simplify: $4(x + 3) + 3(x + 2)$.

24. Solve: $5x + 9 = -1$.

25. A bag of apples costs p pence and a bag of oranges costs q pence. Write and simplify an expression for the total cost of 5 bags of apples and 2 bags of oranges.

26. Work out $4a - 3b$ when $a = 2$ and $b = -5$.

27. Solve: $6x + 2 = 2x + 14$.

28. A rectangle has length $(2x + 2)$ cm and width $(x + 4)$ cm. Its perimeter is 36 cm. Find x.

29. Expand and simplify: $4(3x - 2) - 6x$.

30. If $n = 2^2 \times 3$, find the value of $3n - 4$.

PLATINUM Questions 31–40

31. I think of a number. I double it, then subtract 5. The result is -9. Find the number.

32. Three consecutive integers have a sum of 63. Find the three integers and write an equation to show your method.

33. Solve: $\frac{ax + 4}{c} = 6$.

34. The expression $5n - 3$ is evaluated for two consecutive negative integers. Show that the difference between the two results is always 5, whatever negative integers you choose.

35. A mobile phone plan charges a fixed monthly fee of $£15$ plus $£4$ per GB of data used. Write a formula for the monthly cost C in terms of g (GB used). Use it to find how many GB were used if the bill was $£51$.

36. Alice thinks of a prime number p. She computes $p^2 - p$. Show algebraically that the result is always even. Verify with $p = 7$.

37. Two numbers, x and y, satisfy: $x + y = 20$ and $x - y = 6$. Find x and y.

38. The perimeter of a triangle is 46 cm. One side is $(3x + 2)$ cm, a second side is $(2x - 3)$ cm, and the third side is 7 cm. Find x and the length of each side.

39. Explain why $6(x + 4)$ and $6x + 24$ are equal. What must 24 equal? Now expand $3(x - 5)$ and simplify $3(x - 5) + 7x$.

40. A number machine applies the rule "$\times 4$, then -10". An input gives an output of 6. Find the input. Then find the input that gives an output equal to the original input.