YEAR 7 · 7.3 INTRODUCTION TO ALGEBRA

Name: _____

Date: _____ Class: _____

Pack A · Fluency

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

BRONZE Questions 1–10

1. If $a = 4$, find a value of b so that $3a + b = 15$. Justify your answer.

2. Which of these is the correct algebraic convention: $n3$ or $3n$? Explain why the other form is wrong.

3. Write $\$8x$ 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 $x = 8$. Solve it to check.

5. A number of chairs n is arranged in 4 equal rows. Write an equation for this and solve it to find n.

6. Expand $3(x + 4)$ and show that your answer gives the same value as the original expression when $x = 2$.

7. Solve $2x + 5 = 17$ and check your answer by substituting back.

8. Write two different expressions that both describe "a number n multiplied by 4, then subtract 3". Explain why they are the same.

9. Decide: are $9y$ and $4y$ like terms? Simplify $9y - 4y$ and justify your step.

10. In the expression $7x + 3$, 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 $a = 3$ and $b = 4$.

12. Simplify: $5x + 3y + 2x - 1y$.

13. Expand and simplify: $4(x + 3) + 5$.

14. Solve: $4x - 3 = 21$.

15. Tickets to a show cost $£p$ each. 5 friends buy tickets. Write an expression for the total cost, then find the cost when $p = 8$.

16. Find the value of $3x^2$ when $x = 4$.

17. Simplify: $6a + 5b + 2a - 3b$.

18. A rectangle has length $(x + 3)$ cm and width 4 cm. Write a simplified expression for its perimeter.

19. Expand the bracket: $4(2x - 5)$.

20. Solve: $\frac{x}{a} + 4 = 9$.

GOLD Questions 21–30

21. Simplify: $3x + 5x - 2x$.

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

23. Expand and simplify: $3(x + 2) + 2(x + 5)$.

24. Solve: $5x + 12 = 2$.

25. A bag of apples costs pp pence and a bag of oranges costs qp pence. Write and simplify an expression for the total cost of 3 bags of apples and 4 bags of oranges.

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

27. Solve: $5x + 3 = 2x + 15$.

28. A rectangle has length $(2x + 3)$ cm and width $(x + 5)$ cm. Its perimeter is 40 cm. Find x.

29. Expand and simplify: $3(2x - 4) - 5x$.

30. If $n = 2^2 \times 5$, find the value of $3n - 7$.

PLATINUM Questions 31–40

31. I think of a number. I double it, then subtract 7. The result is -3. Find the number.

32. Three consecutive integers have a sum of 48. Find the three integers and write an equation to show your method.

33. Solve: $\frac{ax + 6}{c} = 9$.

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 $£12$ plus $£3$ 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 $£33$.

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: $x + y = 14$ and $x - y = 4$. Find x and y.

38. The perimeter of a triangle is 37 cm. One side is $(2x + 3)$ cm, a second side is $(3x - 1)$ cm, and the third side is 10 cm. Find x and the length of each side.

39. Explain why $5(x + 3)$ and $5x + 15$ are equal. What must 15 equal? Now expand $4(x - 2)$ and simplify $4(x - 2) + 6x$.

40. A number machine applies the rule "$\times 3$, then -8". An input gives an output of 7. Find the input. Then find the input that gives an output equal to the original input.