GCSE Foundation Mathematics
Practice Test 9: Algebra

Instructions:
Answer all questions. Show your working clearly.
Calculators may be used unless stated otherwise.
Time allowed: 90 minutes

Section A: Expressions and Simplification

1. Simplify these expressions:

   (a) $8x + 5x$

   (b) $19y - 12y$

   (c) $9a + 4b - 5a + 6b$

   (d) $18p - 9p + 7q - 3q$

2. Expand these expressions:

   (a) $7(x + 5)$

   (b) $6(3y - 4)$

   (c) $-8(4a + 3)$

   (d) $11(2m - 5n)$

3. Expand and simplify:

   (a) $9(x + 4) + 5(x - 3)$

   (b) $7(2y + 5) - 6(y - 2)$

   (c) $8(a - 2) + 4(3a + 7)$

   (d) $5(4p + 3) - 7(p - 4)$

4. Factorise these expressions:

   (a) $24x + 32$

   (b) $36y - 27$

   (c) $30a + 45b$

   (d) $42p - 56q$

5. Simplify these expressions involving powers:

   (a) $x^8 \times x^3$

   (b) $y^{19} \div y^{11}$

   (c) $(a^5)^2$

   (d) $7x^4 \times 4x^5$

Section B: Linear Equations

6. Solve these equations:

    (a) $x + 21 = 29$

    (b) $y - 16 = 11$

    (c) $6a = 48$

    (d) $\frac{b}{10} = 6$

7. Work out:

    (a) $11x + 2 = 35$

    (b) $9y - 8 = 19$

    (c) $5a + 23 = 13$

    (d) $7b - 18 = 24$

8. Solve these equations:

    (a) $9(x + 5) = 36$

    (b) $6(y - 7) = 24$

    (c) $8(a + 2) = 56$

    (d) $5(2b - 3) = 25$

9. Solve these equations with unknowns on both sides:

    (a) $7x + 13 = x + 31$

    (b) $12y - 9 = 8y + 19$

    (c) $9a + 7 = 6a + 22$

    (d) $10b - 20 = 4b + 22$

10. Solve these equations involving fractions:

    (a) $\frac{x}{11} + 5 = 8$

    (b) $\frac{y}{6} - 9 = 4$

    (c) $\frac{10a}{9} = 20$

    (d) $\frac{4b+5}{7} = 9$

Section C: Formulae and Substitution

11. Given that $A = \frac{B}{C}$, find A when:

    (a) $B = 63$ and $C = 9$

    (b) $B = 96$ and $C = 12$

    (c) $B = 105$ and $C = 15$

12. Given that $Q = R \times S$, find Q when:

    (a) $R = 11$ and $S = 7$

    (b) $R = 14$ and $S = 6$

    (c) $R = 9.5$ and $S = 8$

13. Given that $G = \frac{1}{2}mn^2$, find G when:

(a) $m = 10$ and $n = 4$

(b) $m = 16$ and $n = 3$

(c) $m = 12$ and $n = 5$

14. The formula for the area of a trapezium is $A = \frac{1}{2}(a+b)h$. Find A when:

    (a) $a = 8$, $b = 12$ and $h = 5$

    (b) $a = 6$, $b = 14$ and $h = 7$

    (c) $a = 9$, $b = 15$ and $h = 6$

15. Make the subject of the formula:

    (a) $y = 7x - 11$. Make x the subject.

    (b) $A = \frac{B}{C}$. Make B the subject.

    (c) $Q = R \times S$. Make R the subject.

    (d) $G = \frac{1}{2}mn^2$. Make m the subject.

Section D: Inequalities

16. Solve these inequalities:

    (a) $x + 9 > 18$

    (b) $y - 12 < 7$

    (c) $11a \geq 44$

    (d) $\frac{b}{12} \leq 3$

17. Solve these inequalities:

    (a) $9x + 5 > 32$

    (b) $7y - 15 < 20$

    (c) $11a + 8 \geq 41$

    (d) $8b - 21 \leq 11$

18. Solve these inequalities:

    (a) $-6x > 24$

    (b) $-10y < 40$

    (c) $-a + 12 \geq 5$

    (d) $-8b - 15 \leq 9$

19. Write down the integer values of x that satisfy:

    (a) $8 < x \leq 13$

    (b) $-6 \leq x < 1$

    (c) $-4 < x < 9$

    (d) $3 \leq x \leq 7$

20. Show these inequalities on a number line:

    (a) $x > 11$

    (b) $x \leq -4$

    (c) $-5 < x \leq 6$

    (d) $4 \leq x < 12$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $10, 19, 28, 37, \ldots$
    (b) $13, 22, 31, 40, \ldots$
    (c) $65, 56, 47, 38, \ldots$
    (d) $8, 16, 24, 32, \ldots$

22. Find the first differences and state whether each sequence is arithmetic:

    (a) $12, 19, 26, 33, 40, \ldots$
    (b) $5, 40, 135, 320, 625, \ldots$
    (c) $54, 44, 34, 24, 14, \ldots$
    (d) $10, 20, 40, 80, 160, \ldots$

23. For these arithmetic sequences, find the nth term:

    (a) $16, 24, 32, 40, \ldots$
    (b) $9, 15, 21, 27, \ldots$
    (c) $31, 23, 15, 7, \ldots$
    (d) $12, 24, 36, 48, \ldots$

24. Use the nth term formula to find:

    (a) The 10th term of the sequence $9n + 2$
    (b) The 17th term of the sequence $8n - 6$
    (c) The 22nd term of the sequence $5n + 4$
    (d) Which term of the sequence $11n - 10$ equals 89?

25. These are geometric sequences. Find the next two terms:

    (a) $8, 32, 128, 512, \ldots$
    (b) $5, 30, 180, 1080, \ldots$
    (c) $243, 81, 27, 9, \ldots$
    (d) $9, 45, 225, 1125, \ldots$

26. A sequence has first term $a = 18$ and term-to-term rule "add 5".

    (a) Write down the first 5 terms.
    (b) Find the nth term formula.
    (c) Which term equals 103?

Section F: Problem Solving with Algebra

27. I think of a number, multiply by 6, then add 17. The result is 53. What was my original number?

28. The perimeter of a rectangle is 46 cm. If the length is t cm and the width is $(t - 6)$ cm, find the value of t.

29. In a right-angled triangle, one angle is $x°$ and another angle is $(4x - 20)°$. Find the value of x.

30. James is u years old. His grandfather is six times his age plus 5 years. The sum of their ages is 68. How old is James?

31. A number pattern starts: $18, 28, 38, 48, \ldots$

    (a) Find the nth term.
    (b) Which term has value 108?
    (c) Is 145 a term in this sequence? Explain your answer.

32. A cinema ticket costs £7.50 booking fee plus £9.50 per ticket. If the total cost is £64, how many tickets were bought?

33. A car rental charges £25 daily fee plus £0.80 per mile. If the total cost is £57, how many miles were driven?

34. The sum of four consecutive integers is 94. Find the four integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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