GCSE Foundation Mathematics
Practice Test 7: 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) $7x + 4x$

   (b) $15y - 8y$

   (c) $6a + 2b - 3a + 7b$

   (d) $14p - 5p + 4q - 2q$

2. Expand these expressions:

   (a) $9(x + 3)$

   (b) $4(6y - 5)$

   (c) $-5(3a + 2)$

   (d) $8(3m - 2n)$

3. Expand and simplify:

   (a) $7(x + 2) + 3(x - 5)$

   (b) $5(2y + 3) - 4(y - 2)$

   (c) $6(a - 3) + 2(5a + 8)$

   (d) $3(3p + 7) - 4(p - 2)$

4. Factorise these expressions:

   (a) $21x + 35$

   (b) $28y - 20$

   (c) $24a + 36b$

   (d) $30p - 45q$

5. Simplify these expressions involving powers:

   (a) $x^5 \times x^4$

   (b) $y^{15} \div y^7$

   (c) $(a^3)^4$

   (d) $5x^4 \times 2x^6$

Section B: Linear Equations

6. Solve these equations:
   (a) $x + 15 = 23$
   (b) $y - 11 = 7$
   (c) $9a = 45$
   (d) $\frac{b}{6} = 8$
7. Work out:
   (a) $8x + 3 = 27$
   (b) $7y - 5 = 16$
   (c) $3a + 17 = 8$
   (d) $5b - 13 = 12$
8. Solve these equations:
   (a) $7(x + 2) = 28$
   (b) $4(y - 3) = 16$
   (c) $6(a + 4) = 42$
   (d) $3(5b - 2) = 21$
9. Solve these equations with unknowns on both sides:
   (a) $5x + 9 = x + 21$
   (b) $8y - 5 = 4y + 15$
   (c) $6a + 3 = 3a + 18$
   (d) $7b - 12 = 2b + 18$
10. Solve these equations involving fractions:
    (a) $\frac{x}{7} + 3 = 6$
    (b) $\frac{y}{4} - 6 = 3$
    (c) $\frac{8a}{5} = 16$
    (d) $\frac{3b+2}{4} = 7$

Section C: Formulae and Substitution

11. Given that $P = \frac{F}{A}$, find P when:
    (a) $F = 48$ and $A = 6$
    (b) $F = 72$ and $A = 8$
    (c) $F = 84$ and $A = 7$
12. Given that $E = M \times C^2$, find E when:
    (a) $M = 5$ and $C = 4$
    (b) $M = 7$ and $C = 3$
    (c) $M = 6$ and $C = 5$
13. Given that $S = \frac{1}{2}at^2$, find S when:

(a) $a = 8$ and $t = 3$
(b) $a = 12$ and $t = 2$
(c) $a = 6$ and $t = 4$

14. The formula for the area of a circle is $A = \pi r^2$. Find A when ($\pi = 3.14$):

(a) $r = 5$
(b) $r = 7$
(c) $r = 6$

15. Make the subject of the formula:

(a) $y = 6x - 7$. Make x the subject.
(b) $P = \frac{F}{A}$. Make F the subject.
(c) $E = M \times C^2$. Make M the subject.
(d) $S = \frac{1}{2}at^2$. Make a the subject.

Section D: Inequalities

16. Solve these inequalities:

(a) $x + 6 > 12$
(b) $y - 8 < 5$
(c) $9a \geq 27$
(d) $\frac{b}{7} \leq 4$

17. Solve these inequalities:

(a) $7x + 2 > 23$
(b) $5y - 11 < 14$
(c) $9a + 4 \geq 31$
(d) $6b - 17 \leq 7$

18. Solve these inequalities:

(a) $-4x > 16$
(b) $-8y < 32$
(c) $-a + 7 \geq 2$
(d) $-6b - 8 \leq 10$

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

(a) $6 < x \leq 11$
(b) $-4 \leq x < 3$
(c) $-2 < x < 7$
(d) $1 \leq x \leq 5$

20. Show these inequalities on a number line:

(a) $x > 8$
(b) $x \leq -2$
(c) $-3 < x \leq 4$
(d) $2 \leq x < 9$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $8, 15, 22, 29, \ldots$

    (b) $11, 18, 25, 32, \ldots$

    (c) $52, 45, 38, 31, \ldots$

    (d) $6, 13, 20, 27, \ldots$

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

    (a) $9, 14, 19, 24, 29, \ldots$

    (b) $3, 24, 81, 192, 375, \ldots$

    (c) $42, 34, 26, 18, 10, \ldots$

    (d) $8, 16, 32, 64, 128, \ldots$

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

    (a) $12, 18, 24, 30, \ldots$

    (b) $7, 11, 15, 19, \ldots$

    (c) $25, 19, 13, 7, \ldots$

    (d) $9, 18, 27, 36, \ldots$

24. Use the nth term formula to find:

    (a) The 8th term of the sequence $7n + 5$

    (b) The 14th term of the sequence $6n - 4$

    (c) The 25th term of the sequence $3n + 7$

    (d) Which term of the sequence $9n - 8$ equals 73?

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

    (a) $5, 20, 80, 320, \ldots$

    (b) $3, 18, 108, 648, \ldots$

    (c) $128, 32, 8, 2, \ldots$

    (d) $4, 24, 144, 864, \ldots$

26. A sequence has first term $a = 12$ and term-to-term rule "add 7".

    (a) Write down the first 5 terms.

    (b) Find the nth term formula.

    (c) Which term equals 82?

Section F: Problem Solving with Algebra

27. I think of a number, multiply by 4, then add 11. The result is 43. What was my original number?

28. The perimeter of a rectangle is 42 cm. If the length is q cm and the width is $(q - 4)$ cm, find the value of q.

29. In a right-angled triangle, one angle is x° and another angle is $(3x - 10)^\circ$. Find the value of x.

30. Sophie is t years old. Her uncle is three times her age plus 8 years. The sum of their ages is 48. How old is Sophie?

31. A number pattern starts: $14, 22, 30, 38, \ldots$

    (a) Find the nth term.

    (b) Which term has value 86?

    (c) Is 125 a term in this sequence? Explain your answer.

32. A swimming pool membership costs £12 joining fee plus £8 per month. If the total cost is £76, how many months was the membership?

33. A mobile phone plan charges £20 monthly fee plus £0.15 per minute. If the total bill is £35, how many minutes were used?

34. The sum of three consecutive even integers is 78. Find the three integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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