PRACTICE EXERCISE ON ALGEBRAIC PROCESSES

At the end of the chapter, students should be able to:
1. Represent word problems using algebraic expressions.
2. Simplify algebraic expressions.
3. Factorise algebraic expressions.
4. Solve simple equations.
5. Solve simple simultaneous equations.
6. Solve problems involving variations.
7. Solve words problems involving any of the above.
8. Make any given variable the subject of the formula.

Solve the following simultaneous equations:

1. $x + y + 6 = 0$

   $2x - 4y = 8$ **(WAEC)**

2. $x + y = \frac{2}{3}$

   $x - y = \frac{5}{3}$ **(WAEC)**

3. $\frac{x}{2} - 3 = 5y$

   $7y + 3 = 2x$ **(WAEC)**

4. $3x - 4 = x + y$

   $\frac{1}{y} = \frac{3}{x-2}$

5. $x - 3y = 6$

   $4x + 3y = 9$

6. $\frac{3x + 8}{5} = \frac{3y - 1}{2}$

   $3x + y = 0$

7. $4x - y = 10$

   $2x + 3y = 12$

8. $3m + n = -3$

   $m - n = 5$

9. $3x + y = 8$

   $x - y = 3$

Solve the following equations:

10. $2x + 3 - \frac{x}{3} = x + 7$ **(WAEC)**
11. $5(a + 2) = 1 - (2a - 1)$
12. $\frac{2x + 1}{3x} = 1\frac{1}{3}$
13. $3y + 4y = 14$
14. $\frac{x}{2} - 3 = 5$
15. $8r - 17 = 15$
16. $\frac{1}{x} = \frac{4}{3}$
17. $5(1 - x) = 3(x + 1)$

Factorise the following:

18. $x(a - c) + y(c - a)$ **(WAEC)**
19. $8a^2 - 18b^{-2}$ **(WAEC)**
20. $x^2 - 3p + px - 3x$ **(WAEC)**
21. $3x^2 - 75$ **(WAEC)**
22. $3xyz - 21x^2y^2 + 15xyz^2$
23. $2a^2b + 10ab^2 - 5bc^2$

Simplify the following algebraic expressions:

24. $3a - (a + 2)$
25. $1 - (2x - 5) + 6$
26. $(4x + 3y) - (y - 3x)$
27. $6x + 5y + 3x - 3x - y + 3x$
28. $(4x - 2y) - (3x + y)$
29. $(2x - 3y)(3x - 2y)$
30. $(a + b)(a - b)$
31. $\left(\frac{x}{2} - 3\right)\left(\frac{y}{3} + 5\right)$
32. $4(2x + 3y) - (3x + 4y)$
33. $3(q + 5) - 2(q + r) + 3(r - 2)$

34. $\frac{x+y}{3}-\frac{x+2}{5}+2(x-y)$

35. $\left(\frac{2}{3}+b\right)\left(\frac{4}{3}-b\right)$

Simplify the following algebraic expressions:

36. $x(x-y)+(x+y)y$

37. $\frac{1}{3}(6a+3b)+3a$

38. $12a-3b-4b$

39. $3(4x+5y)+2(y-z)$

40. $r+4r+8r$

41. $\left(\frac{1}{3}x\right)12x$

Solve:

42. If $P \propto \sqrt{Q}$ and $P = 3$ when $Q = 6$, find Q, when $P = \frac{15}{4}$.

43. If $y \propto \frac{1}{x}$, find the percentage change in y, if x increases by 20%.

44. $Q \propto \frac{1}{r^2}$, find the percentage change in Q, if r increases by 15%.

45. V varies partly as the square of T and partly inversely as R. When $V = 2$, $T = 2$ and $R = 3$. Find R, when $V = 3$ and $T = 4$.

46. If $x \propto y$ and $x = 1\frac{1}{2}$ when $y = 3.6$, find y, when $x = 1.9$.

Make each of the variables indicated the subject of the given formulae.

47. If $h(m + n) = m(h + r)$, find h in terms of m, n and r. **(WAEC)**

48. Make S the subject of the formula in $V = \frac{k}{\sqrt{T-S}}$. **(WAEC)**

49. Make x the subject of the formula in

$$\frac{1+ax}{1-ax}=\frac{p}{q}.$$ **(WAEC)**

50. $L=R-\frac{PQ}{t}$ (t)

51. $V=\pi r^2 h$ (r)

52. $y=ax+bl$ (x)

53. $r-p=\sqrt{2as}$ (a)

Solve the equation:

54. $\frac{3y}{4}+\frac{x}{3}=\frac{7}{12}$. **(WAEC)**

55. Simplify $\frac{4}{5m}-\frac{1}{4m}$. **(WAEC)**

56. Find the value of A in the relation

$A=\frac{1}{2}(a+b)h$ given that $a=2, b=3$ and $h=4$. **(WAEC)**

Solve the following:

57. Ade thinks of a number and adds 3 to it. Suppose he divides 20 by his sum and the answer is 16. What number did Ade think of?

58. When -140 is divided by 7 plus r, the result is 20. What is r?

59. Okon is 3 ft taller than Abu. If Okon is x ft tall, what is Abu's height?

60. The product of two numbers is 60. If one of the numbers is 12, find the other number.

61. The difference between half of a certain number and seven is the same as adding two to the number, find the number.

62. In each of the open sentences, find the number that makes it true.

    (a) $(\,) - 6 = 7$

    (b) $9 - (\,) = 16$

    (c) $(\,) + 5 = 20$

    (d) $4 \times (\,) = 45$

63. Find the quadratic equation whose roots are:

    $x = -2$ or $x = 7$.

64. Find the roots of the equation:

    $2x^2 - 3x - 2 = 0$.

65. What value of k makes the given expression a perfect square?

    $m^2 - 8m + k$

66. Factorise the following expression:

    $2x^2 + x - 15$

67. If 5 times a certain integer is subtracted from twice the square of the integer, the result is 63. Find the integer.

68. Solve the following equation:

    $6x^2 + 7x - 5 = 0$

69. Solve for x in $(x^2 + 2x + 1) = 25$.

70. Simplify $125^{\frac{-1}{3}} \times 49^{\frac{-1}{2}} \times 10^{0}$.

71. If $3^{2x} = 27$, what is x?

72. Factorise $x^2 + 4x - 192$.

73. Factorise $2e^2 - 3e + 1$.

74. Solve the equation $7y^2 = 3y$.

75. Find the value of m which makes $x^2 + 8x + m$ a perfect square.

76. Solve the equation

    $2a^2 - 3a - 27 = 0$.

77. For what value of y is the expression $\frac{(y+2)}{y^2-3y-10}$ undefined?

78. Factorise $3a^2 - 11a + 6$.

79. Solve the equation $3a + 10 = a^2$.

80. Simplify $\left(\frac{3}{x} - \frac{15}{2y}\right) \div \frac{6}{xy}$.

81. Simplify $\frac{1}{4}(2^n - 2^{n+2})$.

82. Find the equation whose roots are $-\frac{2}{3}$ and $-\frac{1}{4}$.

83. Solve $6(x - 4) + 3(x + 7) = 3$.

84. If $2x + y = 7$ and $3x - 2y = 3$, by how much is $7x$ greater than 10?

85. Factorise the expression

$$2y^2 + xy - 3x^2.$$

86. Construct a quadratic equation whose roots are $\frac{1}{2}$ and 2.

87. Write as a single fraction: $\frac{1}{1-x} + \frac{2}{1+x}$.

88. What must be added to the expression $x^2 - 18x$ to make it a perfect square?

89. Solve the equation $\frac{m}{3} + \frac{1}{2} = \frac{3}{4} + \frac{m}{4}$.

90. If $9^{2x+1} = \frac{81^{x-2}}{3x}$, find x.

91. Without using mathematical tables, evaluate $\sqrt{\frac{0.81 \times 10^{-5}}{2.25 \times 10^{7}}}$.

92. Solve the following pair of simultaneous equations $2x + 5y = 6\frac{1}{2}$ and $5x - 2y = 9$.

93. Factorise the expression

$$2s^2 - 3st - 2t^2.$$

94. Solve the equation

$$x^2 - 2x - 3 = 0.$$

95. Write as a single fractions: $\frac{5}{6r} - \frac{3}{4r}$.

96. Factorise $2x^2 - 21x + 45$.

97. Solve the following simultaneous equations:

$$y = 3x$$
$$4y - 5x = 14$$

98. Simplify $\frac{2.25}{0.015}$ leaving your answer in standard form.

99. Simplify $\frac{3}{m + 2n} - \frac{2}{m - 3n}$.

100. Given that $2p - m = 6$ and $2p + 4m = 1$, find the value of $(4p + 3m)$.