

SESSION 4: LINEAR AND QUADRATIC EQUATIONS

KEY CONCEPTS:

- Linear equations
- Quadratic equations
- Linear Simultaneous Equations

TERMINOLOGY

Linear Equation: an equation in which can be written in the form of binomial equal to zero. Variable has a maximum power of 1.

Quadratic equation: equation in which can be written in the form of trinomial equal to zero. Variable has a maximum power of 2.

Variable: a number or set of numbers, represented by a letter. Also called an unknown in an equation.

X-PLANATION

Solving linear equations

Step 1: Group like terms

Step 2: Collect numbers on the one side of the equation and variables on the other

Remember: If a term is subtracted on one side of the equation, we add the term to both sides of the equation to collect like terms

If a term is added on one side of the equation, we subtract the term from both sides of the equation to collect like terms

To simplify a variable multiplied by a number, we divide both sides of the equation by the number.

To simplify a variable divided by a number, we multiply both sides of the equation by the number.

Solving quadratic equations

Step 1: Group like terms so that the equation is equal to zero

Step 2: Factorise the trinomial

Step 3: Let the terms in both brackets equal zero

Step 4: Solve the equations to find two possible values of the variable.

Step 5: Check that the solution values are valid. Values that result in division by zero are not real and are excluded as solutions

Solving linear simultaneous equations

There are two methods to solve linear equations that have two unknowns (variables)

- **By elimination**

In this method, we add or subtract the equations from each other to eliminate one of the variables. You can multiply or divide all terms of one of the equations by a number to get a simple solution. Once the value of one variable is known, we substitute back into one of the original equations to solve for the second variable.

- **By substitution**

In this method, we simplify one of the equations so that one of the unknowns (variables) is equal to an expression that includes the other unknown. Next we substitute this new equation into the second equation and solve for the unknown. Once the value of one variable is known, we substitute back into one of the original equations to solve for the second variable.

X-AMPLE QUESTIONS:

Question:

Simplify the following linear equations:

1. $2k + 3 = 2 - 3(k + 3)$

2. $(d + 4)(d - 3) - d = (3d - 22) - 8d(d - 1)$

3. $m + 6(-m + 1) + 5m = 0$

4. $5t - 1 = t^2 - (t + 2)(t - 2)$

5.

$$5 - \frac{2(m + 4)}{m} = \frac{7}{m}$$

6.

$$\frac{2}{t} - 2 - \frac{1}{2} = \frac{1}{2} \left(1 + \frac{2}{t} \right)$$

Question:

Simplify the following quadratic equations:

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

8. $0 = 2x^2 - 5x - 18$

9. $t^2 = 3t$

10. $2x^2 - 2x = 12$

11. $3x^2 - 63 = 12x$

12. $2x^2 = 8$

13. $2x^2 = -5 - 7x$

Question

Solving the following system of linear equations simultaneously:

14. $7x + 3 = 13$
 $2x - 3y = -4$

15. $7x - 41 = 3y$
 $17 = 3x - y$

