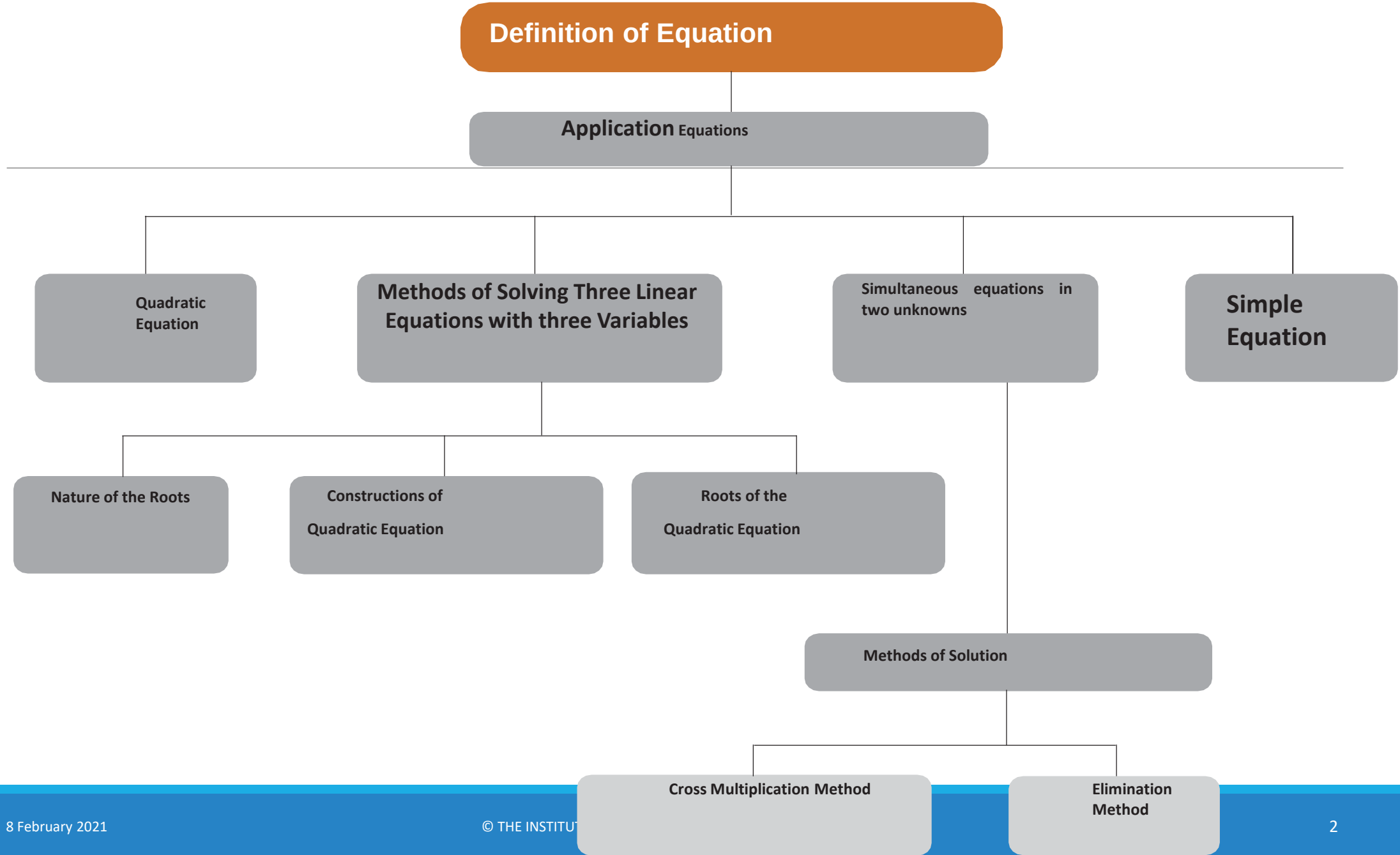
Date: 08 Feb 2021

VIRTUAL COACHING CLASSES
ORGANISED BY BOS (ACADEMIC), ICAI

FOUNDATION LEVEL
PAPER 3: BUSINESS MATHEMATICS, LOGICAL REASONING & STATISTICS
EQUATIONS -I

Faculty: CA Arijit Chakraborty


Definition of Equation
Application Equations
Quadratic Equation
Methods of Solving Three Linear Equations with three Variables
Simultaneous equations in two unknowns
Simple Equation
Nature of the Roots
Constructions of Quadratic Equation
Roots of the Quadratic Equation
Methods of Solution
Cross Multiplication Method
Elimination Method

Equations

- Equation is defined to be a mathematical statement of equality.
- If the equality is true for certain value of the variable involved, the equation is often called a conditional equation and equality sign '=' is used;
- while **if the equality is true for all values of the variable involved**, **the equation is called an identity.**

For example,

4(a + 1) ≡ 4*a* + 4 is an identity, because the expressions 4(*a* + 1) and 4*a* + 4 always have the same value, whatever value *a*takes.

2(x+1) = 2x+2

Form of equation

The expressions are linked with the symbol ≡.

- A simple equation in one unknown *x* is in the form
- $ax + b = 0$. Where a, b are known constants and a not equal to = 0

Types of equations

$8x+17(x-3) = 4\ (4x-9) + 12$ is a Linear equation.

$3x^2 + 5x + 6 = 0$ is a Quadratic equation.

$4x^3 + 3x^2 + x - 7 = 1$ is a Cubic equation.

$x + 2y = 1$, $2x + 3y = 2$ are jointly called Simultaneous equations.

Workout 1

The equation –7 *x* + 1 = 5 – 3 *x* will be satisfied for x equal to:

- 2 b) –1 c) 1 d) none of these

Pick up the correct value of *x* for

x = 2

30 45

a) *x* = 5 b) *x* = 7c) *x* =1 1/3

d) none of these

Let’s solve together: Example 1

Solve: $2x + 5y = 9$ and $3x - y = 5$.

Example 2a

: Solve $3x + 2y + 17 = 0$, $5x - 6y - 9 = 0$

Example 2b

Solve for x and y

$x+2y = 13$

$3x+y = 14$

Example 7 -- Study material : Unit 1 Ex C: No 1

The solution of the set of equations

$3x + 4y = 7$,

$4x - y = 3$ is ?

Example 8 -- Study material : Unit 1 Ex C: No 8

The simultaneous equations $7x–3y = 31$,

$9x–5y = 41$ have solutions given by _____

X=4

Y= -1

Example 9 -- Unit 1 Ex D: No 10
3 unknowns – simultaneous equation

$3x-4y+70z = 0$

$2x+3y-10z = 0$

$X+2y+3z = 13$

Soln =

$X= -10, y = 10, z= 1$

Example 3

Solve for x, y and z:

$2x - y + z = 3,$

$x + 3y - 2z = 11,$

$3x - 2y + 4z = 1$

Example 4

Solve for *x, y* and *z*:

$$\frac{xy}{x+y} = 70,$$

$$\frac{xz}{x+z} = 84,$$

$$\frac{yz}{y+z} = 140$$

Example 5

$2x - y - z = 2$

$x + y + z = 1$

$x + y + 2z = 1$

Example - MTP

solve :

$2x+5y=9$

$3x-y=5$

Quadratic equation

An equation of the form

$ax^2 + bx + c = 0$ where x is a variable and a, b, c are constants with a not equal to 0 is called a quadratic equation or equation of the second degree.

When b=0 the equation is called a pure quadratic equation; when b is not = 0 the equation is called an affected quadratic.

Quadratic Formula:

For $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Roots

Roots of quadratic equation

Let roots of quadratic equation be : alpha & beta

1) sum of roots = -- b/ a
2) Product of roots = c/a

Forms

Equation	Is it Quadratic?	Explanation
$3x^3 - 4x + 5$	No	The first term is raised to the 3rd power. It must be raised to the 2nd power in order to be quadratic.
$5x^2 - 4x + 2$	Yes	This equation is in the correct form: $ax^2 + bx + c$
$7x^2 = 49$	Yes	This equation can be rewritten as: $7x^2 - 49$. In this equation, *b* is 0. *B* or *c* can be 0; however, *a* cannot be 0.
$2x^2 = 8x - 3$	Yes	This equation can be rewritten as $2x^2 - 8x + 3$ which would then be in the correct form of: $ax^2 + bx + c$.

Roots

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

If $b^2 - 4ac = 0$ the roots are real and equal;
If $b^2 - 4ac > 0$ then the roots are real and unequal (or distinct);
If $b^2 - 4ac < 0$ then the roots are imaginary;
If $b^2 - 4ac$ is a perfect square (¹ 0) the roots are real, rational and unequal (distinct

Let's solve together : **Example 5**

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

Example 6

Divide 25 into two parts so that sum of their reciprocals is 1/6.

Let's solve together: **Example 8**

1. The denominator of a fraction exceeds the numerator by 5 and if 3 be added to both, the fraction becomes 3/4 .

Find the fraction

Example : 9

If thrice of A's age 6 years ago be subtracted from twice his present age, the result would be equal to his present age. Find A's present age.

Example 10

For a certain commodity the demand equation giving demand ‘d’ in kg, for a price ‘p’ in rupees per kg. is $d = 100\ (10 – p)$.

The supply equation giving the supply s in kg. for a price p in rupees per kg. is $s = 75(p – 3)$. The market price is such at which demand equals supply.

Find the market price and quantity that will be bought and sold

Example 11

If the numerator of a fraction is increased by 2 and the denominator by 1 it becomes 1. Again if the numerator is decreased by 4 and the denominator by 2 it becomes 1/2 .

Find the fraction.

Example 12

A number consist of three digit of which the middle one is zero and the sum of the other digits is 9.

The number formed by interchanging the first and third digits is more than the original number by 297 find the number

Hints & solution

SOLUTION: Let the number be $100x + y$.

we have $x + y = 9$……(i) Also $100y + x = 100x + y + 297$ (ii)

From (ii) $99(x - y) = -297$

or $x - y = -3$ (iii)

Adding (i) and (ii) $2x = 6$ or $x = 3$ ∴ from (i) $y = 6$

∴ Hence the number is 306.

Example 13

Five times of a positive whole number is 3 less than twice the square of the number. Find the number

Example 14

A distributor of apple Juice has 5000 bottle in the store that it wishes to distribute in a month. From experience it is known that demand D (in number of bottles) is given by $D = -2000p^2 + 2000p + 17000$. The price per bottle that will result zero inventory is

THANK YOU