**CHAPTER SIX**

**SIMULTANEOUS EQUATIONS**

\* In simultaneous equation, one may be given two equations, containing two unknown variables.

\* To solve these equations simultaneously means that you must determine a set of values for these unknown variables, such that when these values are substituted into any of the two equations in turn, each will be satisfied.

\* Different methods such as the elimination method, the substitution method or the graphical method can be applied.

(Q1) Solve the equations given simultaneously

a + b = 10

a - b = 4

N/B

1. Let the first equation be equation (1) and the second one be equation (2).
2. Ensure that the second letters or the unknown variables of each of the equations (i.e. the b in ‘this case) are of the same value.
3. Ensure also that one of the signs is positive while the other is negative.
4. When all these conditions have been satisfied, the two equations are added up.

Solution

a + b = 10----equation (1)

a - b = 4------equation (2)

Since each b has the same value as the other one , and we have both the positive as well as the negative signs being available, we add them together.

i.e.

a + b =10 ----------equation (1)

+a - b = 4 -----------equation (2)

2a = 14

⇒ 2a = 14 ⇒ a = =7

N/B: When positive b is added to negative b, we get 0 for which there is no need to indicate.

In order to find the value of b, substitute or put a = 7 into either equation (1) or equation (2).

Substituting a =7 into eqn. (1)

⇒ a + b = 10

∴ 7 + b = 10

⇒ b = 10 - 7 = 3 ⇒ b = 3.

N/B : The values a = 7 and b = 3 when substituted into either equation (1) or equation (2) must satisfy or balance it.

i.e. a + b = 10 ----------eqn (1)

⇒ 7 + 3 = 10

⇒ 10 = 10.

Also a - b = 4-------------eqn (2)

⇒ 7 - 3 = 4

⇒ 4 = 4.

(Q2) Solve the following equations simultaneously

and .

Soln

Let …………….eqn (1)

And ………… eqn (2)

Adding the two equations up 155

⇒

+

2 =2

∴2= 2 ⇒ = = 1.

Substitute = 1 into eqn (1) to find the value of y

i.e. + = 3 ⇒1 + = 3,

⇒⇒

The values of and which satisfy simultaneously the two given equations are

= 1 and .

N/B: The above method used is referred to as the elimination method.

The same question could have been solved, using the substitution method, which is illustrated next:

+ = 3 …………….eqn (1)

………… eqn (2)

From eqn (1) , + = 3

⇒. Substitute into eqn (2)

i.e ⇒

(3 - ) - ⇒ 3 – – = - 1,

∴3 - 2 = - 1 ⇒ - 2- 1 – 3,

⇒ -2 = - 4 ⇒

⇒

Substitute into eqn (1) to find

i.e. + = 3 ⇒

⇒

⇒.

(Q3) Solve the following equations simultaneously:

Soln

Let …………………eqn (1) and eqn (2)

N/B: Considering these two equations, the values of q are not the same, or equal.

− In order to make them equal, 2 is used to multiply through eqn. 2 (i.e )

− Multiplying through eqn (2) by 2

⇒

∴ …………………eqn (3) − After multiplying through an equation with any number, it changes into another equation

−For this reason, eqn (2) changes into eqn (3) after using 2 to multiply through it.

− We now consider equation (1) and equation (3)

i.e.

…………………eqn (1)

eqn (3)

Since each has the same value as the other one, with both the negative and positive signs being present, we add them up.

157

i.e

. +

------------------

3p =18

Substitute into eqn (2)

i.e

∴.

The required answer is p = 6 and q = 3.

Method 2 (Substitution Method):

………………eqn (1)

…………………eqn (2)

From eqn (2) p

Substitute pinto eqn (1) i.e

∴ q = 3.

Now substitute q = 3 into eqn (1) or eqn (2) to find p.

Using eqn (1) i.e

(Q 4) Find the values of and which satisfy the equations

and simulteniously .

Soln

Let ………………. (1) and ……………..eqn (2)

Multiply eqn (2) by 4

………………..eqn (3)

Add eqn (1) and eqn (3) +

.

Substitute = 1.6 into eqn (1) i.e.

∴

(Q5) Find the values of and w which satisfy these given equations simultaneously:

N/B: There is the presence of the positive as well as the negative sign and each w has the same value as the other .We therefore add them up straight away.

Soln

∴

∴ Substitute into equation (1) i.e.= -3

.

Therefore the required values are

(Q6) Solve simultaneously the equations and

Soln

Let ………………..eqn (1) and 5p + 3q = 27………………eqn (2)

N/B: We have 3q in eqn (2) and only q in eqn (1)

−In order to make them equal, multiply eqn (1) by 3

Soln

Eqn (1) 3

………………………eqn (3)

Add eqn (2) and eqn (3)

eqn (2)

+…………………..eqn (3)

∴p = 3. Substitute p = 3 into eqn (1) i.e. 2p

(Q 7) Solve simultaneously the equations .

Soln

Let …………………….eqn (1) and

………………..eqn (2)

Multiply through eqn (1) using 2

…………………………eqn (3)

Now adding eqn (2) and eqn (3) together

+ P+ 2q = 12

3p =18

3p = 18 .

Substitute p = 6 into eqn (1) to find q i.e

∴

.

(Q 8) Determine the set of values of which satisfy simultaneously these given equations:

N/B: Even though the value of the in each of these two given equations is the same, all the two given signs are positive.

− We must therefore change the positive sign of any of them, into the negative sign by using to multiply through it .

soln

Let

Using to multiply through eqn (2)

Add eqn (3) and eqn (1) together i.e.

+−3− 4y = −7

.

Put

∴∴y = 1 .

(Q9) Find the values of and which satisfy simultaneously the equations

Soln

Let

and

Multiply through eqn (2) using

Adding eqn (3) and eqn (1) +

∴.

Substitute

∴

.

(Q10) Determine the set of values of and which can satisfy the equations

simultaneously.

Soln

N/B: The + 2y in eqn (2) must first be changed into .

To do so, multiply through eqn (2) with .

Eqn (2)

Add eqn (1) and eqn (3)

…………………

Put

∴1

The .

(Q11) Solve the equations .

Soln

Let

The +2b in eqn (2) must be changed into

Adding eqn (1) and eqn (3)

+

∴

Substitute a = 2 into eqn (2) i.e. a + 2b = 4

∴a =2 and b = 1.

(Q12) Determine the values of simultaneously

each of these given equations:

Soln

Let ……………eqn (1)

and…………..eqn (2)

Since eqn (2) contains + 12, the +4 must be converted into

To do so, we multiply equation (1) by

Add eqn (2) and eqn (3) i.e

+

.

.

(Q13) Solve these equations simultaneously:

N/B: The negative and positive signs are present, but there is no whole number which can multiply the 2y to give us 3y.

In order to make the two values of the y equal, Use the number attached to the y in the second equation i.e.2 to multiply the first equation. Also use the number attached to the y in the first equation i.e 3 to multiply the second equation.

Soln

Let

eqn (2)

.

+

8

.

(Q14) Solve for the values of

.

Soln

Let

.

.

.

(Q15) Given that a + 2b =3 and

2a

Soln

Add eqn (3) and eqn (4)

4a − 14b = −10

.

(Q16) Given that

………….eqn (2)

N/B: Since all the two signs are the positive signs, one of them must be converted into the negative sign, and the values of y must be made equal.

-To do so, we rather use eqn (2) instead of using 2, and use 3 to multiply eqn. (1) .

Soln

.

Now substitute

.

.

. .

and 2x+8y = -14.

N/B: Since the signs are all positive, use -3 to multiply through the second equation instead of using 3.

(Q19) Find the values of x and y which satisfy the equations given simultaneously

N/B: Both of the signs given are negative. Therefore one of them must be converted into the positive sign by using to multiply through any of the given equations.

+

.

(Q20) Given that 8w - 2k = 12 and 2w – 6k = 12, determine the values of w and k which simultaneously satisfy these given equations.

N/B:

Since eqn (2) contains - 6k, the -2k found in eqn (1) must be converted into 6k. .

eqn (2) + eqn (3)

.

.

.

(Q21) Solve simultaneously the equations .

.

= 4.

.

(Q22) Solve the following equations simultaneously: and

.

.

.

.

Putting

.

(Q23) Solve the equations given below simultaneously:

.

Method (2) Substitution method:

5x – 2y = 32

**The story problem form of simultaneous equation:**

* Simultaneous equations may be presented in an indirect form, such as the story form.
* A brief story may be presented and from this, two equations can be had through mathematical analysis, with two unknowns and then solved simultaneously.
* (Q1) A group of six ladies and seven gentlemen paid tax totaling ¢127. Another group of eight ladies and ten gentlemen paid tax totaling ¢ 170. If the tax paid by a male is fixed, and that paid by a female is also of a fixed value, determine the tax paid by

1. a single lady. (b) a single gentleman.

Soln

Let

.

(Q2) A family of 3 adults and 2 children paid ¢ 28 as taxi fare. Another family of an adult and 9 children paid ¢ 26 as taxi fare.

1. Determine the fare per child and that per adult.
2. How much will be paid by two children and two adults.
3. Find how much a group of 5 adults and 3 children will pay, given that the fare per child is the same, and that for an adult is also the same.

Soln

Let y = the fare paid by an adult, and let = that paid by each child. In the first case, 3 adults and 2 children paid ¢28S.

Fare paid by each adult = y .

Fare paid by each child =.

.

Since the total fare paid by the three adults and the two children =¢28

In the second case, an adult and 9 children paid ¢26.

Fare paid by the adult = y and the fare paid by 9 children= 9

Since the adult and the 9 children paid ¢26

y + 9

.

.

.

.

.

.

(Q3) The sum of the ages of Akin and Dop is 35 years, and the sum of twice Akin’s age and 3 times Dop’s age is 89. Find their present ages.

Soln

Let

.

(Q4) A man weighed 2 cups of rice together with 4 cups of wheat, and their total weight was 14g .He then weighed 3 cups of rice together with a cup of wheat, and their total weight was 11g.

1. What is the weight of each cup of rice and each cup of wheat.
2. Determine the total weight of 2 cups of rice and 3 cups of wheat.

Soln

Let r = the weight of each cup of rice, and let w = the weight of each cup of wheat. .

In the first case, he weighed 2 cups of rice together with 4 cups of wheat, and had a total weight of 14g,

In the second case , he weighed 3 cups of rice together with a cup of wheat and the total weight was 11g Consider eqn (1) and eqn (2) 2r +4w =14………………………eqn ( 1) 3r + w = 11………………………eqn (2)

Eqn (2)

Now add eqn (3) and eqn (1)

.

.

.

.

(Q5) The total cost of 60 apples and 100 eggs is ¢ 108,000. If the cost of 72 apples is the same as that of 12 eggs, determine the cost of 101 apples and 20 eggs.

Soln

Let = the cost of an apple ⇒ the total cost of the 60 apples = 60

Let y = the cost of an egg, ⇒ the cost of the 100 eggs = 100y.

Since the total cost of the 60 apples and the 100 eggs is ¢108,000 ⇒ 60+100y = 108,000……………………..eqn (1)

Cost of the 72 apples = 72, and the cost of the 12 eggs =12y.

Since the cost of the 72 apples and the 12 eggs are equal, then 72 = 12y ⇒ y⇒ y = 6 ……………………………….eqn (2)

Substitute y = 6 into eqn (1)

i.e. 60+ 100y =108,000

⇒ 60+ 100(6) = 108,000

⇒ 60+ 6=108,000,

⇒ 660108,000,

⇒

⇒ the cost of each apple =¢163.6.

Substitute =163.6 into eqn (2) i.e. y = 6⇒ y = 6(163.6)

⇒ y = 981.6.

⇒ cost of each egg = ¢981.6.

The cost of the 10 apples and the 20 eggs = 10 + 20y

=10(163.6) + 20 (981.6)

=1636 +19632 = ¢21,268.

**Simultaneous equations involving indices:**

* It is a possibility to be given questions based on simultaneous equations, which involve indices or exponential equations.

(Q1) Solve simultaneously the equations given next:

3m × 3n = 243

3m ÷ 32n = 9

Soln

Let 3m × 3n = 243………………………….eqn (1).

And 3m ÷ 32n = 9…………………………..eqn (2).

From eqn (1) 3m×3n = 243.

But 243 = 3×3×3×3×3=35, and 3m×3n =3 m + n

⇒3 m + n = 35 ⇒ m + n = 5.

Let m + n = 5 ……………………………….eqn (3)

From eqn (2) 3m ÷ 32n = 9

But 9 =3×3 = 32 and 3m ÷ 32n = 3m - 2n

⇒ 3m - 2n = 32, ⇒ m− 2n = 2.

Let m – 2n = 2 …………………………….. eqn (4)

Solve eqn (3) and eqn (4) simultaneously

i.e m + n = 5 ……………………………..eqn (3)

m – n = 2 ……………………………..eqn (4)

Eqn. (3) (2) ⇒ 2m + 2n = 10 …………... eqn (5)

Add eqn (4) and eqn (5)

i.e m – 2n = 2 + 2m + 2n = 10

3m = 12

From 3m = 12 ⇒ m = . Substitute m = 4 into eqn (3)

i.e m + n = 5 ⇒ 4 + n = 5, ⇒ n = 5 – 4 = 1.

(Q2) Solve the equations given simultaneously:

.

Soln.

Let ………………………… eqn (1)

And let …………………… eqn (2)

From eqn (1)

⇒ = 32, but 32 =

⇒=

⇒ = ⇒ x + 2y = 5………………… eqn (3)

From eqn (2)

⇒ = 4, ⇒ =

⇒ 6x – 4y = 2……………………………. eqn (4)

Now consider eqn (3) and eqn (4)

i.e x + 2y = 5…………………………… eqn (3)

6x – 4y = 2…………………………... eqn (4)

Eqn. (3)

2x + 4y = 10……………………………..eqn (5)

Now solve eqn (4) and eqn (5) simultaneously by adding them together.

6x – 4y = 2

+ 2x + 4y = 10

8x = 12

8x = 12 ⇒ x = .

Put x = 1.5 into eqn (3)

i.e x+ 2y = 5 ⇒ 1.5 + 2y = 5,

∴ 2y = 5 – 1.5, ⇒ 2y = 3.5

⇒ y = = 1.7.

(Q3) Solve simultaneously the following equations:

= 8

= 128.

Soln.

8 = and 128 =

From = 8 ⇒ =

⇒ x – y = 3……………………………… eqn (1)

From = 128 ⇒ =

⇒ 3x – y = 7…………………………… eqn (2)

Consider eqn (1) and eqn (2)

x – y = 3…………………………… eqn (1)

3x – y = 7…………………………... eqn (2)

Eqn. (1)

-x + y = -3………………………... eqn (3)

Add eqn (3) and eqn (2)

i.e -x + y = -3

+ 3x – y = 7

2x = 4

⇒ 2x = 4 ⇒ x = .

Put x = 2 into eqn (1)

i.e x - y = 3 ⇒ 2 – y = 3,

∴ - y = 3 – 2 ⇒ -y = 1

∴ y = -1.

(Q4) Solve simultaneously

= 81

= 32.

Soln.

Let = 81……………………….. eqn (1)

And = 32………………………. eqn (2)

From eqn (1) = 81 and since 81 = 34

⇒ = 34

⇒ 2x – y = 4

Let 2x – y = 4……………………… eqn (3)

From eqn (2) = 32 and since 32 = 25

⇒ =

⇒ x + y = 5

Let x + y = 5……………………... eqn (4)

Now solve eqn (3) and eqn (4) simultaneously

i.e 2x – y = 4

+ x + y = 5

3x = 9

From 3x = 9 ⇒ x =

Put x = 3 into eqn (4)

i.e x + y = 5 ⇒ 3 + y = 5,

⇒ y = 5 – 3 = 2.

∴ y = 2.

(Q5) Find the values of x and y which satisfy simultaneously the equations given next:

64.

Soln.

Let …………………………….eqn (1).

And 64………………………………. eqn (2).

From eqn (1) and since 625 = 5 x 5 x 5 x 5 = 54

⇒⇒ 2x – y = 4,

Let 2x – y = 4………………………………eqn (3)

From eqn (2) 64 and since 64 = 43

⇒ =

=> x + y = 3

Let x + y = 3……………………………. eqn (4)

Now solve eqn (3) and eqn (4) simultaneously

i.e 2x – y = 4

+ x + y = 3

3x = 7

From 3x = 7 ⇒ x =

∴ x = 2.3.

From eqn (4), x + y = 3 => 2.3 + y = 3 => y = 0.7.

(Q6) Solve the given equations simultaneously.

2x + y = 4

Soln.

Let 2x + y = 4………………………………….eqn (1)

and………………………………….eqn (2)

From eqn (2)

⇒

=> x + y = 3………………………..eqn (3)

NB: 8 =2.

Now consider eqn (1) and eqn (3)

i.e 2x + y = 4……………….eqn (1)

x + y = 3………………..eqn (3)

eqn (3) -1 ⇒ -x –y = -3…………..eqn (4)

Solve eqn (1) and eqn (4) simultaneously

i.e 2x + y = 4

+ -x – y = -3

x = 1

Put x = 1 into eqn (1)

i.e 2x + y = 4 ⇒ 2(1) + y = 4,

⇒ 2 + y = 4 ⇒ y = 4 – 2 = 2,

∴ y = 2.

(Q7) Solve the following equations simultaneously:

=

=

Soln.

16 = = = 24(1 + 2y), and since 22x – 1 = 161 + 2y

⇒ =

⇒ 2x – 1 = 4(1 + 2y)

⇒ 2x – 1 = 4 + 8y

∴2x – 8y = 5…………………………eqn (1)

Consider =

Since ,

then from =

⇒ =

⇒ 3x = 4(y – 1) ⇒ 3x = 4y – 4

⇒ 3x – 4y = - 4……………………………eqn (2)

Now solve eqn (1) and eqn (2) simultaneously

i.e 2x – 8y = 5………………….eqn (1)

3x – 4y = -4…………………eqn (2)

Eqn (2) -2

⇒ - 6x + 8y = 8…………………..eqn (3)

Add eqn (1) and eqn (3)

i.e 2x – 8y = 5…………………eqn (1)

+ -6x + 8y = 8…………………..eqn (3)

-4x = 13

From -4x = 13 ⇒ x =

⇒ x = -3.3

Put x = -3.3 into eqn (1)

i.e 2x - 8y = 5

⇒ 2(-3.3) – 8y = 5,

⇒ - 6.6 – 8y = 5

⇒ - 6.6 – 5 = 8y,

⇒ -11.6 = 8y ⇒ y =

⇒ y = -1.45.

(Q8) Solve the equations given simultaneously.

=

=

Soln.

27 = and =

From =

⇒ =

⇒ x + 1 = 3(y -1) ⇒ x + 1 = 3y – 3,

⇒ x – 3y = -3 – 1

∴ x – 3y = - 4…………………………..eqn (1)

Now =

⇒ =

⇒ 2x = 2(y + 2) ⇒ 2x = 2y + 4,

∴ 2x – 2y = 4…………………………..eqn (2)

You then continue by solving eqn (1) and eqn (2) simultaneously.

**Simultaneous equations involving fractions:**

Sometimes one may be given equations to solve simultaneously, in which fractions are involved.

At times one of the equations may be associated with fractions, while the other may not.

Sometimes, both equations may involve fractions,

To solve such questions, those in the fractional form must be converted into linear or non fractional forms, by multiplying through them with the appropriate number, which will remove these fractions.

(Q1) Solve the equations given below simultaneously:

Use 4 to multiply through the first equation.

Consider

⇒

⇒

Let

And

Eqn (2) × 2 gives us

Add eqn (1) and eqn (3)

i.e.

+ - 4

.

.

(2) Solve the given equations simultaneously:

Soln

Consider

Multiply through using 10

⇒

Let ……………..eqn (1)

And

Multiply eqn ( 2) by 5 and this gives us

…………eqn ( 3)

Now solve eqn (1) and eqn (3) simultaneously

i.e 10

∴

Substitute

i.e

∴

⇒ y =

(Q3) Determine the values of

Soln

Consider the equation

Multiply through using 15

i.e.

⇒

Now consider the second equation

Multiply through using 30

i.e

⇒

i.e

Multiply eqn (1) by

+ 63a + 140b = 840

51a =1020

* .

Put a = 20 into eqn (1) , i.e

⇒ ⇒

.

Q 4) Determine the values of

Consider the first equation, i.e .

Multiply through using 6

i.e

⇒

Now consider the second equation, i.e

Multiply through using 15

i.e 15

⇒ 12

Consider now eqn (1) and eqn (2)

i.e 4x.

Eqn (1)

48

Add eqn (3) and eqn (4)

48 + 40 y = 960

8 = 120

⇒.

Substitute

i.e

∴

∴ 4y = 24 ⇒ y =

∴.

(Q5) Half a certain number was added to one third of another number and our answer was 2. But when twice the first number was added to four times the second number, our answer was 16 .Find these numbers.

Soln

Let a = the first number and let b = the second number in the first case, and since half the first number was added to one third the second number and our answer was 2,

⇒

Multiply through using 6

⇒

Let 3a + 2b = 12 …………….eqn (1).

In the second case, twice the first number was added to four times the second number and our answer was 16.

⇒ 2a +4b = 16 and let

2a + 4b = 16 …………eqn (2) .

Consider eqn (1) and eqn (2) .

3a + 2b = 12 ………..eqn (1)

2a + 4b = 16………….eqn (2)

Multiply eqn (1) by

⇒

Solve now eqn (2) and eqn (3) simultaneously

i.e.

+ 2a + 4b = 16

Put a = 2 in eqn (2)

⇒

=> 4b = 16

⇒ b =

(Q6) Solve simultaneously:

Hint:

Consider

Multiply through using 10

⇒

⇒

Consider

⇒,

⇒

Multiply through using 6

⇒ 6

⇒ 12

⇒

⇒ Continue by solving eqn (1) and eqn (2) simultaneously.

(Q7) Solve the simultaneous equations:

Let ………………………….eqn (1)

and……………………….....eqn (2)

Consider equation (1), since *x*x y = xy, we use xy to multiply through it.

⇒,

⇒ y + x = 2xy…………………………………eqn (3)

Consider eqn (2), since the denominators are also x and y, we use xy to multiply through it since x.

i.e

⇒ 2y + x = 3xy……………………………..eqn (4)

Now Consider eqn (3) and eqn (4)

i.e y + x = 2xy…………………………eqn (3)

2y + x = 3xy………………………..eqn (4)

Multiply through eqn (3) using -1 and this gives

-y – x = -2xy…………………….eqn (5)

Solve eqn (4) and eqn (5) simultaneously by adding them up,

i.e 2y + x = 3xy

+ -y – x = -2xy

1y = 1xy

∴ From 1y = 1xy, divide through using y

⇒

⇒ 1 = x or x = 1.

Put x = 1 into eqn (1)

i.e

⇒

⇒

⇒ y⇒ y = 1.

(Q8) Determine the values of a and b, which simultaneously satisfy the equations:

Let ………………………………….eqn (1)

and ………………………………eqn (2)

Consider equation (1) and since a

i.e

⇒ b + 2a = 3ab………………………………eqn (3).

Consider eqn (2) and since 2a,

i.e

⇒ 4b – 2a = 2ab………………………….….eqn (4).

Solve eqn (3) and eqn (4) simultaneously

b + 2a = 3ab

+ 4b – 2a = 2ab

5b = 5ab

⇒ 1

⇒1 =

⇒ a = 1

(Q9) Solve the following equations simultaneously: and

Let ………………………………….eqn (1)

and

Consider eqn (1), since 2x

i.e

=> 4y + 2x = 6xy……………………………eqn (3)

Consider eqn (2), since 3x.

i.e

6y – 3x = 3xy…………………………………eqn (4)

Now consider eqn (3) and eqn (4)

i.e 4y + 2x = 6xy……………………………eqn (3)

6y – 3x = 3xy………………………….…eqn (4)

Eqn (3)⇒ 12y + 6x = 18xy……………...eqn (5)

Eqn (4) 12y – 6x = 6xy………………..eqn (6)

Add eqn (5) to eqn (6)

i.e 12+ 6x = 18xy

+ 12y – 6x = 6xy

24y = 24xy

⇒ 1.

Divide through using 24

⇒

⇒ 1.

Divide through using y

⇒

⇒ 1 = x or x = 1.

Substitute x = 1 into eqn (1)

i.e

⇒

⇒ 2 +

⇒

⇒ y = 1.

NB: If the two given variables such as the x and the y in the two given equations are not in line with each other, then they must be brought in line with each other. Also, xy = yx and mn = nm.

(Q10) Solve the following equations simultaneously: .

.

Eqn (1)

Eqn (2)

For the x and the y variables in eqn (3) eqn (4) to be in line with each other, rewrite eqn (3) i.e x + y = 5xy as y + x = xy.

Finally solve eqn (3) and eqn (4) simultaneously.

i.e x + y = 5xy………………………………eqn (3)

x - y = xy………………………………..eqn (4).

**Simultaneous equations which give rise to quadratic equations:**

There are certain types of simultaneous equations, which give rise to quadratic equations, which need to be solved.

-Such quadratic equations can be solved by the completing of the square method, or by the use of the formula

(Q1) Find the values of

Soln

Let

and

From eqn (1)

Dividing through using y

⇒.

Substitute

i.e

⇒

⇒.

Multiply through using y

⇒

⇒ 4+y2 = 4y ⇒ 4+ y2

⇒ y2

⇒1y2

Which is a quadratic in y.

Now 1y22 + b.

By comparism,

Now y =

⇒ y =

⇒ y =

⇒

⇒

Substitute

i.e

⇒

.

(Q2) Solve the following equations simultaneously:

ab =3

soln

Let 2a + b = 5 …………….eqn (1)

and

From eqn (2) ab = 3 ⇒ a =

Substitute a =

i.e 2a +b = 5

Multiply through using b

2 = 5b,

2= 02

which is a quadratic in b.

Now 1b22 + b.

By comparism, a = 1, b =

Questions

(Q1) Solve the following equations simultaneously: (a)

(c )

(d)

*Ans: x = -1 and y = 2.*

(e) 3a + 2b =11

a + 4b =7

*Ans: a = 3 and b = 1.*

(f)

(g)

(h)

(j)

(k)

(L) 2a + b = 14

(m)

.

(N) 3a + 2b = 34

(o)

(P)

(Q2) Esi bought 2 apples and 3 pineapples for ¢16. She later went to buy an apple and 4 pineapples for ¢18. If the price for an apple is the same and that for a pineapple is also the same, determine the cost of

1. each apple . Ans¢2
2. each pineapple . Ans ¢4
3. five apples and two pineapples Ans ¢18

(Q3) A bucket containing 3 mangoes and 4 oranges had a total weight of 7g. Another bucket containing 6 mangoes and 2 oranges had a total weight of 8g .If the weight of a mango is fixed, and that of an orange is also fixed, find the weight of

1. each mango Ans: 1g
2. each orange Ans : 1g
3. three mangoes and five oranges. Ans 8g

(Q4) A group of four men and two ladies paid ¢ 10 as lorry fare.

Another group of three gentlemen and three ladies paid ¢9 as lorry fare.

Determine the fare for

1. each man. Ans: ¢2
2. each woman Ans:¢1
3. Determine the fare paid by 3 men and 5 women . Ans :¢11

(Q5) Solve simultaneously the following equations:

Ans:

(Q

Ans: a = 2 and b =

(Q7) Solve the following equations simultaneously:

Ans :

(Q8) Determine the values of

Ans:

(Q9) Solve the following equations simultaneously:

a + 2b = 4

ab = 2

Ans: a = 2 and b = 1

(Q10) Given that

Ans:

: .