ICSE Class 9 Maths Selina Solutions Chapter 8: Here are the Selina answers to the problems found in the ICSE Class 9 Maths Selina Solutions Chapter 8 Logarithms. Students get in-depth knowledge on the subject of logarithms in this chapter. By completing all of the questions in the Selina textbook, students can easily receive a perfect score on their exams.

The ICSE Class 9 Maths Selina Solutions Chapter 8 is quite simple to comprehend. All the exercise questions in the book are addressed in these solutions, which follow the ICSE or CISCE syllabus. The ICSE Class 9 Maths Selina Solutions Chapter 8 are available here in PDF format, which can be accessed online or downloaded. Additionally, students can download these Selina solutions for free and use them offline for practice.

ICSE Class 9 Maths Selina Solutions Chapter 8 Overview

Chapter 8 of the ICSE Class 9 Maths Selina book focuses on logarithms, which are a way of expressing very large or very small numbers in a more manageable form.

ThisICSE Class 9 Maths Selina Solutions Chapter 8 introduces the concept of logarithms, explains their basic properties and rules, and shows how to solve equations involving logarithms. Key topics include the definition of logarithms, their relationship to exponents, and various logarithmic identities.

ICSE Class 9 Maths Selina Solutions Chapter 8

Below we have provided ICSE Class 9 Maths Selina Solutions Chapter 8 –

1. Express each of the following in logarithmic form:

(i) $5^3 = 125$

(ii) $3^{-2} = 1/9$

(iii) $10^{-3} = 0.001$

(iv) $(81)^{3/4} = 27$

Solution:

We know that,

$a^b = c \Rightarrow \log_a c = b$

(i) $5^3 = 125$

$\log_5 125 = 3$

(ii) $3^{-2} = 1/9$

$\log_3 1/9 = -2$

(iii) $10^{-3} = 0.001$

$\log_{10} 0.001 = -3$

(iv) $(81)^{3/4} = 27$

$\log_{81} 27 = ¾$

2. Express each of the following in exponential form:

(i) $\log_8 0.125 = -1$

(ii) $\log_{10} 0.01 = -2$

(iii) $\log_a A = x$

(iv) $\log_{10} 1 = 0$

Solution:

We know that,

$\log_a c = b \Rightarrow a^b = c$

(i) $\log_8 0.125 = -1$

$8^{-1} = 0.125$

(ii) $\log_{10} 0.01 = -2$

$8^{-1} = 0.125$

(iii) $\log_a A = x$

$a^x = A$

(iv) $\log_{10} 1 = 0$

$10^0 = 1$

3. Solve for x: $\log_{10} x = -2$.

Solution:

We have,

$\log_{10} x = -2$

$10^{-2} = x$ [As $\log_a c = b \Rightarrow a^b = c$]

$x = 10^{-2}$

$x = 1/10^2$

$x = 1/100$

Hence, $x = 0.01$

4. Find the logarithm of:

(i) 100 to the base 10

(ii) 0.1 to the base 10

(iii) 0.001 to the base 10

(iv) 32 to the base 4

(v) 0.125 to the base 2

(vi) 1/16 to the base 4

(vii) 27 to the base 9

(viii) 1/81 to the base 27

Solution;

(i) Let $\log_{10} 100 = x$

So, $10^x = 100$

$10^x = 10^2$

Then,

$x = 2$ [If $a^m = a^n$; then $m = n$]

Hence, $\log_{10} 100 = 2$

(ii) Let $\log_{10} 0.1 = x$

So, $10^x = 0.1$

$10^x = 1/10$

$10^x = 10^{-1}$

Then,

$x = -1$ [If $a^m = a^n$; then $m = n$]

Hence, $\log_{10} 0.1 = -1$

(iii) Let $\log_{10} 0.001 = x$

So, $10^x = 0.001$

$10^x = 1/1000$

$10^x = 1/10^3$

$10^x = 10^{-3}$

Then,

$x = -3$ [If $a^m = a^n$; then $m = n$]

Hence, $\log_{10} 0.001 = -3$

(iv) Let $\log_4 32 = x$

So, $4^x = 32$

$4^x = 2 \times 2 \times 2 \times 2 \times 2$

$(2^2)^x = 2^5$

$2^{2x} = 2^5$

Then,

$2x = 5$ [If $a^m = a^n$; then $m = n$]

$x = 5/2$

Hence, $\log_4 32 = 5/2$

(v) Let $\log_2 0.125 = x$

So, $2^x = 0.125$

$2^x = 125/1000$

$2^x = 1/8$

$2^x = (½)^3$

$2^x = 2^{-3}$

Then,

$x = -3$ [If $a^m = a^n$; then m = n]

Hence, $\log_2 0.125 = -3$

(vi) Let $\log_4 1/16 = x$

So, $4^x = 1/16$

$4^x = (¼)^{-2}$

$4^x = 4^{-2}$

Then,

$x = -2$ [If $a^m = a^n$; then m = n]

Hence, $\log_4 1/16 = -2$

(vii) Let $\log_9 27 = x$

So, $9^x = 27$

$9^x = 3 \times 3 \times 3$

$(3^2)^x = 3^3$

$3^{2x} = 3^3$

Then,

$2x = 3$ [If $a^m = a^n$; then m = n]

$x = 3/2$

Hence, $\log_9 27 = 3/2$

(viii) Let $\log_{27} 1/81 = x$

So, $27^x = 1/81$

$27^x = 1/9^2$

$(3^3)^x = 1/(3^2)^2$

$3^{3x} = 1/3^4$

$3^{3x} = 3^{-4}$

Then,

$3x = -4$ [If $a^m = a^n$; then $m = n$]

$x = -4/3$

Hence, $\log_{27} 1/81 = -4/3$

5. State, true or false:

(i) If $\log_{10} x = a$, then $10^x = a$

(ii) If $x^y = z$, then $y = \log_z x$

(iii) $\log_2 8 = 3$ and $\log_8 2 = 1/3$

Solution:

(i) We have,

$\log_{10} x = a$

So, $10^a = x$

Thus, the statement $10^x = a$ is false

(ii) We have,

$x^y = z$

So, $\log_x z = y$

Thus, the statement $y = \log_z x$ is false

(iii) We have,

$\log_2 8 = 3$

So, $2^3 = 8$ … (1)

Now consider the equation,

$\log_8 2 = 1/3$

$8^{1/3} = 2$

$(2^3)^{1/3} = 2$ … (2)

Both equations (1) and (2) are correct

Thus, the given statements, $\log_2 8 = 3$ and $\log_8 2 = 1/3$ are true

6. Find x, if:

(i) $\log_3 x = 0$

(ii) $\log_x 2 = -1$

(iii) $\log_9 243 = x$

(iv) $\log_5 (x – 7) = 1$

(v) $\log_4 32 = x – 4$

(vi) $\log_7 (2x^2 – 1) = 2$

Solution:

(i) We have, $\log_3 x = 0$

So, $3^0 = x$

$1 = x$

Hence, $x = 1$

(ii) we have, $\log_x 2 = -1$

So, $x^{-1} = 2$

$1/x = 2$

Hence, x = ½

(iii) We have, $\log_9 243 = x$

$9^x = 243$

$(3^2)^x = 3^5$

$3^{2x} = 3^5$

On comparing the exponents, we get

2x = 5

x = 5/2 = 2½

(iv) We have, $\log_5 (x – 7) = 1$

So, $5^1 = x – 7$

5 = x – 7

x = 5 + 7

Hence, x = 12

(v) We have, $\log_4 32 = x – 4$

So, $4^{(x – 4)} = 32$

$(2^2)^{(x – 4)} = 2^5$

$2^{(2x – 8)} = 2^5$

On comparing the exponents, we get

2x – 8 = 5

2x = 5 + 8

Hence,

x = 13/2 = 6½

(vi) We have, $\log_7 (2x^2 – 1) = 2$

So, $(2x^2 – 1) = 7^2$

$2x^2 – 1 = 49$

$2x^2 = 49 + 1$

$2x^2 = 50$

$x^2 = 25$

Taking square root on both side, we get

$x = \pm 5$

Hence, x = 5 (Neglecting the negative value)

7. Evaluate:

(i) $\log_{10} 0.01$

(ii) $\log_2 (1 \div 8)$

(iii) $\log_5 1$

(iv) $\log_5 125$

(v) $\log_{16} 8$

(vi) $\log_{0.5} 16$

Solution:

(i) Let $\log_{10} 0.01 = x$

Then, $10^x = 0.01$

$10^x = 1/100 = 1/10^2$

So, $10^x = 10^{-2}$

On comparing the exponents, we get

$x = -2$

Hence, $\log_{10} 0.01 = -2$

(ii) Let $\log_2 (1 \div 8) = x$

Then, $2^x = 1/8$

$2^x = 1/2^3$

So, $2^x = 2^{-3}$

On comparing the exponents, we get

$x = -3$

Hence, $\log_{10} (1 \div 8) = -3$

(iii) Let $\log_5 1 = x$

Then, $5^x = 1$

$5^x = 5^0$

On comparing the exponents, we get

$x = 0$

Hence, $\log_5 1 = 0$

(iv) Let $\log_5 125 = x$

Then, $5^x = 125$

$5^x = (5 \text{ x } 5 \text{ x } 5) = 5^3$

So, $5^x = 5^3$

On comparing the exponents, we get

$x = 3$

Hence, $\log_5 125 = 3$

(v) Let $\log_{16} 8 = x$

Then, $16^x = 8$

$(2^4)^x = (2 \text{ x } 2 \text{ x } 2) = 2^3$

So, $2^{4x} = 2^3$

On comparing the exponents, we get

$4x = 3$

$x = 3/4$

Hence, $\log_{16} 8 = 3/4$

(vi) Let $\log_{0.5} 16 = x$

Then, $0.5^x = 16$

$(5/10)^x = (2 \times 2 \times 2 \times 2)$

$(1/2)^x = 2^4$

So, $2^{-x} = 2^4$

On comparing the exponents, we get

$-x = 4$

$\Rightarrow x = -4$

Hence, $\log_{0.5} 16 = -4$

8. If $\log_a m = n$, express a^{n-1} in terms in terms of a and m.

Solution:

We have, $\log_a m = n$

So,

$a^n = m$

Dividing by a on both sides, we get

$a^n/a = m/a$

$a^{n-1} = m/a$

9. Given $\log_2 x = m$ and $\log_5 y = n$

(i) Express 2^{m-3} in terms of x

(ii) Express 5^{3n+2} in terms of y

Solution:

Given, $\log_2 x = m$ and $\log_5 y = n$

So,

$2^m = x$ and $5^n = y$

(i) Taking, $2^m = x$

$2^m/2^3 = x/2^3$

$2^{m-3} = x/8$

(ii) Taking, $5^n = y$

Cubing on both sides, we have

$(5^n)^3 = y^3$

$5^{3n} = y^3$

Multiplying by 5^2 on both sides, we have

$5^{3n} \times 5^2 = y^3 \times 5^2$

$5^{3n+2} = 25y^3$

10. If $\log_2 x = a$ and $\log_3 y = a$, write 72^a in terms of x and y.

Solution:

Given, $\log_2 x = a$ and $\log_3 y = a$

So,

$2^a = x$ and $3^a = y$

Now, the prime factorization of 72 is

$72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$

Hence,

$(72)^a = (2^3 \times 3^2)^a$

$= 2^{3a} \times 3^{2a}$

$= (2^a)^3 \times (3^a)^2$

$= x^3y^2$ [As $2^a = x$ and $3^a = y$]

11. Solve for x: $\log (x – 1) + \log (x + 1) = \log_2 1$

Solution:

We have,

$\log (x – 1) + \log (x + 1) = \log_2 1$

$\log (x – 1) + \log (x + 1) = 0$

$\log [(x – 1) (x + 1)] = 0$

Then,

$(x – 1) (x + 1) = 1$ [As $\log 1 = 0$]

$x^2 – 1 = 1$

$x^2 = 1 + 1$

$x^2 = 2$

$x = \pm\sqrt{2}$

The value $-\sqrt{2}$ is not a possible, since log of a negative number is not defined.

Hence, $x = \sqrt{2}$

12. If $\log (x^2 – 21) = 2$, show that $x = \pm 11$.

Solution:

Given, $\log (x^2 – 21) = 2$

So,

$x^2 – 21 = 10^2$

$x^2 – 21 = 100$

$x^2 = 121$

Taking square root on both sides, we get

$x = \pm 11$

ICSE Class 9 Maths Selina Solutions Chapter 8 Exercise 8B

1. Express in terms of log 2 and log 3:

(i) log 36

(ii) log 144

(iii) log 4.5

(iv) log 26/51 – log 91/119

(v) log 75/16 – 2log 5/9 + log 32/243

Solution:

(i) log 36 = log (2 x 2 x 3 x 3)

= log $(2^2 \times 3^2)$

= log 2^2 + log 3^2 [Using $\log_a mn = \log_a m + \log_a n$]

= 2log 2 + 2log 3 [Using $\log_a m^n = n\log_a m$]

(ii) log 144 = log (2 x 2 x 2 x 2 x 3 x 3)

= log $(2^4 \times 3^2)$

= log 2^4 + log 3^2 [Using $\log_a mn = \log_a m + \log_a n$]

= 4log 2 + 2log 3 [Using $\log_a m^n = n\log_a m$]

(iii) log 4.5 = log 45/10

= log (5 x 3 x 3)/ (5 x 2)

= log $3^2/2$

= log 3^2 – log 2 [Using $\log_a m/n = \log_a m - \log_a n$]

= 2log 3 – log 2 [Using $\log_a m^n = n\log_a m$]

(iv) log 26/51 – log 91/119 = log (26/51)/ (91/119) [Using $\log_a m - \log_a n = \log_a m/n$]

= log [(26/51) x (119/91)]

= log (2 x 13 x 7 x 117)/ (3 x 17 x 7 x 13)

= log 2/3

= log 2 – log 3 [Using $\log_a$ m/n = $\log_a$ m – $\log_a$ n]

(v) log 75/16 – 2log 5/9 + log 32/243

= log 75/16 – log $(5/9)^2$ + log 32/243 [Using n$\log_a$ m = $\log_a$ m^n]

= log 75/16 – log 25/81 + log 32/243

= log [(75/16)/ (25/81)] + log 32/243 [Using $\log_a$ m – $\log_a$ n = $\log_a$ m/n]

= log (75 x 81)/ (16 x 25) + log 32/243

= log (3 x 81)/16 + log 32/243

= log 243/16 + log 32/243

= log (243/16) x (32/243) [Using $\log_a$ m + $\log_a$ n = $\log_a$ mn]

= log 32/16

= log 2

2. Express each of the following in a form free from logarithm:

(i) 2 log x – log y = 1

(ii) 2 log x + 3 log y = log a

(iii) a log x – b log y = 2 log 3

Solution:

(i) We have, 2 log x – log y = 1

Then,

log x^2 – log y = 1 [Using n$\log_a$ m = $\log_a$ m^n]

log x^2/y = 1 [Using $\log_a$ m – $\log_a$ n = $\log_a$ m/n]

Now, on removing log we have

$x^2/y = 10^1$

$\Rightarrow x^2 = 10y$

(ii) We have, 2 log x + 3 log y = log a

Then,

$\log x^2 + \log y^3 = \log a$ [Using $n\log_a m = \log_a m^n$]

$\log x^2y^3 = \log a$ [Using $\log_a m + \log_a n = \log_a mn$]

Now, on removing log we have

$x^2y^3 = a$

(iii) a log x – b log y = 2 log 3

Then,

$\log x^a - \log y^b = \log 3^2$ [Using $n\log_a m = \log_a m^n$]

$\log x^a/y^b = \log 3^2$ [Using $\log_a m - \log_a n = \log_a m/n$]

Now, on removing log we have

$x^a/y^b = 3^2$

$\Rightarrow x^2 = 9y^b$

3. Evaluate each of the following without using tables:

(i) log 5 + log 8 – 2log 2

(ii) $\log_{10} 8 + \log_{10} 25 + 2\log_{10} 3 - \log_{10} 18$

(iii) log 4 + 1/3 log 125 – 1/5 log 32

Solution:

(i) We have, log 5 + log 8 – 2log 2

$= \log 5 + \log 8 - \log 2^2$ [Using $n\log_a m = \log_a m^n$]

= log 5 + log 8 – log 4

= log (5 x 8) – log 4 [Using $\log_a m + \log_a n = \log_a mn$]

= log 40 – log 4

$= \log 40/4$ [Using $\log_a m - \log_a n = \log_a m/n$]

$= \log 10$

$= 1$

(ii) We have, $\log_{10} 8 + \log_{10} 25 + 2\log_{10} 3 - \log_{10} 18$

$= \log_{10} 8 + \log_{10} 25 + \log_{10} 3^2 - \log_{10} 18$ [Using $n\log_a m = \log_a m^n$]

$= \log_{10} 8 + \log_{10} 25 + \log_{10} 9 - \log_{10} 18$

$= \log_{10} (8 \times 25 \times 9) - \log_{10} 18$ [Using $\log_a l + \log_a m + \log_a n = \log_a lmn$]

$= \log_{10} 1800 - \log_{10} 18$

$= \log_{10} 1800/18$ [Using $\log_a m - \log_a n = \log_a m/n$]

$= \log_{10} 100$

$= \log_{10} 10^2$

$= 2\log_{10} 10$ [Using $\log_a m^n = n\log_a m$]

$= 2 \times 1$

$= 2$

(iii) We have, $\log 4 + 1/3\log 125 - 1/5\log 32$

$= \log 4 + \log (125)^{1/3} - \log (32)^{1/5}$ [Using $n\log_a m = \log_a m^n$]

$= \log 4 + \log (5^3)^{1/3} - \log (2^5)^{1/5}$

$= \log 4 + \log 5 - \log 2$

$= \log (4 \times 5) - \log 2$ [Using $\log_a m + \log_a n = \log_a mn$]

$= \log 20 - \log 2$

$= \log 20/2$ [Using $\log_a m - \log_a n = \log_a m/n$]

$= \log 10$

$= 1$

4. Prove that:

2log 15/18 – log 25/162 + log 4/9 = log 2

Solution:

Taking L.H.S.,

= 2log 15/18 – log 25/162 + log 4/9

= log $(15/18)^2$ – log 25/162 + log 4/9 [Using nlog$_a$ m = log$_a$ m^n]

= log 225/324 – log 25/162 + log 4/9

= log [(225/324)/(25/162)] + log 4/9 [Using log$_a$ m – log$_a$ n = log$_a$ m/n]

= log (225 x 162)/(324 x 25) + log 4/9

= log (9 x 1)/(2 x 1) + log 4/9

= log 9/2 + log 4/9 [Using log$_a$ m + log$_a$ n = log$_a$ mn]

= log (9/2 x 4/9)

= log 2

= R.H.S.

5. Find x, if:

x – log 48 + 3 log 2 = 1/3 log 125 – log 3.

Solution:

We have,

x – log 48 + 3 log 2 = 1/3 log 125 – log 3

Solving for x, we have

x = log 48 – 3 log 2 + 1/3 log 125 – log 3

= log 48 – log 2^3 + log $125^{1/3}$ – log 3 [Using nlog$_a$ m = log$_a$ m^n]

= log 48 – log 8 + log $(5^3)^{1/3}$ – log 3

= (log 48 – log 8) + (log 5 – log 3)

$= \log 48/8 + \log 5/3$ [Using $\log_a m - \log_a n = \log_a m/n$]

$= \log (48/8 \times 5/3)$ [Using $\log_a m + \log_a n = \log_a mn$]

$= \log (2 \times 5)$

$= \log 10$

$= 1$

Hence, $x = 1$

6. Express $\log_{10} 2 + 1$ in the form of $\log_{10} x$.

Solution:

Given, $\log_{10} 2 + 1$

$= \log_{10} 2 + \log_{10} 10$ [As, $\log_{10} 10 = 1$]

$= \log_{10} (2 \times 10)$ [Using $\log_a m + \log_a n = \log_a mn$]

$= \log_{10} 20$

7. Solve for x:

(i) $\log_{10} (x - 10) = 1$

(ii) $\log (x^2 - 21) = 2$

(iii) $\log (x - 2) + \log (x + 2) = \log 5$

(iv) $\log (x + 5) + \log (x - 5) = 4 \log 2 + 2 \log 3$

Solution:

(i) We have, $\log_{10} (x - 10) = 1$

Then,

$x - 10 = 10^1$

$x = 10 + 10$

Hence, $x = 20$

(ii) We have, $\log (x^2 - 21) = 2$

Then,

$x^2 – 21 = 10^2$

$x^2 – 21 = 100$

$x^2 = 100 + 21$

$x^2 = 121$

Taking square root on both sides,

Hence, $x = \pm 11$

(iii) We have, log (x – 2) + log (x + 2) = log 5

Then,

log (x – 2)(x + 2) = log 5 [Using $\log_a m + \log_a n = \log_a mn$]

log $(x^2 – 2^2)$ = log 5 [As $(x – a)(x + a) = x^2 – a^2$]

log $(x^2 – 4)$ = log 5

Removing log on both sides, we get

$x^2 – 4 = 5$

$x^2 = 5 + 4$

$x^2 = 9$

Taking square root on both sides,

$x = \pm 3$

(iv) We have, log (x + 5) + log (x – 5) = 4 log 2 + 2 log 3

Then,

log (x + 5) + log (x – 5) = log 2^4 + log 3^2 [Using $n\log_a m = \log_a m^n$]

log (x + 5)(x – 5) = log 16 + log 9 [Using $\log_a m + \log_a n = \log_a mn$]

log $(x^2 – 5^2)$ = log (16 x 9) [As $(x – a)(x + a) = x^2 – a^2$]

log $(x^2 – 25)$ = log 144

Removing log on both sides, we have

$x^2 - 25 = 144$

$x^2 = 144 + 25$

$x^2 = 169$

Taking square root on both sides, we get

$x = \pm 13$

8. Solve for x:

(i) log 81/log 27 = x

(ii) log 128/log 32 = x

(iii) log 64/log 8 = log x

(iv) log 225/log 15 = log x

Solution:

(i) We have, log 81/log 27 = x

x = log 81/log 27

= log (3 x 3 x 3 x 3)/ log (3 x 3 x 3)

= $\log 3^4/\log 3^3$

= (4log 3)/(3log 3) [Using $\log_a m^n = n\log_a m$]

= 4/3

Hence, x = 4/3

(ii) We have, log 128/log 32 = x

x = log 128/log 32

= log (2 x 2 x 2 x 2 x 2 x 2 x 2)/ log (2 x 2 x 2 x 2 x 2)

= $\log 2^7/\log 2^5$

= (7log 2)/(5log 2) [Using $\log_a m^n = n\log_a m$]

= 7/5

Hence, x = 7/5

(iii) log 64/log 8 = log x

log x = log 64/log 8

= log (2 x 2 x 2 x 2 x 2 x 2)/ log (2 x 2 x 2)

= log 2^6/log 2^3

= (6log 2)/(3log 2) [Using $\log_a m^n = n\log_a m$]

= 6/3

= 2

So, log x = 2

Hence, x = 10^2 = 100

(iv) We have, log 225/log 15 = log x

log x = log 225/log 15

= log (15 x 15)/ log 15

= log 15^2/log 15

= (2log 15)/log 15 [Using $\log_a m^n = n\log_a m$]

= 2

So, log x = 2

Hence, x = 10^2 = 100

9. Given log x = m + n and log y = m – n, express the value of log 10x/y^2 in terms of m and n.

Solution:

Given, log x = m + n and log y = m – n

Now consider log 10x/y^2,

log 10x/y^2 = log 10x – log y^2 [Using $\log_a m/n = \log_a m - \log_a n$]

= log 10x – 2log y

= log 10 + log x – 2 log y

= 1 + (m + n) – 2 (m – n)

= 1 + m + n – 2m + 2n

= 1 + 3n – m

10. State, true or false:

(i) log 1 × log 1000 = 0

(ii) log x/log y = log x – log y

(iii) If log 25/log 5 = log x, then x = 2

(iv) log x × log y = log x + log y

Solution:

(i) We have, log 1 × log 1000 = 0

Now,

log 1 = 0 and

log 1000 = log 10^3 = 3log 10 = 3 [Using $\log_a m^n = n\log_a m$]

So,

log 1 × log 1000 = 0 x 3 = 0

Thus, the statement log 1 × log 1000 = 0 is true

(ii) We have, log x/log y = log x – log y

We know that,

log x/y = log x – log y

So,

log x/log y ≠ log x – log y

Thus, the statement log x/log y = log x – log y is false

(iii) We have, log 25/log 5 = log x

log (5 x 5)/log 5 = log x

log 5^2/ log 5 = log x

2log 5/log 5 = log x [Using $\log_a m^n = n\log_a m$]

2 = log x

So, $x = 10^2$

x = 100

Thus, the statement x = 2 is false

(iv) We know, log x + log y = log xy

So,

log x + log y ≠ log x × log y

Thus, the statement log x + log y = log x × log y is false

11. If $\log_{10} 2$ = a and $\log_{10} 3$ = b; express each of the following in terms of 'a' and 'b':

(i) log 12

(ii) log 2.25

$2\frac{1}{4}$

(iii) log

(iv) log 5.4

(v) log 60

$3\frac{1}{8}$

(iv) log

Solution:

Given that $\log_{10} 2$ = a and $\log_{10} 3$ = b … (1)

(i) log 12 = log (2 x 2 x 3)

= log (2 x 2) + log 3 [Using $\log_a mn = \log_a m + \log_a n$]

= log 2^2 + log 3

= 2log 2 + log 3 [Using $\log_a m^n = n\log_a m$]

= 2a + b [From 1]

(ii) log 2.25 = log 225/100

= log (25 x 9)/(25 x 4)

= log 9/4

= log $(3/2)^2$

= 2log 3/2 [Using $\log_a m^n = n\log_a m$]

= 2(log 3 – log 2) [Using $\log_a m/n = \log_a m - \log_a n$]

= 2(b – a) [From 1]

= 2b – 2a

$2\frac{1}{4}$

(iii) log = log 9/4

= log $(3/2)^2$

= 2log 3/2 [Using $\log_a m^n = n\log_a m$]

= 2(log 3 – log 2) [Using $\log_a m/n = \log_a m - \log_a n$]

= 2(b – a) [From 1]

= 2b – 2a

(iv) log 5.4 = log 54/10

= log (2 x 3 x 3 x 3)/10

= log (2 x 3^3) – log 10 [Using $\log_a m/n = \log_a m - \log_a n$]

= log 2 + log 3^3 – 1 [Using $\log_a mn = \log_a m + \log_a n$ and log 10 = 1]

$= \log 2 + 3\log 3 – 1$ [Using $\log_a m^n = n\log_a m$]

$= a + 3b – 1$ [From 1]

(v) $\log 60 = \log (10 \times 3 \times 2)$

$= \log 10 + \log 3 + \log 2$ [Using $\log_a lmn = \log_a l + \log_a m + \log_{10} n$]

$= 1 + b + a$ [From 1]

$3\frac{1}{8}$

(vi) log = log 25/8

$= \log 5^2/2^3$

$= \log 5^2 – \log 2^3$ [Using $\log_a m/n = \log_a m – \log_a n$]

$= 2\log 5 – 3\log 2$ [Using $\log_a m^n = n\log_a m$]

$= 2\log 10/2 – 3\log 2$

$= 2(\log 10 – \log 2) – 3\log 2$ [Using $\log_a m/n = \log_a m – \log_a n$]

$= 2\log 10 – 2\log 2 – 3\log 2$

$= 2(1) – 2a – 3a$ [From 1]

$= 2 – 5a$

12. If log 2 = 0.3010 and log 3 = 0.4771; find the value of:

(i) log 12

(ii) log 1.2

(iii) log 3.6

(iv) log 15

(v) log 25

(vi) 2/3 log 8

Solution:

Given, log 2 = 0.3010 and log 3 = 0.4771

(i) log 12 = log (4 x 3)

= log 4 + log 3 [Using $\log_a mn = \log_a m + \log_a n$]

= log 2^2 + log 3

= 2log 2 + log 3 [Using $\log_a m^n = n\log_a m$]

= 2 x 0.3010 + 0.4771

= 1.0791

(ii) log 1.2 = log 12/10

= log 12 – log 10 [Using $\log_a m/n = \log_a m - \log_a n$]

= log (4 x 3) – log 10

= log 4 + log 3 – log 10 [Using $\log_a mn = \log_a m + \log_a n$]

= log 2^2 + log 3 – log 10

= 2log 2 + log 3 – log 10 [Using $\log_a m^n = n\log_a m$]

= 2 x 0.3010 + 0.4771 – 1 [As log 10 = 1]

= 0.6020 + 0.4771 – 1

= 1.0791 – 1

= 0.0791

(iii) log 3.6 = log 36/10

= log 36 – log 10 [Using $\log_a m/n = \log_a m - \log_a n$]

= log (2 x 2 x 3 x 3) – 1 [As log 10 = 1]

= log (2^2 x 3^2) – 1

= log 2^2 + log 3^2 – 1 [Using $\log_a mn = \log_a m + \log_a n$]

= 2log 2 + 2log 3 – 1 [Using $\log_a m^n = n\log_a m$]

= 2 x 0.3010 + 2 x 0.4771 – 1

$= 0.6020 + 0.9542 – 1$

$= 1.5562 – 1$

$= 0.5562$

(iv) log 15 = log (15/10 x 10)

= log 15/10 + log 10 [Using $\log_a mn = \log_a m + \log_a n$]

= log 3/2 + 1 [As log 10 = 1]

= log 3 – log 2 + 1 [Using $\log_a m/n = \log_a m – \log_a n$]

$= 0.4771 – 0.3010 + 1$

$= 1.1761$

(v) log 25 = log (25/4 x 4)

= log 100/4

= log 100 – log 4 [Using $\log_a m/n = \log_a m – \log_a n$]

$= \log 10^2 – \log 2^2$

= 2log 10 – 2log 2 [Using $\log_a m^n = n\log_a m$]

= (2 x 1) – (2 x 0.3010)

$= 2 – 0.6020$

$= 1.398$

13. Given 2 $\log_{10} x + 1 = \log_{10} 250$, find:

(i) x

(ii) $\log_{10} 2x$

Solution:

(i) Given equation, $2\log_{10} x + 1 = \log_{10} 250$

$\log_{10} x^2 + \log_{10} 10 = \log_{10} 250$ [Using $n\log_a m = \log_a m^n$ and $\log_{10} 10 = 1$]

$\log_{10} 10x^2 = \log_{10} 250$ [Using $\log_a m + \log_a n = \log_a mn$]

Removing log on both sides, we have

$10x^2 = 250$

$x^2 = 25$

$x = \pm 5$

As x cannot be a negative value, x = -5 is not possible

Hence, x = 5

(ii) Now, from (i) we have x = 5

So,

$\log_{10} 2x = \log_{10} 2(5)$

$= \log_{10} 10$

= 1

14. Given 3log x + ½ log y = 2, express y in term of x.

Solution:

We have, 3log x + ½ log y = 2

$\log x^3 + \log y^{1/2} = 2$ [Using $\log_a m + \log_a n = \log_a mn$]

$\log x^3y^{1/2} = 2$

Removing logarithm, we get

$x^3y^{1/2} = 10^2$

$y^{1/2} = 100/x^3$

On squaring on both sides, we get

$y = 10000/x^6$

$y = 10000x^{-6}$

15. If $x = (100)^a$, $y = (10000)^b$ and $z = (10)^c$, find $\log 10\sqrt{y}/x^2z^3$ in terms of a, b and c.

Solution:

We have,

$x = (100)^a$, $y = (10000)^b$ and $z = (10)^c$

So,

log x = a log 100, log y = b log 10000 and log z = c log 10

⇒ log x = a log 10^2, log y = b log 10^4 and log z = c log 10

⇒ log x = 2a log 10, log y = 4b log 10 and log z = c log 10

⇒ log x = 2a, log y = 4b and log z = c … (i)

Now,

log $10\sqrt{y}/x^2z^3$ = log $10\sqrt{y}$ – log x^2z^3 [Using $\log_a m/n = \log_a m - \log_a n$]

= (log 10 + log $\sqrt{y}$) – (log x^2 + log z^3) [Using $\log_a mn = \log_a m + \log_a n$]

= 1 + log $y^{1/2}$ – log x^2 – log z^3

= 1 + ½ log y – 2 log x – 3 log z [Using $\log_a m^n = n\log_a m$]

= 1 + ½(4b) – 2(2a) – 3c … [Using (i)]

= 1 + 2b – 4a – 3c

16. If 3(log 5 – log 3) – (log 5 – 2 log 6) = 2 – log x, find x.

Solution:

We have,

3(log 5 – log 3) – (log 5 – 2 log 6) = 2 – log x

3log 5 – 3log 3 – log 5 + 2log 6 = 2 – log x

3log 5 – 3log 3 – log 5 + 2log (3 x 2) = 2 – log x

2log 5 – 3log 3 + 2(log 3 + log 2) = 2 – log x [Using $\log_a mn = \log_a m + \log_a n$]

2log 5 – log 3 + 2log 3 + 2log 2 = 2 – log x

2log 5 – log 3 + 2log 2 = 2 – log x

2log 5 – log 3 + 2log 2 + log x = 2

$\log 5^2 - \log 3 + \log 2^2 + \log x = 2$ [Using $n\log_a m = \log_a m^n$]

$\log 25 - \log 3 + \log 4 + \log x = 2$

$\log (25 \times 4 \times x)/3 = 2$ [Using $\log_a m + \log_a n = \log_a mn$ & $\log_a m - \log_a n = \log_a m/n$]

$\log 100x/3 = 2$

On removing logarithm,

$100x/3 = 10^2$

$100x/3 = 100$

Dividing by 100 on both sides, we have

$x/3 = 1$

Hence, $x = 3$

ICSE Class 9 Maths Selina Solutions Chapter 8 Exercise 8(C)

1. If $\log_{10} 8 = 0.90$; find the value of:

(i) $\log_{10} 4$

(ii) $\log \sqrt{32}$

(iii) $\log 0.125$

Solution:

Given, $\log_{10} 8 = 0.90$

$\log_{10} (2 \times 2 \times 2) = 0.90$

$\log_{10} 2^3 = 0.90$

$3 \log_{10} 2 = 0.90$

$\log_{10} 2 = 0.90/3$

$\log_{10} 2 = 0.30$ … (1)

(i) $\log 4 = \log_{10} (2 \times 2)$

= $\log_{10} 2^2$

= 2 $\log_{10} 2$

= 2 x 0.60 … [From (1)]

= 1.20

(ii) log √32 = $\log_{10} 32^{1/2}$

= ½ $\log_{10}$ (2 x 2 x 2 x 2 x 2)

= ½ $\log_{10} 2^5$

= ½ x 5 $\log_{10} 2$

= ½ x 5 x 0.30 … [From (1)]

= 0.75

(iii) log 0.125 = log 125/1000

= $\log_{10}$ 1/8

= $\log_{10} 1/2^3$

= $\log_{10} 2^{-3}$

= -3 $\log_{10} 2$

= -3 x 0.30 … [From (1)]

= -0.90

2. If log 27 = 1.431, find the value of:

(i) log 9 (ii) log 300

Solution:

Given, log 27 = 1.431

So, log 3^3 = 1.431

3log 3 = 1.431

log 3 = 1.431/3

= 0.477 … (1)

(i) $\log 9 = \log 3^2$

= 2log 3

= 2 x 0.477 … [From (1)]

= 0.954

(ii) log 300 = log (3 x 100)

= log 3 + log 100

= $\log 3 + \log 10^2$

= log 3 + 2log 10

= log 3 + 2 [As log 10 = 1]

= 0.477 + 2

= 2.477

3. If $\log_{10} a = b$, find 10^{3b-2} in terms of a.

Solution:

Given, $\log_{10} a = b$

Now,

Let $10^{3b-2} = x$

Applying log on both sides,

$\log 10^{3b-2} = \log x$

(3b – 2)log 10 = log x

3b – 2 = log x

$3\log_{10} a - 2 = \log x$

$3\log_{10} a - 2\log 10 = \log x$

$\log_{10} a^3 - \log 10^2 = \log x$

$\log_{10} a^3 - \log 100 = \log x$

$\log_{10} a^3/100 = \log x$

On removing logarithm, we get

$a^3/100 = x$

Hence, $10^{3b-2} = a^3/100$

4. If $\log_5 x = y$, find 5^{2y+3} in terms of x.

Solution:

Given, $\log_5 x = y$

So, $5^y = x$

Squaring on both sides, we get

$(5^y)^2 = x^2$

$5^{2y} = x^2$

$5^{2y} \times 5^3 = x^2 \times 5^3$

Hence,

$5^{2y+3} = 125x^2$

5. Given: $\log_3 m = x$ and $\log_3 n = y$.

(i) Express 3^{2x-3} in terms of m.

(ii) Write down $3^{1-2y+3x}$ in terms of m and n.

(iii) If $2 \log_3 A = 5x - 3y$; find A in terms of m and n.

Solution:

Given, $\log_3 m = x$ and $\log_3 n = y$

So, $3^x = m$ and $3^y = n$ … (1)

(i) Taking the given expression, 3^{2x-3}

$3^{2x-3} = 3^{2x} . 3^{-3}$

$= 3^{2x} . 1/3^3$

$= (3^x)^2/3^3$

$= m^2/3^3$ … [Using (1)]

$= m^2/27$

Hence, $3^{2x-3} = m^2/27$

(ii) Taking the given expression, $3^{1-2y+3x}$

$3^{1-2y+3x} = 3^1 . 3^{-2y} . 3^{3x}$

$= 3 . (3^y)^{-2} . (3^x)^3$

$= 3 . n^{-2} . m^3$ … [Using (1)]

$= 3m^3/n^2$

Hence, $3^{1-2y+3x} = 3m^3/n^2$

(iii) Taking the given equation,

$2 \log_3 A = 5x - 3y$

$\log_3 A^2 = 5x - 3y$

$\log_3 A^2 = 5\log_3 m - 3\log_3 n$ … [Using (1)]

$\log_3 A^2 = \log_3 m^5 - \log_3 n^3$

$\log_3 A^2 = \log_3 m^5/n^3$

Removing logarithm on both sides, we get

$A^2 = m^5/n^3$

Hence, by taking square root on both sides

$A = \sqrt{(m^5/n^3)} = m^{5/2}/n^{3/2}$

6. Simplify:

(i) $\log (a)^3 - \log a$

(ii) $\log (a)^3 \div \log a$

Solution:

(i) We have, $\log (a)^3 – \log a$

$= 3\log a – \log a$

$= 2\log a$

(ii) We have, $\log (a)^3 \div \log a$

$= 3\log a / \log a$

$= 3$

7. If log (a + b) = log a + log b, find a in terms of b.

Solution:

We have, log (a + b) = log a + log b

Then,

log (a + b) = log ab

So, on removing logarithm, we have

a + b = ab

a – ab = -b

a(1 – b) = -b

a = -b/(1 – b)

Hence,

a = b/(b – 1)

8. Prove that:

(i) $(\log a)^2 – (\log b)^2 = \log (a/b). \log (ab)$

(ii) If a log b + b log a – 1 = 0, then $b^a. a^b = 10$

Solution:

(i) Taking L.H.S. we have,

= $(\log a)^2 – (\log b)^2$

= (log a + log b) (log a – log b) [As $x^2 – y^2 = (x + y)(x – y)$]

= (log ab). (log a/b)

= R.H.S.

– Hence proved

(ii) We have, a log b + b log a – 1 = 0

So,

$\log b^a + \log a^b – 1 = 0$

$\log b^a + \log a^b = 1$

$\log b^a a^b = 1$

On removing logarithm, we get

$b^a a^b = 10$

– Hence proved

9. (i) If log (a + 1) = log (4a – 3) – log 3; find a.

(ii) If 2 log y – log x – 3 = 0, express x in terms of y.

(iii) Prove that: $\log_{10} 125 = 3(1 – \log_{10}2)$.

Solution:

(i) Given, log (a + 1) = log (4a – 3) – log 3

So,

log (a + 1) = log (4a – 3)/3

On removing logarithm on both sides, we have

a + 1 = (4a – 3)/3

3(a + 1) = 4a – 3

3a + 3 = 4a – 3

Hence, a = 6

(ii) Given, 2log y – log x – 3 = 0

So,

log y^2 – log x = 3

log y^2/x = 3

On removing logarithm, we have

$y^2/x = 10^3$ = 1000

Hence, x = $y^2/1000$

(iii) Considering the L.H.S., we have

$\log_{10}$ 125 = $\log_{10}$ (5 x 5 x 5)

= $\log_{10} 5^3$

= 3$\log_{10}$ 5

= 3$\log_{10}$ 10/2

= 3($\log_{10}$ 10 – $\log_{10}$ 2)

= 3(1 – $\log_{10}$ 2) [Since, $\log_{10}$ 10 = 1]

= R.H.S.

– Hence proved

10. Given log x = 2m – n, log y = n – 2m and log z = 3m – 2n. Find in terms of m and n, the value of log x^2y^3/z^4.

Solution:

We have, log x = 2m – n, log y = n – 2m and log z = 3m – 2n

Now, considering

log x^2y^3/z^4 = log x^2y^3 – log z^4

= (log x^2 + log y^3) – log z^4

= 2log x + 3log y – 4log z

= 2(2m – n) + 3(n – 2m) – 4(3m – 2n)

= 4m – 2n + 3n – 6m – 12m + 8n

= -14m + 9n

11. Given $\log_x 25 - \log_x 5 = 2 - \log_x 1/125$; find x.

Solution:

We have, $\log_x 25 - \log_x 5 = 2 - \log_x 1/125$

$\log_x (5 \times 5) - \log_x 5 = 2 - \log_x 1/(5 \times 5 \times 5)$

$\log_x 5^2 - \log_x 5 = 2 - \log_x 1/5^3$

$2\log_x 5 - \log_x 5 = 2 - \log_x 1/5^3$

$\log_x 5 = 2 - 3\log_x 1/5$

$\log_x 5 = 2 + 3\log_x (1/5)^{-1}$

$\log_x 5 = 2 + 3\log_x 5$

$2 = \log_x 5 - 3\log_x 5$

$2 = -2\log_x 5$

$-1 = \log_x 5$

Removing logarithm, we get

$x^{-1} = 5$

Hence, x = 1/5

ICSE Class 9 Maths Selina Solutions Chapter 8 Exercise 8D

1. If 3/2 log a + 2/3 log b – 1 = 0, find the value of $a^9.b^4$

Solution:

Given equation,

3/2 log a + 2/3 log b – 1 = 0

$\log a^{3/2} + \log b^{2/3} – 1 = 0$

$\log a^{3/2} \times b^{2/3} – 1 = 0$

$\log a^{3/2}.b^{2/3} = 1$

Removing logarithm, we have

$a^{3/2}.b^{2/3} = 10$

On manipulating,

$(a^{3/2}.b^{2/3})^6 = 10^6$

Hence,

$a^9.b^4 = 10^6$

2. If x = 1 + log 2 – log 5, y = 2log3 and z = log a – log 5; find the value of a if x + y = 2z.

Solution:

Given, x = 1 + log 2 – log 5, y = 2log3 and z = log a – log 5

Now, considering the given equation x + y = 2z

(1 + log 2 – log 5) + (2log 3) = 2(log a – log 5)

1 + log 2 – log 5 + 2log 3 = 2log a – 2log 5

1 + log 2 – log 5 + 2log 3 + 2log 5 = 2log a

$\log 10 + \log 2 + \log 3^2 + \log 5 = \log a^2$

$\log 10 + \log 2 + \log 9 + \log 5 = \log a^2$

$\log (10 \times 2 \times 9 \times 5) = \log a^2$

$\log 900 = \log a^2$

On removing logarithm on both sides, we have

$900 = a^2$

Taking square root, we get

a = ±30

Since, a cannot be a negative value,

Hence, a = 30

3. If x = log 0.6; y = log 1.25 and z = log 3 – 2log 2, find the values of:

(i) x + y – z (ii) $5^{x + y - z}$

Solution:

Given,

x = log 0.6, y = log 1.25 and z = log 3 – 2log 2

So, z = log 3 – log 2^2

= log 3 – log 4

= log ¾

= log 0.75 … (1)

(i) Considering,

x + y – z = log 0.6 + log 1.25 – log 0.75 … [From (1)]

= log (0.6 x 1.25)/0.75

= log 0.75/0.75

= log 1

= 0 … (2)

(ii) Now, considering

$5^{x+y-z} = 5^0$ … [From (2)]

= 1

4. If a^2 = log x, b^3 = log y and $3a^2 - 2b^3$ = 6 log z, express y in terms of x and z.

Solution:

We have, a^2 = log x and b^3 = log y

Now, considering the equation

$3a^2 – 2b^3 = 6\log z$

$3\log x – 2\log y = 6\log z$

$\log x^3 – \log y^2 = \log z^6$

$\log x^3/y^2 = \log z^6$

On removing logarithm on both sides, we get

$x^3/y^2 = z^6$

So,

$y^2 = x^3/z^6$

Taking square root on both sides, we get

$y = \sqrt{(x^3/z^6)}$

Hence, $y = x^{3/2}/z^3$

5. If log (a – b)/2 = ½ (log a + log b), show that: $a^2 + b^2 = 6ab$.

Solution:

We have, log (a – b)/2 = ½ (log a + log b)

log (a – b)/2 = ½ log a + ½ log b

$= \log a^{1/2} + \log b^{1/2}$

$= \log \sqrt{a} + \log \sqrt{b}$

$= \log \sqrt{(ab)}$

Now, removing logarithm on both sides, we get

$(a – b)/2 = \sqrt{(ab)}$

Squaring on both sides, we get

$[(a – b)/2]^2 = [\sqrt{(ab)}]^2$

$(a – b)^2/4 = ab$

$(a – b)^2 = 4ab$

$a^2 + b^2 – 2ab = 4ab$

$a^2 + b^2 = 4ab + 2ab$

$a^2 + b^2 = 6ab$

– Hence proved

6. If $a^2 + b^2 = 23ab$, show that: log (a + b)/5 = ½ (log a + log b).

Solution:

Given, $a^2 + b^2 = 23ab$

Adding 2ab on both sides,

$a^2 + b^2 + 2ab = 23ab + 2ab$

$(a + b)^2 = 25ab$

$(a + b)^2/25 = ab$

$[(a + b)/5]^2 = ab$

Taking logarithm on both sides, we have

$\log [(a + b)/5]^2 = \log ab$

2log (a + b)/5 = log ab

2log (a + b)/5 = log a + log b

Thus,

log (a + b)/5 = ½ (log a + log b)

7. If m = log 20 and n = log 25, find the value of x, so that: 2log (x – 4) = 2m – n.

Solution:

Given, m = log 20 and n = log 25

Now, considering the given expression

2log (x – 4) = 2m – n

2log (x – 4) = 2log 20 – log 25

$\log (x - 4)^2 = \log 20^2 - \log 25$

$\log (x - 4)^2 = \log 400 - \log 25$

$\log (x - 4)^2 = \log 400/25$

Removing logarithm on both sides,

$(x - 4)^2 = 400/25$

$x^2 - 8x + 16 = 16$

$x^2 - 8x = 0$

$x(x - 8) = 0$

So,

$x = 0$ or $x = 8$

If $x = 0$, then $\log (x - 4)$ doesn't exist

Hence, $x = 8$

8. Solve for x and y; if $x > 0$ and $y > 0$; $\log xy = \log x/y + 2\log 2 = 2$.

Solution:

We have,

$\log xy = \log x/y + 2\log 2 = 2$

Considering the equation,

$\log xy = 2$

$\log xy = 2\log 10$

$\log xy = \log 10^2$

$\log xy = \log 100$

On removing logarithm,

$xy = 100$ … (1)

Now, consider the equation

$\log x/y + 2\log 2 = 2$

$\log x/y + \log 2^2 = 2$

$\log x/y + \log 4 = 2$

$\log 4x/y = 2$

Removing logarithm, we get

$4x/y = 10^2$

$4x/y = 100$

$x/y = 25$

$(xy)/y^2 = 25$

$100/y^2 = 25$ … [From (1)]

$y^2 = 100/25$

$y^2 = 4$

$y = 2$ [Since, $y > 0$]

From $\log xy = 2$

Substituting the value of y, we get

$\log 2x = 2$

On removing logarithm,

$2x = 10^2$

$2x = 100$

$x = 100/2$

$x = 50$

Thus, the values x and y are 50 and 2 respectively

9. Find x, if:

(i) $\log_x 625 = -4$

(ii) $\log_x (5x - 6) = 2$

Solution:

(i) We have, $\log_x 625 = -4$

On removing logarithm,

$x^{-4} = 625$

$(1/x)^4 = 5^4$

Taking the fourth root on both sides,

$1/x = 5$

Hence, $x = 1/5$

(ii) We have, $\log_x (5x - 6) = 2$

On removing logarithm,

$x^2 = 5x - 6$

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

$x^2 - 3x - 2x + 6 = 0$

$x(x - 3) - 2(x - 2) = 0$

$(x - 2)(x - 3) = 0$

Hence,

$x = 2$ or 3

10. If p = log 20 and q = log 25, find the value of x, if 2log (x + 1) = 2p – q.

Solution:

Given, $p = \log 20$ and $q = \log 25$

Considering the equation,

$2\log (x + 1) = 2p - q$

$\log (x + 1)^2 = 2p - q$

$\log (x + 1)^2 = 2\log 20 – \log 25$

$\log (x + 1)^2 = \log 20^2 – \log 25$

$\log (x + 1)^2 = \log 400 – \log 25$

$\log (x + 1)^2 = \log 400/25$

Removing logarithm on both sides, we have

$(x + 1)^2 = 400/25 = 16$

$(x + 1)^2 = (4)^2$

Taking square root on both sides, we have

$x + 1 = 4$

$x = 4 -1$

Hence, $x = 3$

11. If $\log_2 (x + y) = \log_3 (x – y) = \log 25/\log 0.2$, find the value of x and y.

Solution:

Considering the relation, $\log_2 (x + y) = \log 25/\log 0.2$

$\log_2 (x + y) = \log_{0.2} 25$

$= \log_{2/10} 5^2$

$= 2\log_{1/5} 5$

$= 2\log_{5}^{-1} 5$

$= -2\log_5 5$

$= -2 \times 1$

$= -2$

So, we have

$\log_2 (x + y) = -2$

Removing logarithm, we get

$x + y = 2^{-2}$

$x + y = 1/2^2$

$x + y = ¼$ … (i)

Now, considering the relation $\log_3 (x – y) = \log 25/\log 0.2$

$\log_3 (x – y) = = \log_{0.2} 25$

$= \log_{2/10} 5^2$

$= 2\log_{1/5} 5$

$= 2\log_{5^{-1}} 5$

$= -2\log_5 5$

$= -2 x 1$

$= -2$

So, we have

$\log_3 (x – y) = -2$

Removing logarithm, we get

$x – y = 3^{-2}$

$x – y = 1/3^2$

$x – y = 1/9$ … (ii)

On adding (i) and (ii), we get

$x + y = ¼$

$x – y = 1/9$

$2x = ¼ + 1/9$

$2x = (9 + 4)/36$

$2x = 13/36$

$x = 13/(36 x 2)$

= 13/72

Now, substituting the value of x in (i), we get

13/72 + y = ¼

y = ¼ – 13/72

= (18 – 13)/72

= 5/72

Hence, the values of x and are is 13/72 and 5/72 respectively

12. Given: log x/log y = 3/2 and log xy = 5; find the values of x and y.

Solution:

Given, log x/log y = 3/2 … (i) and log xy = 5 … (ii)

So,

log xy = log x + log y = 5

And, we have log y = (2log x)/3 … [From (i)]

Now,

log x + (2log x)/3 = 5

3log x + 2log x = 5 x 3

5log x = 15

log x = 15/5

log x = 3

Removing logarithm, we get

x = 10^3 = 1000

Substituting value of x in (ii), we get

log xy = 5

Removing logarithm, we get

$xy = 10^5$

$(10^3).\ y = 10^5$

$y = 10^5/10^3$

$y = 10^2$

$y = 100$

13. Given $\log_{10} x = 2a$ and $\log_{10} y = b/2$

(i) Write 10^a in terms of x

(ii) Write $10^{2b + 1}$ in terms of y

(iii) If $\log_{10} p = 3a – 2b$, express p in terms of x and y.

Solution:

Given, $\log_{10} x = 2a$ and $\log_{10} y = b/2$

(i) Taking $\log_{10} x = 2a$

Removing logarithm on both sides,

$x = 10^{2a}$

Taking square root on both sides, we get

$x^{1/2} = 10^{2a/2}$

Hence, $10^a = x^{1/2}$

(ii) Taking $\log_{10} y = b/2$

Removing logarithm on both sides,

$y = 10^{b/2}$

On manipulating,

$y^4 = 10^{b/2 \times 4}$

$y^4 = 10^{2b}$

$10y^4 = 10^{2b} \times 10$

Hence, $10^{2b + 1} = 10y^4$

(iii) We have, $10^a = x^{1/2}$

and $y = 10^{b/2}$

Considering the equation, $\log_{10} p = 3a – 2b$

$\log_{10} p = 3a – 2b$

Removing logarithm, we get

$p = 10^{3a – 2b}$

$p = 10^{3a}/10^{2b}$

$p = (10^a)^3/(10^{b/2})^4$

$p = (x^{1/2})^3/(y)^4$

Hence, $p = x^{3/2}/y^4$

14. Solve:

$\log_5 (x + 1) – 1 = 1 + \log_5 (x – 1)$.

Solution:

Considering the given equation,

$\log_5 (x + 1) – 1 = 1 + \log_5 (x – 1)$

$\log_5 (x + 1) – \log_5 (x – 1) = 1 + 1$

$\log_5 (x + 1)/(x – 1) = 2$

Removing logarithm, we have

$(x + 1)/(x – 1) = 5^2$

$(x + 1)/(x – 1) = 25$

$(x + 1) = 25(x – 1)$

$x + 1 = 25x – 25$

$25x – x = 25 + 1$

$24x = 26$

$x = 26/24$

Hence, $x = 13/12$

15. Solve for x, if:

$\log_x 49 - \log_x 7 + \log_x 1/343 + 2 = 0$

Solution:

We have,

$\log_x 49 - \log_x 7 + \log_x 1/343 + 2 = 0$

$\log_x 49/(7 \times 343) + 2 = 0$

$\log_x 1/49 = -2$

$\log_x 1/7^2 = -2$

$\log_x 7^{-2} = -2$

$-2\log_x 7 = -2$

So,

$\log_x 7 = 1$

Removing logarithm, we get

$x = 7$

16. If $a^2 = \log x$, $b^3 = \log y$ and $a^2/2 - b^3/3 = \log c$, find c in terms of x and y.

Solution:

Given,

$a^2 = \log x$, $b^3 = \log y$

Considering the given equation,

$a^2/2 - b^3/3 = \log c$

$(\log x)/2 - (\log y)/3 = \log c$

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

$\log x^{1/2} - \log y^{1/3} = \log c$

$\log x^{1/2}/y^{1/3} = \log c$

On removing logarithm, we get

$x^{1/2}/y^{1/3} = c$

Hence, $c = x^{1/2}/y^{1/3}$ is the required relation

17. Given: $x = \log_{10} 12$, $y = \log_4 2 \times \log_{10} 9$ and $z = \log_{10} 0.4$, find

(i) $x - y - z$

(ii) 13^{x-y-z}

Solution:

(i) Considering, $x - y - z$

$= \log_{10} 12 - (\log_4 2 \times \log_{10} 9) - \log_{10} 0.4$

$= \log_{10} 12 - (\log_4 2 \times \log_{10} 9) - \log_{10} 0.4$

$= \log_{10} (4 \times 3) - (\log_{10} 2/ \log_{10} 4 \times \log_{10} 9) - \log_{10} 0.4$

$= \log_{10} 4 + \log_{10} 3 - (\log_{10} 2 \times \log_{10} 3^2)/ \log_{10} 2^2 - \log_{10} 4/10$

$= \log_{10} 4 + \log_{10} 3 - (\log_{10} 2 \times 2\log_{10} 3)/ 2\log_{10} 2 - (\log_{10} 4 - \log_{10} 10)$

$= \log_{10} 4 + \log_{10} 3 - \log_{10} 3 - \log_{10} 4 + \log_{10} 10$

$= \log_{10} 4 + \log_{10} 3 - \log_{10} 3 - \log_{10} 4 + 1$

$= 1$

(ii) Now,

$13^{x-y-z} = 13^1 = 13$

18. Solve for x, $\log_x 15\sqrt{5} = 2 - \log_x 3\sqrt{5}$

Solution:

Considering the given equation,

$\log_x 15\sqrt{5} = 2 - \log_x 3\sqrt{5}$

$\log_x 15\sqrt{5} + \log_x 3\sqrt{5} = 2$

$\log_x (15\sqrt{5} \times 3\sqrt{5}) = 2$

$\log_x (45 \times 5) = 2$

$\log_x 225 = 2$

Removing logarithm, we get

$x^2 = 225$

Taking square root on both sides,

$x = 15$

19. Evaluate:

(i) $\log_b a \times \log_c b \times \log_a c$

(ii) $\log_3 8 \div \log_9 16$

(iii) $\log_5 8/(\log_{25} 16 \times \log_{100} 10)$

Solution:

Using $\log_b a = 1/\log_a b$ and $\log_x a/\log_x b = \log_b a$, we have

(i) $\log_b a \times \log_c b \times \log_a c$

$$= \frac{\log_{10} a}{\log_{10} b} \times \frac{\log_{10} b}{\log_{10} c} \times \frac{\log_{10} c}{\log_{10} a}$$

$= 1$

(ii) $\log_3 8 \div \log_9 16$

$= \log_3 8/ \log_9 16$

$$= \frac{\log_{10}8}{\log_{10}3} \times \frac{\log_{10}9}{\log_{10}16}$$
$$= \frac{3\log_{10}2}{\log_{10}3} \times \frac{2\log_{10}3}{4\log_{10}2}$$

= 3 x ½

= 3/2

(iii) $\log_5 8/(\log_{25} 16 \times \log_{100} 10)$

$$= \frac{\frac{\log_{10}8}{\log_{10}5}}{\frac{\log_{10}16}{\log_{10}25} \times \frac{\log_{10}10}{\log_{10}100}}$$
$$= \frac{\frac{\log_{10}2^3}{\log_{10}5}}{\frac{\log_{10}2^4}{\log_{10}5^2} \times \frac{\log_{10}10}{\log_{10}10^2}}$$
$$= \frac{\log_{10}2^3}{\log_{10}5} \times \frac{\log_{10}5^2}{\log_{10}2^4} \times \frac{\log_{10}10^2}{\log_{10}10}$$
$$= \frac{3\log_{10}2}{\log_{10}5} \times \frac{2\log_{10}5}{4\log_{10}2} \times \frac{2\log_{10}10}{\log_{10}10}$$

= 3 x ½ x 2

= 3

20. Show that:

$\log_a m \div \log_{ab} m = 1 + \log_a b$

Solution:

Considering the L.H.S.,

$\log_a m \div \log_{ab} m = \log_a m/\log_{ab} m$

$= \log_m ab/\log_m a$ [As $\log_b a = 1/\log_a b$]

$= \log_a ab$ [As $\log_x a/\log_x b = \log_b a$]

$= \log_a a + \log_a b$

$= 1 + \log_a b$

21. If $\log_{\sqrt{27}} x = 2\ 2/3$, find x.

Solution:

We have,

$\log_{\sqrt{27}} x = 2\ 2/3$

$\log_{\sqrt{27}} x = 8/3$

Removing logarithm, we get

$x = \sqrt{27}^{8/3}$

$= 27^{1/2 \times 8/3}$

$= 27^{4/3}$

$= 3^{3 \times 4/3}$

$= 3^4$

Hence, x = 81

22. Evaluate:

$1/(\log_a bc + 1) + 1/(\log_b ca + 1) + 1/(\log_c ab + 1)$

Solution:

We have,

$$\frac{1}{\log_a bc + 1} + \frac{1}{\log_b ca + 1} + \frac{1}{\log_c ab + 1}$$

$$= \frac{1}{\log_a bc + \log_a a} + \frac{1}{\log_b ca + \log_b b} + \frac{1}{\log_c ab + \log_c c}$$

$$= \frac{1}{\log_a abc} + \frac{1}{\log_b aba} + \frac{1}{\log_c abc} \qquad [\because \log_a b + \log_b c = \log_a bc]$$

$$= \frac{1}{\frac{\log abc}{\log a}} + \frac{1}{\frac{\log abc}{\log b}} + \frac{1}{\frac{\log abc}{\log c}}$$

$$= \frac{\log a + \log b + \log c}{\log abc}$$

$$= \frac{\log abc}{\log abc} \qquad [\because \log_a b + \log_b c = \log_a bc]$$

$$= 1$$

Benefits of ICSE Class 9 Maths Selina Solutions Chapter 8

1. Fundamental Understanding of Logarithms:

Concept Clarity: The ICSE Class 9 Maths Selina Solutions Chapter 8 introduces the fundamental concepts of logarithms, including the definition, properties, and rules. Understanding these basics is crucial as logarithms are foundational in many advanced mathematical concepts.

Building Blocks: ICSE Class 9 Maths Selina Solutions Chapter 8 helps students build a solid foundation for more complex topics in higher classes, including calculus and algebra.

2. Practical Applications:

Real-World Applications: Logarithms have real-world applications in fields like science (e.g., pH scale in chemistry), engineering, and computer science. Learning this chapter helps students understand how logarithms are used to solve practical problems.

Problem-Solving Skills: By solving a variety of problems, students improve their analytical and problem-solving skills, which are applicable in various scientific and technological fields.