Miscellaneous exercises 1.0

- **Simplify the following:**

1.**a)** $m^2 \times m^4$ **(b)** $y^3 \times y^5$ **(c)** $p^1 \times p^4$ **(d)** $n \times n^4$ **(e)** $b^4 \times b^3$

2.**a)** $t^5 \times t^4$ **(b)** $q^3 \times q$ **(c)** $h^{10} \times h^{11}$ **(d)** $l \times l$ **(e)** $s^2 \times s^2$

3.**a)** $x^5 \div x^2$ **(b)** $t^9 \div t^5$ **(c)** $p^5 \div p^3$ **(d)** $m^7 \div m^6$ **(e)** $r^3 \div r^5$

4.**a)** $y^8 \div y^4$ **(b)** $q^6 \div q^6$ **(c)** $b^7 \div b^3$ **(d)** $s^3 \div s^5$ **(e)** $f^8 \div f^5$

5.**a)** $4y \times 5y^5$ **(b)** $2m^2 \times 8m^3$ **(c)** $21n^3 \times 7n^4$

6.**a)** $4y^3t^2 \times 2y^2t^2$ **(b)** $16a^2b^3 \times 2a^3b^5$ **(c)** $a^3b^6 \times 9a^5b^6$

7.**a)** $36x^6y^2 \div 9x^2y^2$ **(b)** $6m^8n^6 \div 3m^5n^2$

8.**a)** $10q^5p^2 \div 5q^27^7$ **(b)** $72x^4 \div 9x^3y^7$

- **Find the values of the following**

9. **a)** $4^{3/2}$ **(b)** 3^{-2} **(c)** 4^{-3} **(d)** 4^0 **(e)** $16^{¼}$

10. a) $243^{1/5}$ **(b)** $125^{⅓}$ **(c)** $1000^{⅓}$ **(d)** $125^{2/3}$ **(e)** $25^{3/2}$

11. **a)** $1000^{4/3}$ **(b)** $\left(\frac{16}{9}\right)^{3/2}$ **(c)** $\left(6\frac{1}{4}\right)^{-3/2}$ **(d)** $\left(\frac{27}{64}\right)^{-2/3}$ **(e)** $\left(125\right)^{1/3}$

12. **a)** $\left(\frac{100}{49}\right)^{3/2}$ **(b)** $\left(\frac{4}{9}\right)^{-2}$ **(c)** $64^{5/6}$ **(d)** $81^{-¼}$ **(e)** $81^{3/4}$

13. **a)** $(0.25)^{3/2}$ **(b)** $(2.25)^{-½}$ **(c)** $(0.25)^{½}$ **(d)** $16^{1.75}$ **(e)** $16^{0.75}$

- **Solve the following equations;**

14 **a)** $5^{-y} = 125$ **(b)** $9^x = 1/3$ **(c)** $27^x = 1/3$ **(d)** $4^y = 1/8$

15. **a)** $8^{-x} = 0.25$ **(b)** $27^x = 9^3$ **(c)** $2 \times 2^{3x+1} = 16$ **(d)** $25^x = \frac{1}{125^2}$

16. **a)** $9^x = 729^{-2}$ **(b)** $10^{-x} = 0.0001$ **(c)** $2 \times 2^{2a} = 8 \times 2^3$ **(d)** $100^{-x} = \frac{1}{1000^3}$

Miscellaneous exercise2.0

Express the following in standard form.

1. a) 30000 (b) 17000 (c) 1100000 (d) 131000000

2. a) 2700000 (b) 111000 (c) 8950000 (d) 100000000

3. a) 0.000043 (b) 0.0499 (c) 0.00849 (d) 0.00000051

4. a) 0.000007 (b) 0.0000567 (c) 0.0000044 (d) 0.0000333

Writing the following as single numbers.

5. a) 7×10^{-5} (b) 5×10^{-2} (c) 3.7×10^{-3} (d) 1.1×10^{-2}

6. a) 7.57×10^{-4} (b) 3.381×10^{-1} (c) 3.381×10^{-1} (d) 7.1×10^{2}

7. a) 1.8×10^{3} (b) 9.45×10^{5} (c) 3.99×10^{2} (d) 2.22×10^{1}

Find the value of the following leaving your answers in standard form.

8. a) $(2.57\text{x}10^{2}) \text{ x } (7.4\text{x}10^{5})$ (b) $(1.7\text{x}10^{5}) \text{ x } (9.7\text{x}10^{3})$ (c) $(1.13\text{x}10^{4}) \text{ x } (1.4\text{x}10^{2})$

9. a) $3 \times 10^{-3} \times 5.8 \times 10^{2}$ (b) $7.3 \times 10^{-5} \times 3.2 \times 10^{-2} \times 10$ (c) $8.3\text{x}10^{-6}\text{x}1.9\text{x}10^{3}$

10. a) $\dfrac{4.6 \text{x} 10^{-5} \times 4.8 \times 10^{6}}{5.7 \times 10^{4}}$ (b) $\dfrac{3.5 \times 10^{6} \times 2.9 \times 10^{7}}{1.5 \times 10^{5}}$ (c) $\dfrac{7.7 \times 10^{7}}{2.5\text{x}10^{4}\text{x}5\text{x}10^{-1}}$

11. a) $\dfrac{6.6 \times 10^{5}}{3.2\text{x}10^{4}\text{x}5.5\text{x}10^{3}}$ (b) $\dfrac{9.9 \times 10^{3} \text{ x } 1.3 \times 10^{4}}{6.8\text{x}10^{-2}\text{x}7\text{x}10^{5}}$ (c) $\dfrac{8.8\text{x}10\text{-}2\text{x}7\text{x}10\text{-}5}{3\text{x}10^{-2}\text{x}4\text{x}10^{-3}}$

3. LOGARITHMS

Objectives:
By the end of this topic students should be able to:

(1) Apply the rules of logarithms to simplify logarithmic expressions.
(2) Solve logarithmic equations using the rules of logarithms.
(3) Write logarithmic expressions in index form.

- **This topic is closely connected with indices.**

Example $M = n^x$ is an exponential expression. Now if $M = n^x$ then we can define the power(x) as the logarithm of m to the base n.

i.e. $X = \log_n M$

- Operating rules for logarithms.
  If $A = m^x$ the $\log_m A = x$ and if $B = m^y$ then $\log_m B = y$

Rule 1 $\log_m AB = \log_m A + \log_m B$

- **Worked Examples to illustrate the rule**.

1.3. Simplify: $\log_a 5 + \log_a 2$

Solution:

$\log_a 5 + \log_a 2 = \log_a(5 \times 2)$

$= \mathbf{\log_a 10}$

2.3 Simplify: $\log_2 3 + \log_2 6 + \log_2 7$

Solution:

$\log_2 3 + \log_2 6 + \log_2 7 = \log_a(3 \times 6 \times 7)$

$= \mathbf{\log_2 126}$

3.3 Simplify: $\log_5 21 + \log_3 3$

Solution:

$\log_5 21 + \log_5 3 = \log_5(21 \times 3)$

$= \mathbf{\log_5 63}$

4.3 Simplify: $\log_a x + \log_a y + \log_a z + \log_a w$

Solution:

$\log_a x + \log_a y + \log_a z + \log_a w = \mathbf{\log_a(xyzw)}$

Rule 2 $\log_m(A/B) = \log_m A - \log_m B$

$\log_m A - \log_m B = \log_m (A/B)$

- **Worked Examples to illustrate the rule.**

5.3 Simplify: $\log_4 21 - \log_4 3$

Solution:

$\log_4 21 - \log_4 3 = \log_4 (21/3)$

$= \mathbf{\log_4 7}$

6.3 Simplify: $\log 108 - \log_{10} 16$

Solution:

$\log_{10} 8 - \log_{10} 16 = \log_{10} (8/16)$

$= \log_{10} ½$

$= \mathbf{\log_{10} 0.5}$

7.3. Simplify: $\log_3 8 - \log_3 4$

Solution:

$\log_3 8 - \log_3 4 = \log_3 (8/4)$

$= \mathbf{\log_3 2}$

8.3 Simplify: $\log_4 35 - \log_4 7$

Solution:

$\log_4 35 - \log_4 7 = \log_4 (35/7)$

$= \mathbf{\log_4 5}$

- **Other important results for logarithms:**

a. $\log a1 = 0$: The logarithm of to any base is zero.

Examples:

$\log_{10} 1 = 0$

$\log_{100} 1 = 0$

$\log_a 10 = 0$

$\log_a b^n = n\log_a b$

b.

Examples

- $\log_{100} 100 = 1$
- $\log_8 8 = 1$
- $\log_2 2 = 1$ etc.

c.

Examples

$\log_3 5^2 = 2 \times \log 3^5$

$= 2\log 3^5$

$\log_5 4 = \log_5 2^2$ etc.

d. $\log_a \sqrt[n]{b} = \log_a b^{1/n} = 1/n \times \log_a b = 1/n \log_a b$

- **Worked Examples**

9.3 Find the value of the following: $\log_9 81$

Solution:

$\log_9 81 = \log_9 9^2$: by writing 81 in index form.

$= 2 \times \log_9 9$: by $\log_a b^n = n\log_a b$

$= 2 \times 1$: by $\log_a a = 1$

: . $\log_9 81 = 2$

10.3 Evaluate: $\log_{10} 1000000$

Solution:

$\log_{10} 1000000 = \log_{10} 10^6$: by writing 1000000 in index form.

$= 6 \log_{10} 10$: by $\log_a b^n = n\log_a b$

$= 6 \times 1$: by $\log_a a = 1$

: . $\log_{10} 1000000 = 6$

11.3 Evaluate: $\log_{10} 1/10$

Solution:

$\log_{10} 1/10 = \log_{10} 10^{-1}$: by writing 1-10 in index form with a negative index.

$= -1 \times \log_{10} 10$: by $\log_a an = n\log_a a$

$= -1 \times 1$: by $\log_a a = 1$

: . $\log_{10} 1/10 = -1$

12.3 Evaluate: $\log_9 3 + \log_9 3$

Solution:

$\log_9 3 + \log_9 3 = \log_9(3 \times 3))$: by $\log_{10}A + \log_{10}B = \log_{10}A \times B$

$= \log_9 9$

$= 1$: by $\log_a a = 1$

13.3 Find the value of: $\log_4 80 - \log_4 5$

Solution:

$\log_4 80 - \log_4 5 = \log_4(80 \div 5)$: by $\log_a A - \log_a B = \log_a(A \div B)$

$= \log_4 16$: by simplifying $(80 \div 5)$

$= \log_4 4^2$: by writing 16 in index form.

$= 2 \times \log_4 4$: by $\log_a a^n = n \times \log_a a$

: . **$\log_4 80 - \log_4 5 = 2 \times 1$: by $\log_a a = 1$**

14.3 Find the value of: $\log_3 81 + \log_3 9 + \log_2 243$

Solution:

$\log_3 81 + \log_3 9 + \log_2 243 = \log_3 3^4 + \log_3 3^2 + \log_3 3^5$: by writing 81,9 and 243 in index form.

$= \log_3(3^4 \times 3^2 \times 3^5)$: by $\log_a A + \log_a B = \log_a(A \times B)$

$= \log_3(3^{4+2+5})$: by $a^m \times a^n \times a^z = a^{m+n+z}$

$- \log_3 3^{11}$

$= 11 \times \log_3 3$: by $\log_a a^n = n \log_a a$

$- 11 \times 1$: by $\log_a a = 1$

: . $\log_3 81 + \log_3 9 + \log_2 243 = 11$

15.3 Evaluate without using tables or calculators log4 + 2log5

Solution:

$\log 4 + 2\log 5 = \log_{10}4 + 2\log_{10}5^2$: by $n\log_a b = \log_a b^n$

$= \log_{10}4 + 2\log_{10}25$: by finding the square of 5

$= \log_{10}(4 \times 25)$: by $\log_a A + \log_a B = \log_a(A \times B)$

$= \log_{10} 100$

$= \log_{10} 10^2$: by writing 100 in index form.

$= 2 \times \log_{10}10$: by $\log_a a^n = n \times \log_a a$

$= 2 \times 1$: by $\log_a a = 1$

: . $\log 4 + 2\log 5 = 2$

16.3 Without using tables or calculator evaluate: $\log_{10}3 + \log_{10}15 - \log_{10}4.5$

Solution:

$\log_{10}3 + \log_{10}15 - \log_{10}4.5 = \log_{10}(3 + 15 \div 4.5)$

$= \log_{10}(45 \div 4.5)$

$= \log_{10}\left[\frac{45 \times 10}{4.5 \times 10}\right]$

$= \log_{10}450/45$

$= \log_{10}10$

$= 1$

: . $\log_{10}3 + \log_{10}15 - \log_{10}4.5 =$ 1

17.3 Evaluate: (logm2 + logn2) ÷ log mn

Solution:

$(\log m^2 + \log n^2) \div \log mn = \log m^2$

Solution:

$(\log m^2 + \log n^2) \div \log mn = \frac{\log m^2 + \log n^2}{\log mn}$: by writing $a \div b = \frac{a}{b}$

$= \frac{\log n^2 + n^2}{\log mn}$: by loga + logb = ab

$= \frac{\log(mn)2}{\log mn}$

$= \frac{2 \cancel{\log mn}}{\cancel{\log mn}}$: by logan = nxloga

: . $\log m^2 + \log n^2) \div \log mn = 2$:by canceling log mn by log mn

18.3 Solve for x, given that $\log_{10}(3x + 4) - \log_{10}(3 - x) = 1$

Solution:

$\text{Log}_{10}(3x + 4) - \log_{10}(3 - x) = 1$

L.H.S = $\log_{10}(3x + 4) / (3 - x)$: by log a – log b = log a/b

$\Rightarrow \frac{3x + 4}{3 - x} = 10$: by equating numbers

$\Rightarrow (3 - x) \times \frac{(3x + 4)}{(3 - x)} = 10(3 - x)$: by multiplying (3 – x) on both sides

$\Rightarrow$ $3x + 4\_ = 30 - 10x$

$3x + 10x\_ = 30 - 4$: by collecting like terms

$\frac{13x}{13} = \frac{26}{13}$: by dividing by 13 on both sides.

: . x = 2

19.3 Without using mathematical tables, evaluate: $3\log_{10}5 + \log 1064 - \log 108$

Solution:

$3\log_{10}5 + \log_{10}64 - \log_{10}8 = \log_{10}5^3 + \log_{10}64 - \log_{10}8$: by $n\log = \log a^n$

$= \log_{10}(5^3 \times 64 \div 8)$: by log a + log b – log c

$= \log_{10}(5^3 \times \frac{64}{8})$: by writing 5 x 64 ÷ 8 as $\frac{5^3 \times 64}{8}$

$= \log_{10}(5^3 \times 8)$

$= \log_{10} 1000$: by multiplying 125 x 8

$= \log_{10}10^3$: by writing 1000 in index form

$= 3\log_{10}10$

: . $3\log 10^5 + \log_{10}64 - \log_{10}8 = 3$

20.3 Simplify ½ log 64 + 2log3 – log 12:

Solution:

½ log 64 + 2log 3 – log 12 = $\log 64^{\frac{1}{2}} + \log 3^2 - \log 12$: by $n\log a = \log a^n$

$= \log(8^2)^{\frac{1}{2}} + \log 3^2 - \log 12$: by writing 64 in index form.

$= \log 8 + \log 3^2 - \log 12$: by simplifying $(8^{2 \times \frac{1}{2}})$

$= \log 2^3 + \log 3^2 - \log 12$: by writing 8 in index form.

$= \log (2^3 \times 3^2 - 12)$: by log a + log b – log c = log(a x b ÷ c)

$= \log\frac{(2^3 \times 3^2)}{12}$

$= \log\frac{(2^3 \times 3^2)}{2^2 \times 3}$: by writing 12 in index form.

$= \log(2^{3-2} \times 3^{2-1})$: by $\frac{a^n}{a^m} = a^{n-m}$

$= \log(2^1 \times 3^1)$

: . ½ log 64 + 2 log 3 – log 12 = log 6

21.3. Use logarithms to find: $\log_{10}380$

Solution:

$\text{Log}_{10}\,380$	=	$\log_{10}(3.80 \times 10^2)$	: by writing 380 in standard form.
	=	$\log_{10}\,3.8 + \log_{10}10^2$	: by $\log_{10}(a \times b) = \log a + \log b$
	=	$0.5798 + \log_{10}\,10^2$	: by reading the logarithm of 3.8 from tables or using a calculator.
	=	$0.5798 + 2\log_{10}10$	: by $\log a^n = n \times \log a$
	=	$0.5798 + 2 \times 1$	: by $\log_a a = 1$

: . $\log_{10}380$ = 2.5798

22.3 Find the value of: $\log_{10}\,75000$

Solution:

$\text{Log}_{10}\,75000$	=	$\log_{10}(7.5 \times 10^4)$	: by writing 75000 in standard form.
	=	$\log_{10}\,7.5 + \log_{10}10^4$	: by $\log_{10}(a \times b) = \log a + \log b$
	=	$0.8751 + \log_{10}10^4$	: by reading the logarithms of 7.5 from or using a calculator.
	=	$0.8751 + \log_{10}10$	: by $\log an = n \times \log a$
	=	$0.8751 + 4 \times 1$	: by $\log_a a = 1$
	=	$0.8751 + 4$	

: . $\log_{10}\,75000$ = 4.8751

24.3 Find the value of $10^{3.436}$

Solution:

$10^{3.436}$	=	$10^{3+0.436}$	: by writing the power 3.436 as 3+0.436
	=	$10^3 \times 10^{0.436}$	: by $10^{a+b} = 10^a \times 10^b$
	=	10^{-3} x antilog 0.436	
	=	$10^3 \times 2.7290$	: by reading the antilog of 0.436 from the tables or calculator.

: . $10^{3.436}$ = 2.7290×10^3

25.3 Evaluate: $10^{5.766}$

Solution:

$10^{5.766}$ = $10^{5+0.766}$: by writing the power 5.766 as 5+0.766

= 10^5 x $10^{0.766}$: by 10^{x+y} = a^x x a^y

= 10^5 x antilog of 0.766

= 10^5 x 5.834 : by reading the antilog of 0.766 from the tables or calculator.

: . $10^{5.766}$ 5.834 x 10^5

26.3 Find $10^{2.333}$

Solution:

$10^{2.333}$ = $10^{-2+0.333}$: by writing the power 2.333 as -2+0.333

= 10^{-2} x $10^{0.333}$: by 10^{x+y} = 10^x x 10^y.

= 10^{-2} x antilog of 0.333

= 10^{-2} x 2.1528 : by reading the antilog of 0.333 from the tables or calculator.

: . $10^{2.333}$ = 2.1528 x 10^{-2}

27.3 Evaluate: $10^{3.945}$

Solution:

$10^{3.945}$ = $10^{-3+0.945}$: by writing the power 3.945 as -3+ 0.945

= 10^{-3} x $10^{0.945}$: by 10^{x+y} = 10^x x 10^y

= 10^{-3} x antilog of 0.945

= 10^{-3} x 8.08105 : by reading the antilog of 0.945 from the tables or calculator.

: . $10^{3.945}$ = 8.8105 x 10^{-3} **NB: Write the antilog to 4 decimal places**

28.3 Find if $\log_{10}x$ = 2.815

Solution:

$\text{Log}_{10}x$ = 2.815

⇨ x = $10^{2.815}$: by $x = \log_n m$ ⇨ $m = n^x$ (writing log10 = 2.815 in index form.

= $10^{2+0.18}$: by writing the power 2.815 as 2+0.815

$= 10^2 \times 100.815$: by $10^{x+y} = 10^x \times 10^y$

$= 10^2 \times$ antilog of 0.815

$= 10^2 \times 6.5313$: by reading the antilog of 0.815 from the tables or calculator.

: . x = 6.5313×10^2

29.3 Solve for x given that $\log_{10} x = 0.979$

Solution:

$\text{Log}_{10} x = 0.979$

$x = 10^{0.979}$: by writing log10x=0.979 in index form.

= antilog of 0.979

= 9.5280 : by reading the antilog of 0.979 from tables or calculator.

: . x = 9.5280

30.3 **Solve for x = Given that $10^x = 3.474$**

Solution

$10^x = 3.475$

$\text{Log } 10^x = \log_{10} 3.475$: by taking $\log_{10}$ on both sides.

$X \log_{10} 10 = \log_{10} 3.475$: by $\log_{10} 10^n = n \log_{10} 10$

$X \times 1 = \log_{10} 3.475$: by $\log_{10} 10 = 1$

X = 0.5410 : by reading the log of 3.75 from the tables or a calculator.

31.3 **Solve for x given that $10^x = 2566$.**

Solution

$10^{*} = 2566$

$\text{Log}_{10} 10^x = \log_{10} 2566$: by taking $\log_{10}$ on both sides.

$X \log_{10} 10 = \log_{10} 2566$: by $\log_{10} 10^n$: $n \log_{10} 10$

$X^x 1 = \log_{10} 2366$: by $\log_{10} 10 = 1$

$X = \log_{10} (2.566 \times 10^3)$: by writing 2566 in standard form

$X = \log_{10} 2.566 + \log_{10} 10^3$: $\log10 (axb) = \log_{10}a+\log_{10}b$

$= 0.4093+\log_{10} 10^3$: by reading the log of 2.566 from table or a calculator

$= 0.4093 +3 \log_{10} 10$: by $\log_{10} 10 = n \log_{10} 10$

$= 0.4093 +3x1$: by $\log_{10} 10 =1$

$= 3.4093$

32.3 **Find the value of : log10 6.000499**

Solution:

$\text{Log}_{10} 0.000499 = \log_{10}{}^{(4.99*10-4)}$: by writing 0.000499 in standard form

$= \log_{10} 4.99+ \log_{10} 10^{-4}$: by log10 (a x b) $=\log_{10}a+\log b$

$=0.6981 +\log_{10} 10^{-4}$: by reading the log of 4.99 from the tables or a calculator.

$= 0.6981 +-4$: by $\log_{10} 10^n = n\log_{10} 10$

$= 0.6981 +-4 \times 1$: by $\log_{10} 10 =1$

$= 0.6981 +4$: by writing -4 as 4

Therefore log0.000499 = 4 .6981

N.B some logarithmic numbers have the whole number part and some negative part. Write the whole number part in full with the proper sign in front of it.

Worked examples:

34.3 **Simplify: 4.376 +3.123**

solution

+4+0.376

-3+0.123

1+0.499

4.376 +3. 123 =1.499

25

Simplify: 5.47 + 2.93

Solution:

-5 + 0.47

-2 + 0.93

-7 + 1.40

= 6.40

35.3 Simplify: 4.2789 -1.4727

Solution

-4.2789 we cannot subtract 0.4727 from 0.2789,
+1.4727 borrow 1 from -4, thus leaving as with -5,
and proceed to subtract 0.4727 from 1.2789, and +1 from -5

-5+1.2789
+1+0.4727
-6+0.8062

4.2789 -1.4727 =6.8062

36.3 Simplify: 5.1529 -8.8206

Solution

-5+0.1529 we cannot subtract 0.8206 from 0.1529,
-8+.8206 so we barrow 1 from -5 itus leaving
Us with -6, and proceed to subtract 0.8206 from 1.1529 and -8 from -6.

-5+1.1529
-8+.8206
3+.3323

N.B -5 $+^{+8}$ =3

Therefore 5 .1529 – 8.8206 =3.3323

37.3 Simplify: 3.88 x 2

Solution

-3+0.88
X 2
-6+1.76

3.88 x 2 =5.76

29. Simplify: 2.74 x 4

Solution

-2 + 0.74
x 4
-8 + 2.96

Therefore 2.7 x 4 = 6.96

38.3 Simplify: 8.4726 /2

Solution

8+0.4726 = 4+0.2363

8.4726 / 2 = 4.2363.

39.3 Simplify : 5.6548 /3

Solution

$\frac{5.6548}{3}$:5 is not exactly divisible by 3 and the next number to -5 which is a multiple of 3 is -6. We therefore express -5 as -6+1

$\frac{-6+1.6548}{3}$ =-2+0.5516

Therefore $\frac{5.6548}{3}$ = 2.5516

40.3 Simplify: $\frac{2.3404}{4}$

Solution

$\frac{2.3404}{4} = \frac{2.3404}{4}$ But -2 doesn't give a whole number part when divided by 4, so the next number which is exactly divisible by 4 is -4. We express -2 as -4+2

$= \frac{-4+2.3404}{4}$

= -1+0.5851

= 1.5851.

41.3 **Simplify: 3.62/2**

Solution

$\frac{3.62}{2} = \frac{3.62}{2}$ but -3 is not exactly divisible by 2, so the next numbers which is divisible by 2 is -4 Therefore we express -3 as -4 +1

= $\frac{-4+1.62}{}$

2

= -2+0.81

= 2.81

42.3 Workout: 3.7435 x 4

Solution

-3+0.7435

X 4

-3+2.9740

43.3 Simplify: (5.5/3) +3.9

Solution

$\frac{5.5}{-3} = \frac{-5+0.5}{3}$

$= \frac{-6+1.5}{3}$

= -2+0.5

= -2+0.5+3.9

= -2+0.5+3+0.9

= -2+0.5

-3+0.9

-5+1.4

= -2+0.5+3.9

= -2+0.5 +-3+0.9

= -2+0.5

= -3+0.9

-5+1.4

= 4.4

44.3 Evaluate: 8.945 x 1.357

Solution

NO	**S.F**	**LOG**
8.945	8.945×10^0	0.9516
1.357	1.357×10^0	**0.1326**
	1.2139×10^1	1.0842

45.3 **Use logarithms to evaluate: 431x6.89**

79.5

Solution

No.	**s.f**	**log**
431	4.31×10^2	2.6345
6.89	6.89×10^0	0.8382
		2.4727
79.5	7.95×10^1	1.9004
	3.7351×10^0	0.5723

46.3 Use logarithms to Evaluate: $\frac{81.74 \times 37.31}{5.176 \times 20.56}$

Solution

No	S.F	log
81.74	8.174×10^1	1.9124
37.31	3.731×10^1	+1.5718
		3.4842
5.176	5.176×10^0	0.7140
20.56	2.056×10^1	+1.313
	1.0641×10^2	2.0270

47.3 Use logarithms to Evaluate: $61.73^2 \times 0.00394^2$

Solution

No	**s.f**	**log**
61.732	$(6.173 \times 10)^2$	1.7905
		x2
		1.5810
0.003942	$(3.94 \times 10\text{-}3)^2$	3.5955
		x2

	2.4547×10^3	2.1910 3.3900

48.3 Use logarithms to evaluate: $\frac{0.0000369 \times 28.3}{0.000025 \times .005}$

No	s.f	log	
0.0000369	3.69×10^{-5}	5.5670	
28.3	2.83×10^{1}	1.4518	3.0188
0.00025	2.5×10^{-4}	4.3979	
0.005	5.0×10^{-3}	3.6990	6.0969
	8.351×10^{-2}		2.9219

49.3 Evaluate; $\sqrt[7]{0.08076}$

Solution

No	**s.f**	**log**
0.08076	8.076×10^{-2}	$\frac{2.9072}{7}$
	6.9807×10^{-1}	1.8439

$$\frac{2.9072}{7} = \frac{7+5.9072}{7}$$
$$= 1+0.8439$$
$$= 1.8439$$

50.3 Evaluate $\sqrt[4]{\frac{2764}{34.86}}$

Solution

No	s.f	log
2764	2.764×10^3	3.14415
34.86	3.486×10^1	1.5423
		1.8992
		4
	2.9840×10^0	0.4748

51.3 **Use logarithms to evaluate** $\sqrt[3]{\dfrac{0.5215 \times 1.438}{0.00376}}$

Solution

No	s.f	log
0.5215	5.21×10^{-1}	1.7173
1.438	1.438×10^0	+ 01578
		1.8751
0.00376	3.76×10^{-3}	- 3.5752
		2.2999
		3
	5.8425×10^0	0.7666

52.3 use logarithms to evaluate $\sqrt[3]{\dfrac{0.5327 \times 1.734}{1.918}}$

Solution

No	**s.f**	**log**	
0.5327	5.327×10^{-1}		1.7265
1.734	(1.734×10^0)		0.0797
			1.8062
			0.2828
1.918	1.918×10^0		1.5234
	$\times 10^{-1}$		3
			1.8411

53.3 **Evaluate** $\sqrt[3]{0.0469 \times 0.0015}$

Solution

No	s.f	log
0.0469	4.69×10^{-2}	2.6712
0.0015	1.5×10^{-3}	+ 3.1761
		5.8473÷3
	4.128×10^{-2}	2.6158

$\frac{5.8473}{3} = \frac{6+1.8473}{3}$

$= 2.6158$

54.3 Evaluate $\sqrt[3]{\frac{32.1 \times 0.0017}{0.00076}}$

Solution

No	s.f	log
32.1	3.21×10^{1}	1.5065
0.0017	1.7×10^{-3}	+ 3.2304
		2.7369
0.00076	7.6×10^{-4}	- 4.8808
		1.8561÷3
	4.1562×10^{0}	0.6187

55.3 Use tables to Evaluate: $\sqrt{\frac{2 \times 0.1413 \times 0.325}{0.1413 + 0.3257}}$

Solution

No	s.f	log
2	2×10^{0}	0.3010
0.1413	1.413×10^{-1}	1.1501
0.3257	3.257×10^{-1}	1.5128
0.1413		2.9639
+ 0.3257		1.6693
0.4670		1.2946
	4.670×10^{-1}	2

56.3 Evaluate $0.0714^{-3/5}$

Solution

$$0.0714^{-3/5} = \frac{1}{\sqrt[5]{0.0714^{3}}}$$

No	s.f	log	
1 $0.0714^{-3/5}$	1×10^{0} $(7.14 \times 10^{-2})^{-3/5}$	0.0000 2.8537 x 3 4.5611 ÷ 5 $\frac{5 + 1.5611}{5}$	0.0000 1.3122
	4.873×10^{0}		0.6878

Exercise 4.0

1. The image of point (-1, 1) under an enlargement is (7, 5) with linear scale factor 3.Find the co-ordinates of the centre of enlargement.
2. The image of a point A (-4, 5) under an enlargement is A^1 (5, 7) with linear scale Factor -2. Find the coordinates of the centre of enlargement.
3. The image of a point P (6, +10 under an enlargement is P1 (0, -3) with Linear scale ⅓. Find the coordinates of the centre of enlargement.
4. The image of a point M (6, 1) under an enlargement is M1 (-3, -5) with linear scale factor -½. Find the centre of enlargement.
5. A polygon ABCD under goes an enlargement with centre (0, 0) and linear scale -1. Find without using a graphical method the coordinates of the image $A^1B^1C^1D^1$.
6. A polygon ABCD with vertices A (3, 0), B (4, 0), C (4, 2) and D (3, 4) is enlarged by linear scale 2, centre (0, 0) to form the image $A^1B^1C^1D^1$.
   a) By graphical method find the coordinates of the image $A^1B^1C^1D^1$.
   b) By taking a new centre of enlargement (11, 8) enlarge $A^1B^1C^1D^1$. by scale factor ½ to give A^{II} B^{II} C^{II} D^{II}. Find the coordinates A^{II} B^{II} C^{II} D^{II}
7. An enlargement with centre (-1, 1) maps the point (-4, 5) onto point (5, ⁻7). Find the scale factor.
8. The image of a triangle ABC with vertices A (12, 0), B (12, 6) and C (8, 6) is $A^IB^IC^ID^I$ with vertices A^1(2, 9), B^1 (2, 6), C^1 (4, 6) under an enlargement. Find the centre and the scale factor of the enlargement.
9. With centre (5, -1) find the image of triangle PQR with vertices P (1, 1), Q (5, 1), and R (3, 3) under an enlargement of scale factor 3.
10. A chalk board 2.5m high has an area of $62.5m^2$. Another similar chalk board is twice as high. Find:
    (i) The area scale factor
    (ii) The area of the larger chalk board

11. Two similar water tanks contain 1500 cm^3 and 125 cm^3 respectively. The smaller is 1.2m high. Find the height of the larger one.
12. The height of the perpendicular distance between two parallel sides of a trapezium is 7.5 cm and its area is 82.5cm^2. Another similar trapezium has a perpendicular distance of 2.5 cm. Find the area of the smaller trapezium.
13. A map is drawn to the scale 1:125,000. Find the actual area in km^2 of an island which has an area of 6.5 cm^2.

14. Two similar cylindrical containers have radii 3 cm and 5 cm respectively. Find the ratio of their volumes.

15. A and B are two similar cones and their volumes are in the ratio 30 : 57.
    Find: (i) the ratio of their radii
    (ii) the ratio of their heights
    (iii) the ratio of their surface area.