Saturday X-tra **X-Sheet: 13**

Exponents and Logarithms

Key Concepts

In this session we will focus on summarising what you need to know about:

- Surds
- Simplification of exponents
- Solving exponential equations
- Simplifying using log laws
- Solving exponential equations that require logarithms.

Surd Laws

$$\sqrt[n]{a.b} = \sqrt[n]{a}.\sqrt[n]{b}$$

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

X-ample Questions

1. Simplify without the use of a calculator, showing all working

$$\frac{\sqrt{50} + \sqrt{36} - \sqrt{8}}{6\sqrt{2}}$$

2. Simplify

$$\frac{2^{x-1} \cdot 3^{x+1}}{6^{x+2}}$$

3. Simplify $\dfrac{100^{-\frac{n}{4}}.15^{\frac{n}{2}+2}.24^{\frac{n}{6}}}{9^{\frac{n}{3}+1}}$

4. Simplfy

$$\frac{3 \cdot 2^{x+1}}{2^{x} + 2^{x-1}}$$

5. Simplify

$$\sqrt[n]{\frac{10^n + 2^{n+2}}{5^{2n} + 4.5^n}} \quad where\ n \neq 0$$

6. Simplify $\dfrac{m - m^{-1}}{\left(m^{1/2} + m^{-1/2}\right)^2}$

7. Solve for x

$$4^{2x} = 8^{3x-5}$$

8. Solve for x

$$2^{x-1} = 2^4 + 3.4^2 + 3.8^2$$

9. Solve for x $2^x - 2^{x-1} = 8$

10. Simplify without calculators : $\log_2 12 + \log_2 5 - \log_2 7{,}5$

11. Simplify without a calculator: $\log_3 27 - \log_2 8 - \log 5 - \log 2$

12. Simplify without using a calculator $\dfrac{\log 27 - \log 125}{\log 9 - \log 25}$

13. Simplify without using a calculator $\dfrac{\log 6 - \log 2}{\log 9(2\log 5 + \log 4)}$

14. Simplify without using a calculator $\log_p 12 + 2\log_p 5 - \log_p 3 - 2\log_p 10$

15. Solve for x

a) $3^x = 5$

b) $2.3^x = 10$

X-ercise

1. Simplify without the use of a calculator, showing all working

$$\frac{\sqrt{75} + \sqrt{12}}{\sqrt{48}}$$

2. $\dfrac{2^{x-1} \cdot 3^{x+1}}{6^{x+2}}$

3. $\dfrac{3 \cdot 2^{x+1}}{2^x + 2^{x-1}}$

4. Solve for x if $3^{2x-1} = 27^{2x-1}$

5. Solve for x if $2.3^x = 10$

6. Simplify fully $\dfrac{\log 6 - \log 2}{\log 9(2\log 5 + \log 4)}$

7. Simplify: $2\log_x 3 + \log_x 4 - \log_x 6$

Answers

1. $\dfrac{7}{4}$
2. $\dfrac{1}{216}$
3. 4
4. $x = \dfrac{1}{2}$
5. x=1,465
6. $\dfrac{1}{4}$
7. $\log_x 6$