

Please read the instructions to each part carefully. Marks will not be given out if instructions are not followed. Also, work shown must be neat. Marks will not be given out if work is not neat.

Part A: Quickies. (1 mark each)

- 1) Write 125 as a power of 5: 5^3
- 2) What is the value of 2^5 : 32
- 3) Write as a power: $\sqrt[5]{7^2} = 5^{2/5}$
- 4) Write as a radical: $6^{3/4} = (\sqrt[4]{6})^3$

Part B: Evaluate. No decimal answers and no exponents in your answers.

1) $-8^0 = -1$	2) $4^{-2} = \frac{1}{16}$
3) $\left(\frac{4}{3}\right)^3 = \frac{64}{27}$	4) $3^2 - 2^{-3} = 9 - \frac{1}{8} = 8\frac{7}{8}$
5) $2^{-5} \times 2^7 = 2^2 = 4$	6) $(4^3)^2 = 4^6 = 4096$

Part C: Simplify. No negative exponents or decimals in your answers.

1) $a^3 \times a^{-5} \times a^{12} = a^{10}$	2) $\frac{a^4 b^{11}}{a^{-3} b^8} = a^7 b^3$
3) $(x^{-3} y)^{-7} = \frac{x^{21}}{y^7}$	4) $\frac{(4m^3 n^5)^3}{(-3m^2 n^6)^3} = \frac{64m^9 n^{15}}{-27m^6 n^{18}} = \frac{64m^3}{-27n^3}$
5) $\left(a^{\frac{1}{2}} b^{\frac{3}{4}}\right)^{\frac{8}{3}} = a^{4/3} b^2$	6) $a^{\frac{1}{3}} b^{\frac{2}{5}} \times a^{\frac{3}{2}} b^{\frac{1}{2}} = a^{\frac{10}{6}} b^{\frac{9}{10}}$

Part D: Fractional Exponents. No negative exponents or decimals in your answers.

1. Express as a power. (Get rid of the radical sign and rewrite using exponents).

a) $\left(\sqrt[3]{10^2}\right)^2 = (10^{2/3})^2 = 10^{4/3}$	b) $\frac{1}{(\sqrt[3]{13})^{-2}} = (\sqrt[3]{13})^2 = 13^{2/3}$
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2. Evaluate the following. No decimal answers.

a) $16^{\frac{3}{2}} = (\sqrt[3]{16})^3 = 4^3 = 64$	b) $8^{\frac{-1}{3}} = \frac{1}{\sqrt[3]{8}} = \frac{1}{2}$
c) $32^{0.6} = 32^{\frac{6}{10}} = 32^{\frac{3}{5}} = (\sqrt[5]{32})^3 = 8$	d) $(-8)^{\frac{-2}{3}} = (\frac{1}{\sqrt[3]{-8}})^2 = \frac{1}{4}$

3. Evaluate.

a) $25^{\frac{1}{2}} - 8^{\frac{4}{3}} = \sqrt{25} - (\sqrt[3]{8})^4 = 5 - 16 = -11$	b) $8^{\frac{1}{3}} \times 9^{\frac{1}{2}} = \sqrt[3]{8} \cdot \sqrt{9} = 2 \cdot 3 = 6$
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Part E: Growth & Money Problems. $F = ir^t$ $A = P(1 + \%)^t$

1. If you had a colony of 12 bees that triple every month, how many bees would you have after 4 months?

$$F = 12 \cdot 3^4 = \underline{972}$$

2. If you have \$18000 at that you had invested for 10 years at an interest rate of 16% per annum, how much money did you initially invest?

$$18000 = P \cdot (1.16)^{10} = \underline{4080,30}$$

Part F: Sequences & Series. Show appropriate work.

General formulas: $t_n = a + (n-1)d$ $S_n = \frac{(a+t_n)}{2} \times n$ $t_n = ar^{n-1}$

1. Given the following sequence: 6, 10, 14, ... , find the t_{21} .

$$t_{21} = 6 + (20)4 = \underline{86}$$

2. Given the following sequence -7, 3, 13, 23, 33, 43 find the missing terms.

$$-7 + 4d = 33 \therefore d = 10$$

3. How many terms are in the following sequence? 11, 14, 17, ..., 146

$$146 = 11 + (n-1)3 \quad 146 = 11 + 3n - 3 \quad \therefore n = \underline{46}$$

4. Determine the first four terms of the arithmetic sequence in which the 6th term is 33 and the 9th term is 57.

$$33 + 3d = 57 \quad \therefore d = 8$$

$$3d = 24$$

$$\underline{-7, 1, 9, 17, 25, 33}$$

5. Give the first 4 terms of the following sequence: $t_n = 12 - 5n$

$$t_1 = 12 - 5(1) = \underline{7} \quad t_2 = 12 - 5(2) = \underline{2} \quad t_3 = 12 - 5(3) = \underline{-3} \quad t_4 = 12 - 5(4) = \underline{-8}$$

6. Given the following sequence: 4 + 11 + 18 + ... find S_{15} .

$$t_{15} = 4 + 14(7) = 102 \quad S_{15} = \frac{(4+102)}{2} \cdot 15 = \underline{795}$$

7. Find the sum of the following sequence: -12 + -9 + -6 + ... + 39

$$39 = -12 + (n-1)3 \quad 39 = -12 + 3n - 3 \quad \therefore n = 18$$

$$S_{18} = \frac{(-12+39) \cdot 18}{2}$$

8. Given the following geometric series: 3, 6, 12, ... , find t_9 .

$$S_{18} = \underline{243}$$

$$t_9 = 3(2)^{8} = 3(256) = \underline{768}$$