USING ALGEBRA WORKSHEET

Q1

a) Simplify (√3+5) (√3−5)

b) Express √12 + √27 in the form n√3, where n is an integer.

c) Rationalise the expression $\frac{1}{1+\sqrt{2}}$

Q2

a) Express $x^2 + 4x - 7$ in the form $(x + p)^2 - q$, where p and q are integers.

b) Hence, or otherwise, find the coordinates of the minimum point of the curve $y = x^2 + 4x - 7$

c) Solve the equation for x and sketch a graph to show the root/s of the equation.

$$\frac{x}{x+4} + \frac{1}{x} = \frac{3}{4}$$

Q3

The quadratic equation $x^2 + (3k + 1)x + (4 - 9k)$, where k is constant, has repeated roots.

a) Show that $9k^2 + 42k - 15 = 0$

b) Hence find the possible values of k

Q4

a) Find the binomial expansion of $(2 + 3x)^5$, simplifying the terms.

b) Hence find the binomial expansion of $(2 + 3x)^5 - (2 - 3x)^5$

Q5

a) Evaluate and simplify the following logarithm to find x

$2\log_b 5 + \frac{1}{2} \log_b 9 - \log_b 3 = \log_b x$

b) Use the logarithm laws to simplify this expression

$$log_2 \frac{8x^3}{2y} = log_2 8x^3 - log_2 2y$$

c) The formula for the amount of energy E (in joules) released by an earthquake is E = (1.74 × 1019 × 101.44M) where M is the magnitude of the earthquake on the Richter scale.

i. The Newcastle earthquake in 1989 had a magnitude of 5 on the Richter scale. How many joules were released?

ii. In an earthquake in San Francisco in the 1900s the amount of energy released was double that of the Newcastle earthquake. What was its Richter magnitude?

Q6

The first term of an infinite geometric series is 96. The common ratio of the series is 0.4.

a) Find the third term of the series.

b) Find the sum to infinity of the series.

c) The nth term of the series is un . Find the value of $\sum_{n=4}^{\infty} u_n$

Q7

An arithmetic series has first term a and common difference d. The sum of the first ten terms of the series is 460.

a) Show that 2a + 9d = 92

b) Given also that the 25th term of the sequence is 241, find the value of d

c) The nth term of the series is u_n . Given that $u_k < 1000$ and $u_{k+1} > 1000$, find the value of $\sum_{n=1}^{k} u_n$

Q8

a) Given that $\log_a b = c$, express b in terms of a and c.

b) By forming a quadratic equation, show that there is only one value of x satisfying the equation $2\log_3 (x - 1) - \log_3 (x + 5) = 1$