II Roots multiplied by a given non-zero constant k.

Theory Let α be a root of a polynomial equation $f(x) = 0$, then $k\alpha$ is a root of a polynomial equation $f(\frac{y}{k}) = 0$.

That is to say, change $x \to \frac{y}{k}$

Class Work II.1

Given the equation $x^2 - x - 6 = 0$, roots 3, –2.

Find the equation whose roots are –24 and 16.

k = _____, the new equation is ( )^2 – ( ) – 6 = 0

On simplification, the equation is _____ = 0

Class Work II.2

(a) Let α, β and γ be the roots of $x^3 + qx^2 + r = 0$.

Find the new equation whose roots are 2α, 2β and 2γ.

(b) Find the value of $(\beta + \gamma - \alpha)(\alpha + \gamma - \beta)(\alpha + \beta - \gamma)$

$\alpha + \beta + \gamma$ = sum of roots of the old equation = _____

$\beta + \gamma - \alpha = (\alpha + \beta + \gamma) - 2\alpha$ = _____

$\alpha + \gamma - \beta$ = _____

$\alpha + \beta - \gamma$ = _____

From (a), $(y - 2\alpha)(y - 2\beta)(y - 2\gamma) = y^3 + 2qy^2 + 8r$

Put $y = -q$, do the rest yourself.