

Liam's goal is to save \$20 000. What principal invested for 5 years at 6% per annum, compounded semi-annually, then for the next 3 Years at 6.5% per annum, compounded quarterly, achieves this goal in 8 years?

$$x\left(1 + \frac{n\%}{100}\right)^k, \quad x - \text{sum at start, } n - \text{interest rate, } k - \text{number of periods.}$$

Half year interest rate = $(1/2)(6\%) = 3\%$. There are 10 half year periods in 5 years.

Quarter year interest rate = $(1/4)(6.5\%) = 1.625\%$. There are 12 quarters in 3 years.

$$x(1 + 0.03)^{10} + x(1 + 0.01625)^{12} = 20000,$$

$$(1 + 0.03)^{10} \approx 1.344, \quad (1 + 0.01625)^{12} \approx 1.213,$$

$$1.344x + 1.213x = 20000$$

$$2.557x = 20000, \quad x = \frac{20000}{2.557} \approx 7822.$$

Answer: 7882\$.