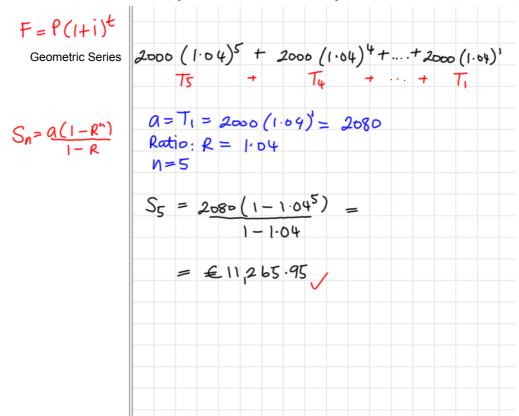
A special savings account offers an AER of 4% per annum. If I invest €2000 per year in this account, how much will my investment be worth in 5 years time?



4. Show that the future value of a series of n payments of $\in \mathbb{P}$, earning an interest rate of i% per annum, can be written as:

% per annum, can be written as:
Future value =
$$P(1 + i) \left(\frac{(1+i)^n - 1}{i} \right)$$

$$S_n = \underbrace{\alpha(1-R^n)}_{1-R}$$

F=P(1+i)^t
assume n payments means 7
1 per year for n years

$$S_{n} = \underbrace{a(1-R^{n})}_{1-R}$$

$$R = T_{i} = P(1+i)$$

$$R = 1+i$$

$$n = n$$

$$R = 1 + 1$$

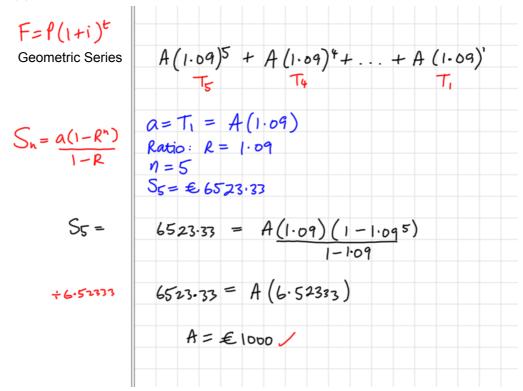
$$S_n = P(1+i)(1-(1+i)^n)$$

$$= P(1+i) \left(1 - (1+i)^n \right)$$

$$+ x - i$$

multiply above and below by -1

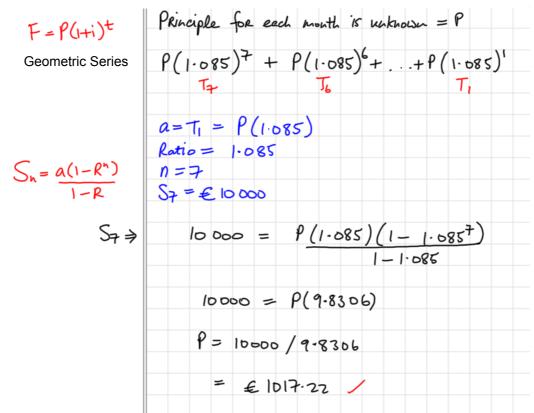
- 6. Anne received a cheque in the post for €6523.33 after saving for 5 years with her bank in a scheme offering 9% per annum. If she invested €A per annum,
 - (i) write down a geometric series representing the value of her investment over the 5 years
 - (ii) find the value of A.



7. Use the future value formula to find the final value if €200 is invested every month for 2 years. The interest rate is 9% per annum, compounded monthly.

change annual equivalent rate to monthly equivalent rate Instalments?	9% pa. \Rightarrow mER? $(1.09)^1 = (1+R)^{12} \Rightarrow R = \frac{12}{3}[1.09 - 1]$ R = 0.0072 2 years = (12)2 = 24 mouths
F=P(1+i)t	
Geometric Series	200 (1.0072)24 + 200 (1.0072)23 + + 200 (1.0072)
$S_n = \alpha(1-R^n)$	T ₂ 4 T ₂ 3 T ₁
1-R	$a = T_1 = 200 (1.0072)^1 = 201.44$
	Ratio: $R = 1.0072$ $N = 24$
Future Value =	$S_{24} = 201.44 (1 - 1.0072^{24})$ $1 - 1.0072$
	= £ 5256-82/

8. George wants to make regular payments into an account that pays 8.5% per annum compound interest in order to have €10 000 after 7 years. Find the amount of each annual payment.



9. Ella wants to have €5000 in 3 years time. She invests in an annuity that pays 7.2% per annum, compounded quarterly. How much does she need to deposit each quarter to achieve her target of €5000?

$$(1+i)' = (1+R)^{4}$$

$$ReR?$$

$$(1-072)' = (1+R)^{4} \Rightarrow R = \sqrt[4]{1-072} - 1 = 0.0175$$
number of instalments?
$$F = P(1+i)^{4}$$
Let each instalment = P
Geometric Series
$$P(1-0175)^{12} + P(1-0175)^{11} + ... + P(1-0175)^{11}$$

$$T_{1} = a = P(1-0175)$$

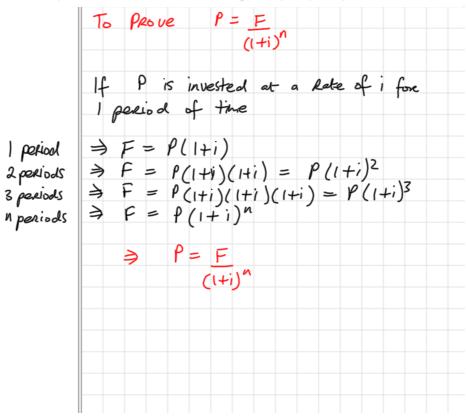
$$Ratio = R = 1-0175$$

$$N = 12$$

$$S_{12} = 5000$$

$$S_{12} \Rightarrow F = 5000 / 13-4565 = £371.57$$

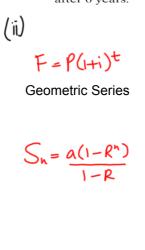
- **10.** Prove that the present value of an annuity (instalments paid at the beginning of each period) is given by:
 - Future value (calculated at the end of each period) \div $(1 + i)^n$.

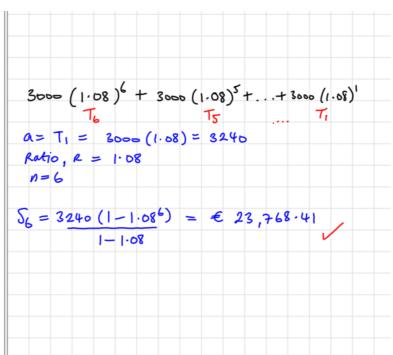


- 11. Show how the present value of an annuity involving depositing €3000 per year in an account for 6 years can be written as a geometric series, given that the interest rate is 8% per annum.
 - (i) Calculate the present value.
 - (ii) Calculate the future value of the annuity.
 - (iii) If the present value of the annuity in (i) was put on deposit as a single investment at 8% per annum, show that it will amount to the same future value of the annuity after 6 years.

ώ	The first instalment is €3000 this is needed
P= <u>F</u>	immediately and won't be earning interest
Geometric Series	3000 + 3000 + . 3000 + 3000 (1.08)5 (1.08)4 (1.08)
	To Ts T2 T1
$S_n = \underbrace{a(1-R^n)}_{1-R}$	$T_1 = a = 3000$ $R = 1/1.08$ $N = 6$
Present Value =	$S_6 = \frac{3000 \left(1 - \left(\frac{1}{1.08}\right)^6\right)}{1 - \left(\frac{1}{1.08}\right)}$
	= €14,978.13

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(iii)

