

F = final value

P = principal (start value)

Formula $F = P(1+i)^t$

i = interest rate \rightarrow a percentage %

t = time in years.

Eg 1) Calculate the compound interest and final value of investing €600 for 2 years @ 5%.

Principal = 600 P

time = t (2 years)

i rate = 5%

1 yr $600 \times 5\% = 30$

2 yr $630 \times 5\% = 31.5$

End of yr 2

$630 + 31.5$

€661.5 Final amount

interest $30 + 31.5 = €61.5$

Formula

$$F = 600(1 + 5\%)^2$$

$$F = 661.5$$

Eg 2) Different interest Rates every year.

^{principal} €4600 is invested for 2 years

at 4% for year 1 and 5% for year 2.

Find the total amount of the investment and interest earned?

$$1st \rightarrow 4600 \times 4\% = 184$$

$$4600 + 184 = 4784$$

$$2nd \rightarrow 4784 \times 5\% = 239.2$$

$$\text{End of year 2 } 4784 + 239.2 = \text{€}5023.20$$

$$\text{Interest Earned } 184 + 239.2 = \text{€}423.2$$

C/W \rightarrow H/W

Pg 121 Q 3 (ii) (iii) and (iv)



T&T3 5.7



T&T3
5.7.pptx

PROJECT MATHS

Text & Tests

Leaving 3 Certificate

Section 5.7 Compound interest**Example 1**

Find the compound interest on €2800 for 3 years at 7.5% per annum.

Example 2

If €650 amounts to €702 in one year, find the rate.

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Example 3

A woman invested €6000 in a Building Society for two years.
The rate of interest for the first year was 3% per annum.
She did not withdraw any money at the end of the first year.
At the end of the second year her total investment was worth €6427.20.
What was the rate of interest for the second year?

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Example 4

What sum of money, invested at 4% per annum compound interest, will amount to €3149.62 after 3 years?

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Example 5

An investment bond gives a 20% return when invested for 8 years. Calculate the AER (annual equivalent rate) for this bond, correct to one decimal place.

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Example 6

A machine depreciates in value by 10% per annum.

If the machine is worth €58 320 at the end of 3 years, find its value when new.

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Exercise 5.7

1. Express each of these percentages as decimals:

(i) 4%

(ii) $5\frac{1}{2}\%$

(iii) 12%

(iv) $14\frac{1}{2}\%$

(v) 112%

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Exercise 5.7

2. Write down the multiplier when you want to find these percentages of an amount:

- (i) 106% (ii) $105\frac{1}{2}\%$ (iii) 110% (iv) 96% (v) $112\frac{1}{2}\%$

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Exercise 5.7

209 Tables pg 30 $F = P(1+i)^t$

3. Calculate, to the nearest cent where necessary, the compound interest on

(i) €600 for 2 years at 5%.

(ii) €1800 for 2 years at 9%

(iii) €3500 for 3 years at $7\frac{1}{2}\%$

(iv) €7800 for 3 years at $3\frac{1}{2}\%$.

$$\text{ii) } F = 1800(1+9\%)^2$$

calculator

$$F = 2138.58$$

$$\begin{aligned} \text{Interest} &= F - P \\ &= 2138.58 - 1800 \\ &= \pounds 338.58 \end{aligned}$$

C/W
Pg 121 Q5 → 8.

$$\text{iii) } F = 3500(1+7.5\%)^3$$

$$F = 4348.03$$

$$\text{Interest} = \pounds 848.03$$

$$\text{iv) } F = 7800(1+3.5\%)^3$$

$$F = 8647.99$$

$$\text{Interest} = \pounds 847.99.$$

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Exercise 5.7

4. €4600 was invested for 2 years at compound interest. If the rate for the first year was 4% and for the second year was 5%, find the total interest for the two years.

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Exercise 5.7

5. A company borrowed €12 000 from a bank at 11% per annum compound interest. The company repaid €5000 at the end of the first year. How much was owed to the bank at the end of the second year?

$$12,000 \times 11\% = 1320 \text{ interest}$$

$$12,000 + 1320 = 13320 \text{ End yr 1}$$

$$13320 - 5000 = 8320$$

$$2\text{gr } P = 8320 \times 11\% = 915.20 \text{ interest.}$$

$$\text{End of year 2 } 8320 + 915.20 = \text{€}9235.20.$$

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Exercise 5.7

6. €2500 was invested in a building society.
If it amounted to €2612.50 after one year, calculate the rate of interest.

$$\text{Formula: } \frac{\text{Interest}}{\text{Principal}} \times 100$$

$$\text{Interest} = F - P$$
$$2612.50 - 2500 = 112.5$$

$$\frac{112.5}{2500} \times 100 = 4.5\%$$

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Exercise 5.7

7. A sum of money is invested at 7% per annum.
If it amounts to €6848 after one year, find the sum invested.

$$\begin{array}{rcc} \text{Sum} & \text{Interest} & \text{Final} \\ 100\% + & 7\% & = 6848 \end{array}$$

$$107\% = 6848$$

$$1\% = \frac{6848}{107} = 64$$

$$100\% = 64 \times 100 = \text{€}6400$$

HW Q8+9 Pg 121/122.

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Exercise 5.7

8. €8000 is invested for 3 years at compound interest.
The rate for the first year is 5% and for the second year is 6%.
Find the amount of the investment at the end of two years.
At the end of the third year, the money invested amounted to €9260.16.
Calculate the rate of interest for the third year.

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Exercise 5.7

9. What sum of money invested for 3 years at 8% per annum compound interest would amount to €1007.77?

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Exercise 5.7

- 10.** A person invested €10 000 in a building society.
The rate of interest for the first year was $2\frac{1}{2}\%$.
At the end of the first year the person invested a further €1000.
The rate of interest for the second year was 2%.
Calculate the value of the investment at the end of the second year.
At the end of the third year the total investment amounted to €14 014.
Calculate the rate of interest for the third year.

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Exercise 5.7

- 11.** What sum of money invested at 5% per annum compound interest would amount to €10 988.78 in 6 years?

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Exercise 5.7

- 12.** A person borrows €15 000 for two years.
Interest for the first year is charged at 12% per annum.
The person repays €6000 at the end of the first year.
If the amount owed at the end of the second year is €12 042, find the rate of interest for the second year.

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Exercise 5.7

- 13.** €5000 was invested for 3 years at compound interest.
The rate for the first year was 4%. The rate for the second year was $4\frac{1}{2}\%$.
(i) Find the amount of the investment at the end of the second year.
(ii) At the beginning of the third year a further €4000 was invested.
The rate for the third year was $r\%$.
The total investment at the end of the third year was €9811.36.
Calculate the value of r .

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Exercise 5.7

- 14.** A sum of money was invested for 2 years.
The rate of interest for the first year was 4% and for the second year was 5%.
If the amount at the end of the second year was €9282, find the sum invested.

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Exercise 5.7

- 15.** A sum of money invested at $r\%$ per annum compound interest amounts to €5175 after one year and to €5951.25 after two years.
Find (i) the value of r (ii) the sum invested.

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Exercise 5.7

- 16.** An investment bond gives 25% interest after 5 years.
Calculate the AER (annual equivalent rate) for this bond.
Give your answer correct to one decimal place.

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Exercise 5.7

- 17.** A credit card company charges interest at a rate of 2.5% per month.
Calculate the overall percentage rate of interest for 12 months, to the nearest 0.1%.

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Exercise 5.7

18. Another credit card company's monthly interest rate is 1.5%. Calculate the annual interest rate, to the nearest 0.1%.

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Exercise 5.7

19. Sean borrows €4000 from a bank on 1 January. He agrees to pay back €1000 at the end of each month. The bank charges interest at 2% per month on the outstanding amount of the loan.
- (i) Continue the calculation until the loan is fully repaid. (The final repayment will be less than €1000.) When is it finally repaid?
- (ii) How much is the last repayment?

Amount on 1 January	€4000
Interest, January	+ 80
Repayment, 31 Jan	– 1000
Amount on 1 February	3080
Interest, February	+ 61.60
Repayment, 28 Feb	– 1000
Amount on 1 March	2141.60

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Exercise 5.7

- 20.** A sum of money invested at compound interest amounted to €4897.20 at the end of two years.
- (i) The interest for the second year was 5%.
How much was the investment worth at the end of the first year?
 - (ii) The original sum invested was €4400.
What was the rate of interest for the first year?

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Exercise 5.7

- 21.** A person invested € B in a building society at 4% per annum. At the end of the first year the person invested a further € B , and left all the money in the society for a further year at 5% per annum. If the total investment at the end of the second year amounted to €17 136, find the value of B .

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Exercise 5.7

22. The Sharks Loans Company is considering different ways of charging interest.

Option A Charge 78% per year

Option B $78\% \div 2 = 39\%$, so charge 39% per six months

Option C $78\% \div 4 = 19.5\%$, so charge 19.5% per three months

Option D $78\% \div 12 = 6.5\%$, so charge 6.5% per month

Calculate the AER, correct to one decimal place, for each option.

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Exercise 5.7

23. A woman invested €8000 in a bank at 7% per annum compound interest.

She withdrew €2000 at the end of the first year.

She left the remainder in the bank for a further year at $r\%$ interest. If her investment amounted to €6920.80 at the end of the year, find the value of r .

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Exercise 5.7

- 24.** A machine cost €15 000.
If it depreciated in value by 15% per annum, find its value at the end of two years.

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Exercise 5.7

- 25.** Vans depreciate in value by 20% per annum.
- If a van is bought for €23 000, find its value at the end of three years.
 - If the value of a van is €11 520 after two years, find its value when new.

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Exercise 5.7

- 26.** A new car was bought for €24 000. It decreased in value by 20% in the first year. If its value at the end of the second year was €16 128, by what percentage did its value decrease during the second year?

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Exercise 5.7

- 27.** The value of a second-hand car decreases by 15% every year. What is the percentage decrease in its value over a period of 3 years? Give your answer correct to the nearest whole number.

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Exercise 5.7

- 28.** The population of newts in a pond is decreasing by 8% a year. There are 756 newts in the pond now. How many will be there in 6 years time?

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Exercise 5.7

- 29.** A car depreciates in value each year by 20% of its value at the beginning of that year. If the value of the car at the end of its first three years is €14 336, find the value of the car when new.

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Exercise 5.7

30. A hospital physiotherapy department gives ultraviolet treatment. Every patient having the treatment receives a dose of 1 minute 9 seconds on day 1. Each day the dose is increased by a percentage which depends on the patient's skin type, as shown in the table opposite. (The dose is increased until it reaches a maximum of 46 minutes 18 seconds, when it is kept constant from then on.)

Skin type	Percentage increase per day
1. Always burns	10%
2. Tans with care but burns easily	15%
3. Tans easily and rarely burns	20%
4. Always tans, never burns	25%

- (i) Monica has skin of type 3. Calculate her dose on day 3.
 (ii) Karl has skin type 4. On which day will his dose first go above 3 minutes?
 (iii) Rita has skin type 2. On day 14 her dose is 4 minutes 0 seconds. What is her dose on day 16?

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Answers 5.7

1. (i) 0.04 (ii) 0.055 (iii) 0.12
 (iv) 0.145 (v) 1.12
2. (i) 1.06 (ii) 1.055 (iii) 1.1
 (iv) 0.96 (v) 1.125
3. (i) €61.50 (ii) €338.58
 (iii) €848.04 (iv) €848.00
4. €423.20 5. €9235.20
6. 4.5% 7. €6400
8. €8904; 4% 9. €800
10. €11 475; 4% 11. €8200
12. 11.5%
13. (i) €5434 (ii) $r = 4\%$
14. €8500
15. (i) 15% (ii) €4500
16. 4.6% 17. 26.8% 18. 19.6%
19. (i) 31st May (ii) €212.28
20. (i) €4664 (ii) 6%
21. $B = €8000$
22. A – 78%, B – 93.2%, C – 103.9%, D – 112.9%
23. 5.5%
24. €10 837.50
25. (i) €11 776 (ii) €18 000
26. 16% 27. 39%
28. 458 29. €28 000
30. (i) 1 min 39 sec (ii) Day 6
 (iii) 5 min 17 sec