PROJECT MATHS

Text & Tests

Leaving 3 Certificate

chapter

5 Arithmetic

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.

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?

Example 4

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

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.

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.

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%

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) $112\frac{1}{2}\%$

Exercise 5.7

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 $3\frac{1}{2}$%.

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.

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?

Year 1: $12{,}000\left(1+\frac{11}{100}\right)^1$ OR 12,000 × 11%

€ 13,320
− 5000
€ 8320

Year 2 = $8320\left(1+\frac{11}{100}\right)^1$ OR 8320 × 11% +

= € 9235.20

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.

Interest $\quad 2612.50 - 2500 = €112.5$

$$\frac{\text{Interest}}{\text{Start Amount}} \qquad \frac{112.5}{2500} \times 100 = 4.5\%$$

Exercise 5.7

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

$$P = \frac{A}{(1+\frac{r}{100})^t}$$

$$P = \frac{6848}{(1+\frac{7}{100})^1}$$

$$P = €6400$$

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.

1st year $8000 \times 5\% = €8400$

2nd year $8400 \times 6\% = €8904$

3rd interest $9260.16 - 8904 = 356.16$ interest

$$\frac{356.16}{8904} \times 100 = 4\%$$

Exercise 5.7

H/W

Pg 122

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

Exercise 5.7

HW

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.

Exercise 5.7

H/W

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

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.

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.

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.

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.

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.

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%.

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%.

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

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?

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.

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.

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.

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.

Exercise 5.7

25. Vans depreciate in value by 20% per annum.

(i) If a van is bought for €23 000, find its value at the end of three years.

(ii) If the value of a van is €11 520 after two years, find its value when new.

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?

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.

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?

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.

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?

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