

Chapter 5

Financial Maths

(Usually Q1/Q2 Paper 1)

This revision guide covers

- **Ratio and proportions**
- Currency transactions
- Converting between decimal, percent and fraction.
- **Percentages and VAT**
- **Mark up, Margin and Percentage Profit/Loss**
- Error, Percentage Error/ Relative error
- Income Tax
- **Compound interest**
- **Rate**
- AER/ Depreciation

After completing booklet; practice answering exam paper questions – Questions ½'s

Date	How many pages I got done	

Highlight the topics you need to go over before the L.C exam

Ratio and Proportions:

Question

A pet shop sells guinea pigs and goldfish.

The ratio of guinea pigs to goldfish is 20:28

- Give this ratio in its simplest form
- The shop has a total of 120 guinea pigs and fish.
Work out the number of guinea pigs the shop has.

Answer

- Step 1: What number goes into BOTH 20 and 28? _____
Step 2: Divide each number in 20:28 by this number. _____
- Step 1: What is the proportion out of? Add ratios from part a

- Step 2: Divide the total number of animals by this number. _____
- Step 3: Multiply this number by first part of ratio. _____
- Step 4: Multiply the number by the second part of the ratio. _____

Answer: Guinea pigs= _____
Goldfish = _____

Question 2:

The ratio of boys to girls in a class is 15 : 18. The school has a total of 200 students.

- Write this ratio in its simplest form.
- Work out the number of boys is to girls.

Question on : Sharing an amount in a given ratio

Question

Madeeha's father won £149

He shared the money between his three children in the ratio 6:3:1

Madeeha was given the biggest share.

- Work out how much money Madeeha was given.
- She saved $\frac{3}{4}$ of her share.
How much did she save?

Answer

- Step 1: What is the proportion out of? Add ratios from part a

- Step 2: Divide the total number amount by this number. _____
- Step 3: Multiply this number by biggest number in the ratio _____

- b) Step 1. Take the answer from part a, divide by denominator of the fraction. _____
Step 2. Take the answer from step 1 and multiply it by the numerator of the fraction. _____
Answer: _____

Question

Share £240 in the ratio 1 : 2 : 5

Explain how you worked out your answer.

- a) Step 1: What is the proportion out of? Add ratios from part a

Step 2: Divide the total number amount by this number. _____
Step 3: Multiply this number by FIRST number in the ratio _____
Step 4: Take the number from step 2 and multiply now by the second number in ratio. _____
Step 5: Take the number from step 2 and multiply now by the third number in ratio. _____

How much did each get? **Answer:** _____

Question

It takes 30 litres of fruit drink to fill 50 cups.

How many litres of fruit drink are needed to fill 70 cups?

Answer

Step 1: Find out how much fruit drink is needed for 1 cup.

(Divide total volume by the number of cups) 1 cup = _____

Step 2: Find out how much fruit drink needed for 70 cups.

(Multiply your answer in step 1 by 70) **Answer:** _____

Question

It takes 250g of flour to make 3 cakes.
How many grams of flour would it take to make 10 cakes?
Explain how you found your answer.

Answer

Step 1: Find out how much flour is needed for 1 cake.

(Divide total mass by the number of cups) 1 cake = _____

Step 2: Find out how much flour is needed for 10 cakes.

(Multiply your answer in step 1 by 10) **Answer:** _____

Question

Amanda, Sarah and Bethany share the cost of a holiday in the ratio 5 : 4 : 3.

Amanda pays 235euro

- Work out the total cost of the holiday.
- Work out how much Bethany pays.

(show all your working out)

Answer

1. Find what the proportion is out of. (add the ratios) _____
2. Note Amanda pays 5 parts of the amount, this equals £235.
So how much would one part be?
3. Divide 235euro by 5. _____
4. To get total cost of holiday. Multiply step 3 answer by total proportion.

1. Total cost of holiday (part a answer) _____
2. Total proportion of holiday _____
3. Divide cost by total proportion _____
4. Multiply step 3 by Bethany's proportion _____

Question: VERY IMPORTANT QUESTION!!!

Bill and Ben share an amount of compost between them in the ratio 3 : 4.
Bill has 310kg of compost,
How much does Ben have?

Answer:

1. How many parts does Bill have? _____
2. So one part would be? _____
- (divide Bills compost amount by his proportion) 1 part= _____
3. Multiply step 2 by Bens part _____

Question

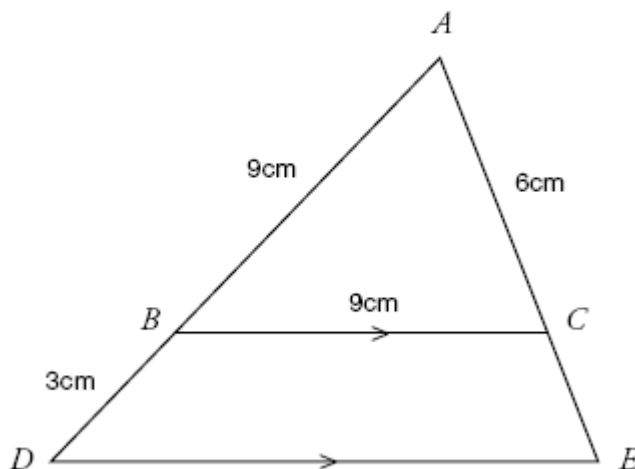
It takes 9 builders 12 days to build a wall.
All the builders work at the same rate.
How long would it take 6 builders to build the same wall?

Answer

Find out how long it would take one builder. _____
Multiply this by 6 Builders. _____

Challenge Question VERY IMPORTANT!!!

In the triangle ADE
BC is parallel to DE
AB = 9cm, AC = 6cm, BD = 3cm, BC = 9cm



a) Work out the length of CE

Currency Exchange rates

1) I am going on holiday and want to buy some euros. If $\text{£}1 = \text{€}1.40$, then complete the table:

Pounds (£)	Euros (€)
£2	
£5	
£10	
£15	
£22	
£27	
£39	
£100	
£175	

Euros (€)	Pounds
€14	
€28	
€140	
€10	
€12	
€18	
€25	
€50	
€32	

2) Now I need to change some English money into American Dollars, this exchange rate is $\text{£}1 = \$1.80$. Complete the table:

Pounds (£)	US. Dollars (\$)
£3	
£7	
£12	
£25	
£28	
£41	
£50	
£125	
£312	

US. Dollars	Pounds
\$18	
\$36	
\$180	
\$9	
\$5	
\$20	
\$42	
\$70	
\$105	

Q3. Which of the following is the better exchange rate if you were converting €120 to USA dollars and explain your choice? Bank A charges commission at €2.50 per transaction and an exchange rate of $\text{€}1 = \$1.02$. Bank B charges no commission and an exchange rate of $\text{€}1 = \$1.10$.

Q4. A DVD is selling for €30.00 in Ireland and the same DVD is selling for \$35 in the USA. The exchange rate is $\$1.00 = \text{€} 0.63$. Is there a price difference between the two countries and if so state the percentage difference, correct to one decimal place, in the price in Ireland to that in the USA? Show your calculations.

Converting percentage to a fraction:

$$1) \quad 12\% = \frac{12}{100} = \frac{3}{25} \quad 2) \quad 40\% = \frac{40}{100} = \underline{\hspace{2cm}}$$

Now try:

$$3) \quad 14\% = \quad \quad \quad 4) \quad 25\% = \quad \quad \quad 5) \quad 30\% =$$

$$6) \quad 37\% = \quad \quad \quad 7) \quad 66\% = \quad \quad \quad 8) \quad 82\% =$$

Converting fractions to percentages:

Convert these fractions to percentages by converting them to decimals and multiplying by 100. Round all your percentages to the nearest decimal place.

$$1) \quad \frac{1}{5} = \quad \quad 2) \quad \frac{3}{4} = \quad \quad 3) \quad \frac{3}{8} = \quad \quad 4) \quad \frac{4}{9} =$$

$$5) \quad \frac{5}{8} = \quad \quad 6) \quad \frac{7}{16} = \quad \quad 7) \quad \frac{2}{10} = \quad \quad 8) \quad \frac{11}{3} =$$

$$9) \quad \frac{7}{8} = \quad \quad 10) \quad \frac{8}{15} = \quad \quad 11) \quad \frac{8}{3} = \quad \quad 12) \quad \frac{14}{20} =$$



Percentage Parts

Examples

1. 25% of 80

$80 \div 100 = 0.8$

$0.8 \times 25 = 20$

2. 8% of 50

$50 \div 100 = 0.5$

$0.5 \times 8 = 4$

Part 1

1. 10% of 600

2. 10 % of 750

3. 15% of 400

4. 75% of 80

5. 95% of 150

6. 45% of 90

7. 5% of 20

8. 20% of 450

9. 35% of 850

10. 80% of 7000

11. 25% of 60

12. 75% of 50

Part 2

	Increase	Answer
Increase 450E by 10%	10% of 450 $10 \div 100 \times 450 = \text{£}45$	$450 + 45 = 495\text{E}$
Increase 370E by 15%	15% of 370 $15 \div 100 \times 370 = \text{£}55.50$	
Increase 150E by 20%	20% of 150	
Increase 880E by 5%		

Percentage Decrease:

	Decrease	Answer
Decrease 940E by 10%	10% of 940 $10 \div 100 \times 940 = \text{£}94$	$940 - 94 = 846$ EURO
Decrease 290E by 15%	15% of 290 $15 \div 100 \times 290 = \text{£}43.50$	
Decrease 750E by 20%	20% of 750	
Decrease 340E by 5%		
Decrease 430E by 2%		
Decrease 800E by 12%		

VAT:

What does "VAT" mean? _____

What does "INCLUSIVE OF VAT" mean? _____

What does "after VAT" mean? _____

What does "EXCLUSIVE OF VAT" mean? _____

What does "before VAT" mean? _____

Calculate PRICE (including/inclusive) with VAT added:

	Calculation work	Price inclusive of VAT
92euro before VAT VAT 23%		
800euro excluding VAT VAT 23%		
1567euro before VAT VAT 23%		
3170euro excluding VAT VAT 23%		
2 euro before VAT VAT 23%		

Calculate PRICE (excluding) before VAT added

	Calculation	Price exclusive of VAT
100euro including VAT VAT 23%		
3400 euro VAT 23%		
25euro including VAT VAT 23%		
5.60euro including VAT VAT 23%		
400 euro including VAT VAT 23%		

**John buys a computer priced at 654E inclusive of VAT at 23%.
Calculate the price of the computer exclusive of VAT.**

Mark-up, Margin and Percentage Profit/Loss:

What does *cost price* mean?

What does *selling price* mean?

What does profit mean? _____

What does loss mean? _____

To calculate the profit/ loss made, you need to use;

$$\text{Selling Price} - \text{Cost Price} = \text{Profit/ Loss}$$

No.	Cost Price	Selling Price	Profit/loss	Percentage= $\frac{\text{Profit/Loss}}{\text{Cost price}} \times 100$
1.	3,000	5,000	£2,000	-
2.	7,000	13,000		
3.	18,000	15,000		
4.	21,000	19,900		
5.	19,500	23,000		
6.	984,000	893,000		
7.	387,500	894,500		
8.	21,473.33	19,945.89		
9.	19,367	78,600		

Q1. Conor has a business selling medical supplies. The company's policy is to sell all goods at cost + 20% mark-up. If he sells first-aid boxes for 20E, what is the cost price of a first-aid box?

Step 1: Note: Selling Price = Cost price + Profit. What percentage is the selling price? _____

Step 2: Put the percentage for selling price = selling price _____

Step 3: Find what 1% is. _____

Step 4: Calculate the 100% _____

Step 5: Note that Cost price = 100% _____

Step 6: Answer: Cost price = _____

Q2. Noel owns a clothes shop. She decides to sell off the last season's stock at a loss of 10%. She sells a hoody for 18E. How much did it cost her originally?

Step 1: Note: Selling Price = Cost price – loss. What percentage is the selling price? _____

Step 2: Put the percentage for selling price = selling price _____

Step 3: Find what 1% is. _____

Step 4: Calculate the 100% _____

Step 5: Note that Cost price = 100% _____

Step 6: Answer: Cost price = _____

Q3. As part of a mini company project, Rob sells personalised hoodies. He sells them for 15E and this includes a mark-up of 25%. How much should she sell the goods for?

YOU NEED TO LEARN THESE FORMULAS:

1. Selling Price – Cost Price = Profit/ Loss

2. $MARK\ UP = \frac{Profit}{Cost\ Price}$

3. $Margin = \frac{Profit}{Selling\ Price}$

Question: What is the difference between Mark-up and Margin? _____

Q1. A computer is sold for 440E at a profit of 65E. Calculate the margin on the computer correct to nearest whole number.

Q2. A phone is sold at 350E at a profit of 50E. Calculate the mark-up on the computer correct to nearest whole number.

Step 1: Find cost price.
Step 2: Calculate the mark-up using above formula.
Step 3: Ensure rounded to nearest whole number.

Q3. A coat is sold at 100E at a profit of 20E. Calculate the mark-up.

Step 1: Find cost price.
Step 2: Calculate the mark-up using above formula.

Q4. A car is sold at 3,500E at a profit of 500E. Calculate the mark-up.

Step 1: Find cost price.

Step 2: Calculate the mark-up using above formula.

Q5. A house is sold at 456,000E at a profit of 15,000E. Calculate the mark-up.

Step 1: Find cost price.

Step 2: Calculate the mark-up using above formula.

Challenge Question:

Q1. A retailer bought a few DVD players for 12,000E. He sold half of them at 14% mark-up and the other half at 20% margin. Calculate the total profit made and hence the selling price.

Step 1: What is half of 12,000? _____

Step 2: Find profit made on the 6,000 (cost) when mark-up is 14%. Use; $MARK UP = \frac{Profit}{Cost Price}$

Step 3. Find profit made on the other half of DVD players.

$$Margin = \frac{Profit}{Cost + profit}$$

Step 4. Find total profit by adding profits together.

Percentage Error:

Error = True Value - Estimate

(Always take the positive)

$$\text{Percentage Error} = \frac{\text{Error}}{\text{True Value}} \times 100$$

$$\text{Relative Error} = \frac{\text{Error}}{\text{True Value}} \times 100$$

1. Joshua uses his thermometer and finds the boiling point of ethyl alcohol to be 75°C. He looks in a reference book and finds that the actual boiling point of ethyl alcohol is 80°C. What is his percent error?

Step1. Find Error.

Step 2. Find Percentage Error.

2. An object has a mass of 35.0 grams. On Anthony's balance, it weighs 34.85 grams. What is the percent error of his balance?

Step1. Find Error.

Step 2. Find Percentage Error.

3. Ariel weighed an object on her balance and recorded a mass of 24.3 grams. Her teacher told her that there was obviously something wrong with her balance because it was giving her a reading which was 30.0% too high. What was the actual mass of the object?

Step 1. Note (Error = True value – Estimate)

Step 2. Note (Percentage Error = $\frac{\text{Error}}{\text{True Value}} \times 100$)

so Percentage Error = _____

Sub in Known values and calculate the True Value.

4. The density of water at 4°C is known to be 1.00 g/mL. Kayla experimentally found the density of water to be 1.075 g/mL. What is her relative error?

Step1. Find Error.

Step 2. Find Relative Error.

Question:

- (a) (i)** Write each of the numbers below correct to the nearest whole number.

$1 \cdot 8 =$ $15 \cdot 2 =$ $4 \cdot 9 =$

- (ii) Use your values from above to estimate the value of $\frac{1.8 \times 15.2}{4.9}$.

- (iii) Use your calculator to find the actual value of $\frac{1.8 \times 15.2}{4.9}$. Give your answer correct to one decimal place.

- (b) (i)** Find the difference between the actual value and your estimated value in part (a) (ii).

- (ii) Find the percentage error in your estimate. Give your answer correct to one decimal place.

Income Tax:

What do the following words mean?

Standard Rate: _____

Higher Rate: _____

Gross tax: _____

Tax credit: _____

Tax payable/Net tax: _____

Universal Social Charge (USC): _____

PRSI _____

Statutory deductions: _____

Non-statutory deductions: _____

Gross income: _____

Q1. A man's income for the year is 40,000E. He has a standard rate cut off point of 20,000E and a tax credit of 3,000E. If the standard rate of income tax is 20% and the higher rate is 40%, how much income tax does he pay for the year?

Step 1: Find the amount of standard rate tax.

Step 2. Find the amount of higher rate tax

Step 3: Find total gross tax (by adding standard rate tax and higher rate tax)

Step 4: Calculate tax payable using formula. (Tax payable = Gross tax – Tax credit)

Q2. A woman pays 3,500E income tax for the year and she has a tax credit of 2,000E. If she pays tax at the standard rate of 20% on all her income, calculate her gross income for the year.

Step 1: Calculate the gross tax by using the formula. (Tax payable = gross tax – tax credits)

Step 2. Note that gross tax = 20% of gross income

Step 3. Find what 100% equals.

Question 1

(25 marks)

Alan pays income tax, a universal social charge (USC) and pay-related social insurance (PRSI) on his gross wages. His gross weekly wages are €510.

- (a) Alan pays income tax at the rate of 20%. He has weekly tax credits of €63. How much income tax does he pay?

Step 1: Calculate the gross tax. (20% of 510E)

Step 2. Calculate the payable income tax by using formula
(payable tax = gross tax – tax credits)

Answer: _____

- (b) Alan pays the USC at the rate of 2% on the first €193, 4% on the next €115 and 7% on the balance. Calculate the amount of USC Alan pays.

Step 1: Find the 2% of 193E.

Step 2: Find the 4% of 115E.

Step 3. Find remaining balance. (510E – 193E – 115E)

Step 4. Find the 7% of remaining balance.

Step 5. Find the total USC by adding step1,2,4.

- (c) Alan also pays PRSI. His total weekly deductions amount to €76.92. How much PRSI does Alan pay?

Step 1. Add up the deductions we now know of. (Tax + USC)

Step 2. Subtract known deductions from total deductions to get PRSI.

Answer: _____

Compound Interest: (Investing money or Borrowing money)

This formula is on page 30 of the LOG TABLES

Matamaitic an airgeadais	Financial mathematics
Lontu seo a leanas, is é t an fad ama ina bhlianta agus is é i an ráta bliantúil úis, dímhéasa nó fáis, agus é sloinnte mar dheachúil nó mar chodán (ionas go seasann $i = 0.08$ do ráta 8%, mar shampla)*.	In all of the following, t is the time in years and i is annual rate of interest, depreciation or growth, expressed as a decimal or fraction (so that, for example, $i = 0.08$ represents a rate of 8%)*
Ús iolraithe $F = \text{luach deiridh}, P = \text{príomhshuim}$	Compound interest $F = \text{final value}, P = \text{principal}$

F = Final value (amount borrowed + interest) (Note sometimes written as the symbol **A**)

P = Principle (amount borrowed or invested)

i=Rate of interest per year (**always use decimal form**)

t= Time

Use this formula to solve the following questions:

Question 1

2,500E is invested at 5% for two years. Calculate the final value.

Answer

P = _____

i= _____

t= _____

Step2: Sub into formula to find Final Value.

Question 2:

10,000E is borrowed at 8% for three years. Calculate the final Value.

Answer:

P = _____

i= _____

t= _____

Step2: Sub into formula to find Final Value.

Question 3 : 15,000E is borrowed at 6% for three years. Calculate the interest payable.

Answer

P = _____

i= _____

t= _____

Step2: Sub into formula to find Final Value.

Step 3: Calculate payable interest. (Final Value - Principle)

Question 4:

John invested 10,000E at 3% per annum. At the beginning of the second year, 1450E is withdrawn from this amount. The interest rate for the second year rises to 3.5%.

i) Calculate the value of the investment at the end of year 1.

ii) Calculate the value of the investment at the end of year 2.

Answer:

i) Using formula $F=P(1+i)^t$ to find value at end of first year.

ii) At the end of year 2, 1450E is withdrawn: Calculate the new Principle (P) by subtracting 1450E from 10,000E.

P = _____

t=1 year

i= _____

Find final value for year 2 using the above formula.

Question 5:

Rob borrows 60,000E at 3%. At the end of year 1 he repays 16,000E. The rate of interest is then lowered to 2%. How much will he owe at the end of the second year?

Answer:

iii) Using formula $F=P(1+i)^t$ to find value at end of first year.

iv) At the end of year 2, 16,000E is repaid: Calculate the new Principle (P) by subtracting 16,000E from 60,000E.

P = _____

t=1 year

i= _____

Find final value for year 2 using the above formula.

Question 6.

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

Answer:

Step 1: State what is given.

F= _____

i= _____

t= _____

Step 2: Using the formula, find the final value F

CHALLENGE QUESTION: Question 1

A different investment bond gives 20% interest after 8 years.
Calculate the AER for this bond.

Hint:

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

To get i: Rearrange so:

$$F^{\frac{1}{t}} = P(1+i)$$

Calculating Rate:

$$\text{Rate} = \frac{\text{Interest}}{\text{Principle}} \times 100\%$$

Question 1

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

Answer

Step 1: Find interest. (Final amount - principle)

Step 2: Calculate rate using formula $\text{Rate} = \frac{\text{Interest}}{\text{Principle}} \times 100\%$

Question 2:

If 800E amounts to 950E in one year, find the rate.

Answer:

Step 1: Find interest. (Final amount - principle)

Step 2: Calculate rate using formula $\text{Rate} = \frac{\text{Interest}}{\text{Principle}} \times 100\%$

Question 3:

A man invested 5000E in a Building Society for two years. The rate of interest for the first year was 3% per annum. He did not withdraw any money at the end of the first year. At the end of the second year, his total investment was worth 5427.20E. What was the rate of interest for the second year?

Answer

Step 1: Calculate the amount at the end of the first year using $F = P(1+i)^t$

P=_____ i=_____ t=1 year

Step 2: What was the amount of the second year (from question?)_____

Step 3: Find the interest: (Final amount - Principle (Start of year))

Step 4: Calculate the rate using the formula:

$$\text{Rate} = \frac{\text{Interest}}{\text{Principle}} \times 100\%$$

AER (the true interest)/ Depreciation:

What does AER mean? _____

We still use the formula on PAGE 30 LOG TABLES:

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

Remember i in this formula was always a decimal.

When asked to find AER, we need to convert the decimal to the percentage.

Vice Versa

i	R
0.07	
0.045	
0.12	
0.18	
0.0375	
0.00057	

i	R
	45%
	65%
	75%
	2%
	3%
	10%

Question 1

An investment bond gives 20% return when invested 8 years. Calculate the AER.

Answer:

Step 1: Note that the principle percentage is 100%. Note that the AER percentage is 20% so the final amount as a percentage will be these two percentages added together. Final amount as a percentage _____

Final amount as a decimal : _____

Step 2:

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

Note that F can be written as 1.2P. Sub in.

$$1.2P = P(1+i)^t \quad (\text{NOTE: } P \text{ is common so ignore})$$

Step 3:

$$1.2 = (1+i)^t \quad \text{Sub in the value given in question for } t.$$

Step 4:

Rearrange to get rid of the power.

$$1.2^{\frac{1}{t}} = (1+i)$$

Step 5:

Find value of i using calculator: _____

Step 6:

Convert i (from decimal) to r (percentage)

Answer: _____

Question 2:

An investment bond gives 35% return when invested 9 years. Calculate the AER.

Answer:

Step 1: Note that the principle percentage is 100%. Note that the AER percentage is 35% so the final amount as a percentage will be these two percentages added together. Final amount as a percentage _____

Final amount as a decimal : _____

Step 2:

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

Note that F can be written as 1.35P. Sub in.

$$1.35P = P(1+i)^t \quad (\text{NOTE: } P \text{ is common so ignore})$$

Step 3:

$$1.35 = (1+i)^t \quad \text{Sub in the value given in question for } t.$$

Step 4:

Rearrange to get rid of the power.

$$1.35^{\frac{1}{t}} = (1+i)$$

Step 5:

Find value of i using calculator: _____

Step 6:

Convert i (from decimal) to r (percentage)

Answer: _____

Question 2:

An investment bond gives 15% return when invested 4 years. Calculate the AER.

Depreciation:

The formula for Depreciation is on page 30 OF

LOG TABLES:

$$F = P(1-i)^t$$

Depreciation
– reducing balance method
 F = later value, P = initial value

Highlight the negative sign!

Question 1

A car depreciates in value by 15% per annum. If the car is worth 15,000E at the end of 3 years, find its value when new.

Step1. Record values given.

F=_____

t=_____

i=_____ (as decimal)

Step2: Sub into formula:

$$F=P(1-i)^t$$

Question 2:

A machine which cost 35,650E depreciates to a value of 480E in 10 years.

- i) Find the annual rate of depreciation
- ii) Find the net book value (NBV), to nearest euro, at the end of the sixth year.
- iii) If the company sold the machine at the end of the sixth year for 2,000E, calculate the percentage loss they would make on its NBV at that time. Give your answer to the nearest whole number.

Answer:

- i) Record what is given:

F:_____ P:_____ t=_____

Now calculate I by using formula for depreciation:

$$F=P(1-i)^t$$

Rate:_____

- ii) Record what given in ii)

t=_____ P=_____ i=_____ (from i)

Calculate F from formula:

$$F=P(1-i)^t$$

iii) $\text{Loss} = \text{Current Value} - \text{selling Price}$

$$\text{Percentage loss} = \frac{\text{Loss}}{\text{Value}} \times 100$$

Notes to self: