06

Year 11 Standard Mathematics

Interest and Depreciation

PROFECTUS

6.1 Percentage Applications

WORKED EXAMPLES – PERCENTAGE PROBLEMS

1. Increase $100 by 20%.

2. Decrease 14 km by 15%.

3. Thomas's weight increased from 62 kg to 78 kg. Find the percentage increase in his weight.

4. The value of a car decreased from $16 500 to $12 800. Calculate the percentage decrease in value.

5. A signed cricket bat was purchased for $700. It was later sold for $1250. Calculate the percentage profit.

6. A phone was purchased for $1280 and later sold for $800. Calculate the percentage loss.

7. A stamp collection was bought for $3600. In the first year its value increased by 5%. In the second year it increased in value by a further 6%.
    a. Calculate the stamp collection's value at the end of the first year.
    b. Calculate its value at the end of the second year.
    c. What is the overall change in its value after 2 years?
    d. Find the percentage profit if it is sold for the value at the end of 2 years.

WORKED EXAMPLES – GST PROBLEMS

1. Calculate the GST payable on:
    a. A restaurant meal with a pre-GST cost of $84.00
    b. A pre-GST bill for $368.00 from an electrician.

2. Terry buys a sofa for $720 which includes GST.
    a. Find the GST paid on the sofa.
    b. Find the original cost of the sofa before the GST was added.

HOMEWORK PROBLEMS

Year 11 Oxford Maths, Exercise 6A, Page 204 to 209:

- Q1: f, g, h, i
- Q2: f, g, h, i

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- Q4: c, d, e, f
- Q5, c, d, e, f
- Q6
- Q8
- Q10
- Q12: e, f, g, h
- Q13
- Q15
- Q17: e, f, g, h
- Q20
- Q21
- Q22

6.2 Simple Interest

THEORY

- The Simple Interest Formula:

$$I = Prn$$

  - I – **Interest** earned for lending or investing the money.
    - This is not the total amount owed! The amount owed is the sum of the principal amount and the interest i.e. $A = P + I$.
  - P – **Principal** is the initial amount of money borrowed, lent or invested.
  - r – **Rate of simple interest** per time period expressed as a decimal, e.g. 5% = 0.05.
  - n – **Number of time periods** (days, weeks, months or years)

Note: The units of measurement for r and n need to be the same.

WORKED EXAMPLES

1. Calculate the amount of simple interest paid on an investment of $15,000 at 10% simple interest per annum for 4 years.

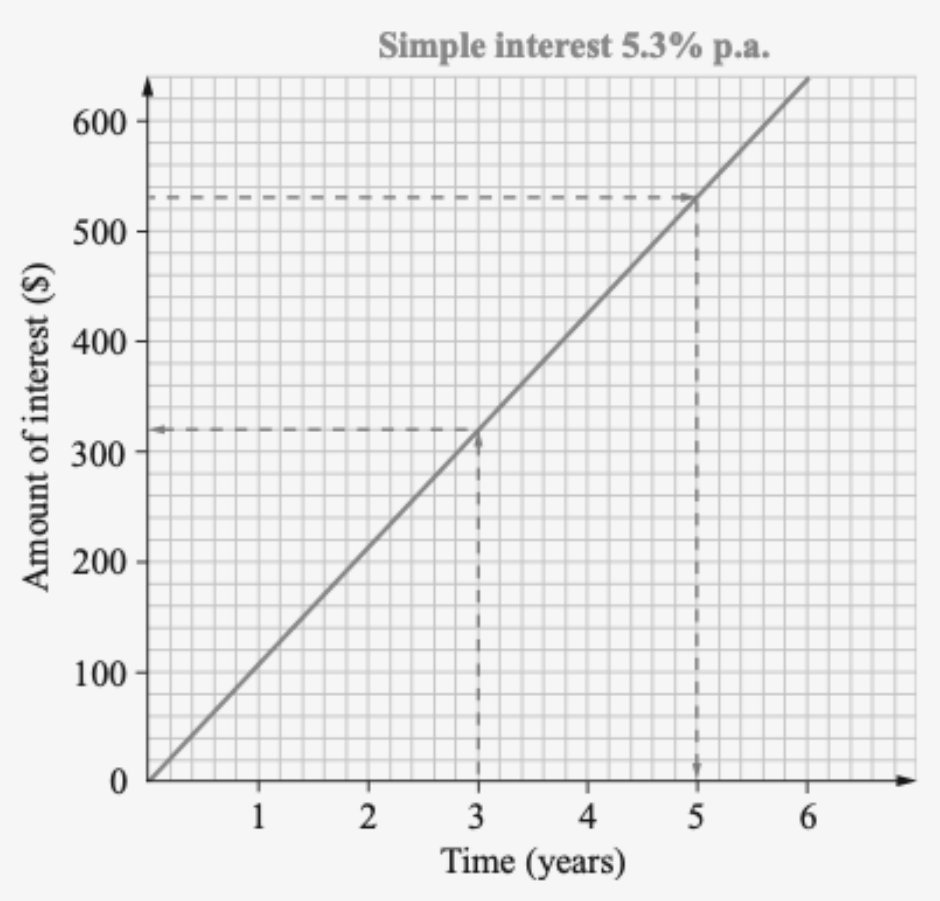
2. Calculate the amount of simple interest paid on an investment of $59,000 at a flat rate of 24% p.a. over 6 months.

3. Find the amount owed on a loan of $22,000 at 9.12% per annum simple interest at the end of:
   a. 2 years
   b. 15 months
   c. 2 years and 6 months
   d. 2 years and 11 months

4. If $3500 is invested for 3 years the amount of interest earned is $735. Calculate the annual simple interest rate as a percentage.

6.2

5. The graph shows the simple interest earned on an investment of $2000 at 5.3% p.a. interest.



   a. the amount of interest earned after 3 years
   b. the time taken to earn $530 interest.

6. Mira invests $18,000 for $2\frac{1}{2}$ years. What is the minimum rate of simple interest needed for her to earn $4500?

HOMEWORK PROBLEMS

Year 11 Oxford Maths, Exercise 6B, Page 210 to 213:

- Q4
- Q6
- Q10: e, f
- Q15
- Q16

Year 11 Oxford Maths, Exercise 6C, Page 215 to 217:

- Q3
- Q6

6.3

HARDER QUESTIONS

Question 1

Two car companies are selling the same model car but on different terms as indicated below:

	Cash Price	Terms
Company A	$22000	15% deposit plus 36 equal monthly payments of $770
Company B	$23000	$2300 deposit plus 36 equal monthly payments of $786

(a) Explain why the total interest paid under Terms to Company A would be $9020.

(b) Calculate the flat rate of annual interest (ie Simple Interest) charged by Company A, giving your answer to the nearest integer percentage.

(c) If you had to buy on Terms, which company provides the best buy? (Show the calculations which justify your answer)

Question 2

If Geoff invests $30000 at 10% per annum simple interest until he has $42000, for how many years will he need to invest the money?

Question 3

Josh decides to put $5000 into an investment account that pays 5.0% per annum simple interest. If he leaves the money there until it doubles, how long will this take, to the nearest month?

Question 4

A personal loan of $15000 over a 2-year period costs $500 per month to repay.

(a) How much money will be repaid in total?

(b) How much of the money repaid is interest?

Question 5

Rhonda invested $1750 at 6.4% p.a. simple interest. For how many days was the money invested if she earned $56.15 interest?

6.3 Answers

Section 6.2: Simple Interest

Q1: (a) Explanation (b) $\approx 16\%$ (c) Company B, Proof

Q2: 4 years

Q3: 20 years

Q4: (a) $\$18,000$ (b) $\$3000$

Q5: 183 days

6.3 Straight-Line Depreciation

THEORY

- **What is Depreciation?** A loss in the value of an item over time.

- **What is Straight-Line Depreciation?** It is a form of depreciation which assumes that the item depreciates by a constant amount each year. In year 12, we look at more complex models of depreciation.

- **What is the Salvage Value?** The reduced value of an item after depreciation. Also, can be known as the book value, scrap value of the written-down value.

- The **Straight-Line Depreciation Formula**:

$$S = V_0 - Dn$$

  - S – **Salvage Value:** See above.
  - V_0 – **Purchase Value:** The amount paid initially to buy the item i.e. *value* at time 0.
  - D – **Amount of Depreciation per Time Period**
  - n – **Number of Time Periods**

  Note: The units of measurement for the time periods in D and n need to be the same!

WORKED EXAMPLES – TABLES

1. Construct a table to calculate the value of a $30 000 car after 3 years if it depreciates $4500 each year. Hint: In your table include the following columns: Year, Value ($), Depreciation ($), Depreciated Value ($).

2. Construct a table to calculate the value of a $26 500 car after 3 years if it depreciates $1700 each year. Find the percentage decrease of the depreciation over this 3 year period.

WORKED EXAMPLES – FORMULA

1. A car purchased for $12 800 depreciates $1540 per year. Calculate
   a. Its book value after 5 years
   b. The scrap value if the useful life is 8 years.

2. A computer was purchased for $3800 and depreciates by $650 per year. Calculate its book value after:
   a. 2 years
   b. 1000 years

c. 4.321 years

3. A car purchased for $21 990 was worth $11 990 after 4 years, using the straight-line method of depreciation. Calculate the annual amount of depreciation.

HOMEWORK PROBLEMS

Year 11 Oxford Maths, Exercise 6D, Page 219 to 221:

- Q1
- Q4
- Q6
- Q13
- Q14
- Q16
- Q18

6.4 Compound Interest

THEORY

- **What is Compound Interest?** Interest that is added to the principal at regular time intervals during an investment or loan period so future interest is calculated including that amount.

- **Simple Interest Vs Compound Interest?** In Compound Interest, the interest earned in the previous time periods also earn interest, whereas with Simple Interest only the first time period earns interest and then this amount is added on for each following time period.

- **Note:** In year 11 it is quite simple, however, in year 12 we look at the Compound Interest formula as well as how it can relate to Appreciate and Inflation.

WORKED EXAMPLES

1. $20,000 is invested for 3 years at 10% p.a. interest compounded annually.
    a. Create a table with the following columns: Year, Value at Year's Start ($), Interest Accrued ($), Value at Year's End ($).
    b. Find the amount the $20,000 will grow to after 3 years.
    c. Find the total amount of interest earned.

2. $12,000 is invested for 4 years at 5% p.a. interest compounded annually.
    a. Create a table.
    b. Find the amount the $12,000 will grow to after 2 years.
    c. Find the total amount of interest earned as a percentage of the original investment.
    d. Find the amount the $12,000 will be at after 3.5 years. Can you find this out or not?

HOMEWORK PROBLEMS

Year 11 Oxford Maths, Exercise 6E, Page 223 to 225:

- Q3
- Q4
- Q6
- Q7