A Guide to Finance, Growth and Decay

Teaching Approach

Finance, Growth and Decay is a relatively simple section to master. If the learners put in the practice, and follow the step by step processes, they should be able to get full marks for each question.

Start the section by showing the first video. This is a very good revision of the Finance taught in grade 10. It explains and revises the difference between compound and simple interest. Also revises the use of the simple and compound interest formulae.

Once revision has been done, it’s a good idea to focus on how to compound over different periods. Give the learners a clear idea of what it means to compound annually, semi-annually, quarterly, monthly and daily.

Next move on to the concept of decay or depreciation. Explain what the term means and how it applies in real life. Explain the difference between simple and compound decay using the simple and compound interest formulae as points of comparison. Remember that simple decay is sometimes referred to as straight line depreciation and compound decay is also called reducing balance depreciation.

Nominal and effective interest is the more difficult concept to grasp as it is so abstract. Watch lesson 5 ‘Nominal and Effective Interest Rates’ in class and discuss with your learners how banks present interest rates. Give them many questions that will help them to practice to use of the formula.

Timeline problems are another potential stumbling block. Do many examples in class and draw the timeline for each one. Show them how to use the long and short method to solve for them. Both of these methods can be found in video 7, ‘Financial Timeline Problems’.
Video Summaries

Some videos have a ‘PAUSE’ moment, at which point the teacher or learner can choose to pause the video and try to answer the question posed or calculate the answer to the problem under discussion. Once the video starts again, the answer to the question or the right answer to the calculation is given.

Mindset suggests a number of ways to use the video lessons. These include:

- Watch or show a lesson as an introduction to a lesson
- Watch of show a lesson after a lesson, as a summary or as a way of adding in some interesting real-life applications or practical aspects
- Design a worksheet or set of questions about one video lesson. Then ask learners to watch a video related to the lesson and to complete the worksheet or questions, either in groups or individually
- Worksheets and questions based on video lessons can be used as short assessments or exercises
- Ask learners to watch a particular video lesson for homework (in the school library or on the website, depending on how the material is available) as preparation for the next day’s lesson; if desired, learners can be given specific questions to answer in preparation for the next day’s lesson

1. **Revising Simple and Compound Interest**
   This video explains and revises the difference between compound and simple interest. It also revises the use of the simple and compound interest formulas.

2. **Working with Compounding Periods**
   Interest can be compounded at an annual or semi-annual or quarterly or monthly basis. This video discusses the different ways compounding will affect the future value of an investment.

3. **Introducing Decay**
   This lesson introduces the concept of decay. It looks at how the value of a car depreciates over time.

4. **Using the Decay Formulae**
   This lesson looks at how to calculate decay. It gives learners examples of how the formulae for simple and compounded decay can be used for both financial and other life problems.

5. **Nominal and Effective Interest Rates**
   This lesson works with nominal and effective interest rates. We use the example of a bank loan to explain more challenging concepts related to interest and depreciation rates.

6. **Problem Solving in Financial Math**
   In this lesson, we solve compound growth and decay problems using simple and compound decay formulae.
7. **Financial Timeline Problems**
This lesson tackles financial timeline problems. In these problems, we change the interest rate of investments, as well as the amount of money that’s in an investment.

### Resource Material

<table>
<thead>
<tr>
<th>1. Revising Simple and Compound Interest</th>
<th><a href="http://www.basic-mathematics.com/simple-vs-compound-interest.html">http://www.basic-mathematics.com/simple-vs-compound-interest.html</a></th>
<th>The difference between simple and compound interest is explained here in simple terms.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.getobjects.com/Components/Finance/TVM/iy.html">www.getobjects.com/Components/Finance/TVM/iy.html</a></td>
<td>Explanation of simple and compound interest, rate of return, and effective interest rate.</td>
</tr>
<tr>
<td></td>
<td>studymaths.co.uk/topics/simpleAndCompoundInterest.php</td>
<td>Revision notes explaining how to solve problems involving simple and compound interest. Example questions given with full solutions.</td>
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<tr>
<td></td>
<td><a href="http://www.youtube.com/watch?v=4aCdfgl6kB4">http://www.youtube.com/watch?v=4aCdfgl6kB4</a></td>
<td>This video will show you how to compute simple and compound interest problems. You will learn how to find the total amount of money that you will earn or owe depending on the principle, interest rate, and length of time.</td>
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<td></td>
<td><a href="http://www.youtube.com/watch?v=Gj09kFje4mc">http://www.youtube.com/watch?v=Gj09kFje4mc</a></td>
<td>This video computes compound interest using the simple interest formula. The same problem is done in Part B using the compound interest formula.</td>
</tr>
<tr>
<td>2. Working with Compounding Periods</td>
<td><a href="http://en.wikipedia.org/wiki/Compound_interest">http://en.wikipedia.org/wiki/Compound_interest</a></td>
<td>An advanced explanation on compound interest, including compounding over different time periods.</td>
</tr>
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<td></td>
<td><a href="http://www.mathsisfun.com/money/compound-interest-periodic.html">http://www.mathsisfun.com/money/compound-interest-periodic.html</a></td>
<td>A more basic explanation on compound interest, including compounding over different time periods.</td>
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<td></td>
<td><a href="http://www.youtube.com/watch?v=n86exyWN6ik">http://www.youtube.com/watch?v=n86exyWN6ik</a></td>
<td>An introduction video to straight line and reducing balance depreciation. This is also known as simple and compound decay.</td>
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<td><strong>4. Using the Decay Formulae</strong></td>
<td><a href="http://www.youtube.com/watch?v=y-HXXzkyY8k">http://www.youtube.com/watch?v=y-HXXzkyY8k</a></td>
<td>Calculations showing simple decay.</td>
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<td></td>
<td><a href="http://www.youtube.com/watch?v=ZEIllyCbjVk">http://www.youtube.com/watch?v=ZEIllyCbjVk</a></td>
<td>Calculations using reducing balance depreciation, otherwise known as compound decay.</td>
</tr>
<tr>
<td><strong>5. Nominal and Effective Interest Rates</strong></td>
<td><a href="http://wiki.answers.com/Q/What_is_the_difference_between_effective_interest_rates_and_nominal_interest_rates">http://wiki.answers.com/Q/What_is_the_difference_between_effective_interest_rates_and_nominal_interest_rates</a></td>
<td>The difference between nominal and effective interest rates.</td>
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<td></td>
<td><a href="http://cnx.org/content/m38830/1.1/">http://cnx.org/content/m38830/1.1/</a></td>
<td>Examples on calculating nominal and effective interest rates.</td>
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<td></td>
<td><a href="http://www.slideshare.net/kwesikisiedu/nominal-and-effective-interest-rates">http://www.slideshare.net/kwesikisiedu/nominal-and-effective-interest-rates</a> <a href="http://www.slideshare.net/kwesikisiedu/nominal-and-effective-interest-rates">www.x-kit.co.za</a></td>
<td>A slide show presentation on calculating nominal and effective interest rates.</td>
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Task

Question 1
R 8 000 is invested into a savings account at 12,3% per annum compounded half-yearly. Determine the effective interest rate.

Question 2
Thabiso invests R 12 000 for 4 years at 10% per annum simple interest. Thereafter he invests the accumulated amount for another 2 years at 12% per annum compounded quarterly. Calculate how much money he will have saved at the end of 6 years.

Question 3
A computer is purchased for 16 000. It depreciates at 15% per annum. Determine the book value of a computer after 3 years if depreciation is calculated on a simple decay basis.

Question 4
The value of a laptop that cost R9 500 is reduced by 12,5% per annum on a reducing balance. What will the value of the laptop be after 4 years?

Question 5
Mandy invests R 5 000 in the bank for 2 years at an interest rate of 8,5% p.a. compounded monthly. At the end of the 2 years she invests another R 6 500 for 3 years at 9,25% p.a. compounded quarterly. At the end of the 5th year Mandy withdraws R 4 000 from the account. How much money will she have in her account at the end of 7 years if the interest rate stays the same?

Question 6
An investor tells you he can double your investment in 5 years. Calculate the annual rate of interest that he must give you so that you can double your investment. Assume interest is compounded monthly.

Question 7
What amount must be invested for two years at an interest rate of 10% compounded semi-annually in order to receive R 2 000?
Task Answers

Question 1

\[ 1 + \text{i}_{\text{eff}} = \left(1 + \frac{\text{i}_{\text{nom}}}{n}\right)^n \]

\[ 1 + \text{i}_{\text{eff}} = \left(1 + \frac{0.123}{2}\right)^2 \]

\[ \text{i}_{\text{eff}} = 12.67\% \]

Question 2

\[ A = P(1 + \text{in}) \]
\[ A = 12000(1 + 0.104) \]
\[ A = R16800 \]
\[ A = P(1 + \text{i})^n \]
\[ A = 16800\left(1 + \frac{0.12}{4}\right)^8 \]

Question 3

\[ A = P(1 - \text{in}) \]
\[ A = 16000(1 - 0.153) \]
\[ A = R8800 \]

Question 4

\[ A = P(1 - \text{i})^n \]
\[ A = 9500(1 - 0.125)^4 \]
\[ A = R5568.73 \]

Question 5

\[ A = 5000\left(1 + \frac{0.085}{12}\right)^{24}\left(1 + \frac{0.0925}{4}\right)^{20} + 6500\left(1 + \frac{0.0925}{4}\right)^{20} - 4000\left(1 + \frac{0.0925}{4}\right)^8 = R14821.79 \]
**Question 6**

\[ A = P(1 + i)^n \]

\[ 2 = 1(1 + \frac{i}{12})^{60} \]

\[ \frac{60\sqrt{2} - 1}{2} = \frac{i}{12} \]

\[ i = 13.94\% \]

**Question 7**

\[ A = P(1 + i)^n \]

\[ 1000 = P(1 + \frac{0.10}{2})^4 \]

\[ 1000 = P(1.21550625) \]

\[ R82270 = P \]
Acknowledgements

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