

(A) Lesson Objectives

- a. Introduce formulas for working with depreciation
- b. Connect depreciation to arithmetic and geometric sequences

(B) Opening Problem

Typically, when a business purchases an asset (like a machine or delivery vehicles), this asset becomes less valuable (depreciates) over time. We will investigate two ways in which an asset can depreciate → at a fixed, constant amount every year or at a fixed rate every year.

My brother is an electrician and runs his own business. His company owns a car which was initially purchased at \$25,000. The depreciation of this company car can be accounted for in one of two ways: OPTION A → the car is expected to last for 5 years, so its value can be depreciated by \$5,000 per year (straight line method) or OPTION B → the car depreciates at a rate of 20% p.a. of its residual value

Complete the following table, showing the values of the car and the book value of the car.

	Initial value of car	1 year	2 years	3 years	4 years	5 years
Value of the car at the BEGINNING of the year given OPTION A						
Value of the car at the END of the year given OPTION A						
Loss in value of the car OPTION A						
Value of the car at the BEGINNING of the year given OPTION B						
Value of the car at the END of the year given OPTION B						
Loss in value of the car OPTION B						

WORKING WITH OPTION A:

- i. Write out the first 5 book values of the car as terms of an arithmetic sequence.
- ii. Determine the value of u_1 and d for Q(i) and explain their significance in the context of the question
- iii. How did you determine the value of the car at any given year using OPTION A?
- iv. My brother decides that the car will have a residual value of \$7,500 at the end of 5 years, rather than an assumed book value of \$0. He wants to use a straight line depreciation method (like OPTION A) in order to determine the book value of the car at any point in those 5 years. What will be the value of the car in 3.25 years?

WORKING WITH OPTION B:

- i. Write out the first 5 book values of the car as terms of a geometric sequence.
- ii. Determine the value of u_1 and r for Q(i) and explain their significance in the context of the question
- iii. How did you determine the value of the car at any given year using OPTION B?
- iv. My brother wants to use a declining balance depreciation method (like OPTION B) in order to determine the book value of the car at any point in time. What will be the value of the car in 6.5 years?
- v. My brother wants to use a declining balance depreciation method (like OPTION B). But he assumes that he can sell the car for \$5,000 at the end of 7 years. What will be the annual rate of depreciation of the car under this assumption?

(C) Basic Skills – Formulas for Depreciation

For OPTION A → Straight line depreciation method →

For OPTION B → Declining Balance depreciation method →

(D) Practice

1. The painting Elisa bought for \$560 from an art exhibition appreciates (increases in value) by 15% p.a. If this rate of appreciation continued, determine the value of the painting after 25 years
2. A company car purchased for \$42 000 depreciates at 10% per annum straight line depreciation.
 - a. Calculate the salvage value of the car after 4 years.
 - b. Calculate the total depreciation over the first 7 years.
 - c. How long will it take until the car will reach its scrap value of \$5000?
3. A company car purchased for \$42 000 depreciates at 10% per annum using declining balance depreciation method.
 - a. Calculate the salvage value of the car after 4 years.
 - b. Calculate the total depreciation over the first 7 years.
 - c. How long will it take until the car will reach its scrap value of \$5000?

7. A \$30 000 new car can be depreciated under straight line depreciation at \$3500 per year or under declining balance at 15% p.a.
- a. Complete the table below showing the value of the car under both schemes for a period of 5 years.

Age (years)	Straight line value (\$)	Declining balance value (\$)
0	30 000	30 000
1		
2		
3		
4		

- b. Draw a graph of both the straight line and declining balance depreciation and use the graph to show the point at which the straight line value of the car falls below the declining balance value.

8. The Australian Taxation Office allows depreciation on tools of trade as a legitimate tax deduction. A plumber purchases tools to the value of \$15 000. He is allowed a tax deduction of 30% p.a. for depreciation of these tools. When the salvage value of the tools falls below \$5000, the plumber is allowed to write off the tools on the next year's tax return. Complete the table below and determine when the tools can be written off.

Year	Salvage value (\$)	Tax deduction (\$)
1		
2		
3		
4		
5		
6		