

ACCOUNTING FOR DEPRECIATION, DEPLETION AND AMORTIZATION

**** PROBLEMS IN THIS MODULE INCLUDE TOPICS INCLUDED
IN THE LONG-LIVED ASSETS MODULE ****

Key Terms and Concepts to Know

Depreciation/Depletion/Amortization

- Depreciation is the systematic allocation of the cost of a long-lived asset to expense.
- Depletion is the systematic allocation of the cost of a natural resource to expense.
- Amortization is the systematic allocation of the cost of an intangible asset to expense.

Depreciation/Depletion/Amortization Methods:

- Straight-line method provides an equal amount of depreciation expense each year of the useful life in years
- Units-of-activity (Units-of-production) method provides an expense that fluctuates with a level of activity over the useful life in units of activity
- Double-declining balance method is an accelerated depreciation method that provides greater expenses in the early years and lesser depreciation expense in the later years of the useful life.

Partial-year Depreciation

- Most assets are not acquired on the first day of the fiscal year or disposed of on the last day of the fiscal year.
- Depreciation expense must be calculated for the period the asset was owned.
- Generally this means to the nearest month or half-month, although the calculation may be to the day if the depreciation expense is unusually large.

Changes in Estimates

- Depreciation calculations are based on certain key assumptions or estimates: useful life (whether in years or units) and salvage value.
- Management may opt to change these estimates at any time, and these changes affect the depreciation expense in subsequent years.
- Depreciation expense in the years after the change in estimate is based on the book value at the date of change less any salvage value (as changed) divided by the remaining useful life (as changed).

Key Topics to Know

Principles of Depreciation

Depreciation is:

- The allocation of the cost of an asset to the periods it is used.
- **Not** an attempt to track the market value of the asset.
- Required because physical deterioration and/or obsolescence cause all fixed assets to lose their usefulness.
- Land is not depreciated because it does not lose its usefulness.
- Recorded, for income statement purposes, as an expense to match revenues generated by using the asset with the expenses incurred to produce the revenue.
- Recorded, for balance sheet purposes, in a contra account called Accumulated Depreciation. The fixed asset account is not directly reduced because depreciation is only an estimate of how much of its usefulness has expired.
- Recorded for the period the asset is owned, typically every month but certainly at the end of each fiscal year. Depreciation expense may have to be adjusted in the year of acquisition and/or the year of disposal to reflect the actual number of months the asset was owned.

Depreciation Methods

Straight-Line Method

- Allocates the cost of the asset to expense evenly over years asset is used.
- The life of the asset is measured in years.
- Formula is: $(\text{Cost} - \text{Residual Value}) / \text{Estimated Life} = \text{Annual Depreciation}$

Example #1

P Company purchased a machine that cost \$50,000 and will last 5 years. A salvage value was not assigned to the asset.

Required: Determine the annual depreciation expense using the straight-line method and prepare the journal entry to record the expense.

Solution #1

$\$50,000 / 5 \text{ years} = \$10,000 \text{ per year}$
 $\$10,000 = \text{portion of cost to be expensed for each full year of use}$

Depreciation Expense-Machinery	10,000	
Accumulated Depreciation- Machinery		10,000

Units-of-Activity Method

- Allocates the cost of the asset to expense based on a measure of how much the asset was used each period.
- The life of an asset is measured in units of activity, i.e. miles, or hours used.
- Formula is: $(\text{Cost} - \text{Residual Value}) / \text{Estimated Life in Units} = \text{Depreciation Expense Per Unit}$
- $\text{Depreciation Expense Per Unit} \times \text{units used in the period} = \text{Depreciation Expense for the period}$

Example #2

F Company purchased a machine that cost \$50,000 and will be able to produce 500,000 units of product before wearing out. Expected activity by year will be: year 1 – 80,000 units; year 2 – 100,000; year 3 – 100,000; year 4 – 110,000 and year 5 – 110,000. A salvage value was not assigned to the asset.

Required: Determine the first year's depreciation expense using the units-of-activity method and prepare the journal entry to record the expense.

Solution #2

$\$50,000 / 500,000 \text{ units} = \$.10 \text{ per unit}$
 $\$.10 \times 80,000 \text{ units produced} = \$8,000 \text{ depreciation expense for year 1}$

Depreciation Expense-Machinery	8,000	
Accumulated Depreciation- Machinery		8,000

Declining Balance Method

- Allocates more of the cost of the asset to expense in the first years of the useful life and less in the later years.
- The life of the asset is measured in years.
- Formula is: $(\text{Cost} - \text{Accumulated Depreciation}) * \text{Declining Balance Rate}$
OR
 $\text{Book Value} * \text{Declining Balance Rate}$
- Rate = Double the straight-line method rate: $(100\% / \text{useful life}) \times 2$
OR
 $200\% / \text{useful life}$
- Residual Value is not used in the calculation of annual depreciation until the last year. An asset may not be depreciated below its residual value.

Example #3

F Company purchased a machine that cost \$50,000 and will last 5 years. A salvage value was not assigned to the asset.

Required: Determine the annual depreciation expense using the declining balance method and prepare the journal entry to record the expense.

Solution #3

<u>Year</u>	<u>Beginning book value</u>	<u>Depreciation rate</u>	<u>Depreciation expense</u>	<u>Ending book value</u>	<u>Accumulated depreciation</u>
1	50,000	40%	20,000	30,000	20,000
2	30,000	40%	12,000	18,000	32,000
3	18,000	40%	7,200	10,800	39,200
4	10,800	40%	4,320	5,680	44,880
5	5,680	40%	2,272	3,408	47,152

Depreciation Expense-Machinery	20,000	
Accumulated Depreciation- Machinery		20,000

It is typical of the declining balance method that assets without a residual value are not fully depreciated. That is, at the end of their useful life, the book value is not zero. For

this reason, many companies switch from the declining balance method to the straight-line method when depreciation expense for the declining balance method becomes less than under the straight line method.

Example #4:

P Company purchased equipment for \$70,000. This equipment has a 5 year life and an \$8,000 residual value.

Required: Calculate depreciation for each of the five years using the declining balance method at twice the straight-line rate.

Solution #4

Straight-line rate = $1/5$ or 20%; Declining Rate = 40%
Maximum Depreciation allowed = \$62,000

<u>Year</u>	<u>Beginning book value</u>	<u>Depreciation rate</u>	<u>Depreciation expense</u>	<u>Ending book value</u>	<u>Accumulated depreciation</u>
1	70,000	40%	28,000	42,000	28,000
2	42,000	40%	16,800	25,200	44,800
3	25,200	40%	10,080	15,120	54,880
4	15,120	40%	6,048	9,072	60,928
5*	9,072	40%	1,072	8,000	62,000

*In Year 5, the asset may not be depreciated beyond its residual value. That is, the net book value may not be less than the residual value. Applying the double declining balance method in year 5 calculates an expense of $(70,000 - 60,928) * 40\% = \$3,628.80$ which reduces the book value below the residual value.

Partial Year Depreciation

Example #5

On April 1, P Company purchased a machine that cost \$50,000 and will last 5 years. A salvage value was not assigned to the asset. The asset was disposed of on September 1 of year 3.

Required: Determine the annual depreciation expense for years 1, 2 and 3 using the straight-line method.

Solution #5

$\$50,000 / 5 \text{ years} = \$10,000 \text{ per year}$
 $\$10,000 = \text{portion of cost to be expensed for each full year of use}$

Year 1	$\$10,000 \times 9 \text{ months}/12 \text{ months} = \$7,500$
Year 2	$\$10,000$
Year 3	$\$10,000 \times 8 \text{ months}/12 \text{ months} = \$6,667$

Changes in Estimates**Example #6**

L Company purchased a machine that cost \$500,000 and will last 5 years. A salvage value was not assigned to the machine. On January 1 of year 3, the salvage value was changed to \$30,000. L Company also purchased a building at a cost of \$1,000,000 and assigned a useful life of 40 years. A salvage value was not assigned to the building. After 10 years, the useful life of the building was extended to 50 years.

Required: Determine the annual depreciation expense before and after the change in estimate for each asset using the straight-line method.

Solution #6

$\$500,000 - \$0 / 5 \text{ years} = \$100,000 \text{ per year}$
 $\$100,000 = \text{portion of cost to be expensed for each full year of use}$

Prior to change		\$100,000
Subsequent to change:		
Cost		\$500,000
Accumulated depreciation 2 yrs.	$\$100,000 \times 2 \text{ years} =$	\$200,000
Book value at date of change		\$300,000
Less change in salvage value	$\$30,000 - \$0 =$	\$30,000
Depreciable value		\$270,000
Remaining useful life		3 years
Revised depreciation expense		\$90,000

$\$1,000,000 - \$0 / 40 \text{ years} = \$25,000 \text{ per year}$
 $\$25,000 = \text{portion of cost to be expensed for each full year of use}$

Prior to change			\$25,000
Subsequent to change:			
Cost			\$1,000,000
Accumulated depreciation 10 yrs.	$\$25,000 \times 10 \text{ years} =$		\$250,000
Book value at date of change			\$750,000
Less salvage value			\$0
Depreciable value			\$750,000
Remaining useful life	50 year new life – 10 years to date =		40 years
Revised depreciation expense			\$18,750

Depletion of Natural Resources

- Mining companies purchase rights to metal ore or mineral deposits. These rights are recorded in an asset account when they are purchased.
- As ore is mined, part of the cost must be removed from the asset account. This process is called depletion.
- The depletion method is the same as Units of Activity Method.
- The accumulated depletion account is credited when the asset is amortized.

Amortization of Intangible Assets

- The periodic expensing of the cost of intangible assets.
- The Straight-line Method is generally used.
- Intangibles are amortized over their useful life, not to exceed the legal life.
- The accumulated amortization account is credited when the asset is amortized.

Practice Problems

Practice Problem #1

Q Company purchased a piece of equipment that cost \$250,000 on January 1. The equipment will last 8 years and have a residual value of \$10,000. On October 1, the company purchased another piece of equipment identical to the first.

Required: Calculate the depreciation expense for the year for each piece of equipment.

Practice Problem #2

A Company purchased machinery that cost \$510,000. It is estimated that the machine will be operated for 100,000 hours over its useful life and have a residual value of \$10,000.

Required: a) What is the rate of depreciation per hour?
b) Journalize the entry for annual depreciation if the machine had been operated for 22,000 hours.

Practice Problem #3

R Company purchased a machine that cost \$100,000. The machine is expected to last 4 years and has a residual value of \$7,000.

Required: Calculate the depreciation expense to be recorded each year under the declining balance method.

Practice Problem #4

Q Company purchased a punch press costing \$600,000. The useful life was 10 years and the salvage value was \$5,000. On January 1 of year 6, the salvage value was eliminated and the useful life extended to 15 years.

Required: Determine the annual depreciation expense before and after the change in estimate using the straight-line method.

Problem #5

On August 1, B Company acquired timber rights for \$40,000,000. The timber is estimated to produce at 80,000,000 board-feet of lumber. Along with the timber rights, B Company also acquired the patent on a proprietary method of preparing the trees for the sawmill at a cost of \$2,500,000. The patent had 9 years remaining on its legal life at time of acquisition. B Company believes that the patent will be useful for 5 years, by which time a newer technology will have been developed. During the current year, trees producing 800,000 board-feet of lumber were cut down.

- Required:
- a) Determine the amount of depletion expense for the current year.
 - b) Determine the amount of amortization expense for the current year.

Problem #6

D Company had two disposals of equipment during the year:

On June 1, a machine that cost \$80,000 was sold for \$24,000. The accounting records revealed that accumulated depreciation as of January 1 was \$50,000 and annual depreciation is \$10,000.

On October 1, a machine that cost \$50,000 was sold for \$16,000. The accounting records revealed that accumulated depreciation as of January 1 was \$35,000 and annual depreciation is \$5,000.

- Required:
- a) Determine the amount of gain or loss on disposal for each machine.
 - b) Prepare the journal entries to record the disposals.

True / False Questions

1. Depreciation in accounting is the process of allocating to expense the cost of an asset over its service life.
True False
2. Accumulated Depreciation is a liability account that is increased by credits.
True False
3. The Accumulated Depreciation account allows us to reduce the carrying value of assets through depreciation, while maintaining the original cost of each asset in the accounting records.
True False
4. When a change in estimate is required, the company changes depreciation in prior, current and future years.
True False
5. Declining-balance depreciation will be lower than straight-line depreciation in earlier years, but higher in later years.
True False
6. The cost of natural resources is allocated to expense through a process known as depletion.
True False
7. Straight-line, declining-balance, and activity-based depreciation all are acceptable depreciation methods for both financial reporting and tax reporting.
True False
8. Straight-line depreciation assumes that the benefits we derive from the use of an asset are the same each year.
True False
9. Depreciation in accounting records the decrease in value of an asset.
True False
10. Calculation of partial-year depreciation expense is not required if a depreciable asset is used for most of the year before it is disposed of.
True False

Multiple Choice Questions

1. Accumulated Depreciation
 - a) Is used to show the amount of cost expiration of intangibles
 - b) Is the same as Depreciation Expense
 - c) Is used to show the amount of cost expiration of natural resources
 - d) Is a contra asset

2. Equipment with a cost of \$80,000 has an estimated residual value of \$5,000 and an estimated life of 4 years or 12,000 hours. It is to be depreciated by the straight-line method. What is the amount of depreciation for the first full year, during which the equipment was used 3,300 hours?
 - a) \$20,000
 - b) \$18,750
 - c) \$20,625
 - d) \$22,000

3. A purchase of equipment for \$18,000 also involved freight charges of \$500 and installation costs of \$2,500. The estimated salvage value and useful life are \$2,000 and 4 years, respectively. Annual straight-line depreciation expense will be:
 - a) \$4,750
 - b) \$4,500
 - c) \$4,125
 - d) \$4,625

4. An asset purchased on January 1 for \$48,000 has an estimated salvage value of \$3,000. The current year's Depreciation Expense is \$5,000 and the balance of the Accumulated Depreciation account, after adjustment, is \$20,000. If the company uses the straight-line method, what is the asset's remaining useful life?
 - a) 9 years
 - b) 4 years
 - c) 8 years
 - d) 5 years

5. On January 1, J Company purchased some equipment for \$15,000. The estimated salvage value and useful life are \$3,000 and 4 years, respectively. On January 1 two years later, the company determined that the asset's remaining useful life is 3 years. What is the revised depreciation expense for the year if the company uses the straight-line method?
 - a) \$3,000
 - b) \$2,000
 - c) \$4,000
 - d) \$2,250

6. On March 1, M Company purchased a patent from another company for \$90,000. The estimated useful life of the patent is 10 years, and its remaining legal life is 15 years. The Amortization Expense for 2002 is:
 - a) \$9,000
 - b) \$7,500
 - c) \$6,000
 - d) \$5,000

7. P Company purchased a depreciable asset for \$22,000 on April 1, Year 1. The asset will be depreciated using the straight-line method over its four-year useful life. Assuming the asset's salvage value is \$2,000, what will be the amount of accumulated depreciation on this asset on December 31, Year 3?
 - a) \$5,000
 - b) \$15,000
 - c) \$15,125
 - d) \$13,750

8. A company's property records revealed that equipment costing \$450,000 was acquired on October 1. It was assigned a salvage value of \$30,000 and a useful life of 7 years. Straight-line depreciation for the year of acquisition was:
 - a) \$15,000
 - b) \$30,000
 - c) \$45,000
 - d) \$60,000

The next 3 questions refer to the following information.

On January 1, L Company acquired 50,000 acres of hardwood forest at a cost of \$15,000,000 to use in its lumbering operations. 5,000 acres were harvested in the year of acquisition. 8,000 acres were harvested in the following year.

9. The depletion expense in the year of acquisition was:
 - a) \$150,000
 - b) \$1,500,000
 - c) \$15,000
 - d) \$15,000,000

10. The depletion expense in the year following acquisition was:
 - a) \$15,000,000
 - b) \$2,400,000
 - c) \$240,000
 - d) \$390,000

11. If the forest had been acquired on July 1 instead of January 1, the depletion expense in the year of acquisition would have been:
 - a) \$150,000
 - b) \$1,500,000
 - c) \$75,000
 - d) \$750,000

12. An exclusive right granted to its owner to manufacture and sell an item, or to use a process, for 20 years is:
 - a) Copyright
 - b) Leasehold
 - c) Patent
 - d) Intangible asset

13. The calculation of depletion expense is most like:
 - a) Straight-line depreciation method
 - b) Declining balance depreciation method
 - c) Intangible asset amortization method
 - d) Units of activity depreciation method

14. Amortization of an intangible asset is calculated using the:
- a) Straight-line depreciation method
 - b) Declining balance depreciation method
 - c) Intangible asset amortization method
 - d) Units of activity depreciation method
15. A machine with a cost of \$130,000 has an estimated residual value of \$10,000 and an estimated life of 4 years or 18,000 hours. What is the amount of depreciation for the second full year, using the declining-balance method at double the straight-line rate?
- a) \$30,000
 - b) \$31,500
 - c) \$32,500
 - d) \$65,000

Solutions to Practice Problems

Problem #1

First piece of equipment: $(250,000 - 10,000) / 8 \text{ years} = \$30,000$ annual expense

Second piece of equipment: $(250,000 - 10,000) / 8 \text{ years} = \$30,000$ annual expense

However, equipment was acquired on October 1, so it was used for 3 months during the year: $30,000 \times 3 \text{ months} / 12 \text{ months} = \$7,500$ expense for the year

Problem #2

$(510,000 - 10,000) / 100,000 \text{ hours} = \5 per hour

22,000 hours for the year * \$5 per hour = \$110,000

Depreciation Expense	110,000	
Accumulated Depreciation		110,000

Problem #3

4 year life = $\frac{1}{4}$ or 25% per year under straight-line depreciation

Double rate to 50% for declining balance depreciation or $200\% / 4 \text{ years} = 50\%$

Maximum depreciation allowed: $100,000 - 7,000 = 93,000$

<u>Year</u>	<u>Beginning book value</u>	<u>Depreciation rate</u>	<u>Depreciation expense</u>	<u>Ending book value</u>	<u>Accumulated depreciation</u>
1	100,000	50%	50,000	50,000	50,000
2	50,000	50%	25,000	25,000	75,000
3	25,000	50%	12,500	12,500	87,500
4	12,500	50%	*5,500	7,000	93,000

*Maximum depreciation allowed in year 4 is \$5,500 which brings accumulated depreciation to \$93,000. The asset may not be depreciated below its residual value of \$7,000.

Problem #4

$\$600,000 - \$5,000 / 10 \text{ years} = \$59,000 \text{ per year}$
 $\$59,000 = \text{portion of cost to be expensed for each full year of use}$

Prior to change		\$59,000
Subsequent to change:		
Cost		\$600,000
Accumulated depreciation 10 yrs.	$\$59,000 \times 5 \text{ years} =$	\$295,000
Book value at date of change		\$305,000
Less salvage value		\$0
Depreciable value		\$305,000
Remaining useful life	15 year new life – 5 years to date =	10 years
Revised depreciation expense		\$30,500

Problem #5

a)

$\$40,000,000 / 80,000,000 \text{ bf} = \$.50 \text{ per bf}$
 $\$.50 \times 800,000 \text{ bf} = \$400,000 \text{ depletion expense}$

b)

$\$2,500,000 / 5 \text{ years} = \$500,000 \text{ per year}$
 Amortization expense = \$500,000

Problem #6

$\$10,000 * 5 \text{ months} / 12 \text{ months} = \$4,167$ depreciation expense for January thru May

Accumulated depreciation at disposal date = $\$50,000 + \$4,167 = \$54,167$

Depreciation Expense-Machinery	4,167	
Accumulated Depreciation- Machinery		4,167

Gain on disposal:

Selling Price	\$24,000	
-Book Value	<u>25,833</u>	(80,000 - 54,167)
Loss	1,833	

Cash	24,000	
Accumulated Depreciation- Machinery	54,167	
Machinery		80,000
Gain on disposal	1,833	

$\$5,000 * 9 \text{ months} / 12 \text{ months} = \$3,750$ depreciation expense for January thru September

Accumulated depreciation at disposal date = $\$35,000 + \$3,750 = \$38,750$

Depreciation Expense-Machinery	3,750	
Accumulated Depreciation- Machinery		3,750

Gain on disposal:

Selling Price	\$16,000	
-Book Value	<u>11,250</u>	(50,000 - 38,750)
Gain	4,750	

Cash	16,000	
Accumulated Depreciation- Machinery	38,750	
Machinery		50,000
Gain on disposal		4,750

Solutions to True / False Problems

1. True
2. False - accumulated Depreciation is a contra-asset account; it reduces an asset account.
3. True
4. False - when a change in estimate is required, the company changes depreciation in current and future years, but not in prior periods.
5. False - declining-balance depreciation will be higher than straight-line depreciation in earlier years, but lower in later years.
6. True
7. False - these are acceptable methods for financial reporting, not tax reporting. Most companies use MACRS for income tax depreciation.
8. True
9. False - Depreciation in accounting is the process of allocating to expense the cost of an asset over its service life.
10. False – depreciation must be calculated for the entire period the asset is owned.

Solutions to Multiple Choice Questions

- | | |
|-----|---|
| 1. | D |
| 2. | B |
| 3. | A |
| 4. | D |
| 5. | B |
| 6. | A |
| 7. | D |
| 8. | A |
| 9. | B |
| 10. | B |
| 11. | B |
| 12. | C |
| 13. | D |
| 14. | A |
| 15. | C |