



## Mcgraw Hill Questions and Answers

1) Mary wants to save money for her son's college tuition. She deposits \$1200 at the end of each year in an ordinary annuity that pays 9% interest, compounded annually.

Answer each part. Do not round any intermediate computations nor answers.

(a) Find the total value of the annuity at the end of the 1<sup>st</sup> year

(b) Find the total value of the annuity at the end of the 2<sup>nd</sup> year

(c) Find the total value of the annuity at the end of the 3<sup>rd</sup> year

Ans:

**(a) Finding the total value of the annuity at the end of the 1<sup>st</sup> year**

At the end of the 1<sup>st</sup> year, Mary makes a \$1200 payment.

Since the payment is made at the end of the 1<sup>st</sup> year, the \$1200 payment does not earn interest in the 1<sup>st</sup> year.

So, the total value of the annuity at the end of the 1<sup>st</sup> year is \$1200.

**(b) Finding the total value of the annuity at the end of the 2<sup>nd</sup> year**

At the end of the 2<sup>nd</sup> year, Mary makes another \$1200 payment. Also, the \$1200 principal from the previous year earns 9% interest.

Here is a table that describes the amounts that contribute to the total value of the annuity at the end of the 2<sup>nd</sup> year.

Description	Amount
Principal at the end of the 1 <sup>st</sup> year.	\$1200
Interest earned during the 1 <sup>st</sup> year.	$=\$1200(0.09) = \$108$



Payment at the end of the 2 <sup>nd</sup> year.	\$1200
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We add the amounts in the table to find the total value of the annuity at the end of the 2<sup>nd</sup> year.

$$= \$1200 + \$108 + \$1200 = \$2508$$

**(c) Finding the total value of the annuity at the end of the 3<sup>rd</sup> year**

At the end of the 3<sup>rd</sup> year, Mary makes another \$1200 payment. Also, the \$2508 principal from the previous year earns 9% interest.

Here is a table that describes the amounts that contribute to the total value of the annuity at the end of the 3<sup>rd</sup> year.

Description	Amount
Principal at the end of the 2 <sup>nd</sup> year.	\$2508
Interest earned during the 2 <sup>nd</sup> year.	$= \$2508(0.09) = \$225.72$
Payment at the end of the 3 <sup>rd</sup> year.	\$1200

We add the amounts in the table to find the total value of the annuity at the end of the 3<sup>rd</sup> year.

$$= \$2508 + \$225.72 + \$1200 = \$3933.72$$

**2) On June 1, the home mortgage balance was \$192,000 for the home owned by Amy Morgan. The interest rate for the loan is 8.125 percent. Assuming that Amy makes the June monthly mortgage payment of \$1536, calculate the following:**

- The amount of interest included in the June payment (round your answer to the nearest cent).
- The amount of the monthly mortgage payment that will be used to reduce the principal balance.
- The new balance after Amy makes this monthly mortgage payment.

Ans:

(a)

$$\text{Interest} = \text{Principal (P)} \times \text{Rate (R)} \times \text{Time (T)}$$

$$= \$192,000 \times 8.125\% \times \frac{1}{12}$$

$$= \$192,000 \times 0.08125 \times \frac{1}{12}$$

$$= \$1300$$

(b)



To determine the principal reduction amount, subtract the monthly interest from the monthly mortgage payment.

$$\begin{aligned}\text{Principal reduction amount} &= \text{Monthly mortgage payment} - \text{Interest amount for the month} \\ &= \$1536 - \$1300 = \$236\end{aligned}$$

(c)

To calculate the new principal balance, subtract the principal reduction amount from the principal balance at the beginning of the month.

$$\begin{aligned}\text{New principal balance} &= \text{Balance on June 1} - \text{Principal reduction amount} \\ &= \$192,000 - \$236 \\ &= \$191,764\end{aligned}$$

**3) Christine is taking out a mortgage for \$258,000 to buy a new house and is deciding between the offers from two lenders. She wants to know which one would be the better deal over the life of the mortgage loan, and by how much.**

Answer each part. Do not round intermediate computations, and round your answers to the nearest cent.

(a) A savings and loan association has offered her a 30- year mortgage loan at an annual interest rate of 4.7%. Find the monthly payment.

(b) Her credit union has offered her a 40-year mortgage loan at an annual interest rate of 3.5%. Find the monthly payment.

(c) Suppose Christine pays the monthly payment each month for the full term. Which lender's mortgage loan would have the lowest total amount to pay off, and by how much?

Ans:

(a)

**Monthly Payment Formula**

$$M = \frac{P \left( \frac{r}{12} \right)}{1 - \left( 1 + \frac{r}{12} \right)^{-12t}}$$

Here  $M$  is the monthly payment,  $P$  is the principal,  $r$  is the interest rate, and  $t$  is the number of years that payments are made.



We have the following.

$$P = \$258,000$$

$$r = 4.7\% = 0.047$$

$$t = 30$$

Using these values and the ALEKS calculator, we get the following.

$$M = \frac{258,000 \left( \frac{0.047}{12} \right)}{1 - \left( 1 + \frac{0.047}{12} \right)^{-12(30)}} = 1338.085 \dots$$

Rounded to the nearest cent, the monthly payment to the savings and loan association would be \$1338.09

**(b) Finding the monthly payment for the credit union offer**

We have the following.

$$P = \$258,000$$

$$r = 3.5\% = 0.035$$

$$t = 40$$

Using these values and the ALEKS calculator, we get the following.

$$M = \frac{258,000 \left( \frac{0.035}{12} \right)}{1 - \left( 1 + \frac{0.035}{12} \right)^{-12(40)}} = 999.468 \dots$$

Rounded to the nearest cent, the monthly payment to the credit union would be \$999.47

(c) There would be  $30 \times 12 = 360$  payments to the savings and loan association and  $40 \times 12 = 480$  payments to the credit union.

We find the total amount to pay off each mortgage loan by multiplying the monthly payment by the number of payments.

$$\text{Savings and loan: } 1338.09 \times 360 = \$481,712.40$$

$$\text{Credit union: } 999.47 \times 480 = \$479,745.60$$

So, the total amount paid to the credit union would be smaller. We subtract to find how much.

$$\$481,712.40 - \$479,745.60 = \$1966.80$$



4) Kala has decided to invest to help with her retirement savings. How much would she have to invest to have \$148,700 after 18 years, assuming an interest rate of 3.41% compounded annually?

Ans:

### Compound Interest Formula

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

Here  $A$  is the future amount in the account,  $P$  is the principal (the amount invested),  $r$  is the annual interest rate,  $n$  is the number of times a year the interest is compounded, and  $t$  is the term of the investment in years.

We are looking for the principal Kala needs to invest. So, we solve the compound interest formula for  $P$ .

$$P = \frac{A}{\left( 1 + \frac{r}{n} \right)^{nt}}$$

We have the following for this problem.

$$A = \$148,700$$

$$r = 3.41\% = 0.0341$$

$$n = 1$$

$$t = 18 \text{ years}$$

Using these values and the ALEKS calculator, we get the following.

$$P = \frac{148,700}{\left( 1 + \frac{0.0341}{1} \right)^{1(18)}} = 81,317.736 \dots$$

Rounded to the nearest dollar, the amount Kala must invest is \$81,318

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5) The price of an item has risen to \$261 today. Yesterday it was \$180. Find the percentage increase.

Ans) We start by finding how much the price increased from yesterday.

$$\text{Amount of increase: } \$261 - \$180 = \$81$$

We need to write the amount of increase as a percentage of yesterday's price.

To do this, we first divide the amount of increase by yesterday's price.



$$\frac{\text{Amount of increase}}{\text{Yesterday's price}} = \frac{81}{180} = 0.45$$

We then convert this to a percentage by multiplying by 100.

$$\text{Percentage increase: } (100 \times 0.45) \% = 45 \%$$

6) Teresa wants to buy a new car but needs money for the down payment. Her parents agree to lend her money at an annual rate of 2%, charged as simple interest. They lend her \$2000 for 4 years. She makes no payments except the one at the end of that time.

- (a) How much total interest will Teresa have to pay?  
(b) What will the total repayment amount be (including interest)?

Ans:

### Simple Interest Formula

$I = Prt$   $I$  is the total interest earned or paid  
 $P$  is the principal (amount invested or loaned)  
 $r$  is the annual interest rate (as a decimal)  
 $t$  is the term of the investment or loan in years

(a)

For our problem we have the following.

$$P = \$2000$$
$$r = 2\% = 0.02$$
$$t = 4 \text{ years}$$

Using these values and the ALEKS calculator, we get the following.

$$I = 2000(0.02)(4) = 160$$

So, the total interest is \$160

(b) To find the total amount (also called future value), we add the principal and the interest.

$$\text{Total repayment amount} = \$2000 + \$160 = \$2,160$$



7) An item costs \$440 before tax, and the sales tax is \$26.40. Find the sales tax rate.

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Ans) To find the sales tax rate, we divide the sales tax by the cost before tax.

$$\text{Sales tax rate: } \frac{26.40}{440} = 0.06$$

We convert this rate to a percentage by multiplying it by 100

$$100 \times 0.06 = 6\%$$

So, the sales tax rate is 6%

8) A camera has a listed price of \$811.99 before tax. If the sales tax rate is 9.75%, find the total cost of the camera with sales tax included. Round your answer to the nearest cent, as necessary.

Ans) The sales tax is 9.75% of \$811.99, and we calculate it as follows.

First, we change 9.75% to a decimal.

$$9.75\% = 0.0975$$

Then, we multiply.

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