

GENERAL MATHEMATICS

Name of the Learner: _____ Grade level: _____

Section: _____ Date: _____

LEARNING ACTIVITY SHEET

FAIR MARKET OF A CASH FLOW STREAM INCLUDES ANNUITY

Background Information for learners

This activity sheet will serve as a self-learning guide for the learner. This will also help you to become money wise when you plan to have your own car, lot, or even a house in the future despite of having little budget. Specifically, in this topic, you will learn to compare the offers and find out which one is cheaper or more affordable by computing or calculating the fair market value of the items.

The concept for the present and future value of annuity is to solve problems about cash flows.

The cash flow is a term that refers to payments received (cash inflows) or payments or deposit made (cash outflows). Cash inflows can be represented by positive numbers and cash outflows can be represented by negative numbers.

The fair market value or economic value of a cash flow (payment stream) on a particular date refers to a single amount that is equivalent to the value if the payment stream at that date. This particular is called the focal date.

Lets have an example

Company A offers P150,000 at the end of 3 years plus P300,000 at the end of 5 years. Company B offer P25,000 at the end of each quarter for the next 5 years. Assume tat money is worth 8%compounded annually. Which offer has a better market value?

Identify the given:

Company A P150,000 at the end of 3 years P300,000 at the end of 5 years	Company B P25,000 at the end of each quarter for the next 5 years
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Find: fair market value of each offer

(a) Illustrate the cash flows of the two offers using time diagrams.

Company A Offer:

			150,000		300,000
0	1	2	3	4	5

Company B Offer:

25,000	25,000	25,000			25,000
0	1	2	3	...	20

(b). Choose a focal date and determine the values of the two offers at the focal date.

Since the focal date is the start of the term, compute the present value of each offer.

Company A Offer:

The present value of P150,000 three years from now is

$$P_1 = F(1 + j)^{-n}$$
$$P_1 = 150,000(1 + 0.04)^{-6}$$
$$P_1 = P118,547.18$$

The present value of P300,000 five years from now is

$$P_2 = F(1 + j)^{-n}$$
$$P_2 = 300,000(1 + 0.04)^{-10}$$
$$P_2 = P202,669.25$$

Fair Market Value (FMV)

$$= P_1 + P_2$$
$$= P118,547.18 + P202,669.25$$
$$= P321,216.43$$

Company B Offer:

Compute for the present value of a general annuity with quarterly payments but with semi-annual compounding at 8%

Solve the equivalent rate, compounded quarterly, of 8% compounded semi-annually.

$$\begin{aligned}F_1 &= F_2 \\P\left(1 + \frac{i^{(4)}}{4}\right)^{4(5)} &= P\left(1 + \frac{i^{(2)}}{2}\right)^{2(5)} \\ \left(1 + \frac{i^{(4)}}{4}\right)^{20} &= \left(1 + \frac{0.08}{2}\right)^{10} \\ 1 + \frac{i^{(4)}}{4} &= (1.04)^{\frac{1}{2}} \\ \frac{i^{(4)}}{4} &= (1.04)^{\frac{1}{2}} - 1 \\ \frac{i^{(4)}}{4} &= 0.019803903\end{aligned}$$

The present value of an annuity is given by

$$\begin{aligned}P &= F(1 + j)^{-n} \\ P &= 25,000(1 + 0.019803903)^{-20} \\ P &= P409,560.47\end{aligned}$$

Therefore, Company B's offer is preferable since its market value is larger.

Learning Competencies with code

The students are able to calculate the fair market of a cash flow stream that includes annuity.
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ACTIVITY 1. Calculate the future value of simple ordinary annuity.

1. Reden and Redenton are twins. After the graduation and being finally able to get a good job, they plan for retirement as follows.

- Starting at the age of 20, Reden deposits P15,000.00 at the end of each year for 30 years.
- Starting at age 35, Redenton deposits P20,000 at the end of each year for 18 years.

Who will have the greater amount at retirement if both annuities earn 12% per year compounded annually?

2. If you pay P100.00 at the end of each month for 25 years on account that pays interest at 9% compounded monthly, how much money do you have after 25 years?

ACTIVITY 2. Calculate the present value of simple ordinary annuity.

1. Hazel Joy borrowed money to her husband to buy a car. She will repay it by making monthly payments of P10,000 per month for the next 2 years at an interest rate of 6% per year compounded monthly. How much did Hazel Joy borrow?

2. Mary works very hard because she wants to have enough money in her retirement account when she reaches the age of 60. She wants to withdraw P50,000.00 every 3 months for 20 years starting 3 months after she retires. How much Mary deposited at retirement at 7.5% per year compounded quarterly for annuity?

ACTIVITY 3. Calculate the fair market of a cash flow stream that includes annuity.

Mr. Ribaya received two offers on a lot that he wants to sell. Mr. Ocampo has offered P50,000 and P1,000,000 lump sum payment 5 years from now. Mr. Cruz, has offered P50,000 plus P40,000 every quarter for five years. Compare the fair market values of the two offers if money can earn 5% compounded annually. Which offer has a higher market value?

RUBRIC

CRITERIA	1	2	3	4	TOTAL
IDENTIFYING GIVEN STEPS	No given are correct	At most 4 is correct given	At least 4 is correct given	All the given are correct	
ACCURACY	Entire activity assignment was incorrect	Several step of the problem was incorrect	One step of the problem was incorrect	Each step of the problem was completed and correct	

*Rubric is for all the activities.

Reflection *The learner writes how he/she feels about the activity.)*

References for learners

Oronce, O. (2016). General Mathematics. Manila: Rex bookstore, Inc.

<https://www.coursehero.com/file/p7tdb9t/Calculate-the-fair-market-value-of-a-cash-flow-stream-that-includes-an-annuity/>

Answer key

Activity 1

1. Reden

Given:

$$P = 15,000$$

$$j = 0.12$$

$$n = 30$$

Solution:

$$FV = P \frac{(1+j)^n - 1}{j}$$

$$FV = 15,000 \frac{(1+0.12)^{36} - 1}{0.12}$$

$$FV = 15,000 \frac{(58.1355739286)}{0.12}$$

$$FV = 15,000(484.4631160717)$$

$$FV = P7,266,946.74$$

$$FV = P \frac{(1+j)^n - 1}{j}$$

$$FV = 20,000 \frac{(1+0.12)^{18} - 1}{0.12}$$

$$FV = 20,000 \frac{(6.689965795)}{0.12}$$

$$FV = 15,000(55.7497149585)$$

$$FV = P1,114,994.30$$

2.

Given:

$$P = 15,000$$

$$j = 0.12$$

$$n = 30$$

Redenton

Given:

$$P = 20,000$$

$$j = 0.12$$

$$n = 18$$

Solution:

$$FV = P \frac{(1+j)^n - 1}{j}$$

$$FV = 100 \frac{(1+0.0075)^{54} - 1}{0.0075}$$

$$FV = 100 \frac{(0.4970384672)}{0.0075}$$

$$FV = 100(66.2717956247)$$

$$FV = P6,627.18$$

Activity 2.

1.

Given:

$$P = 10,000$$

$$j = 0.005$$

$$n = 24$$

Solution:

$$PV = \frac{P[1 - (1 + j)^{-n}]}{j}$$

$$PV = \frac{10,000[1 - (1 + 0.005)^{-24}]}{0.005}$$

$$PV = \frac{10,000(0.1128143311)}{0.005}$$

$$PV = P225,628.66$$

2.

Given:

$$P = 10,000$$

$$j = 0.005$$

$$n = 24$$

Solution:

$$PV = \frac{P[1 - (1 + j)^{-n}]}{j}$$

$$PV = \frac{50,000[1 - (1 + 0.0065)^{-80}]}{0.0065}$$

$$PV = \frac{50,000(0.3925248318)}{0.0065}$$

$$PV = P3,140,198.65$$

Activity 3.

Given:

Mr. Ocampo's offer 50,000 down payment P1,000,000 after 5 years	Mr. Ocampo's offer 50,000 down payment P40,000 every quarter for 5 years
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Solution 1. Choose a focal date to be the start of the term. Since the focal date is at $t = 0$, compute for the present value of each offer.

Mr. Ocampo's offer

Mr. Cruz offer

Fair Market Value

$$FMV = 50,000 + 783,526.17$$

$$FMV = P833,526.17$$

$$FMV = 50,000 + 705,572.68$$

$$FMV = P755,572$$

Solution 2. Choose the focal date to be the end of the term.

Mr. Ocampo's offer

Mr. Cruz offer

Fair Market Value

$$FMV = 1000000 + 63,814.08$$

$$FMV = P1,063,814.08$$

$$FMV = 900,509.40 + 63,814.08$$

$$FMV = P964,323.48$$

Mr. Ocampo's offer still has a higher value, even if the focal date is to be the end of the term.