AFTERSCHOOL TRAINING TOOLKIT

Finding Math
All About Money: Does it Pay? (Teacher's Guide)

Mr. Opportunist decides to get a credit card to pay for items such as gasoline and food. He finds a card that offers an interest rate of 12% and begins putting it to use. Eventually, because of the convenience of not having to carry cash, he ends up charging almost everything he purchases on the card. The first statement he receives shows a balance of $1200.00. Mr. Opportunist, realizing he might be getting himself into major debt if he isn't careful, determines to pay off this balance before using the card again.

Part 1: Below is a Credit Card Table representing Mr. Opportunist's plan to pay off his balance. Again, the interest rate of the credit card is 12% (a very good rate, by the way), and the original balance is $1200.00. He decides to pay a fixed amount of $100.00 each month, figuring he can pay the balance off in a year. To find the amount of interest Mr. Opportunist pays each month while paying off his balance, multiply the remaining balance by 0.01 (12% ÷ 12, which is how the credit card companies figure interest. The 12 comes from 12 months per year, not from the 12%). The remainder of the $100 goes to the Principle.

Month	Payment (fixed)	Interest paid (12% ÷ 12= 0.01)	Principle Paid	Remaining Balance
				$1,200.00 (original balance)
1	$100	$12.00	$88.88	$1,112.00
2	$100	**$11.12**	$88.88	$1,023.12
3	$100	$10.23	**$89.77**	$933.35
4	$100	$9.33	$90.67	**$842.68**
5	$100	$8.43	$91.57	$751.11
6	$100	**$7.51**	$92.49	$658.62
7	$100	$6.59	**$93.41**	$565.21
8	$100	$5.65	$94.35	**$470.86**
9	$100	$4.71	$95.29	$375.57
10	$100	**$3.76**	**$96.24**	$279.33
11	$100	$2.79	$97.21	$182.12
12	$100	**$1.82**	**$98.18**	**$83.94**
13	$84.78	$0.84	$83.10	$0.00

Questions:

1. Fill in the missing amounts. Explain/show your reasoning.
   [there are missing amounts on the student worksheet – bolded cells]

2. Why does the Principle Paid increase every month until month 13?
   Because as the balance decreases, the amount of interest paid also decreases. This results in more of the $100 going towards the principle.

3. Why does the Interest Paid decrease every month?
   Because the balance is decreasing. As the balance decreases, so does the resulting interest payment.

4. Add up the Principle Paid column. Why doesn't the sum equal exactly $1200.00?
   Due to rounding.

5. What is wrong with Mr. Opportunist's assumption that putting $1200 on a credit card will cost $1200? Why does it take longer to pay off the card than he thinks it will?
   He forgets to figure in interest payments.

6. How much does Mr. Opportunist pay to charge $1200 to his credit card?
   *$84.78 (the sum of the **interest paid**)*

7. Why is this amount the same as the 13th payment?
   One would think that after paying $1200 ($100 a month for 12 months), the remainder of the balance would be the amount of interest paid. In fact, it is the same. The interesting analysis for this question is looking at the final payment, which is different than the remaining balance in month 12. Mr. Opportunist must pay interest on this remaining balance, which is why the payoff amount is different than the remaining balance.

Part 2: Mr. Opportunist budgets $960/year to spend at his favorite store, and figures that he can pay $80 a month toward his balance. He secures a credit card from the store with an 18% interest rate, and a 10% minimum payment, and is pretty sure that he can always pay more than the monthly minimum (he's heard that it is best to pay more than the minimum if

Month	1	2	3	4	5	6	7	8	9	10
Amount	$110	$140	$60	$320	$75	$280	$105	$90	$90	$260

He figures if he spends a little more than $80 one month, he will just cut back the following month. In Month 4, Mr. Opportunist decides he can spend more money than he budgeted, because the deals are so good! As he sees it, he is only paying $80 for $320 worth of merchandise, and he will cut back later.

But, Mr. Opportunist realizes, once 10 months have passed, that he is in quite a mess and needs to stop and think about how he got in to it.
1. Predict how many months it takes Mr. Opportunist to pay off the credit card balance if he doesn't make any more purchases. Why do you think so?
2. Complete the credit table below to find the answer (it is started for you!):
   [there are blanks on the student worksheet – bolded cells]

Month	Balance Forward	Purchaes	New balance	Interest paid (18% ÷ 12 = 0.01)	Adjusted Balance	Payment	New Balance
1		$80.00	$110.00	$0.00	$110.00	$80.00	$30.00
2	$30	$140.00	$170.00	$2.55	$172.55	$80.00	$92.55
3	$92.55	$60.00	$152.00	$2.29	$154.84	$80.00	$74.84
4	**$74.84**	$320.00	**$394.84**	$5.92	$400.76	$80.00	$320.76
5	$320.76	$75.00	$395.76	**$5.94**	$401.70	$80.00	$321.70
6	$321.70	$280.00	$601.70	$9.03	**$610.73**	$80.00	$530.73
7	**$530.73**	**$105.00**	$635.73	$9.54	$645.27	$80.00	$565.27
8	$565.27	$90.00	**$655.27**	**$9.83**	$665.10	$80.00	$585.10
9	$585.10	$90.00	$675.10	**$10.13**	**$685.23**	$80.00	$605.23
10	$605.23	$260.00	$865.23	$12.98	**$878.21**	$87.82	$790.39

Mr. Opportunist stops to think, and decides to stop making purchases. Month 11 is filled out for you. Fill out the rest of the credit card table for Mr. Opportunist.

Month	Balance Forward	Purchaes	New balance	Interest paid (18% ÷ 12 = 0.01)	Adjusted Balance	Payment	New Balance
11	$790.39	$0.00	$790.39	$11.86	$802.25	$80.23	$722.02
12	**$722.02**	**$0.00**	**$722.02**	**$10.83**	**$732.85**	**$80.00**	**$652.85**
13	**$652.85**	**$0.00**	**$652.85**	**$9.79**	**$662.64**	**$80.00**	**$582.64**
14	**$582.64**	**$0.00**	**$582.64**	**$8.74**	**$591.38**	**$80.00**	**$511.38**
15	**$511.38**	**$0.00**	**$511.38**	**$7.67**	**$519.05**	**$80.00**	**$439.05**
16	**$439.05**	**$0.00**	**$439.05**	**$6.59**	**$445.64**	**$80.00**	**$365.64**
17	**$365.64**	**$0.00**	**$365.64**	**$5.48**	**$371.12**	**$80.00**	**$291.12**
18	**$291.12**	**$0.00**	**$291.12**	**$4.37**	**$295.49**	**$80.00**	**$215.49**
19	**$215.49**	**$0.00**	**$215.49**	**$3.23**	**$218.72**	**$80.00**	**$138.72**
20	**$138.72**	**$0.00**	**$138.72**	**$2.08**	**$140.80**	**$80.00**	**$60.80**
21	**$60.80**	**$0.00**	**$60.80**	**$0.91**	**$61.71**	**$61.71**	**$0.00**

Questions:

1. How long does it take Mr. Opportunist to pay off his balance once he stops making purchases?

   11 months

2. What lessons can we learn from Mr. Opportunist? Think about his assumption that he will spend close to his budgeted amount, and that he pays off more than his monthly minimum.

   Mr. Opportunist does not take into account a couple of important ideas:
   1. *When spending on credit, it is easy to go over your budget because you are not actually spending the money at the time you make your purchases;*
   2. *You accrue interest, even when you pay off more than your monthly minimum. Paying interest costs money!*

3. How much does it cost for Mr. Opportunist to use credit for all of his purchases instead of cash? Explain.

   *$139.76 (the **interest paid** column added up)*

4. Create a graphic display of some of the data in the table. You may create a scatter plot, line graph, or another display of your choice. Be sure to include a title and label all axes! What observations and conclusions can you make about the data in the table, based on your display?

   Answers vary. You might provide graph paper, or large poster paper, with which students can create their displays.

Suggested Extension Activities:

1. Have students fill out a credit table for a situation relevant to them. Prompt them to choose the store, amounts, and situation. They might want to use the table from **Part A**, which doesn't ask them to add up purchases along the way, or the table from **Part B,** which does include monthly purchases. They may make their decisions based on what they have learned so far.

   If students have access to the Internet, ask them to visit www.bankrates.com, to find a student credit card rate for their state. Using this interest rate and a monthly payment of their choice, they can fill out a table to determine how much it will cost them to buy on credit. To figure out the monthly interest rate, divide the annual percentage rate by 12. For example, the interest payment on a 10.5% credit card rate is found by dividing 10.5 by 12, which equals 0.875%, or 0.00875. If the balance is $1000, calculate the monthly interest by multiplying $1000 x 0.00875, which equals $8.75.

2. Ask students to find and use formulas for any of their calculations from Parts 1 and/or 2.

   Some students might find it interesting to use a calculator to obtain answers recursively. For example, the Remaining Balance in Part 1 can be found using the following keystrokes (on a TI-83 calculator):

Keystroke	Screen Shows:
1200 ENTER	1200
ANS – (100 – ANS (0.01) ENTER	1112
ENTER	1023.12
ENTER	933.35
ENTER	842.68
And so on...	

Each time one hits "ENTER," the calculator performs the calculation and gives the new balance.

Teachers may want to show a simple example to students. For instance, the teacher could show subtracting $100 a month from $1200 as follows:

Keystroke	Screen Shows:
1200 ENTER	1200
– 100 (screen shows ANS – 100)	1100
ENTER	1000
ENTER	900
ENTER	800
And so on...	

Table A

Month	Payment (fixed) $ _____	Interest paid (____% ÷ 12= _____)	Principle Paid	Remaining Balance
				$_____ (original balance)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

Questions:

1. What did you learn about credit cards by doing these activities?

2. Prepare a brief report for your classmates explaining what you learned, so that everyone can be a smart consumer. Include your ideas about the following questions:
   a. Is there a way to use credit without paying interest?
   b. What is the cost of using credit?
   c. Assuming one decides to use a credit card for purchases, what is the smartest way to go about doing so?
   d. Other discoveries?

Table B

Month	Balance Forward	Purchaes	New balance	Interest paid (___% ÷ 12 = _____)	Adjusted Balance	Payment	New Balance
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							

Questions:
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   b. What is the cost of using credit?
   c. Assuming one decides to use a credit card for purchases, what is the smartest way to go about doing so?
   d. Other discoveries?

Note: The above questions might be used to guide students' thinking. However, the use of these questions might also limit students' thinking. Teachers should decide, based on their knowledge of the students and what they are taking away from the activity, whether or not to scaffold the activity with the guiding questions. In some cases, students may come up with answers to these questions and more without being prompted (which would be preferred). Teachers might also decide to ask the questions as a part of a wrap up discussion in the event that these important points do not come out of the class reports.