**Financial Literacy Lesson Plan**

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| **Connections to Financial Literacy**   * *Planning for the future as students compare and make decisions related to different employee remuneration* *options;* * *Personal financial planning as students compare and make decisions related to different employee remuneration* *options considering personal debt.* | | |
| **Unit 1: Day 3: This Job Suits Me Fine!** | **Subject/Course**  **MPM1D Principles of Mathematics, Grade 9, Academic**  **MFM1P Foundations of Mathematics, Grade 9 Applied**  **MPM2D Principles of Mathematics, Grade 10 Academic**  **MFM2P Foundations of Mathematics, Grade 10 Applied** | |
| Curriculum Expectations | Learning Goals | |
| **MPM1D Analytic Geometry**  **Overall Expectation**  By the end of this course, students will:  • solve problems involving linear relations.  **Specific Expectation**  Using the Properties of Linear Relations to Solve Problems   * determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application.   **MFM1P Linear Relations**:  **Overall Expectation**  By the end of this course, students will:  • connect various representations of a linear relation, and solve problems using the representations.  **Specific Expectation**  Connecting Various Representations of Linear Relations and Solving Problems Using the Representations   * determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application   **MPM2D Analytic Geometry**:  **Overall Expectation**  By the end of this course, students will:  • model and solve problems involving the intersection of two straight lines  **Specific Expectation**  Using Linear Systems to Solve Problems   * solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method.   **MFM2P Modelling Linear Relations**:  **Overall Expectation**  By the end of this course, students will:  • solve systems of two linear equations, and solve related problems that arise from realistic situations.  **Specific Expectation**  Solving and Interpreting Systems of Linear Equations   * solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method.   **Mathematical Process Focus: Connecting:** students willmake connections among the mathematical concepts and procedures involved in linear relations, and relate mathematical ideas to situations or phenomena drawn from financial contexts. | At the end of this lesson, students will be able to:   * apply linear relationships and linear systems to solve problems (e.g., selecting payment options, justifying a financial situation); * reflect on solving linear systems as a method to inform and generalize decisions. | |
| Instructional Components and Context | | |
| Readiness Students can   * calculate a percentage * graph a linear relation from a table of values * identify some characteristics of a linear relation (e.g., initial value, y-intercept, rate of change) * create a table of values for a linear relation * interact positively within a small group situation  Terminology Linear relation  Scatter plot  Independent variable  Dependent variable  Graph of a line  Point of intersection  Salary  Commission | | Teacher’s Note The lesson times listed in this lesson are suggestions. Times will vary depending on the prior knowledge of your students with the concepts and/or ideas presented. Materials  * Black Line Masters Minds On: Employer 🡨🡪 Employee (BLM 3.1 – 3.3) * Black Line Masters Action!: I’m So Confused - Which Way to Choose? * Black Line Masters Consolidate: No Need to Guess! * Teacher Q & A * Select from: Graph paper   Graph Wipe Boards  Graphing calculators  Spreadsheet software |

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| **Minds On (15 - 25 minutes, depending on course)** | **Connections** |
| **Groups of 4 ⇒ Employers 🡪🡨 Employees**  Distribute BLM 3.1 – 3.3. Each group reads the two employment earning schedules on 3.1 and selects one of 5 questions to discuss. One student in the group acts as scribe using BLM 3.2. Allow 5 minutes. Then groups find another group that chose a different question and the groups share using BLM 3.3. Allow 5 minutes.  Students return to original groupings. Teacher leads class sharing, and may ask class to consider any questions that were not chosen. Teacher engages class in a discussion of what generates larger sales volume measured in dollars – inexpensive items (low $/sale but large number of sales) or expensive items (larger $/sale but fewer sales).  The groups work through Check Your Understanding on BLM 3.4 and BLM 3.5. Teacher leads sharing, noting students who require further support to understand salary/commission options. | **DIapplesmall**Students select from the questions provided to connect their knowledge to an area of interest  afl Teacher will identify students who have little understanding of salary versus commission as well as students for whom a percentage calculation is a challenge  aol Students have the opportunity to clarify their understanding during the Check Your Understanding  **DIapplesmall** Students who continue to struggle with the concept of commission or who are unable to perform earnings calculations will require support during the Action! |
| **Action! (35 - 40 minutes, may require a second period of class time)** |  |
| **Groups of 2 ⇒ I’m So Confused - Which Way to Choose?**  Distribute BLM 3.6 and 3.7. Students will look at the history of sales made by an employee, Kernan, who has to choose whether to continue with salary plus commission option or switch to a full commission option. They will suggest his best option using this information.  Students will create data for each option, graph each, and transfer the information onto a single grid. Students will revisit their recommendation in light of this new information. | *DIapplesmall*  Course distinctions and differentiating the task:  1. A table of Kernan’s remuneration under the two plans has been included on BLM 3.6. A teacher may elect to take more time and have students create the two remuneration column entries, either to gain more practice calculating percentages or to allow the students more time to discover the constant rate of change generated in the data. For this purpose, a copy of the table *without* the computations has been included in the Teacher Q & A as BLM 3.6 (Alternate).  2. The investigation of Kernan’s circumstances (BLM 3.6, BLM 3.7) may be excluded. A teacher of MPM2D may elect to go straight into the activities beginning at BLM 3.8 to BLM 3.12.  More details are available on Teacher Reference Sheet 1: Q&A pages 20 – 21 of this package. |

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| **Consolidation** **(10 - 15 minutes)** |  |
| **Individual ⇒ No Need to Guess!**  Distribute BLM 3.13. Students are given 1 – 2 minutes to compare their work on BLM 3.12. Teacher leads class discussion to extract key ideas: linear relation, difference in slope causes lines to intersect, identification of best plan depends on level of sales.  Students take home BLM 3.14 to practice graphing two linear relations where one is a constant relation and the other is a direct variation. Students use mathematics as a tool to help make financial decisions. Teacher will collect these the next day. | aol Assess students’ ability to solve this system. Some students may have progressed to solving this problem algebraically. |

**BLM 3.1: Employers and Employees**

A large electronics chain store, ZAP INC, offers its full-time employees two choices for the payment of their monthly income:

**Plan A**: Total earnings are based on a guaranteed salary of $250.00 every pay period (which is every two weeks) plus 2% commission on all pre-tax sales made during that pay period.

OR

**Plan B**: There is no guaranteed salary. Total earnings are based on 7% commission on all pre-tax sales made during the pay period.

All part-time employees are paid by Plan B.

Select one of the following questions to discuss in your group. Select one member to record your discussion on the next page.

1. What are the advantages to an employer for offering an employee a salary versus a commission?
2. What are the advantages to an employer for offering an employee a commission versus a salary?
3. Describe some characteristics of an employee who might choose Plan A.
4. Describe some characteristics of an employee who might choose Plan B.
5. Why does it make sense that part-time employees are paid by Plan B?

**BLM 3.2: Employers and Employees**

Our thinking about question #\_\_\_\_\_\_\_.

**BLM 3.3: Employers and Employees**

Now find a group that answered a different question. Share your reflections with each other. Record below any interesting things you heard from the other group and any new ideas you have about your own question after this discussion.

Return to your original groups.

**BLM 3.4: Employers and Employees: Check Your Understanding**

**Employees who go to work for ZAP are required to select one of the two options when they start working there. They are allowed to change payment plans once each year, on the anniversary of their employment.**

Read the following employee profiles. They are all excellent employees who are knowledgeable about the products sold in the store.

* Nathan is 16 and a full-time student, so he gets only 2 shifts of 8 hours each week. He gets a 40 minute break each shift (for which he is not paid). Nathan usually works in the entertainment department, which sells computer games, movies, and music CD’s.
* Raj is 22 and works at the store on a full-time basis, which means that he works 5 days for 8 hours a day, but 1 hour is his lunch break (for which he is not paid). Raj is assigned to work in different departments according to customer traffic on that day.
* Clarissa is 30 and works at the store on a full-time basis (5 days each week, 8 hours per day). However, she is training for a store manager position, so she is frequently busy with store management activities. This means that she does not spend as much time on the sales floor as her employees. She also has a 1 hour unpaid lunch break each day.
* Harpreet is 30 and she is also a full-time employee. She has worked at the store for 10 years. She specializes in computer hardware, and spends most of her time in the computer department.

With your group, make a recommendation as to which plan you think would be most appropriate for each of the four employees. Describe your thinking: What information are you using to make your decision? What additional information would you need to have in order to make a more informed decision?

**BLM 3.5: Employers and Employees: Check Your Understanding**

|  |  |  |
| --- | --- | --- |
| **EMPLOYEE** | **OUR**  **RECOMMENDATION** | **THINKING** |
| Nathan |  |  |
| Raj |  |  |
| Clarissa |  |  |
| Harpreet |  |  |

**BLM 3.6: I’m So Confused - Which Way to Choose?**

The company has another full time employee, Kernan, 22 years old. When he joined the company last year, he opted for Plan A. At that time, the guaranteed salary was important to help him plan a schedule of payments to pay off his student loans. He owed $2100 at that time.

Kernan kept track of his sales each pay period. He compiled all related sales and payment information into a spreadsheet.

He is approaching the anniversary of his employment and he needs to decide in the next week if he wants to continue on Plan A or switch to Plan B. He has a balance of $670 left on his student loan. He is considering switching to payment Plan B. What would you recommend?

|  |  |  |  |
| --- | --- | --- | --- |
| **PAY PERIOD** | **TOTAL AMOUNT OF**  **PRE-TAX SALES** | **Payment using**  **Plan A** | **Payment using**  **Plan B** |
| 1 | $1,820.01 | $286.40 | $127.40 |
| 2 | $3,867.82 | $327.36 | $270.75 |
| 3 | $3,041.59 | $310.83 | $212.91 |
| 4 | $7,821.00 | $406.42 | $547.47 |
| 5 | $3,688.22 | $323.76 | $258.18 |
| 6 | $8,890.77 | $427.82 | $622.35 |
| 7 | $4,903.65 | $348.07 | $343.26 |
| 8 | $9,614.03 | $442.28 | $672.98 |
| 9 | $11,928.74 | $488.57 | $835.01 |
| 10 | $6,489.39 | $379.79 | $454.26 |
| 11 | $8,010.32 | $410.21 | $560.72 |
| 12 | $12,862.54 | $507.25 | $900.38 |
| 13 | $11,096.95 | $471.94 | $776.79 |
| 14 | $10,055.57 | $451.11 | $703.89 |
| 15 | $16,672.89 | $583.46 | $1,167.10 |
| 16 | $17,119.54 | $592.39 | $1,198.37 |
| 17 | $10,894.62 | $467.89 | $762.62 |
| 18 | $19,352.24 | $637.04 | $1,354.66 |
| 19 | $12,733.73 | $504.67 | $891.36 |
| 20 | $20,927.76 | $668.56 | $1,464.94 |
| 21 | $14,033.66 | $530.67 | $982.36 |
| 22 | $18,720.06 | $624.40 | $1,310.40 |
|  | Total Earnings | $10,190.89 | $16,418.16 |

**BLM 3.6 (Alternate) I’m So Confused - Which Way to Choose?**

The company has another employee, Kernan. He is 22 and he works full time. When he joined the company last year, he opted for Plan A. At that time, the guaranteed salary was important to help him plan a schedule of payments to pay off his student loans. He owed $2100 at that time.

Kernan kept track of his sales each pay period. He compiled all related sales and payment information into a spreadsheet.

He is approaching the anniversary of his employment and he needs to decide in the next week if he wants to continue on Plan A or switch to Plan B. He has only $670 left in loans to pay off, so he is considering if he might be able to take the riskier Plan B. What would you recommend?

|  |  |  |  |
| --- | --- | --- | --- |
| **PAY PERIOD** | **TOTAL AMOUNT OF**  **PRE-TAX SALES** | **Payment using**  **Plan A** | **Payment using**  **Plan B** |
| 1 | $1,820.01 |  |  |
| 2 | $3,867.82 |  |  |
| 3 | $3,041.59 |  |  |
| 4 | $7,821.00 |  |  |
| 5 | $3,688.22 |  |  |
| 6 | $8,890.77 |  |  |
| 7 | $4,903.65 |  |  |
| 8 | $9,614.03 |  |  |
| 9 | $11,928.74 |  |  |
| 10 | $6,489.39 |  |  |
| 11 | $8,010.32 |  |  |
| 12 | $12,862.54 |  |  |
| 13 | $11,096.95 |  |  |
| 14 | $10,055.57 |  |  |
| 15 | $16,672.89 |  |  |
| 16 | $17,119.54 |  |  |
| 17 | $10,894.62 |  |  |
| 18 | $19,352.24 |  |  |
| 19 | $12,733.73 |  |  |
| 20 | $20,927.76 |  |  |
| 21 | $14,033.66 |  |  |
| 22 | $18,720.06 |  |  |

**BLM 3.7: I’m So Confused - Which Way to Choose?**

In your pairs, answer the following questions. Record your written answers in the space provided.

Do you think of Plan B is riskier for Kernan? Why or why not?

Which plan would you recommend to Kernan for the coming year? Explain your reasoning.

**BLM 3.8: I’m So Confused - Which Way to Choose?**

**Recall Plan A: Total earnings are based on a guaranteed monthly base salary of $250.00 every pay period (which is very two weeks) plus a 2% commission on all pre-tax sales made during that pay period.**

Complete the table of values for earnings for the pre-tax sales amounts shown.

|  |  |
| --- | --- |
| **Pre-tax sales ($)** | **Total earnings ($)** |
| 500 | $250 + 0.02(500) = $260.00 |
| 1000 |  |
| 1500 |  |
| 2000 |  |
| 2500 |  |
| 3000 |  |
| 3500 |  |
| 4000 |  |
| 4500 |  |
| 5000 |  |
| 5500 |  |
| 6000 |  |

**BLM 3.9: I’m So Confused - Which Way to Choose?**

Create a scatter plot to represent the data of Plan A on the grid below. Label the horizontal axis (independent variable) *“Kernan’s Sales ($)”* and the vertical axis (dependent variable) *“ Kernan’s Earnings ($) using Plan A”.*

Use a scale of $500 on the horizontal axis and a scale of $50 for the vertical axis.

Draw a line of best fit through the data points. What type of data is generated by Plan A? How do you know?



**BLM 3.10: I’m So Confused - Which Way to Choose?**

**Recall Plan B: There is no guaranteed salary. Total earnings are based on a 7% commission on all pre-tax sales made during the pay period.**

Complete the table of values for earnings for the pre-tax sales amounts shown.

|  |  |
| --- | --- |
| **Pre-tax sales ($)** | **Total earnings ($)** |
| 500 | 0.07(500) = $35.00 |
| 1000 |  |
| 1500 |  |
| 2000 |  |
| 2500 |  |
| 3000 |  |
| 3500 |  |
| 4000 |  |
| 4500 |  |
| 5000 |  |
| 5500 |  |
| 6000 |  |

**BLM 3.11: I’m So Confused - Which Way to Choose?**

Create a scatter plot to represent the data of Plan B on the grid below. Label the horizontal axis (independent variable) *“Kernan’s Sales ($)”* and the vertical axis (dependent variable) *“ Kernan’s Earnings ($) using Plan B”.*

Use a scale of $500 on the horizontal axis and a scale of $50 for the vertical axis.

Draw a line of best fit through the data points. What type of data is generated by Plan B? How do you know?

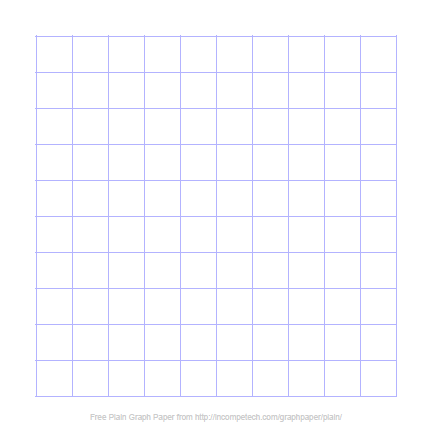


**BLM 3.12: I’m So Confused - Which Way to Choose?**

Transfer the two lines you drew on the previous two grids onto this grid. Label each line by its correct plan name (Plan A or Plan B).

Compare the two lines. What do you notice?

How can you tell, by looking at your graph, which plan is better and under what circumstances? Explain.



Would you reconsider your recommendation to Kernan? Explain.

**BLM 3.13: No Need to Guess!**

On the graph below, label the line that represents Plan A and the line that represents Plan B.



Looking at the graph, at what range of sales would an employee need to have so that Plan A would be the better choice? Plan B?

**BLM 3.14: No Need to Guess! Name:**

**Bring your work and your answer to class tomorrow.**

a) Jesse has to choose between two job offers selling insurance products. Company A pays their new sales agents a salary of $31 000 for their first year (while they are training on the job), then moves them to a commission schedule after the first year. Company B offers no fixed salary, but has a commission rate of 20% of the value of the sales.

How much would Jesse have to sell in his first year in order for him to make more money working for Company B?

b) Reflect on your personal career and financial goals. Which payment option would work best for you? Explain your reasoning.

**Teacher Reference Sheet 1: Q&A**

1. In what courses can I use this lesson?

This lesson was designed to be usable in MPM1D, MFM1P, MPM2D, and MFM2P. Because each course has an expectation that students solve a system of two linear equations graphically, the lesson can be integrated into each course. However, the purpose and placement of the lesson differs from course to course.

1. What expectations are covered by this lesson?

**MPM1D and MFM1P**

**MPM1D** The Analytic Geometry strand has the Specific Expectation: *By the end of the course, students will determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application (****Sample problem:*** *A video rental company has two monthly plans. Plan A charges a flat fee of $30 for unlimited rentals; Plan B charges $9, plus $3 per video. Use a graphical model to determine the conditions under which you should choose Plan A or Plan B.).*

**MFM1P** This course has the same specific expectation in the Linear Relations strand.

**MPM2D and MFM2P**

**MPM2D** The Analytic Geometry strand has the Specific Expectation: *By the end of this course, students will solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method (****Sample problem:*** *The Robotics Club raised $5000 to build a robot for a future competition. The club invested part of the money in an account that paid 4% annual interest, and the rest in a government bond that paid 3.5% simple interest per year. After one year, the club earned a total of $190 in interest. How much was invested at each rate? Verify your result.).*

**MFM2P** The Modeling Linear Relations strand has the Specific expectations: *By the end of this course, students will solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method (****Sample problem:*** *Maria has been hired by Company A with an annual salary, S dollars, given by S = 32 500 + 500a, where a represents the number of years she has been employed by this company. Ruth has been hired by Company B with an annual salary, S dollars, given by S = 28 000 + 1000a, where a represents the number of years she has been employed by that company. Describe what the solution of this system would represent in terms of Maria`s salary and Ruth`s salary. After how many years will their salaries be the same? What will their salaries be at that time?).*

1. Where does this lesson belong in my courses?

In MPM1D and MFM1P, this lesson is designed to follow an extensive exploration of graphing linear relations. Before leaving this topic, students are to extend their learning by looking at the solution of a system of two linear equations in two variables from a graphing only perspective and interpret the meaning of the point of intersection of two lines that simultaneously represent the relationship between the same two variables. This continues into the Analytic Geometry strand in MPM2D and Modelling Linear Relations strand in MFM2P, in which students revisit graphing solutions, but are introduced to algebraic methods of solution. This lesson consolidates the linear relations (1D and 1P) and analytic geometry (1D only) expectations of constructing a table of values, graphing a scatter plot, identifying the meaning of properties of a linear relation from a realistic situation (including constant rate of change, initial value, direct and partial variation, restrictions on a variable (MPM1D only)). It could serve as an assessment for learning or an assessment of learning activity.

In MPM2D, this lesson is designed to be used at the start of the linear systems unit of the Analytic Geometry strand. This lesson would effectively identify where students are starting with respect to their understanding of linear relations and their level of readiness for the new unit.

In MFM2P, this lesson would serve to consolidate the *Graphing and Writing Equations of Lines* specific expectations of the Modeling Linear Relations strand of the course, just before moving into the *Solving and Interpreting Systems of Linear Equations* set of specific expectations. As for MPM2D, it offers an assessment for learning opportunity for students and teachers to determine a student’s level of readiness to proceed to systems of two linear equations.

1. What options do I have for delivering this lesson?

There are many opportunities in this lesson to use available technologies. Spreadsheets, graphing calculators, and graphing software are all options. However, none of these is necessary. A student having access to spreadsheet software, for example, could use it to calculate Kernan’s pay. However, it can be done by hand. The same is true of the graphing. If a teacher feels that software is a better option for the students and that the students are able to create an algebraic representation of the linear functions, Plan A and Plan B, then the instruction could easily be changed. The option of doing everything by hand was built into the lesson to accommodate classrooms that do not have access to these technological supports.

The lesson plan indicates where teachers may alter the delivery of the lesson based on which of the four courses they are teaching:

Course distinctions:

A table of Kernan’s remuneration under the two plans has been included in the lesson (BLM 3.6). A teacher may elect to take more time and have students create the two remuneration column entries, either to gain more practice calculating percentages or to allow the students more time to discover the constant rate of change generated in the data. For this purpose, a copy of the table *without* the computations has been included in the Teacher Q & A as BLM 3.6 (Alternate).

The investigation of Kernan’s circumstances (BLM 3.6, BLM 3.7) may be excluded. A teacher of MPM2D may elect to go straight into the general cases (beginning at BLM 3.8 to BLM 3.12).

**Teacher Reference Sheet 2 Answers for table on BLM 3.8**

|  |  |
| --- | --- |
| **Pre-tax sales ($)** | **Total earnings ($)** |
| 500 | $250 + 0.02(500) = $260.00 |
| 1000 | $270.00 |
| 1500 | $280.00 |
| 2000 | $290.00 |
| 2500 | $300.00 |
| 3000 | $310.00 |
| 3500 | $320.00 |
| 4000 | $330.00 |
| 4500 | $340.00 |
| 5000 | $350.00 |
| 5500 | $360.00 |
| 6000 | $370.00 |

**Teacher Reference Sheet 3 Answers for table on BLM 3.10**

|  |  |
| --- | --- |
| Pre-tax sales ($) | Total earnings ($) |
| 500 | 0.07(500) = $35.00 |
| 1000 | $70.00 |
| 1500 | $105.00 |
| 2000 | $140.00 |
| 2500 | $175.00 |
| 3000 | $210.00 |
| 3500 | $245.00 |
| 4000 | $280.00 |
| 4500 | $315.00 |
| 5000 | $350.00 |
| 5500 | $385.00 |
| 6000 | $420.00 |

**BLM 3.6 (Alternate) I’m So Confused - Which Way to Choose?**

The company has another employee, Kernan. He is 22 and he works full time. When he joined the company last year, he opted for Plan A. At that time, the guaranteed salary was important to help him plan a schedule of payments to pay off his student loans. He owed $2100 at that time.

Kernan is wise about his personal finances, so he kept track of his sales each pay period. He compiled all his information into a spreadsheet.

He is approaching the anniversary of his employment and he needs to decide in the next week if he wants to continue on Plan A or switch to Plan B. He has only $670 left in loans to pay off, so he is considering if he might be able to take the riskier Plan B. What would you recommend?

|  |  |  |  |
| --- | --- | --- | --- |
| **PAY PERIOD** | **TOTAL AMOUNT OF PRE-TAX SALES** | **Plan A** | **Plan B** |
| 1 | $1,820.01 |  |  |
| 2 | $3,867.82 |  |  |
| 3 | $3,041.59 |  |  |
| 4 | $7,821.00 |  |  |
| 5 | $3,688.22 |  |  |
| 6 | $8,890.77 |  |  |
| 7 | $4,903.65 |  |  |
| 8 | $9,614.03 |  |  |
| 9 | $11,928.74 |  |  |
| 10 | $6,489.39 |  |  |
| 11 | $8,010.32 |  |  |
| 12 | $12,862.54 |  |  |
| 13 | $11,096.95 |  |  |
| 14 | $10,055.57 |  |  |
| 15 | $16,672.89 |  |  |
| 16 | $17,119.54 |  |  |
| 17 | $10,894.62 |  |  |
| 18 | $19,352.24 |  |  |
| 19 | $12,733.73 |  |  |
| 20 | $20,927.76 |  |  |
| 21 | $14,033.66 |  |  |
| 22 | $18,720.06 |  |  |