**Instructions:** The following problems are either direct copies of problems from activities and exit slips or slight modifications of problems from activities and exit slips. The activity or exit slip that each problem came from has been included in case you wish to return to the given activity sheet or exit slip. Only problems for Unit 1 through Unit 4 have been included. Unit 4 problems are only from Investigations 4.1 and 4.2. If your class has gone beyond Investigation 4.3, you should supplement this review sheet with additional problems.

**Activity 1.2.6 Problems**

Indicate whether the following situations can be represented by repeated addition or repeated multiplication.

1. Your phone bill has a charge of $29.95 and an extra $0.10 per minute for the *n* minutes you went over your plan. Write an expression for the cost of your phone bill if you exceed your plan by *n* minutes.
2. You put the wrong soap in the dishwasher, and strange things happened. Your dishwasher started with 150 bubbles, and for *n* minutes, the number of bubbles tripled each minute. Write an expression for the number of bubbles in your dishwasher after *n* minutes.

**Activity 1.2.7 Problems**

1. Your boss just gave your team the following data on a new cup design. Your job is to determine the heights of cartons that would hold stacks of 25, 50, and 100 cups.

|  |  |
| --- | --- |
| **# of Cups** | **Height of Stack (cm)** |
| 1 | 14.2 |
| 2 | 14.8 |
| 3 | 15.4 |
| 4 | 16.0 |
| 5 | 16.6 |

1. Write a rule and a formula that model the boss’s data, using n for the number of cups and H for the height of the stack.

Rule:

Formula:

1. Find the stack height for 25 cups.
2. Find the stack height for 50 cups.
3. Find the stack height for 100 cups.

**Activity 1.3.1 Problems**

1. You bring $20 to a carnival to buy tickets for an arcade game. You spend $1.50 for each ticket. You play the game several times until you win.
2. Complete the table below by identifying the amount of money you have left after buying tickets for different numbers of games.

|  |  |  |
| --- | --- | --- |
| **Games** | **Amount of Money** | **Recursive Pattern** |
| 0 | 20.00 | 20.00 |
| 1 | 18.50 | 20.00 – 1.50 |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |

1. What is a recursive rule for the sequence of amounts?
2. Write an explicit rule for the sequence of amounts. Let *a* represent the amount of money you have left and *g* represent the number of games.

1. How much money do you have left after 8 games?
2. You buy an Xbox 360 game system for $250 and you spend $50 for each additional game.
3. Complete the table below by identifying the total cost for the Xbox 360 and the indicated number of games.

|  |  |  |
| --- | --- | --- |
| **Games** | **Total Cost** | **Recursive Pattern** |
| 0 | 250 | 250 |
| 1 | 300 | 250 + 50 |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |

1. What is a recursive rule for the sequence of total costs?
2. Write an explicit rule for the sequence of total costs. Let *t* represent the total costs and *g* represent the number of video games purchased.
3. What is the total cost if you buy 10 games?
4. Identify a recursive rule and an explicit rule for the sequence: 2, 5, 8, 11, …
5. Identify a recursive rule and an explicit rule for the sequence: 12, 7, 2, -3,…

**Activity 1.4.2 Problems**

1. You drop a ball from the bleachers that are 16 feet high. Each time the ball bounces, the height decreases by half of the previous height. After 1 bounce, the height of the ball is 8 feet.
2. Complete the table below by identifying height of the ball after each bounce.

|  |  |  |
| --- | --- | --- |
| **Bounces** | **Height** | **Recursive Pattern** |
| 0 | 16 | 16 |
| 1 | 8 | 16 ( 1/2 ) |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |

1. What is the recursive rule for the sequence of heights?
2. Graph the relationship between the ball’s height and the number of bounces on the coordinate plane below. Label and scale the axes appropriately.



1. Write an explicit rule for the sequence of heights. Let *h* represent the height of the ball after each bounce and let *b* represent the number of the bounce.

1. Find the height of the ball after the 11th bounce.

**Activity 1.4.3 Problems**

1. Congratulations! You have just won first prize in a poetry writing contest. If you take the $100 you won and invest it in a mutual fund earning 4.5% interest per year, about how long will it take for your money to triple?
2. You open up a new investment account and make an initial deposit of $1,200. Your account earns 3.6% interest per year. How long will it take for your money to double?
3. You have a choice. You can be paid $300 up front for working for a family friend for two weeks (14 days). Or, you can be paid a penny on the first day, and each day after your payment will double. (2 pennies on the second day, 4 pennies on the third day, etc.) What payment plan is best? Explain your answer.
4. John’s current salary is $40,000 per year. His annual pay raise is always a percent of his salary. What would his salary be if he received four consecutive 2.4% pay increases?

**Exit Slip 1.2.2 Problems**



**Exit Slip 1.2.3 Problems**

Simplify each expression.

16. 2(*x* + 2 + 3*x* ) – 4 17. 3*x*2 + 2*x* – 4(1 – 2*x*2 + 4)

18. –*x* + 4*x* + 2*x*2 – 3 19. 4*x*2 + 5(2 – 3*x* + *x*2) – 3(7 + *x*)

**Exit Slip 1.5 Problem**

1. A circle is drawn as shown below. Stage 1 has 4 circles created around the previous stage. Stage 2 has 4 circles drawn around each of the circles created in the previous stage.

**Stage 0**  **Stage 1** **Stage 2**

1. How many circles are created in Stage 3?
2. How many circles are created in Stage 4?

**Activity 2.1.2 Problems**

1. Let’s now convert stories to mathematical expressions. Given the story on *x*, write a mathematical expression that describes the story. Use *x* to represent the unknown number.
2. Multiply a number by 7, and then add 2.
3. Add 14 to a number and then multiply the sum by – 3.
4. Subtract a number from 12.
5. Subtract 4 from a number.
6. Now define the function using your expression from **part (a)** above.
7. Using your function, find .
8. Using your function, find .
9. Using your function, find .

**Activity 2.2.4 Problems**

1. In 2010, Connecticut was the 7th highest state in the nation in per pupil spending. Connecticut’s per pupil spending from 2005 to 2010 can be described by the mathematical model

where *P* is Connecticut’s elementary-secondary per pupil spending and *t* is the number of years since 2005.

* 1. Use the formula to estimate Connecticut’s per pupil spending in 2010.
  2. Use the formula to predict Connecticut’s per pupil spending in 2014.
  3. When will per pupil spending in Connecticut reach $18,000? Identify the actual year.
  4. We can also express the relationship between year and per pupil spending as a function:

, where *t* is the number of years since 2005

Why is the relationship a function?

* 1. Find . What does your answer mean in terms of this problem?
  2. Explain the meaning of the sentence: .

**Activities 2.3.4, 2.4.5a, 2.4.8 Problems**

Solve the following equations. Show your work below each equation. Check your solution.

1. 4*c* + 8*c* = –55 + 3*c*
2. 4*f* – 24 + 4*f* = –8 – 3
3. 5*w* – 7 = 2*w* + 1

1. *x* + 6*x* + 49 = 2(5*x* + 59)
2. 3(11 + 6*y)* – 8*y* = –3

1. 8*w* – 5(5*w* – 8) = 13 + 5*w*
2. 
3. 
4. A health club charges non-members $2 per day to use all the facilities and $5 per day for aerobics classes. Members pay a yearly fee of $200 plus $3 per day for aerobic classes. You plan to take an aerobics class each time you go to the gym. Write and solve an equation to find the number of days you must use the club to justify a yearly membership*. Hint: Find the number of times for which the two plans would cost the same.*

**Exit Slip 2.3.1 Problem**

1. Mrs. Fox wants to take her children to Hartford Stage to see a play. Tickets cost $55 per person, there is a handling fee of $2.00 per ticket and a parking voucher will cost $6.50. If she spends $405.50 for tickets, handling fees, and parking, how many tickets did she buy?

Define your variables, write an equation, and solve it to determine the number of tickets that Mrs. Fox bought.

**Activity 2.4.10 Problem**

1. Chantal has just been hired to run a new movie theater. It is a really special one because of its design. Each row has three more seats in it than the row before it. As Chantal was walking through the theater, she noticed that row 20 had exactly 65 seats in it. Using this information, can you tell how many seats are in the first row?

**Exit Slip 2.4.3 Problem**

1. The Harris family has been saving $400 for each of their sons for college every year since they were born. The family has saved $8,800 so far. If Tyrone is 2 years older than Jamal, how old is each boy?

**Activity 2.5.1 Problems**

1. The equation relates the amount of money in an account, *A*, with the principal amount invested *P*, simple interest rate *r*, and length of the investment, *t*. Solve this literal equation for *r* and then solve it for *t*.
2. An interesting geometric formula is . This formula gives you the total angle measure, *S*, of a regular polygon with *n* sides. Suppose you googled cool math terms and found that the sum of the angles of a hendecagon is 1620. Unfortunately, your computer crashed before you were able to see how many sides a hendecagon has. How could you use the formula to find the answer? Briefly explain your thinking.

**Activity 2.5.2 Problems**

1. Solve for *a.*
2. Solve for *h.*
3. Solve for *w.*
4. Solve for *y.*

**Activity 2.6.1 Problems**

Graph each situation on the number line.

1. To serve as president of the United States you must be at least 35 years old.



1. To compete in the junior Olympics you must be under 17 years of age.



1. For Thanksgiving dinner we will need a turkey weighing more than 20 pounds.



1. At the amusement park, only children less than 48 inches tall may use the kiddie cars.



1. If you want to ride the roller coaster your height must be 54 inches or more.



1. To be eligible to vote your age must be greater than or equal to 18 years.



**Activity 2.6.2 Problems**

1. Explain the difference between an equation and an inequality.
2. How many solutions does an equation have?
3. How many solutions does an inequality have?
4. **5 < *x***
5. What does 5 < *x* mean?
6. Is 4 ½ a possible solution for *x*? Why / why not?
7. Is 5 a possible solution for *x*? Why / why not?
8. Is 5 ½ a possible solution for *x*? Why / why not?
9. Write another inequality that looks different than 5 < *x* but *means the same thing.*



1. Graph the solution on a number line.

**Activity 2.6.6 Problems**

1. (a) Solve: (b) Solve:



**Activity 2.6.8 Problems**

1. Chloe and Charlie are taking a trip to the pet store to buy some things for their new puppy. They know that they need a bag of food that costs $7, and they also want to buy some new toys for the puppy. They find a bargain barrel containing toys that cost $2 each.
2. Write an expression for the amount of money they will spend if they purchase a bag of food and *t* toys.
3. Together, Chloe and Charlie can spend no more than $40. Use this information and the expression you wrote in part (a) to write an inequality for finding the number of toys they can buy.
4. Solve the inequality and graph the solution on the number line below.
5. Explain what the graph of the solution means?
6. Valley Video charges a $15 annual membership fee plus $3 for each movie rental. Tanya puts aside $100 for renting movies for the year. How many movies can Tanya rent from Valley Video? Use an inequality to solve this problem. Graph your solution on the number line and explain the meaning of your graph in a sentence.

**Activity 3.1.2 Problems**

1. Identify whether or not each relation is a function.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | –2 | –1 | 0 | 1 | –2 |
| ***y*** | 4 | –1 | 3 | 2 | 1 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | –2 | –1 | 0 | 1 | 2 |
| ***y*** | 0 | 5 | 6 | 0 | 3 |

(a) (b)

(c)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **State** | Maine | New Hampshire | Vermont | Massachusetts | Rhode Island | Connecticut |
| **Capital** | Augusta | Concord | Montpelier | Boston | Providence | Hartford |

**3**

**1**

**2**

**–12**

**6**

**24**

**6**

**3**

**9**

**4**

**–9**

**0**

(d) (e)

(f) {(2, 3), (4, 3), (-1, 0), (6, 1), (-2, 8)}

(g) {(3, 4), (5, -2), (7, -1), (3, 2), (1, 5)}

1. Determine the domain and range of each relation above.
2. Identify whether or not each graph represents a function.

|  |  |
| --- | --- |
| (a) | (b) |
| (c) | (d) |

1. Determine the domain and range of each relation above.

**Activity 3.2.3 Problems**

1. The median age of the U.S. population has been increasing since 1850.

The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a function of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. The amount of points scored by a player depends upon the number of baskets she makes.

The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a function of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. The independent variable is the gender of your teacher and the dependent variable is the subject they teach. Is this relationship a function? Explain your response.
2. The independent variable is the length of the side of a cube and the dependent variable is the volume of the cube. Is this relationship a function? Explain your response.
3. The independent variable is a student’s age and the dependent variable is the number of siblings the student has. Is this relationship a function? Explain your response.
4. . on? Explain your response. cribe whether a real world relationship is a function or not.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_12. 12The independent variable is time and the dependent variable is the world population. Is this relationship a function? Explain your response.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. The independent variable is the day of the year and the dependent variable is the time of low tide on that day of the year. Is this relationship a function? Explain your response. | |  |  |  |  |  | | --- | --- | --- | --- | --- | | **High & Low Tides at Old Saybrook, CT**  November 2012 | | | | | | Day | Low | High | Low | High | | **Tues 13** | 2:50 AM | 9:12 AM | 3:38 PM | 9:38 PM | | **Wed 14** | 3:40 AM | 10:02 AM | 4:28 PM | 10:29 PM | | **Thurs 15** | 4:31 AM | 10:55 AM | 5:20 PM | 11:24  PM | |

**Activity 3.3.1 Problem**

1. Functions may be defined by algebraic rules. Suppose *f(x)*, *g(x)*, and *h(x)* are defined as follows:
2. For the function *f*, when the input is 6, the output is \_\_\_\_\_.
3. For the function *g*, when the input is –5, the output is \_\_\_\_\_\_.
4. For the function *h*, when the input is 2, the output is \_\_\_\_\_\_.
5. Find *f*( –3).
6. Find *g*(7).
7. Find *h*(7).
8. Fill in the tables below:

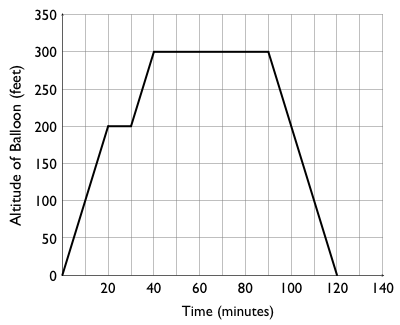
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *x* | *f*(*x*) |  | *x* | *g*(*x*) |  | *x* | *h*(*x*) |
| -3 |  |  | -3 |  |  | -3 |  |
| -2 |  |  | -2 |  |  | -2 |  |
| -1 |  |  | -1 |  |  | -1 |  |
| 0 |  |  | 0 |  |  | 0 |  |
| 1 |  |  | 1 |  |  | 1 |  |
| 2 |  |  | 2 |  |  | 2 |  |
| 3 |  |  | 3 |  |  | 3 |  |

1. Describe any patterns you see in the tables above.
2. Does *f*(*x*) mean *f* “times” *x*? Explain.

**Activity 3.3.4 Problem**

1. The graph below shows the altitude during a hot air balloon ride with Berkshire Balloons. The altitude of the hot air balloon is a function of time.

**Hot Air Balloon**



1. Find the domain and range of the function graphed above.

Domain: Range:

1. Find *ƒ*(30) and explain what it means in the context of the problem.
2. If *ƒ*(*x*) = 100, find all values of *x* and explain what they mean in the context of the problem.
3. When is the balloon at 200 feet?
4. For how long are you flying at an altitude at or above 200 feet?
5. If *ƒ*(*x*) = 300, find all values of *x*.

**Exit Slip 3.3.1 Problem**

1. Timmy gets paid $20.00 to baby-sit plus $5.00 for every room he cleans, ***r***, at his Aunt’s house. His total payment, ***P***, is represented by the equation .
2. Write the equation in function notation.
3. Find *P*(4).
4. What does *P*(4) mean in the context of the problem?
5. Find the value of *r* which satisfies the equation *P*(*r*) = 35.
6. What does the solution of the equation *P*(*r*) = 35 mean in the context of the problem?

**Exit slip 3.3.2 Problem**

1. Riot signed up with an online music-sharing network. The network charges customers $25.00 per month but pays customers $0.02 for every song that they upload from their music collection. Riot’s monthly cost, *C*, depends on the number of songs that he uploads during the month, *s*, and is represented by the equation .
2. Write the equation in function notation.
3. Find *C*(200).
4. What does this mean in the context of the problem?
5. Find the value of *s* which satisfies the equation *C*(*s*) = $12.08.
6. What does the solution of the equation *C*(*s*) = $12.08 mean in the context of the problem?
7. How many songs would Riot have to upload in a month in order for his membership to be free?

**Activity 3.3.4a Problem**

1. Ben’s free throw follows a curved path. It goes up and then comes back down. The height of the ball ***h*** (in meters) at time ***t*** (in seconds) is given by the equation .

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Independent variable: 2. Dependent variable: 3. Use function notation to express the function: 4. We can say \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is   a function of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.   1. Find the height of Ben’s shot after 2.5 seconds. Use function notation. 2. Find the time it takes for Ben’s shot to be 10 meters above ground. 3. What are the domain and range of this function? 4. Describe the shape of this graph. Use the Parent Function Reference Sheet. | Complete the table below:   |  |  | | --- | --- | | **Time**  **(seconds)** | **Height (meters)** | | 0 |  | | .5 |  | | 1 |  | | 1.5 |  | | 2 |  | | 2.5 |  | | 3 |  |   Graph the function on the axes below.  Scale and label the axes.  C:\Users\TRAVEL\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\G5RXD1SG\highway version c.png |

**Activity 3.4.9 Problem**

1. The table below shows first-class mail postage charges based on the weights of **large envelopes**.

|  |  |
| --- | --- |
| **Large Envelopes** | |
| **Weight, *w***  **(in ounces)** | **Postage charged**  **(in $)** |
|  | 0.90 |
|  | 1.10 |
|  | 1.30 |
|  | 1.50 |
|  | 1.70 |
|  | 1.90 |
|  | 2.10 |

*Source: USPS.com, April 2012*

The relationship between postage charge and weight is a function. This particular function is an example of a **step function**.

1. Identify the independent variable.
2. Identify the dependent variable.
3. If your letter weighs 1.8 oz. the postage charge is \_\_\_\_\_.
4. If your letter weights 4.3 oz. the postage charge is \_\_\_\_\_.
5. If your letter weighs 5 oz. the postage charge is \_\_\_\_\_.
6. If your letter weighs 6.6 oz, the postage charge is \_\_\_\_\_.
7. Is weight a function of postage charge? *Hint*: Look at your answers from question (4) and question (5).

**Activity 4.1.3 Problems**

1. Describe what’s happening in the following distance-time graphs. Include values!

|  |  |
| --- | --- |
| (a) | (b) |

**Activity 4.2.1 Problems**

Solve the following problems by finding the circumference and area of different sizes of pizzas.

1. Complete the table below using the formula:

|  |  |
| --- | --- |
| **Radius (inches)** | **Circumference (inches)** |
| 8 |  |
| 12 |  |
| 16 |  |
| 20 |  |

1. Plot the data from the table above on the coordinate plane below. Label and scale the axes.



1. Is there a linear relationship between the circumference of a pizza and the radius? Explain.

**Activity 4.2.2 Problems**

1. Determine if the table represents a linear function.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 5 | 4 | 3 | 2 | 1 |
| ***y*** | 0 | -1 | -2 | -3 | -4 |

(Yes / No) Why?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 0 | 5 | 10 | 20 | 30 |
| ***y*** | 18 | 14 | 10 | 2 | –6 |

(Yes / No) Why?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | -4 | -2 | 0 | 2 | 4 |
| ***y*** | 3 | 6 | 11 | 18 | 27 |

(Yes / No) Why?

**Activity 4.2.2 Problems**

1. Determine if each table represents a linear function. Explain why or why not.

Comment on between coordinate pairs.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 0 | 2 | 4 | 6 | 8 |
| ***y*** | 0 | -4 | -16 | -36 | -64 |

Linear Function (Yes / No)

Why?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | -5 | 0 | 5 | 10 | 15 |
| ***y*** | 20 | 17 | 14 | 11 | 8 |

Linear Function (Yes / No)

Why?

**Activity 4.2.6 Problem**

1. The pool is full of water. It is the end of the summer and you need to drain the pool in preparation for winter weather. When the drain is open, **500 gallons flow out every minute**.The amount of gallons of water in the pool is a function of the time (in minutes) it is draining.
2. What is the independent variable?
3. What is the dependent variable?
4. Complete the table. *(Note that time is increasing by 10 minute increments)*.

|  |  |
| --- | --- |
| **Time (in minutes)**  ***x*** | **Water in Pool (in gal.)**  ***y*** |
| 0 |  |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |
| 70 |  |
| 80 |  |

1. Use the table to answer the following questions.

(A) As the time increases, what happens to the amount of water in the pool; does it increase or decrease?

1. Use the table to find how much the amount of water in the pool changes every 10 minutes.
2. How long will it take the pool to drain completely? Explain your reasoning.
3. In this situation does it make sense to have a negative number in the second column? Explain.
4. Which of the following would be a reasonable domain for this function?
5. 0 gallons – 37,500 gallons
6. 0 minutes – 75 minutes
7. {0, 10, 20, 30, 40, 50, 60, 70, 80}
8. Which of the following would be a reasonable range for this function?
9. 0 gallons – 37,500 gallons
10. 0 minutes – 75 minutes
11. {-2500, 2500, 7500, 12500, 17500, 22500, 27500, 32500, 37500}