Jump, Frog, Jump

Freddie, the frog, loves to jump! Today he has decided to put numbers on the lily pads in the pond and do a lot of jumping.

1. If Freddie starts on zero, jumps to the right and takes hops of size 1, what numbers will he land on?

2. If he starts on zero, jumps to the right and takes hops of size 2, what numbers will Freddie land on?

3. If Freddie starts on 1, jumps to the right and takes hops of size 2, what numbers will he land on?

4. If Freddie starts on 5, jumps to the right and takes hops of size 4, what numbers will he land on?

Discuss the problems with your partners!

TC _____

5. If Freddie starts on 3, jumps to the right and takes hops of size 2, where will he land on the 7^{th} hop?

   Prediction:

   Landing:

6. If he starts on 4, jumps to the right and takes hops of size 2, where will Freddie land on the 7^{th} hop?

   Prediction:

   Landing:

7. If Freddie starts on 2, jumps to the right and takes hops of size 3, where will he land on the 7^{th} hop?

   Prediction:

   Landing:

8. Can you figure out a mathematical shortcut to predict where Freddie, the frog, will land on the 7^{th} hop?

9. If he starts on 3 and takes hops of size 2, Freddie will land on _____ on the 7^{th} hop.

   Shortcut method:

   Test your prediction!

   Test your shortcut again

10. If he starts on 1 and takes hops of size 3, Freddie will land on _____ on the 7^{th} hop.

    Shortcut method:

Discuss the problems with your partners!

TC _____

11. What about the 10^{th} hop? If Freddie starts on 0 and takes hops of size 2, where will he land on the 10^{th} hop?

    Prediction:

    Landing:

12. If Freddie starts on 5 and takes hops of size 3, where will he land on the 10^{th} hop?

    Prediction:

    Landing:

    Can you figure out a mathematical shortcut to predict where he will land? on the 10^{th} hop?

    Shortcut:

13. If he starts on 1 and takes hops of size 2, Freddie will land on _____ on the 10^{th} hop.

Discuss the problems with your partners!

TC _____

14. Answer Freddie's question: How many hops can I take if before landing on 11 if I start on 3 and take hops of size 2?

15. If Freddie starts on 7 and takes a hop size of 3, what are the hops he can take and still be on a lily pad less than 21?

16. If Freddie starts on 5 and takes hops of size 4, how many hops does it take to land on a lily pad more than 18?

17. Freddie has a new problem. This time he wants to predict how many hops it will take him to get to a particular lily pad. If he starts on 5 and takes hops of size 2, how many hops will it take to get to 13?

18. If Freddie starts on 3 and takes hops of size 4, how many hops will it take to get to 23?

19. If Freddie starts on 2 and takes hops of size 3, how many hops will it take to get to 20?

20. Can you find a mathematical shortcut to predict the number of hops to take to land on a certain number?

    Shortcut:

21. If Freddie starts on 3 and takes hops of size 2, he will have to take _____ hops to land on 19.

22. Test your shortcut again.

    Shortcut:

23. If Freddie starts on 4 and takes hops of size 3, he will have to take _____ hops to land on 25.

Discuss the problems with your partners!

TC _____

24. If he starts on -6 and takes steps of +2, where will Freddie land?

Hop #	Landing
0	
1	
2	
3	
4	
5	

25. If he starts on 11 and takes steps of -4, where will Freddie land?

Hop #	Landing
0	
1	
2	
3	
4	
5	

26. Given the following landings, determine where Freddie would have to start and the hop size he would have to take.

Hop #(X)	Landing (Y)
0	
1	19
2	17
3	15
4	13
5	11

Start: _____

Hop Size: _____

27. Given the following landings, determine where Freddie would have to start and the hop size he would have to take.

Hop #(X)	Landing (Y)
0	
1	1
2	4
3	7
4	10
5	13

Start: _____

Hop Size: _____

28. Use your calculator to draw a scatterplot for the points in the table in problem 20. Using "Guess and Check", find the equation for the line that passes through all of the points in your scatterplot.

start: _____ hop size: _____ equation: _____

29. Use your calculator to draw a scatterplot for the points in the table in problem 21. Using "Guess and Check", find the equation for the line that passes through all of the points in your scatterplot.

start: _____ hop size: _____ equation: _____

Use the Table function on the calculator to see if you equation contains all of Freddie's ordered pairs.

30. Describe the relationship between the Start number, the Hop Size, and the Equation.

Discuss the problems with your partners!

TC _____

31. Predict the equation that would pass though these points

X	Y
0	
1	9
2	12
3	15
4	18
5	21

Equation: _____

Explain how you know that your equation works:

32. Predict the equation that would pass though these points

X	Y
0	
1	9
2	7
3	5
4	3
5	1

Equation: _____

Explain how you know that your equation works:

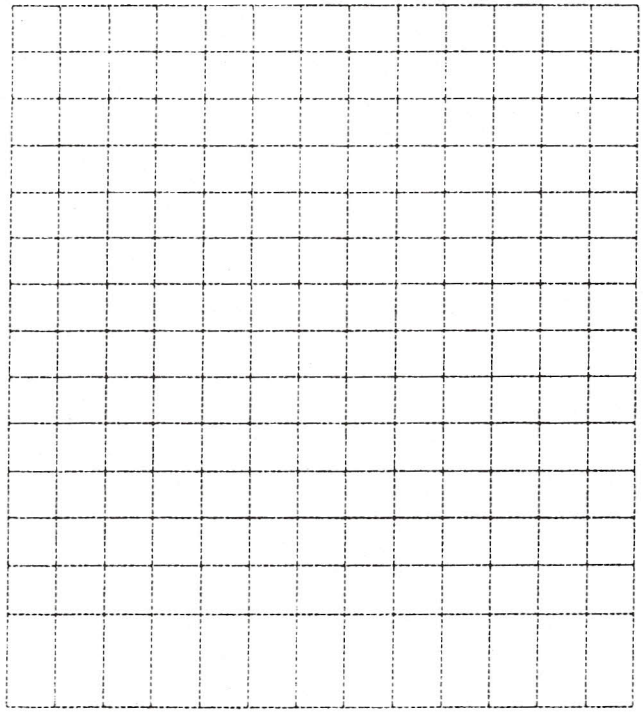
33. Freddie has a challenge for you. He has decided to start at -5 and take hops of size 3. Your job is to show the table, the set of ordered pairs, the graph, and the equation.

Hop #	Landing

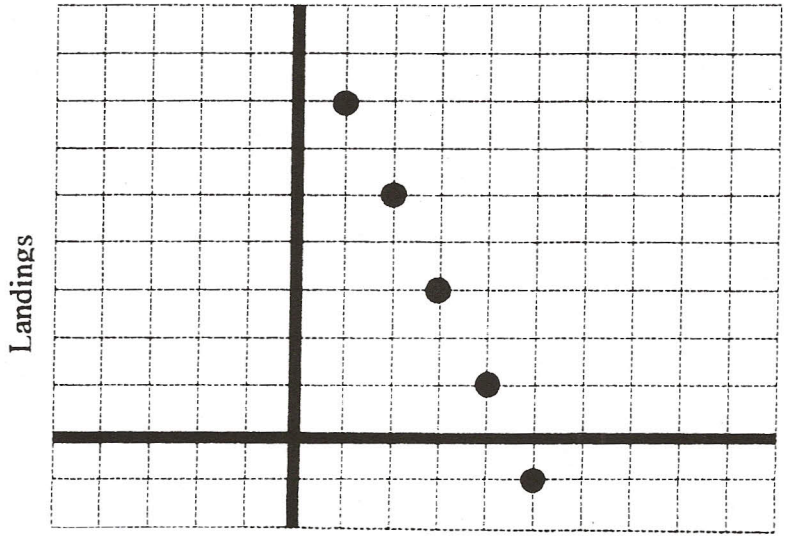
Ordered Pairs:

Equation:

_____



34. Last week, Freddie created this graph by hopping on the lily pads. Find the hop size, where he started from and the equation.



Hop Size:

Start:

Equation:

Jump, Frog, Jump Extension—Systems

There were two frogs, Freddie and Johnnie. Johnnie challenged Freddie to a race. Both frogs always hopped at the same time, but Freddie hopped 2 lily pads at a time and Johnnie hopped 3 lily pads at a time. Johnnie wanted to race (he thought he was faster), but Freddie did not want to compete. Freddie said that he would race as long as he could get a head start. So, Johnnie agreed that Freddie could start at lily pad 1. Johnnie started at the -2 lily pad. The finish line is lily pad number 10.

1. Did the frogs ever land on the same lily pad at the same time? If so, which lily pad?

2. What happened before the frogs landed on the same lily pad—who was ahead?

3. After landing on the same lily pad, the frogs jumped again. Now, which frog moved ahead?

   Why?

4. Which frog will reach the finish first? Justify your answer.

5. Where could we move the finish lily pad so that Freddie will win? Explain.

6. Design a race so that the frogs have different hop sizes but land on the finish at the same time.

7. Design a race so that the frogs meet on lily pad 14.

8. Freddie starts at -7 and takes hops of size 4. Johnnie starts at -4 and takes hops of size 3. When and where will Freddie and Johnnie land on the same pad at the same time?

9. Verify your response to question 8 by completing these tables:

Freddie

Hop #	Landing
1	
2	
3	
4	
5	

Johnnie

Hop #	Landing
1	
2	
3	
4	
5	

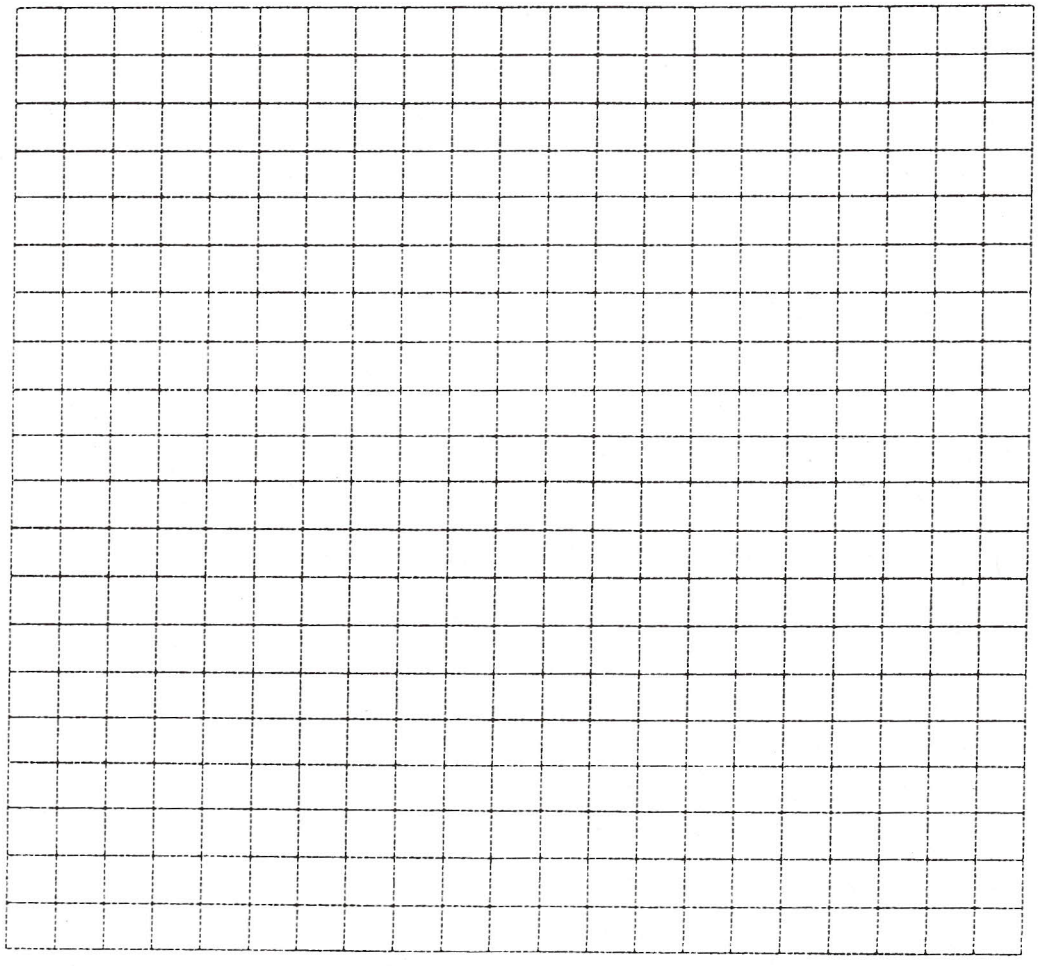
Discuss with your partners how this verifies where and when Freddie and Johnnie have landed on the same pad at the same time.

TC _____

10. *Write a rule in terms of Hop # (X) and Landing (Y) for Freddie's moves.*

11. Write a rule in terms of Hop # (x) and Landing (y) for Johnnie's moves.

12. On the same grid, graph both Freddie's and Johnnie's rules.



13. Determine the point on the graph where the two graphs intersect.

Discuss with your partners the meaning of the coordinates of this point in terms of Hop # and Landing as you compare the coordinates of this point to your response to problem # 8.

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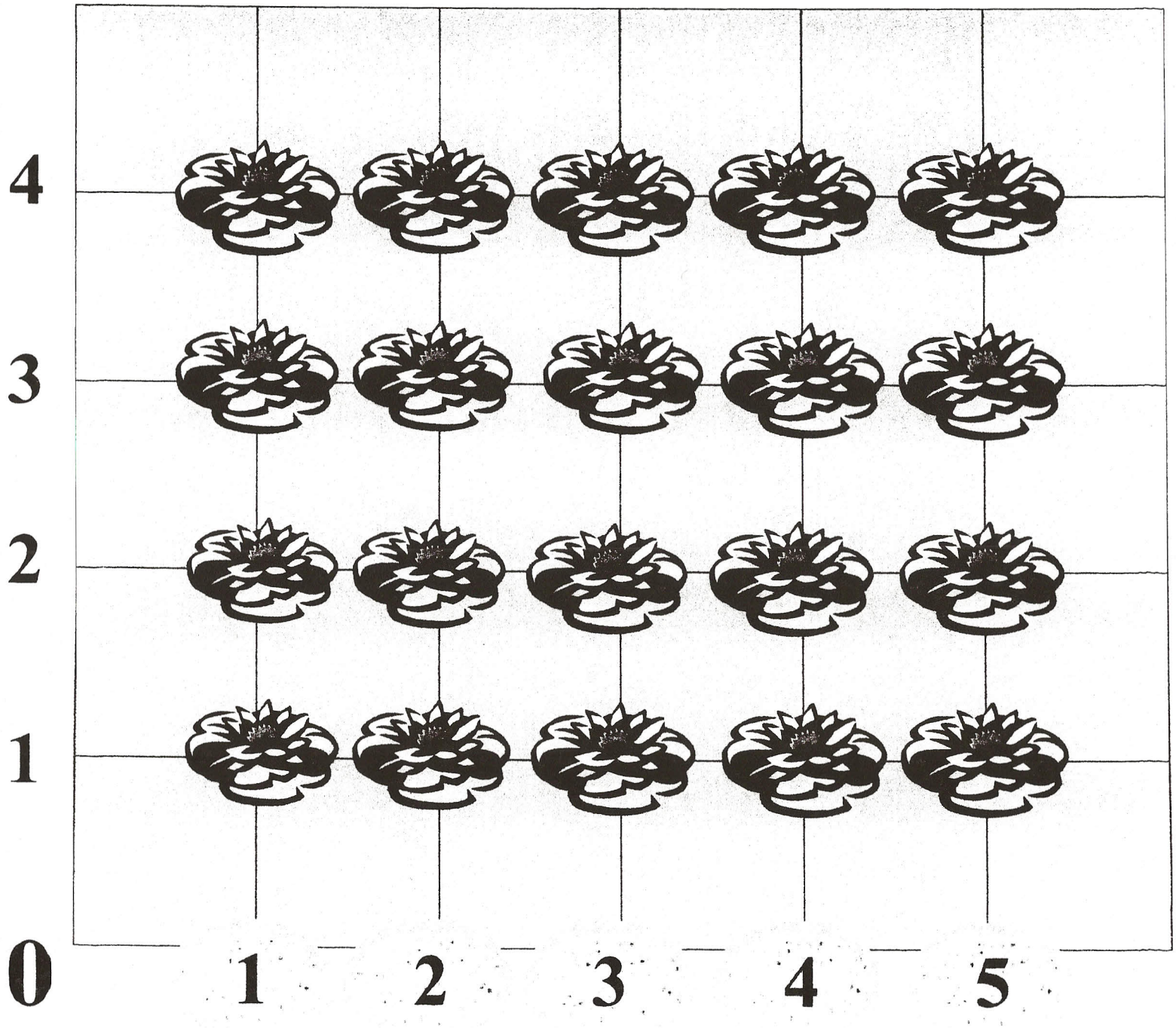
4
3
2
1
0
1
2
3
4
5