

Number Cube Game

You and your partner will each roll a number cube 20 times. Before you begin, each of you will predict the sum of the 2 cubes that will come up most often. Who had the best prediction? Based on knowledge from the first game, make your predictions and play the game again.

Grade Levels Pre-K-2

Number Cube Game

You and your partner will each roll a number cube 20 times. Before you begin, each of you will predict the sum of the 2 cubes that will come up most often. Who had the best prediction? Based on knowledge from the first game, make your predictions and play the game again.

Context

This task was presented to first grade students who had been studying sums to 12. These students had little experience with problem solving and the topic of probability.

What This Task Accomplishes

This task will assess student competence in addition facts to 12. The task will also act as a pre-assessment on student knowledge of probability concepts. The task will also introduce students to recording data on charts and graphs and using graphs to draw conclusions.

What the Student Will Do

Students will work in partners, first making a prediction of the sum that will come up most often on the number cubes. Students will then toss the number cubes 20 times and record their sums in a chart. The students will then translate their chart to a graph and determine who is the "winner" of game number one. Students will hopefully use the information gathered throughout this experimental probability experiment to make a more informed prediction for game number two. Students are encouraged to make mathematically relevant comments and observations about the solution and process.

Time Required for Task

45 minutes

Interdisciplinary Links

This task can be tied to a unit on games, or fairs and carnivals.

Teaching Tips

To help students understand the task, I modeled the game with a student volunteer in front of the class. The student and I each picked a sum we thought would be most probable. We rolled the number cubes 20 times and students in the class took turns figuring the sums. The sums were recorded on a piece of chart paper that took on the same format as the student

Exemplars

worksheet. Then the sums were translated onto a graph and students analyzed the graph to determine a winner, as well as practice making relevant mathematical observations about the data. Students then chose partners and went off on their own to complete the activity. To assist students in better seeing the experimental probability with a more accurate sample size, students could combine their sums on a class graph that should better reflect the theoretical probability. Teachers may also want to take the opportunity to discuss which number cube combinations result in which sums and which sums have the most combinations.

Suggested Materials

- Number cubes (two per student)
- Worksheets provided (see pages 5-8)

Note: Students will need copies of pages two and three for game number two as well.

Possible Solutions

The sum of seven theoretically has the most probable chance of occurring, although experimental probabilities will vary, especially due to sample size.

Benchmark Descriptors

Novice

The Novice may or may not have correctly found the sums of the number cubes and may incorrectly fill out the chart. The Novice will transfer the sums to the graph and determine who won. On game number two the Novice will not use information gained from game number one to make a prediction. The student's "I noticed..." statements are rudimentary. Little or no language of probability is used to communicate.

Apprentice

The Apprentice may make some flaws when determining the sums of the number cubes, but will correctly fill out the chart. The Apprentice will transfer the sums to the graph and determine who won. On game number two, the student begins to show signs of basing a prediction on the mathematical experiment in game number one. The student's "I noticed..." statements begin to become analytical in nature. A little probability terminology may be used by the Apprentice.

Practitioner

The Practitioner accurately determines the sums on the number cubes and correctly fills out the chart and graph. On game number two, the student bases a prediction on the mathematical experiment in game number one. The student's "I noticed..." statement shows evidence of understanding the underlying concepts of probability. Some probability terminology will be used by the Practitioner.

Expert

The Expert accurately determines the sums on the number cubes and correctly fills out the

Exemplars

chart and graph. On game number two, the student bases a prediction on the mathematical experiment in game number one. The student's "I noticed..." statement shows evidence of understanding the underlying concepts of probability and of statistics, as well as makes other mathematically relevant comments or observations. The Expert will use the language of probability and statistics to communicate ideas.

Exemplars

Page 1

Number Cube Game #1 Worksheet

I think the sum of ____ will come up most often.

My partner thinks the sum of __ will come up most often.

The winner of game #1 is _____

The winner's sum of ____ came up ____ out of 20 times.

I noticed... _____

Exemplars

Page 2

Number Cube Game Record

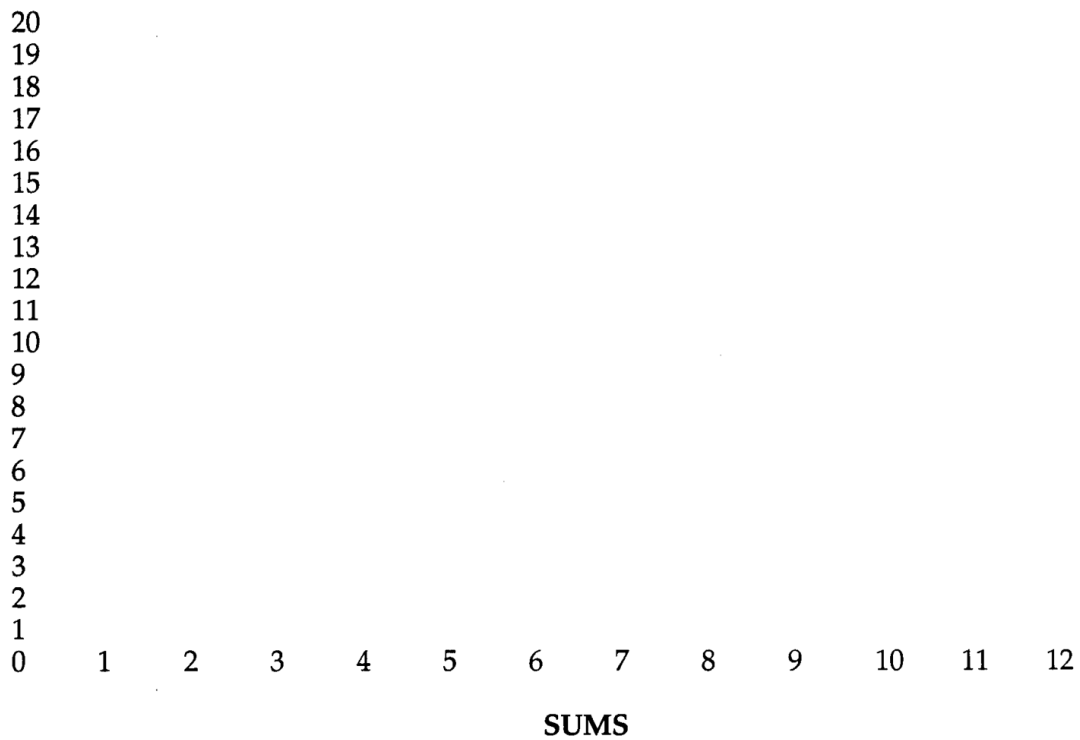
Roll #	Number Cube 1	+	Number Cube 2	=	Sum
1			+		=
2			+		=
3			+		=
4			+		=
5			+		=
6			+		=
7			+		=
8			+		=
9			+		=
10			+		=
11			+		=
12			+		=
13			+		=
14			+		=
15			+		=
16			+		=
17			+		=
18			+		=
19			+		=
20			+		=

Exemplars

Page 3

Number Cube Game #1

Number of Times Sum Comes Up



Exemplars

Page 4

Number Cube Game #2

This time I think the sum of ____ will come up most often this time because...

My partner thinks the sum of ____ will come up most often this time.

The winner of game #2 is _____

The winner's sum of ____ came up ____ out of 20 times.

I noticed... _____

Exemplars

Novice

Number Cube Game #1

I think the sum of 12 will come up most often.

My partner thinks the sum of ~~12~~⁹ will come up most often.

The winner of game #1 is Kesha

The winner's sum of 9 came up 4 out of 20 times.

I noticed...

311 57 680 9

Student states results of the experiment.

Exemplars

Novice

Dice Game Record

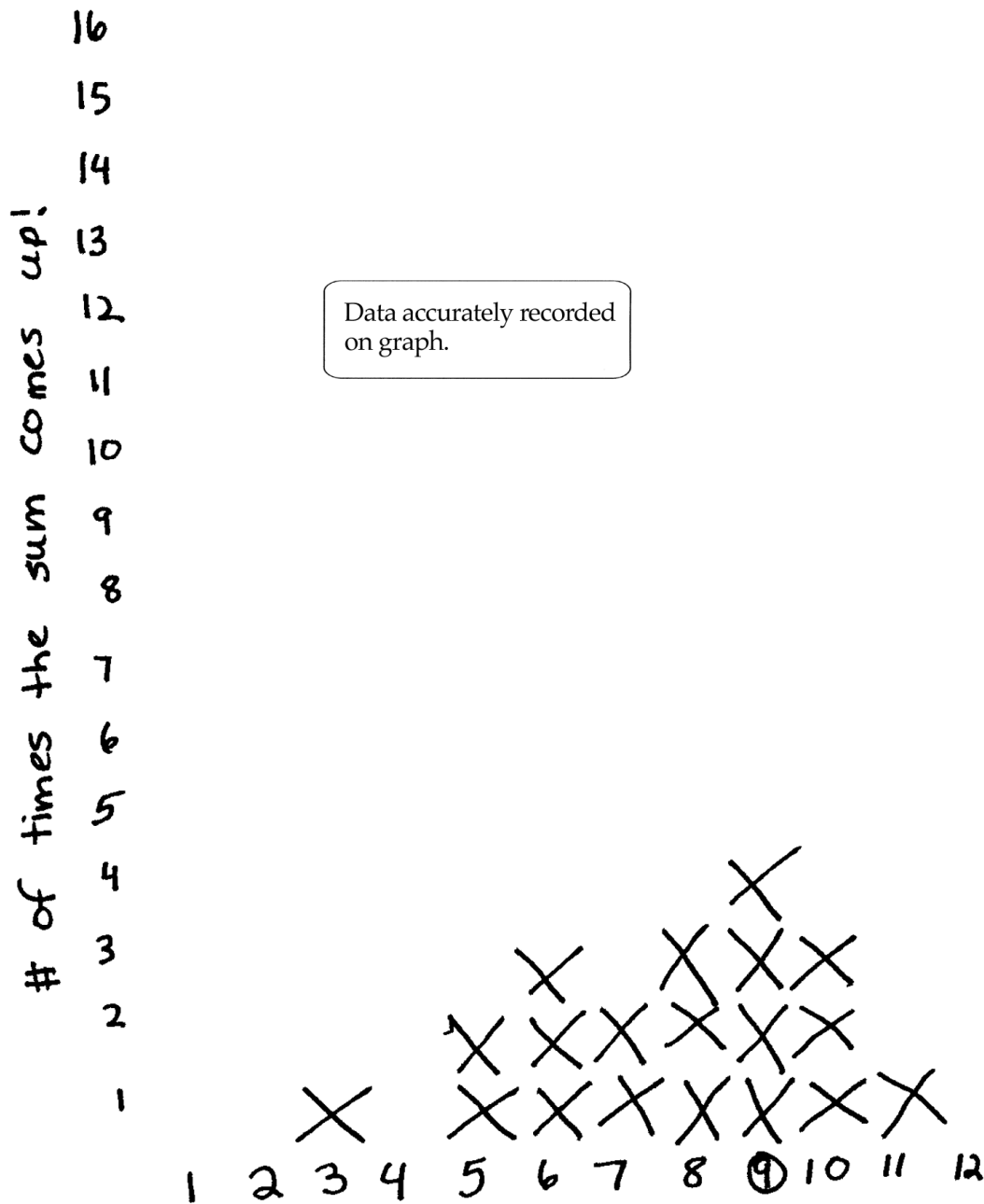
Roll #	Dice 1	+	Dice 2	=	Sum
1	5	+	2	=	7
2	6	+	4	=	10
3	6	+	2	=	8
4	5	+	5	=	10
5	5	+	1	=	6
6	1	+	5	=	6
7	6	+	5	=	11
8	3	+	6	=	9
9	5	+	1	=	6
10	5	+	1	=	6
11	2	+	1	=	3
12	5	+	3	=	8
13	3	+	3	=	6
14	3	+	6	=	9
15	4	+	5	=	9
16	6	+	4	=	10
17	6	+	2	=	8
18	5	+	3	=	8
19	3	+	6	=	9
20	4	+	3	=	7

Data is accurately recorded on chart and results of computation are correct.

Exemplars

Novice

The Dice Game



Exemplars

Novice

This time I think the sum of 10 will come up most often this time because... it is my favorite number

My partner thinks the sum of 9 will come up most often this time.

The winner of game #2 is Kesha

The winner's sum of 10 came up 1 out of 20 times.

I noticed... _____

Student does not use results from first experiment to base second prediction.

7 M O t 5 2 M O t
1 4 1 1

2 6 8 1 2 1 1 0 P 1 2

Student is able to draw conclusions about the data.

Exemplars

Novice

Sums are correct and accurately recorded.

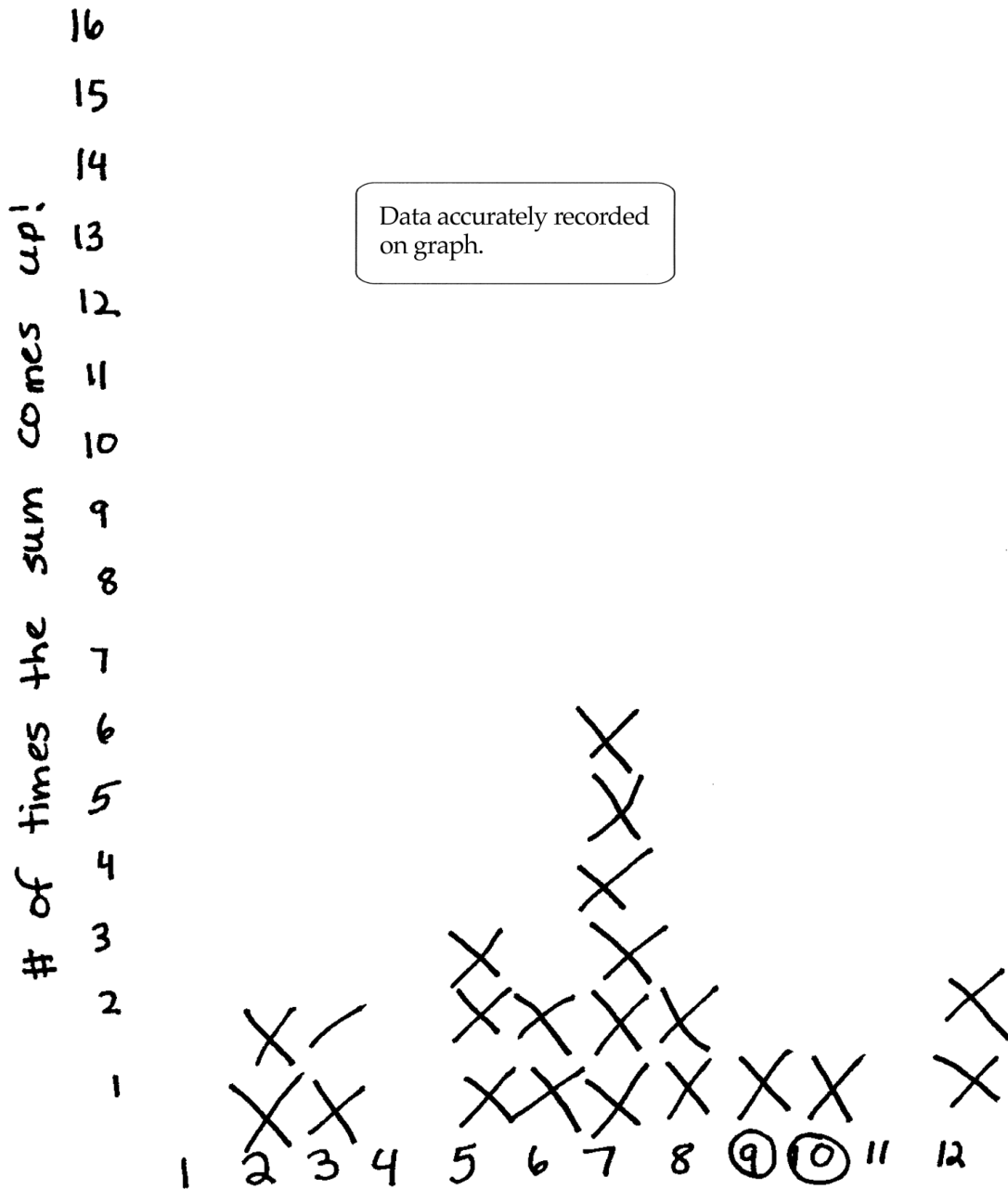
Game Record

	Dice 1	+	Dice 2	=	Sum
2	1	+	4	=	5
3	6	+	3	=	9
4	2	+	3	=	5
5	4	+	2	=	6
6	1	+	2	=	3
7	6	+	4	=	10
8	2	+	5	=	7
9	5	+	3	=	8
10	1	+	5	=	6
11	4	+	1	=	5
12	3	+	4	=	7
13	6	+	1	=	7
14	1	+	2	=	2
15	5	+	6	=	7
16	6	+	6	=	11
17	5	+	1	=	7
18	1	+	2	=	2
19	5	+	5	=	7
20	3	+	6	=	8
	6	x		=	12

Exemplars

Novice

The Dice Game



Exemplars

Apprentice

Number Cube Game #1

I think the sum of 12 will come up most often.

My partner thinks the sum of 4 will come up most often.

The winner of game #1 is Bo

The winner's sum of 4 came up 2 out of 20 times.

I noticed...

8

It is unclear what the student notices about "8".

Exemplars

Apprentice

Dice Game Record

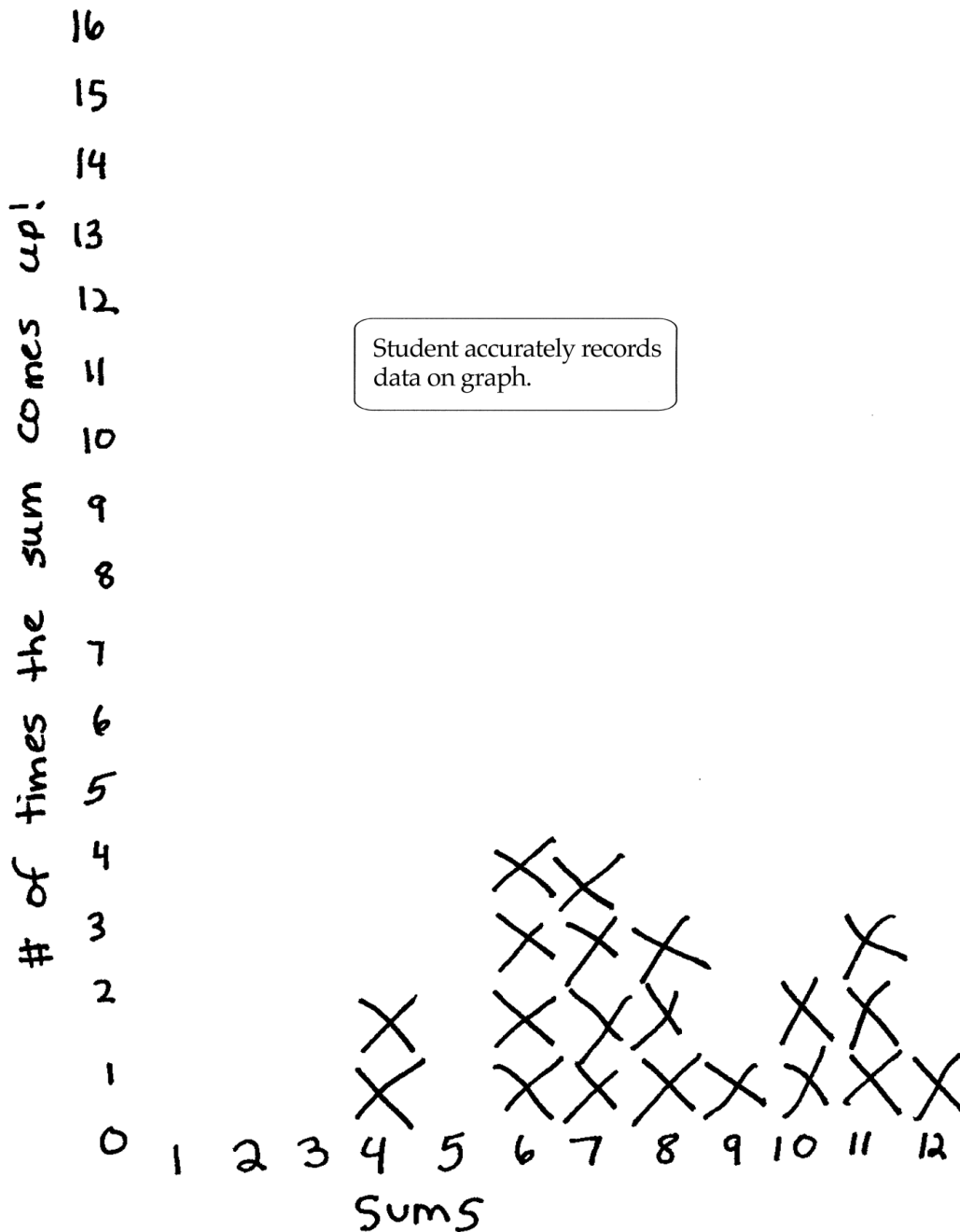
Roll #		Dice 1	+		Dice 2	=		Sum
1		4	+		6	=		10
2		4	+		2	=		6
3		6	+		5	=		11
4		3	+		6	=		9
5		6	+		1	=		7
6		5	+		3	=		8
7		4	+		4	=		8
8		3	+		1	=		4
9		1	+		5	=		6
10		1	+		6	=		7
11		1	+		6	=		7
12		6	+		5	=		11
13		1	+		5	=		6
14		1	+		5	=		6
15		1	+		5	=		6
16		6	+		1	=		7
17		6	+		5	=		11
18		6	+		4	=		10
19		6	+		6	=		12
20		6	+		2	=		8

Student accurately records facts on chart, although there is an error.

Exemplars

Apprentice

The Dice Game



Exemplars

Apprentice

Number Cube Game #2

This time I think the sum of 11 will come up most often this time because... HAS 3

My partner thinks the sum of 4 will come up most often this time.

The winner of game #2 is Both

The winner's sum of 4 came up 11 out of 20 times.

I noticed... 8 HAS the same

Here the student shows some evidence of basing prediction on results of game number where 11 came up three times.

Again, it is unclear what the student is referring to here.

Exemplars

Apprentice

Dice Game Record

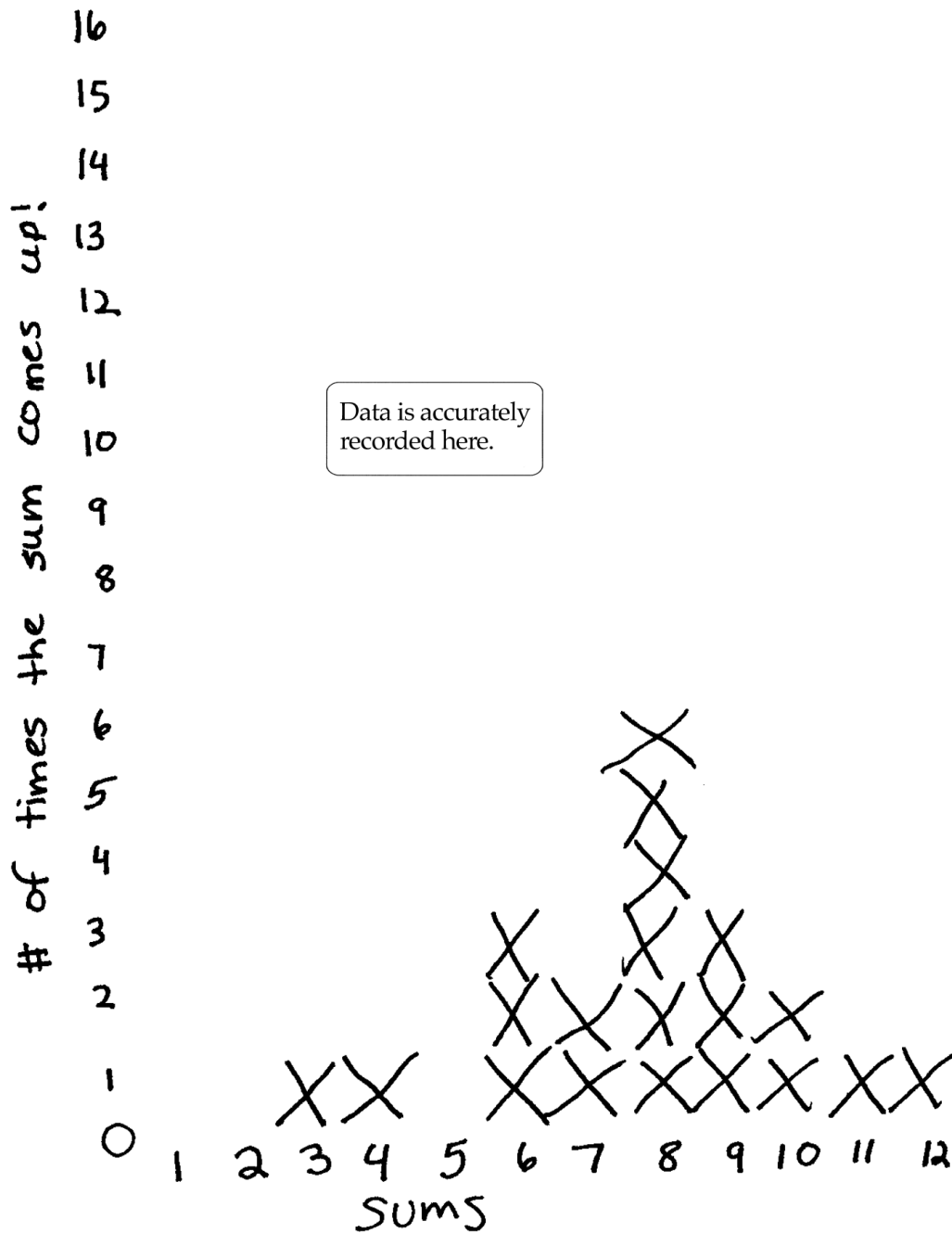
Roll #	Dice 1	+	Dice 2	=	Sum
1	5	+	5	=	12
2	4	+	2	=	6
3	5	+	4	=	9
4	2	+	3	=	7
5	5	+	2	=	7
6	3	+	4	=	6
7	6	+	4	=	10
8	2	+	6	=	8
9	6	+	2	=	8
10	6	+	2	=	8
11	4	+	2	=	6
12	2	+	3	=	5
13	3	+	5	=	8
14	4	+	3	=	7
15	2	+	5	=	7
16	6	+	5	=	11
17	5	+	4	=	9
18	5	+	1	=	6
19	5	+	2	=	7
20	6	+	2	=	8

This data is accurately recorded, although student has difficulty writing numbers.

Exemplars

Apprentice

The Dice Game



Exemplars

Practitioner

Student makes a relevant comment.

Number Cube Game #1

I think the sum of 7 will come up most often.

My partner thinks the sum of 4 will come up most often.

The winner of game #1 is Tom

The winner's sum of 7 came up 3 out of 20 times.

I noticed...

I didnt Like Math but this was fun. 10 came up alot.

Exemplars

Practitioner

Data accurately recorded, with a few computational errors.

Dice Game Record

Roll #	Dice 1	+	Dice 2	=	Sum
1	4	+	6	=	16
2	3	+	5	=	8
3	2	+	1	=	3
4	2	+	1	=	3
5	4	+	6	=	10
6	3	+	1	=	6
7	4	+	3	=	7
8	5	+	1	=	5
9	4	+	1	=	5
10	3	+	4	=	8
11	5	+	1	=	6
12	4	+	6	=	10
13	2	+	1	=	3
14	4	+	3	=	7
15	6	+	2	=	8
16	5	+	3	=	8
17	5	+	3	=	5
18	4	+	6	=	10
19	2	+	5	=	7
20	4	+	6	=	10

Exemplars

Practitioner

Number Cube Game #2

This time I think the sum of 10 will come up most often this time because... Last time it won

My partner thinks the sum of 10 will come up most often this time.

The winner of game #2 is 10

The winner's sum of 10 came up 2 out of 20 times.

Student bases prediction on results of last experiment.

I noticed... _____

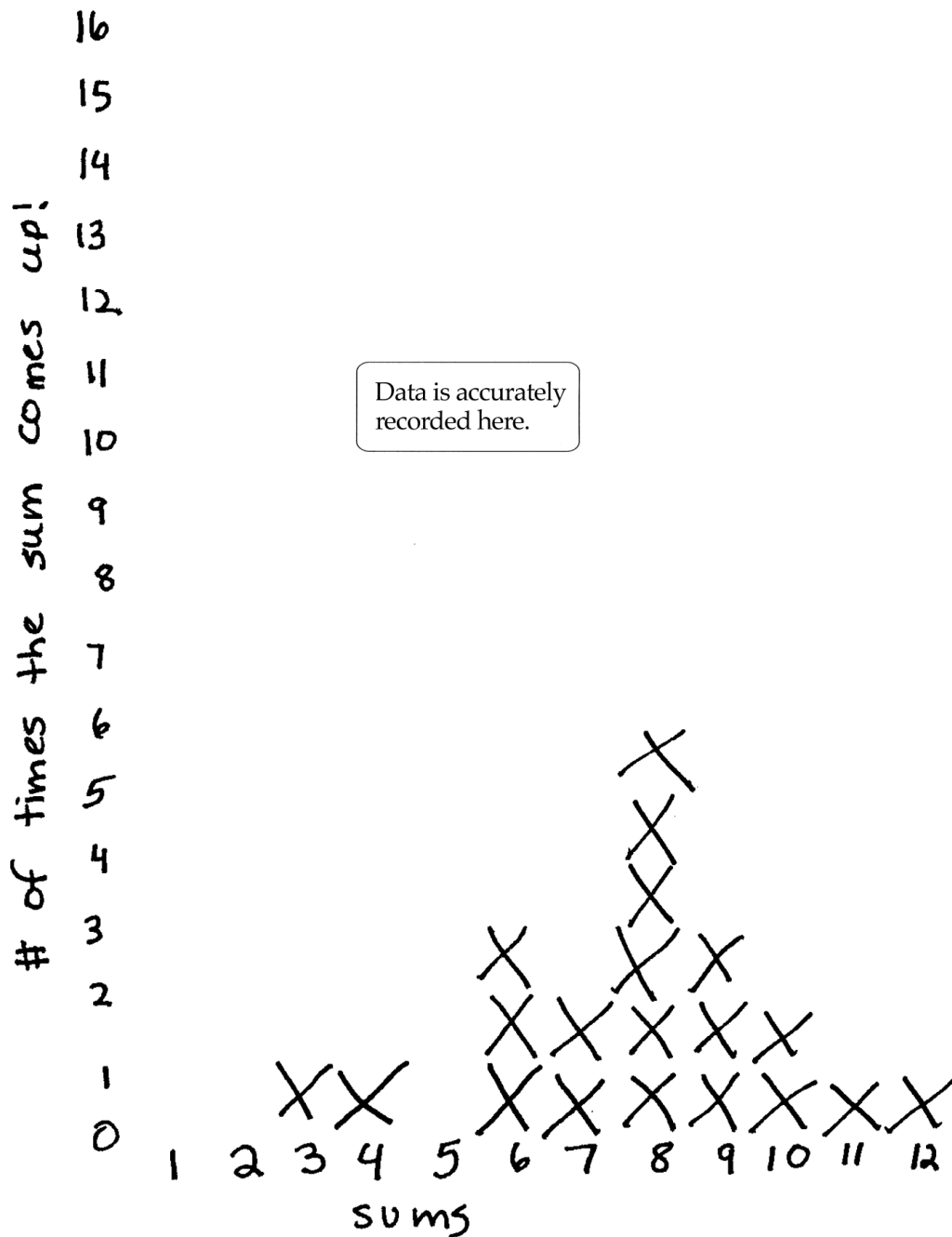
"I could have been the winner if I picked 7 again 4 got more this time than last time. You never know if you're going to win."

Student makes a profound statement about probability.

Exemplars

Practitioner

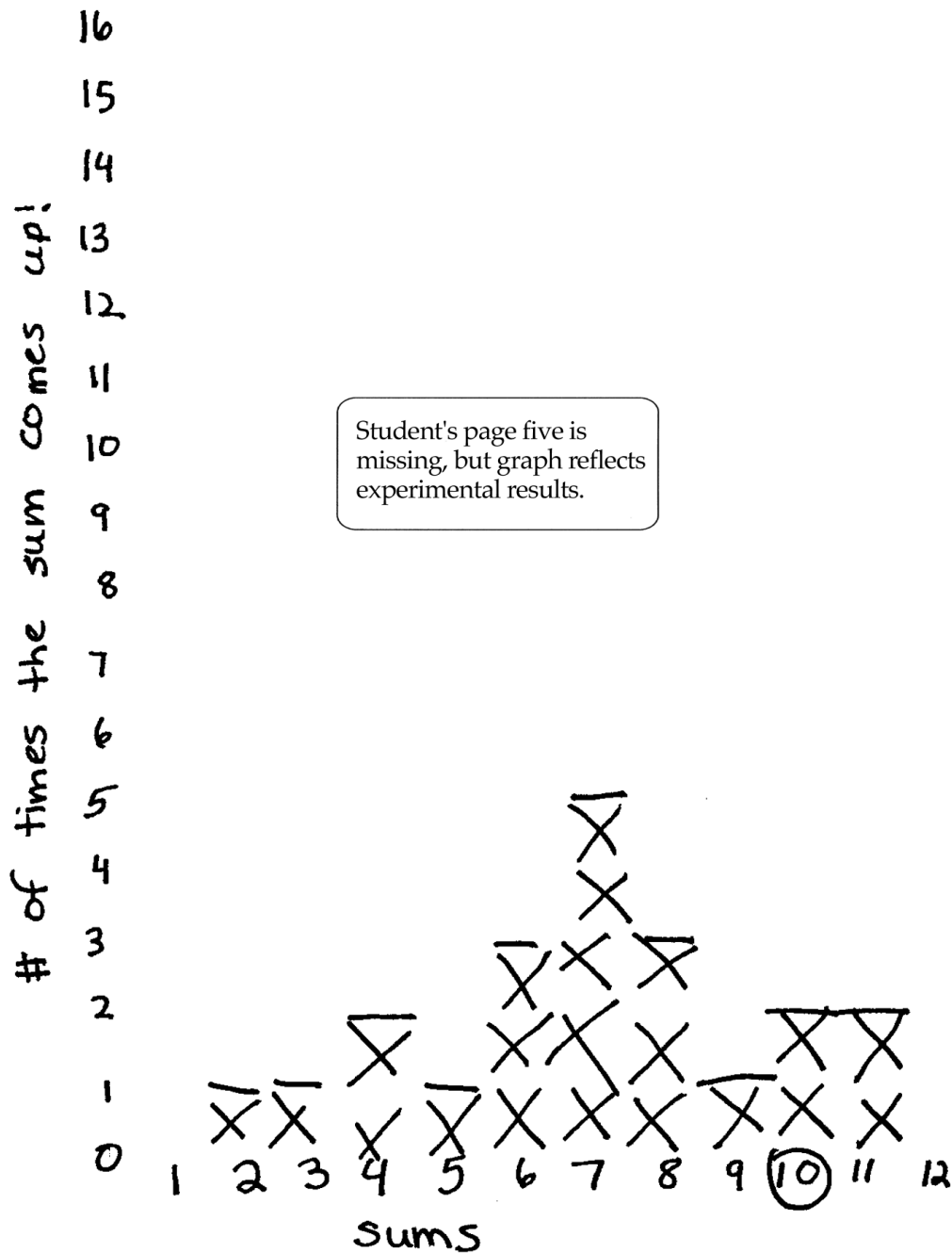
The Dice Game



Exemplars

Practitioner

The Dice Game



Exemplars

Expert

Number Cube Game #1

Student has difficulty writing numbers correctly.

I think the sum of 6 will come up most often.

My partner thinks the sum of 4 will come up most often.

The winner of game #1 is Bo

The winner's sum of 5 came up 5 out of 20 times.

I noticed...

↑ r 1 2 6 6

"The graph looks like a triangle"

Student observes the bell curve that is created by graphing this type of probability activity

Exemplars

Expert

Student accurately finds sums of dice.

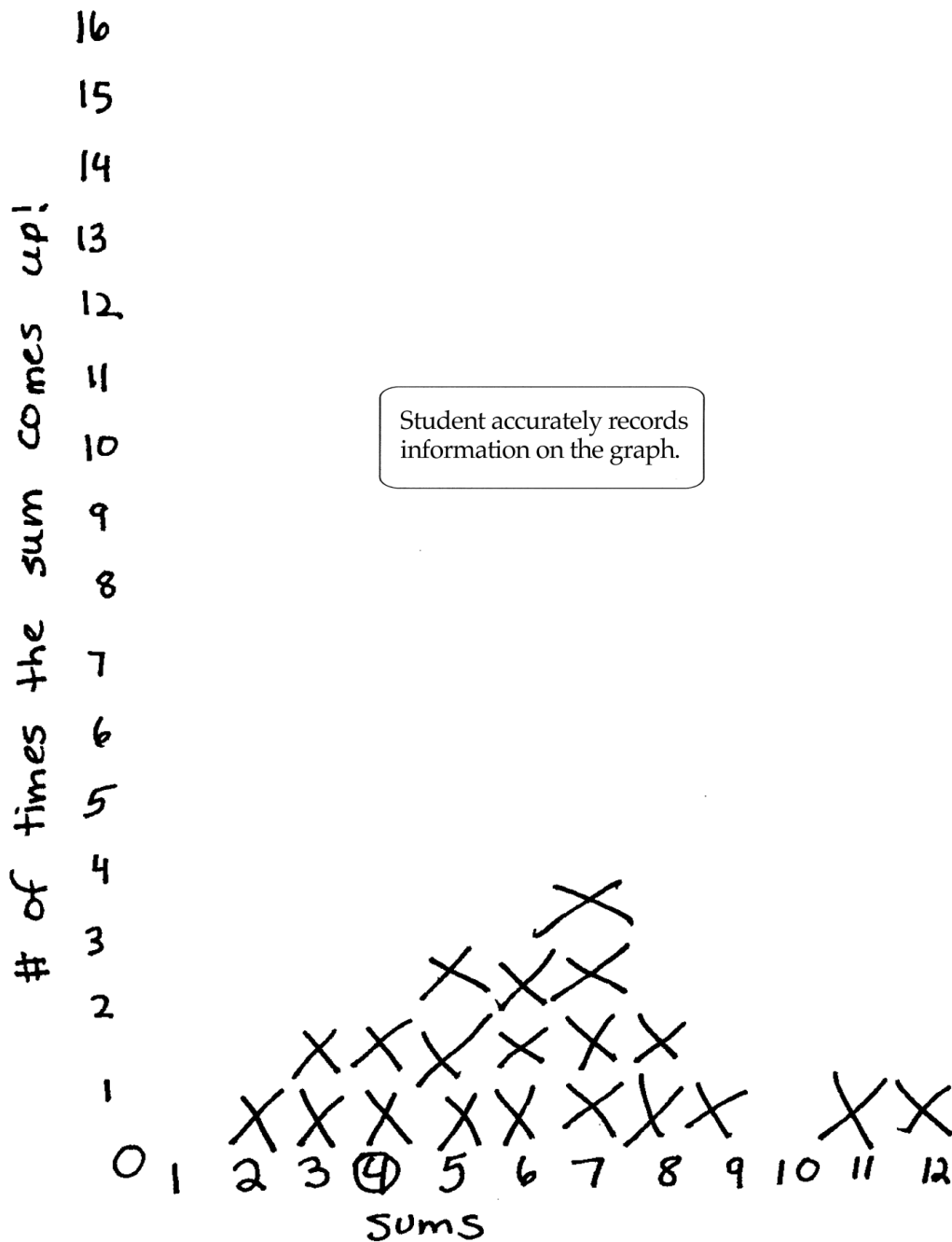
Dice Game Record

Roll #	Die 1	+	Die 2	=	Sum
1	6	+	6	=	12
2	4	+	1	=	5
3	1	+	2	=	3
4	1	+	1	=	2
5	6	+	1	=	7
6	1	+	2	=	3
7	5	+	2	=	7
8	6	+	5	=	11
9	3	+	3	=	6
10	3	+	1	=	4
11	5	+	3	=	8
12	5	+	1	=	6
13	1	+	5	=	6
14	4	+	1	=	5
15	4	+	3	=	7
16	4	+	2	=	6
17	2	+	2	=	4
18	2	+	3	=	5
19	6	+	3	=	9
20	2	+	5	=	7

Exemplars

Expert

The Dice Game



Exemplars

Expert

Number Cube Game #2

This time I think the sum of 7 will come up most often this time because... "It came up most last time"

My partner thinks the sum of 3 will come up most often this time.

The winner of game #2 is BO

The winner's sum of 3 came up 2 out of 20 times.

I noticed... 3 2

Student makes mathematically relevant comments.

"You can never get 1"
"This time 7 only came up once"

Student uses results of first experiment to make prediction.

Exemplars

Expert

Dice Game Record

Roll #	Dice 1	+	Dice 2	=	Sum
1	2	+	2	=	7
2	6	+	3	=	9
3	4	+	6	=	10
4	5	+	5	=	10
5	5	+	3	=	8
6	4	+	2	=	6
7	6	+	6	=	12
8	3	+	1	=	4
9	2	+	1	=	3
10	6	+	6	=	12
11	3	+	1	=	4
12	3	+	1	=	4
13	6	+	2	=	8
14	2	+	1	=	3
15	5	+	1	=	6
16	5	+	2	=	7
17	6	+	2	=	8
18	5	+	5	=	10
19	5	+	1	=	4
20	6	+	4	=	10

Exemplars

Expert

The Dice Game

