



Is it fair?

Sample responses



6

Mathematics

Queensland Comparable
Assessment Tasks
(QCATs) 2011

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E Sample: Response 1

Guide to making judgments — Year 6 Mathematics

Name

Focus: Apply knowledge of chance events, variation and bias to develop arguments and improve game fairness.

Knowledge and understanding	Thinking and reasoning Reflecting	Communicating
<p>Uses possible outcomes and frequency to estimate likelihood as a common fraction.</p> <p>Compares and orders estimates of likelihood.</p> <p>Identifies differences between graphs.</p> <p>Questions 1–5</p>	<p>Reflects on learning and applies new understandings to:</p> <ul style="list-style-type: none"> develop mathematical arguments plan, evaluate and explain changes to game rules. <p>Questions 6–9</p>	<p>Communicates using mathematical language and representations to justify thinking and reasoning.</p> <p>Questions 1–3, 6, 8, 9</p>
<p>Explains differences between graphs using a comprehensive understanding of the factors influencing chance events and variation.</p> <p>Correctly compares and orders estimates of likelihood, and identifies outcomes with equal likelihoods. Considers chance events when explaining differences between graphs.</p> <p>Correctly expresses likelihoods as common fractions.</p> <p>Translates information from graphs into tables. Identifies obvious mathematical differences between graphs. Identifies a most and least likely outcome.</p> <p>Identifies numbers of outcomes from grid.</p>	<p>Justifies arguments using a comprehensive mathematical interpretation of the quantitative data and factors influencing chance events and bias.</p> <p>Makes changes to rules which make the game fair. Accurately judges Player B's chances of winning, and justifies using an understanding of chance events.</p> <p>Makes changes to rules which improve the fairness of the game. Considers chance events in arguments.</p> <p>Makes a relevant statement about why the game is unfair or why the rule changes are fair. Identifies likelihood of Player B winning.</p> <p>Makes a change to the rules.</p>	<p>Communicates and justifies thinking and reasoning using clear mathematical language.</p> <p>Communicates using appropriate mathematical language.</p> <p>Records possible outcomes and frequency in graphs.</p>
		<p>A</p> <p>B</p> <p>C</p> <p>D</p> <p>E</p>
<p>Demonstrates the descriptor at this level.</p> <p>The response for Q5 is not considered to be mathematical — labels have been transferred from the graphs.</p>	<p>Demonstrates the descriptor at this level.</p> <p>Q7 demonstrates lapses in understanding of game construction and the requirement that someone is able to win.</p>	<p>Demonstrates all of the descriptors up to this level and aspects of the descriptor above.</p> <p>Uses some mathematical language.</p>

Overall grade

This response demonstrates a very limited level of achievement across all assessable elements. On balance, it is judged to be an E.

Collecting and analysing experimental data

Activity

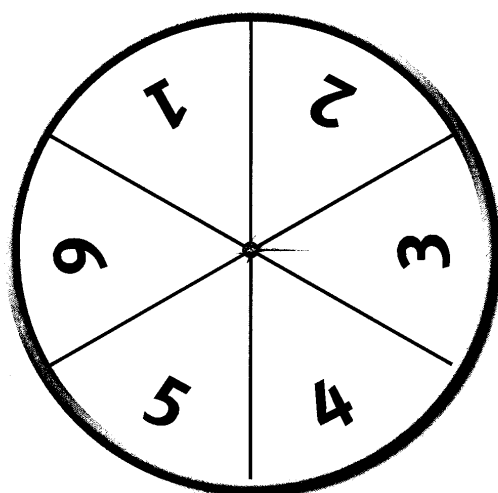
Play "Take a spin" in your pairs again. Complete Question 1 as you play.



1. Complete Graph 1 by using a cross (X) to record the difference for each spin while you play the game.

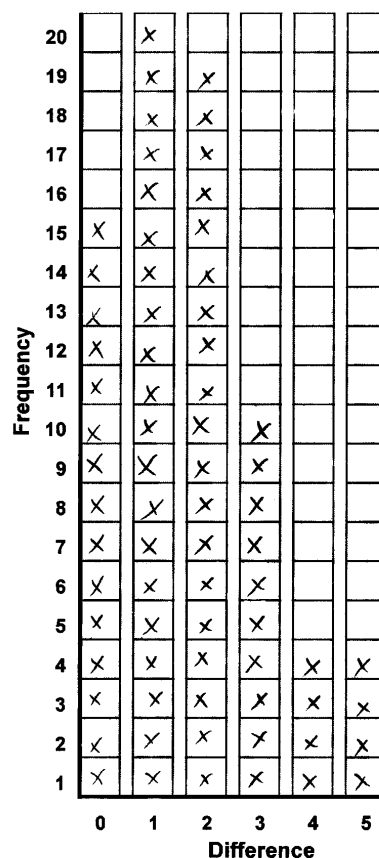
Stop recording if one of the differences reaches the top of the graph.
Finish the game you are playing if this happens.

Take a spin



Game	Player A (0, 1 or 2)	Player B (3, 4 or 5)
1	||||	||||
2	||||	||||
3	||||	||||
4	||||	||||
5		
6		

Graph 1: Frequency of each difference



E Sample: Response 1


Use Graph 1 on page 4 to answer Question 2.

2. a) Complete the Frequency column in Table 1 below.
- b) In the Likelihood column, express the likelihood of spinning each difference as a common fraction.
- c) Order the differences from most likely to least likely in Diagram 1.

Table 1: Likelihood of spinning each difference

Difference	Frequency	Likelihood
0
1
2
3
4
5
Total	

Diagram 1: Order of likelihood

Difference	Likelihood
	most likely
	
	least likely



Stop here: Wait for your teacher's directions.

Exploring outcomes and theoretical likelihood

This grid shows all **possible outcomes** when using two spinners and finding the difference. Use the grid to answer the questions below.

		Player B					
		1	2	3	4	5	6
Player A	1	0	1	2	3	4	5
	2	1	0	1	2	3	4
	3	2	1	0	1	2	3
	4	3	2	1	0	1	2
	5	4	3	2	1	0	1
	6	5	4	3	2	1	0

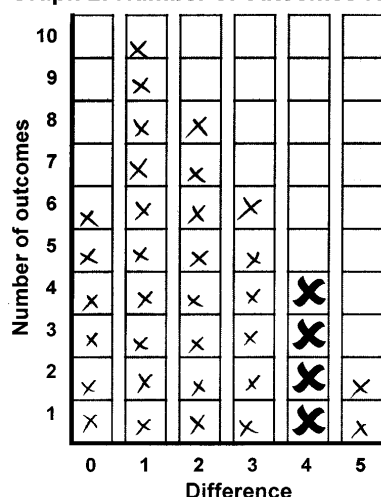
The difference of 4 has 4 possible outcomes. These can be written as: (1, 5) (2, 6) (5, 1) (6, 2)

3. a) How many possible outcomes have a difference of 2? *four*
- b) Write all the possible outcomes that have a difference of 3.

(4, 1) (5, 2) (3, 6)

- c) Complete Graph 2 by using a cross (**X**) to indicate the number of outcomes for each difference.

Graph 2: Number of outcomes for each difference



The possible outcomes for the difference of 4 have been completed for you.

E Sample: Response 1

Look at the shape of Graph 1 on page 4 and Graph 2 on page 6, then complete the sentence below.

4. The two graphs may not be the same shape because: *one has frequency and one has number of outcomes.*
-
-
-
-

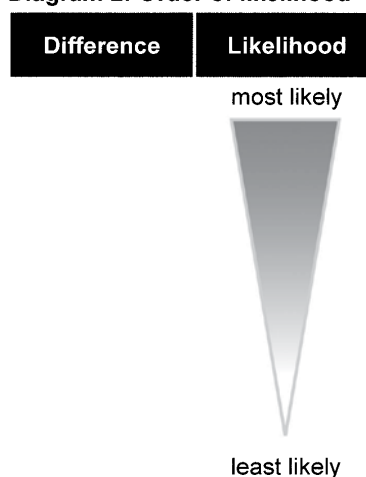
Use Graph 2 to answer the following.

5. a) Complete Table 2 below.
- b) Order the differences from most likely to least likely in Diagram 2.

Table 2: Likelihood of spinning each difference

Difference	Number of outcomes	Likelihood
0	<i>six</i>	.....
1	<i>ten</i>	.....
2	<i>eight</i>	.....
3	<i>six</i>	.....
4	<i>four</i>	.....
5	<i>two</i>	.....
Total	<i>thirty-six</i>	.....

Diagram 2: Order of likelihood



Stop here: Wait for your teacher's directions.

It's not fair!

During the group discussion (page 3), you talked about the question:

Is the game "Take a spin" fair or unfair?

6. Explain why the game is not fair.

Use the information you have collected to support your explanation.

no one knows what the paper clip spins on
because it depends upon the force
on direction you spin, the players
might have different shape of
paperclips and they might have
done it on the different sides of the
clip, so it makes it an unfair game.

Applying your learning

In a fair game, each player has an equal chance of winning.

7. **Make the game “Take a spin” fair.**
Complete the rules below.

Take a spin

Rules for play

Getting ready

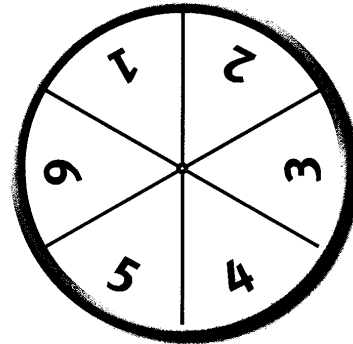
- Both players spin.
- The player who spins the lowest number will be Player A.

Playing the game

- Both players spin.
- When each spinner stops, find the difference between the numbers.
- If the **difference** is *0, 1, 2*
then Player A scores *5 points*
- If the **difference** is *0, 1, 2*
then Player B scores *5 points*
- Use a tally mark to record each point.

Winning the game

*whoever is the first to score 20 points
is the winner*



8. **Explain how your changes to the game make it fair.**

*Player A and player B have the same
differences so it will be equally likely
for the both of them to win*

E Sample: Response 1

9. If "Take a spin" is now a fair game and Player A has won 5 out of 5 games, what is the likelihood that Player B will win game 6?

Use a cross to indicate the likelihood on the line below.

impossible

unlikely

equally likely

likely

certain

Explain your answer.

because they both have the same
numbers so they each get a point
when the number is spun

E Sample: Response 2

Guide to making judgments — Year 6 Mathematics

Name

Focus: Apply knowledge of chance events, variation and bias to develop arguments and improve game fairness.

Knowledge and understanding	Thinking and reasoning Reflecting	Communicating
<p>Uses possible outcomes and frequency to estimate likelihood as a common fraction.</p> <p>Compares and orders estimates of likelihood.</p> <p>Identifies differences between graphs.</p> <p>Questions 1–5</p>	<p>Reflects on learning and applies new understandings to:</p> <ul style="list-style-type: none"> develop mathematical arguments plan, evaluate and explain changes to game rules. <p>Questions 6–9</p>	<p>Communicates using mathematical language and representations to justify thinking and reasoning.</p> <p>Questions 1–3, 6, 8, 9</p>
<p>Explains differences between graphs using a comprehensive understanding of the factors influencing chance events and variation.</p> <p>Correctly compares and orders estimates of likelihood, and identifies outcomes with equal likelihoods. Considers chance events when explaining differences between graphs.</p> <p>Correctly expresses likelihoods as common fractions.</p> <p>Translates information from graphs into tables. Identifies obvious mathematical differences between graphs. Identifies a most and least likely outcome.</p> <p>Identifies numbers of outcomes from grid.</p>	<p>Justifies arguments using a comprehensive mathematical interpretation of the quantitative data and factors influencing chance events and bias.</p> <p>Makes changes to rules which make the game fair. Accurately judges Player B's chances of winning, and justifies using an understanding of chance events.</p> <p>Makes changes to rules which improve the fairness of the game. Considers chance events in arguments.</p> <p>Makes a relevant statement about why the game is unfair or why the rule changes are fair. Identifies likelihood of Player B winning.</p> <p>Makes a change to the rules.</p>	<p>Communicates and justifies thinking and reasoning using clear mathematical language.</p> <p>Communicates using appropriate mathematical language.</p> <p>Records possible outcomes and frequency in graphs.</p>
		<p>A</p> <p>B</p> <p>C</p> <p>D</p> <p>E</p>

Demonstrates most descriptors up to and including this level.

Identifies the most and least likely in Q2.

Q5 demonstrates a difficulty in understanding some mathematical language.

Statements made demonstrate no reflection upon learning within this QCAT.

Demonstrates the descriptor at this level.

Overall grade

This response demonstrates a limited level of achievement in **knowledge and understanding** and a very limited level of achievement in **thinking and reasoning, reflecting** and **communicating**.

The focus of this QCAT is on **thinking and reasoning** and **reflecting**.

On balance, it is judged to be an E.

Collecting and analysing experimental data

Activity

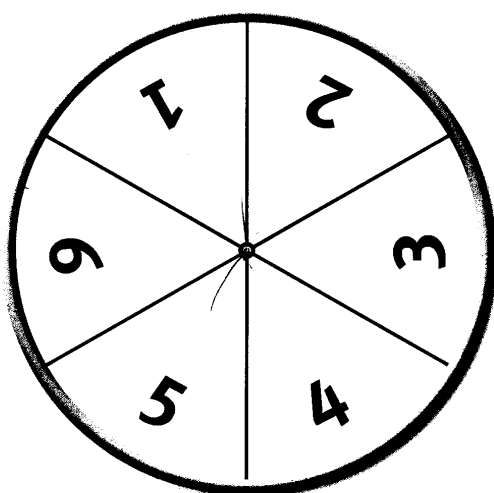
Play "Take a spin" in your pairs again. Complete Question 1 as you play.



1. Complete Graph 1 by using a cross (X) to record the difference for each spin while you play the game.

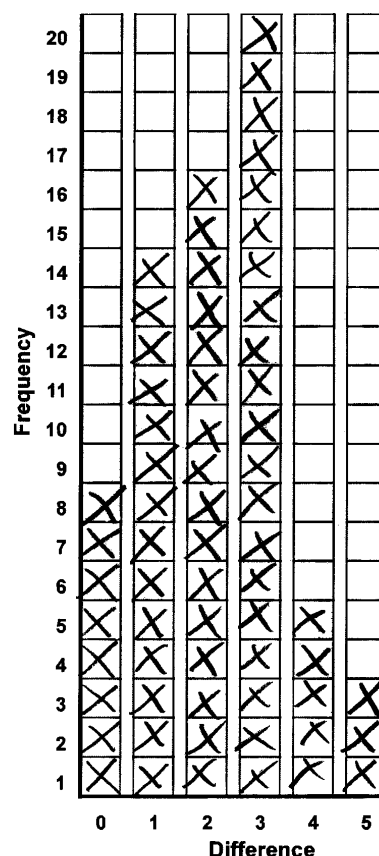
Stop recording if one of the differences reaches the top of the graph.
Finish the game you are playing if this happens.

Take a spin 



Game	Player A (0, 1 or 2)	Player B (3, 4 or 5)
1	||||	||||
2	||||	||||
3	||||	||||
4	||||	||||
5		
6		

Graph 1: Frequency of each difference



E Sample: Response 2


Use Graph 1 on page 4 to answer Question 2.

2. a) Complete the Frequency column in Table 1 below.
- b) In the Likelihood column, express the likelihood of spinning each difference as a common fraction.
- c) Order the differences from most likely to least likely in Diagram 1.

Table 1: Likelihood of spinning each difference

Difference	Frequency	Likelihood
0	8	.....
1	14	.....
2	16	.....
3	20	.....
4	5	.....
5	3	.....
Total	.....	.....

Diagram 1: Order of likelihood

Difference	Likelihood
20	most likely
	
3	least likely



Stop here: Wait for your teacher's directions.

Exploring outcomes and theoretical likelihood

This grid shows all **possible outcomes** when using two spinners and finding the difference. Use the grid to answer the questions below.

		Player B					
		1	2	3	4	5	6
Player A	1	0	1	2	3	4	5
	2	1	0	1	2	3	4
	3	2	1	0	1	2	3
	4	3	2	1	0	1	2
	5	4	3	2	1	0	1
	6	5	4	3	2	1	0

The difference of 4 has 4 possible outcomes.

These can be written as:

(1, 5) (2, 6) (5, 1) (6, 2)

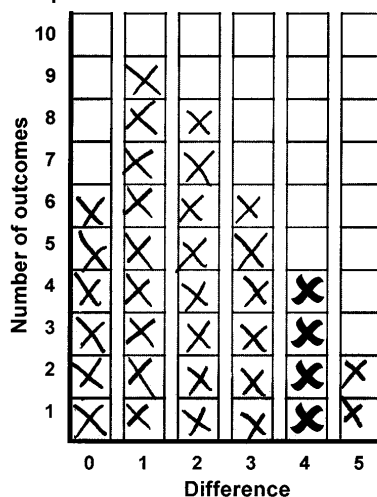
3. a) How many possible outcomes have a difference of 2? 8

b) Write all the possible outcomes that have a difference of 3.

4, 1, 5, 2, 6, 3, 1, 4, 2, 5, 3, 6

c) Complete Graph 2 by using a cross (X) to indicate the number of outcomes for each difference.

Graph 2: Number of outcomes for each difference



The possible outcomes for the difference of 4 have been completed for you.

E Sample: Response 2

Look at the shape of Graph 1 on page 4 and Graph 2 on page 6, then complete the sentence below.

4. The two graphs may not be the same shape because:

one we spin and one we don't spin

Use Graph 2 to answer the following.


5. a) Complete Table 2 below.

- b) Order the differences from most likely to least likely in Diagram 2.

Table 2: Likelihood of spinning each difference

Difference	Number of outcomes	Likelihood
0	6	.....
1	9	.....
2	8	.....
3	6	.....
4	4	.....
5	2	.....
Total	33	.....

Diagram 2: Order of likelihood

Difference	Likelihood
9	most likely
	
2	least likely



Stop here: Wait for your teacher's directions.

It's not fair!

During the group discussion (page 3), you talked about the question:

Is the game "Take a spin" fair or unfair?

6. Explain why the game is not fair.

Use the information you have collected to support your explanation.

its unfair because As most are
right handed and if B was left
handed they might win.

Applying your learning

In a fair game, each player has an equal chance of winning.

7. **Make the game “Take a spin” fair.**
Complete the rules below.

Take a spin

Rules for play

Getting ready

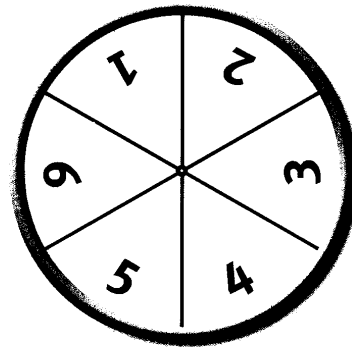
- Both players spin.
- The player who spins the lowest number will be Player A.

Playing the game

- Both players spin.
- When each spinner stops, find the difference between the numbers.
- If the **difference** is 0, 1 or 2
then Player A scores a point
- If the **difference** is 3, 4 or 5
then Player B scores a point
- Use a tally mark to record each point.

Winning the game

the first player to score 10 points
wins the game



8. **Explain how your changes to the game make it fair.**

My change is to make the
game fair is to let player B win

E Sample: Response 2

9. If "Take a spin" is now a fair game and Player A has won 5 out of 5 games, what is the likelihood that Player B will win game 6?

Use a cross to indicate the likelihood on the line below.

impossible

unlikely

equally likely



likely

certain

Explain your answer.

because we let player B win.