

Assessing students' work

The following descriptions indicate typical levels of performance. After each description is an example of some work at this level.

Little progress

- **Representing:** Considers the likelihood of some totals appearing, but this is incomplete and unsystematic.
- **Analysing:** Recognises that totals may be impossible, and/or recognises some totals are more likely than others. Reasons given may be invalid or absent.
- **Interpreting and evaluating:** Rejects card B as impossible. Selects a preferred Bingo card with insufficient or invalid explanation. May create a valid card but no clear reasons are given for the numbers chosen.
- **Communicating and reflecting:** Communicates results, but with errors and omissions.

Sample response: Hazel

Hazel correctly states that Card B cannot win because it contains 1. She does not show any evidence of working out probabilities or possible scores. Hazel believes that numbers close together are less likely to be called. She creates a valid Bingo card but her explanation is unclear.

① Spinning Bingo
 Card A - It is the only one with 1:2 also
 it can't be Card B because that has 1! And card
 C all the numbers are close together e.g 2 3 4 5
 and 10 13 14 15 16 giving it less chance, whereas
 Card A has more variety giving it more chance of
 winning. Also Card C has 16 which none of the numbers
 add up to.

③ I chose these numbers because most if not all the
 numbers add up to them.

15	13	3
9	10	11
5	7	12

Questions for Hazel:

Hazel could be encouraged to improve her response by asking the following questions:

- *What range of scores can you get from the pair of spinners?*
- *Which numbers on the cards are impossible to get?*
- *Why do you think that numbers close together have 'less chance'?*
- *How can you systematically record all possible combinations of scores from the spinners?*
- *What does this tell you about the most likely and least likely totals?*

Some progress

- **Representing:** Considers the likelihood of some totals appearing, but this may be incomplete or unsystematic.
- **Analysing:** Recognises that totals may be impossible, and/or recognises some totals are more likely than others. Some reasoning is evident, but is incomplete and may contain errors.
- **Interpreting and evaluating:** Rejects card B as impossible. Chooses Card A with some valid reasoning. Creates a valid Bingo card but insufficient reasons are given for the numbers chosen.
- **Communicating and reflecting:** Communicates conclusions and reasoning with some errors and omissions.

Sample response: James

James correctly states that Card B cannot win because it contains two impossible numbers. He also correctly states that Card A is the best choice and gives a partial explanation. Then he designs a valid Bingo card and states that the numbers have lots of "adding factors". This shows some understanding, but his argument is incomplete.

Spinner Bingo

1. Definitely not B - has two impossible numbers 1 and 17
 A has more probable numbers like 8
 C has hard to get numbers like 2
 So A is best.

2.

12	11	4
7	9	5
8	6	10

3. These numbers have lots of adding factors, like
 $8 = 1 + 7$ $8 = 4 + 4$ $8 = 3 + 5$

Questions for James:

James could be encouraged to improve his response by asking the following questions:

- *Can you explain what you mean by "they have lots of 'adding factors'"?*
- *How could you record all the possible total numbers and the ways they can be obtained?*
- *How might this information help in producing a card that has the best chance of winning?*

Substantial progress

- **Representing:** Selects a systematic method for deciding how totals may be made in different ways.
- **Analysing:** Explores different combinations that are possible but misses some possibilities or duplicates others. Deduces that some totals are impossible and that some are more likely than others.
- **Interpreting and evaluating:** Chooses Card A with valid reasoning. Deduces which totals give the best chance of winning. Designs a Bingo card that has a reasonable chance of winning but is not optimal. (All numbers are possible and at most two of: 2, 3, 4, 14, 15, 16.)
- **Communicating and reflecting:** Communicates conclusions and reasoning clearly and effectively though there may be some errors.

Sample response: Tara

Tara shows evidence of working out possible total scores by listing, but there are errors.

For example, she shows 1+2 but not 2+1 etc.

She does not notice that Card B contains two impossible total scores.

She correctly states that Card A has the best possible chance of winning because the numbers are most common. Then she designs a valid bingo card with correct explanation.

1. Card A because when added together those are the most common.

3. I chose the numbers because they are the most common answers.

6	13	8
11	10	12
9	14	7

Questions for Tara:

Tara could be encouraged to improve her response by asking the following questions:

- What scores on the red and blue spinners would give a total score of 3?
- How does this answer affect the total number of ways you have calculated?
- How might we attach a probability to each of the possible total numbers?

Task accomplished

- **Representing:** Selects a systematic method for deciding how totals may be made in different ways.
- **Analysing:** Explores the different combinations that are possible. Recognises the importance of the order. E.g. (1,3), (3,1) are both listed. Deduces that some totals are impossible and that some are more likely than others.
- **Interpreting and evaluating:** Chooses card A with valid reasoning. Deduces which totals give the best chance of winning. Designs a Bingo card that is optimal: numbers chosen are in the range 5 to 13
- **Communicating and reflecting:** Communicates conclusions and reasoning clearly and effectively.

Sample response: Colleen

Colleen shows evidence of working out probabilities using a lattice diagram and a correct listing of the probabilities of possible scores. She correctly states that card B cannot win because it contains the number 1, but she does not also mention that the number 17 is an impossible total. She correctly selects the card that has the best chance of winning using quantitative data. Then she designs an optimum bingo card with an explanation. Her work is clear and easy to follow.

1.	+	1	2	3	4	5	6	7	8
		1	2	3	4	5	6	7	8
		2	3	4	5	6	7	8	9
		3	4	5	6	7	8	9	10
		4	5	6	7	8	9	10	11
		5	6	7	8	9	10	11	12
		6	7	8	9	10	11	12	13
		7	8	9	10	11	12	13	14
		8	9	10	11	12	13	14	15
		9	10	11	12	13	14	15	16

$1 = \frac{2}{64}$ $2 = \frac{3}{64}$ $3 = \frac{4}{64}$ $4 = \frac{5}{64}$ $5 = \frac{6}{64}$
 $6 = \frac{7}{64}$ $7 = \frac{8}{64}$ $8 = \frac{9}{64}$ $9 = \frac{10}{64}$
 $10 = \frac{11}{64}$ $11 = \frac{12}{64}$ $12 = \frac{13}{64}$
 $13 = \frac{14}{64}$ $14 = \frac{15}{64}$ $15 = \frac{16}{64}$ $16 = \frac{17}{64}$

A

4	13	5
12	9	6
8	11	15

B

14	6	17
7	10	4
1	15	12

C

5	13	4
14	3	16
2	13	0

$4 = \frac{3}{64}$
 $5 = \frac{4}{64}$
 $6 = \frac{5}{64}$
 $8 = \frac{7}{64}$
 $9 = \frac{8}{64}$
 $11 = \frac{6}{64}$
 $12 = \frac{5}{64}$
 $13 = \frac{4}{64}$
 $15 = \frac{3}{64}$

This card cannot win because it has the number 1 in it and scoring one with the spinners can never happen.

$2 = \frac{1}{64}$ $13 = \frac{4}{64}$
 $3 = \frac{2}{64}$ $14 = \frac{3}{64}$
 $4 = \frac{3}{64}$ $15 = \frac{2}{64}$
 $5 = \frac{4}{64}$ $16 = \frac{1}{64}$
 $10 = \frac{7}{64}$

Card A has more chance of winning than the other cards because the numbers on the cards mainly have a higher chance of being scored than they do on card C and Card B can never win because of the number 4.

Spinner Bingo

3. I chose 9 because it has the highest chance of ~~being~~ picked.
I chose 8 + 10 because it has the second highest chance of ~~being~~ picked.
I chose 7 + 11 because it has the third highest chance of being picked.
I chose 6 + 12 because it has the fourth highest chance of being picked.
I chose 5 + 13 because it has the ~~5th~~ fifth highest chance of being picked.

Questions for Colleen:

Colleen could be encouraged to improve her response by asking the following questions:

- What other number on card B is not possible?