

ACTIVITY IA4.11: Bulls-eye Dice

Intended learning: To coordinate combinations and partitions in the range 1 to 20.

Instructional mode: Longer, reproductive practice for pairs or groups.

Materials: Four standard 6-sided dice for each pair, or four giant dice for the whole class version. An extra die for the Super Bulls-eye variation.

Description: Students play against each other in the group, taking turns. A player begins a turn by rolling four dice. The player then chooses some of the numbers to add together, to make a total as close as possible to the bulls-eye of 10. The turn gets a score according to how close the total is to the bulls-eye: 8 and 12 score 2, 9 and 11 score 1, 10 scores 0. The player records the turn in a table with three columns (see Figure 4.5a). Players play six rounds, and the winner is the player with the lowest total score.

Bulls-eye Combination. In this variation, a player *has to use* all four dice, and can add or subtract each number to make their total, as illustrated in Figure 4.5b.

Super Bulls-eye. As with *Bulls-eye Combination*, a player rolls four dice, and needs to add or subtract each number to make their total. However they also roll a *bonus die*. The bonus die can be ignored, be used to replace one of the original dice, or be included as a fifth number, as illustrated in Figure 4.5c.

	<table><tr><th>Number sentence</th><th>Total</th><th>Score</th></tr><tr><td>$6+4$</td><td>10</td><td>0</td></tr><tr><td>$5+3+3$</td><td>11</td><td>1</td></tr></table>	Number sentence	Total	Score	$6+4$	10	0	$5+3+3$	11	1	(a)
Number sentence	Total	Score									
$6+4$	10	0									
$5+3+3$	11	1									
Dice: 6 4 3 2											
Dice: 5 3 3 1											

	<table><tr><th>Number sentence</th><th>Total</th><th>Score</th></tr><tr><td>$6+4+3-2$</td><td>11</td><td>1</td></tr><tr><td>$5+3+3-1$</td><td>10</td><td>0</td></tr></table>	Number sentence	Total	Score	$6+4+3-2$	11	1	$5+3+3-1$	10	0	(b)
Number sentence	Total	Score									
$6+4+3-2$	11	1									
$5+3+3-1$	10	0									
Dice: 6 4 3 2											
Dice: 5 3 3 1											

	<table><tr><th>Number sentence</th><th>Total</th><th>Score</th></tr><tr><td>$6+4+3+2-5$</td><td>10</td><td>0</td></tr><tr><td>$5+3+1+1$</td><td>10</td><td>0</td></tr></table>	Number sentence	Total	Score	$6+4+3+2-5$	10	0	$5+3+1+1$	10	0	(c)
Number sentence	Total	Score									
$6+4+3+2-5$	10	0									
$5+3+1+1$	10	0									
Dice: 6 4 3 2 & 5											
Dice: 5 3 3 1 & 1											

Figure 4.5 Example scoring tables for (a) Bulls-eye Dice, (b) Bulls-eye Combination and (c) Super Bulls-eye

Responses, variations and extensions:

- Basic *Bulls-eye Dice* is easy to explain and play. About 70% of rolls can hit the bulls-eye. It is good for developing facility with combinations to 10.

- Play *Bulls-eye Combination* after basic Bulls-eye. It is more complicated, and requires more arithmetical reasoning to consider possible additions and subtractions. Having dice to arrange helps students think through the different combinations. Only about 35% of rolls can hit the bulls-eye, making a nice change from basic Bulls-eye, worth thinking hard for.
- If there is sufficient interest, introduce *Super Bulls-eye*. The bonus die creates many more possible combinations. About 90% of rolls can hit the bulls-eye, but you have to think hard.
- Any variation can be played in teams of two as well.
- *Bulls-eye Combination* can be played in a whole-class race variation. Four huge classroom dice are rolled, and the numbers are announced. All students have 20 seconds to write down their best combination with the four numbers, before the dice are rolled again. After six rounds, students swap sheets, check each other's answers, and calculate each other's scores.
- Motivated by the whole-class race variation, students can discuss thinking strategies for finding good combinations. A rich variety of combination and partition knowledge and relational thinking can emerge.