

Remainder Race

Investigating division with remainders

Purpose

In this game, the students divide two-digit numbers by one-digit divisors to determine the amount that remains. Although the game requires mental strategies for division, the students may not need to calculate the quotient.

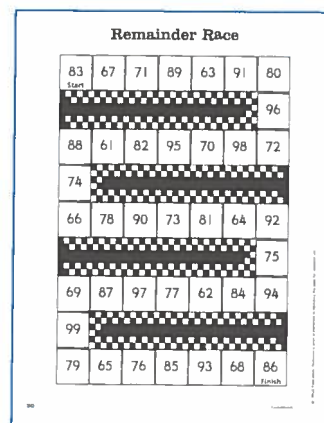
Materials

Each group of players will need

- A 'Remainder Race' game board (page 30) as shown below.
- One (1) 'divisor' cube showing the numerals 2, 3, 4, 5, 6, and 9. This can be made from a blank wooden cube.

Each player will need

- One (1) counter (a different color for each player).



2 to 3 players

Before the Game

Review the rules of divisibility for the six divisors shown on the 'divisor' cube as follows:

- [2] A number is divisible by two if the digit in the ones place is divisible by 2.
- [3] A number is divisible by three if the sum of its digits is divisible by 3.
- [4] A number is divisible by four if the number represented by the digits in the tens and ones place is divisible by 4.
- [5] A number is divisible by five if the digit in the ones place is either 0 or 5.
- [6] A number is divisible by six if it is divisible by 2 and 3.
- [9] A number is divisible by nine if the sum of its digits is divisible by 9.

During the Game

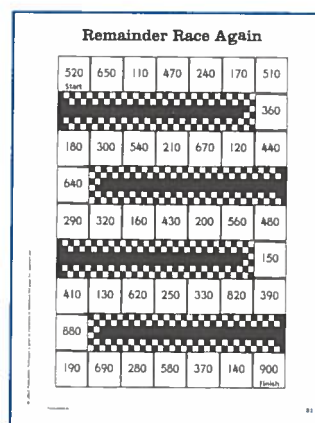
Discuss the strategies the students are using to figure out the remainders. The discussion will vary, but the students may use rules of divisibility for division by 2, 3, 5, and 6. They could use their knowledge of number facts for division by 9. To divide by 4, it is likely that the students will actually need to do the calculation mentally or use a known 'fact'. For example, to calculate the remainder for $63 \div 4$, two students used the following methods:

Rosie: $63 \div 4$ is the same as $40 \div 4$ plus $23 \div 4$. Four divides 20 evenly so there are 3 left over.

Ryan: I know 15 times 4 is 60, so there are 3 left over.

After the Game

Lead a discussion about the results of the game. Ask, *What number on the cube gave you the best results?* (The students should know that the remainders are greater when dividing by 9.) *Which divisors made it easy to calculate the remainder?* (2 and 5.) *Which divisor(s) did you not want to roll?* (The students should know that dividing by 2 gave either no remainder or a remainder of 1.)



Beyond the Game

- The game can be extended to involve three-digit dividends that are multiples of 10. The students will need a copy of the 'Remainder Race Again' game board on page 31 (as shown). They will also need the number cube from the main game. Do the students see that each number on the board is a multiple of 10, therefore division by 2 and 5 will result in no remainders? Players who roll these numerals will miss a turn.
- Allow the players to challenge an opponent if they believe that the remainder has been calculated incorrectly. If the challenger is correct then he or she can have two consecutive turns in the next round. If the challenger is incorrect, then he or she must miss a turn.

How to Play

The aim is to be the first player to reach the finish square.

- The players' counters are placed on the starting square.
- The first player rolls the divisor cube and divides the starting number (83) by the number rolled to determine the remainder.
- If there is a remainder, the player moves his or her counter forward the number of spaces indicated by the remainder. If there is no remainder, the player does not move his or her counter.

Example: Adam rolls 4 and calculates $83 \div 4$ to determine that the remainder is 3. Adam moves his counter forward 3 spaces.

- The other player(s) has a turn.
- The first player to reach or go beyond the finish square is the winner.

Reading the Research

Children's use of multiplication strategies to solve division problems exemplifies the adaptive expertise that grows out of understanding (Ambrose, Baek, & Carpenter, 2003).