Session 6

The Fraction Track Game

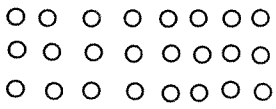
What Happens

Students play the Fraction Track Game, turning over Fraction Cards to determine their total move. As the students put together different amounts to equal the fraction turned up, they discover how fractions can be broken into parts with unlike denominators. Their work focuses on:

- finding equivalent fractions
- ordering fractions
- adding fractions
- breaking fractions into parts

Ten-Minute Math: Seeing Numbers Once or twice in the next few days, do Seeing Numbers with your students. Try the Generating Number Sentences variation.

Show a small number of objects arranged in equal parts. To practice writing equations and other notations for computation, students working alone or in pairs generate as many number statements as they can about the arrangement. Pool all the different statements, perhaps by asking some pairs to each write one on the board. Consider, for example, an array of 24 counters in three rows of eight:



Possible statements include these:

$\frac{24}{8} = 3$ $\quad \frac{1}{3}$ of $24 = 8$ $\quad \frac{2}{3}$ of $24 = 16$

$\frac{1}{8}$ of $24 = 3$ $\quad \frac{2}{8}$ of $24 = 6$

$24 \div 3 = 8$ $\quad 8\overline{)24}$

$3 \times 8 = 24$ $\quad 8 + 8 + 8 = 24$

For complete directions and variations on the Seeing Numbers activity, see p. 124.

Materials

- Chips or small counters to use as game pieces (20 per group of 3–4 students)
- Students' Fraction Track Gameboards
- Fraction Cards (1 deck per group)
- Transparency of Fraction Track Gameboard, page 1
- Student Sheet 15 (1 per student, homework)
- Overhead projector

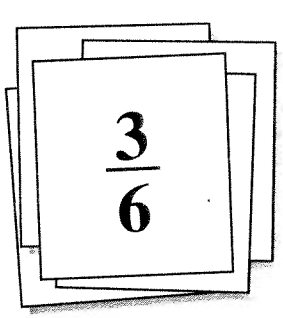
Activity

Introducing the Fraction Track Game

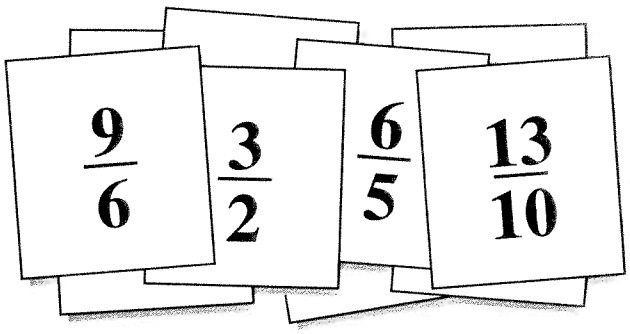
Before You Begin The Fraction Track Game is more complex than many of the other games students have been playing. The rules themselves are fairly simple, but a player's move can be enormously complex. Be sure to read the directions to the game (Student Sheet 15), read and understand the introductory example that follows, and play several games yourself before teaching the students how to play; this will help you anticipate difficulties and potential points of confusion.

Introducing the Game Explain that there are two versions of the game. Today they will try Playing to 1, using the Fraction Tracks they completed. Later they will use the entire gameboard for Playing to 2.

Show the Fraction Track Gameboard transparency (page 1 only, with missing dots and fractions filled in) on the overhead. Place seven chips on the gameboard, one per track, on fractions less than 3/4. Show students that for this version of the game, you have removed all fractions greater than 1 from the deck of Fraction Cards, and they will need to do the same before they play.



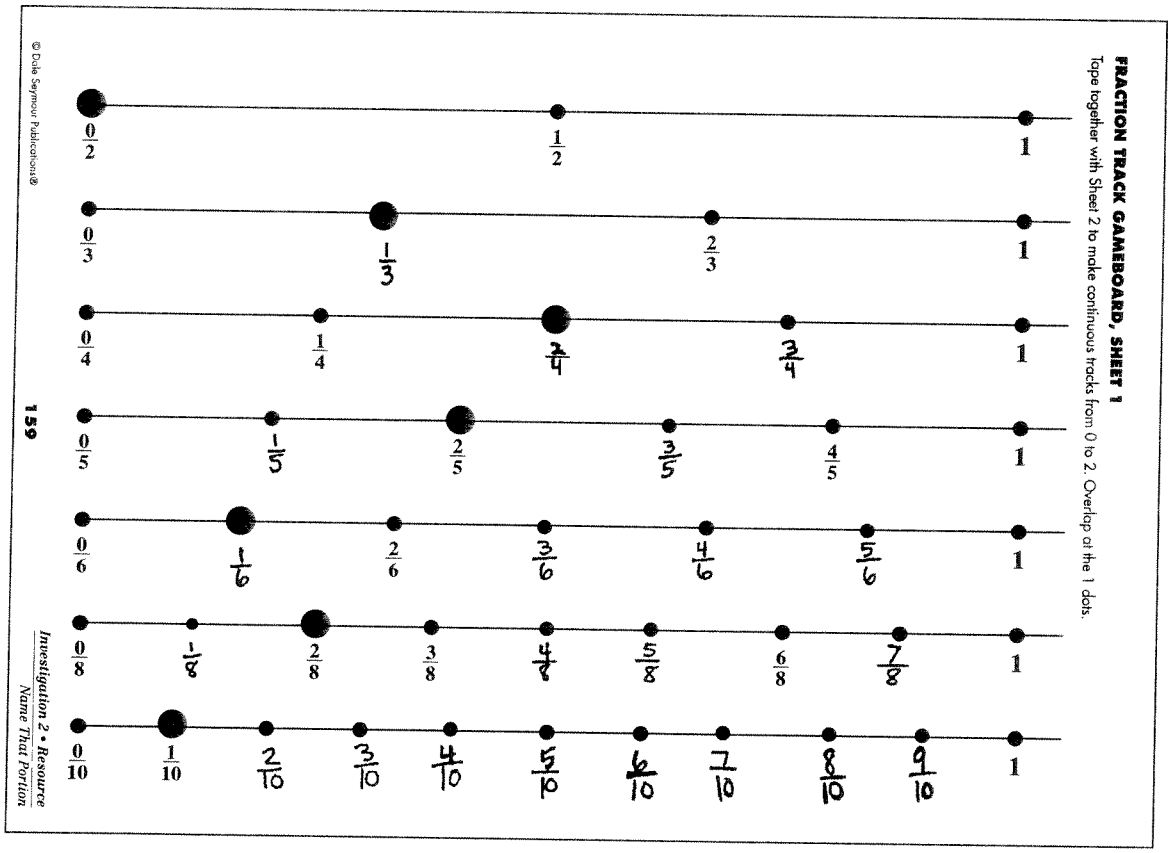
Fraction Cards



Remove all fractions greater than 1.

In this game, players take turns randomly drawing a Fraction Card and moving chips along the number lines (or *tracks*) on the gameboard for a total move equal to the fraction on the card. The chips are shared by all the players, so wherever they are left at the end of one player's turn will be the starting points for the next player's turn.

The goal is to move the chips so that one (or more) of them lands exactly on the number 1. A player may not move beyond the 1, or "wrap around" to restart the chip at the beginning of the same track during a turn. This rule is included so that players will not be able to play *only* the exact fraction on their card each time. When a chip lands on 1, if the fraction for that turn is not used up, the player must continue with a move on another track. When a chip lands on 1, the player takes that chip. A new chip is placed on the same track at 0 just before the next player's turn.



Discuss possible moves. For example, for the board shown above, suppose you draw the 4/5 card.

- You could move 8/10 on the tenths line (from 1/10 to 9/10), but you would not win a chip.
- You cannot move the whole distance on the fifths track. You could move 3 of the 4 fifths to get from 2/5 to 1; then you must move the other fifth on another track—that is, 2/10 on the tenths track.
- Another correct (but extremely unlikely) play would be to move 1/2 on the fourths track (to land on 1), leaving 1 1/2 fifths. You could move this distance on the tenths track as 3/10.

Students will vary enormously in the complexity of their moves. For more examples, see the **Dialogue Box,** Playing the Fraction Track Game (p. 57).

When students play, they will take turns. For your demonstration game, draw another card as if it were someone else's turn. Move the chips on the transparency according to students' suggestions. Encourage students to think about different possible moves for the same Fraction Card and to share any strategies they are using to find them.

Activity

Playing the Fraction Track Game

Once students understand how to play the Fraction Track Game, they play in groups for the rest of the session. The game can be played by two or three players, or by pairs playing as opposing teams. Each group of players will play on one of their gameboards; they also need a deck of Fraction Cards and about 20 chips or counters. It is helpful to have several laminated gameboards available for use in the classroom.

Remind students that they need to remove the percent cards and all cards greater than 1 from the Fraction Card deck. These cards should be placed back in the envelope. Students also fold back their gameboards so that only the first half shows. You might distribute Student Sheet 15, How to Play the Fraction Track Game, if you feel it would be useful during class; students will take this sheet home as part of their homework.

Walk around and assist students as needed so they understand how to play the game. Some students will want to move only on the track that has the same denominator as the fraction on the card they picked. At times this will be impossible, as that would make them go off the end. Encourage them to think about other ways to move the same fraction by asking how they could use some or all of their fraction on another track. If they seem stuck, remind them how they used a straightedge to label equivalents. The **Dialogue Box,** Playing the Fraction Track Game (p. 57), contains excerpts from the discussions among groups playing both versions of the game, and shows when the teacher does and doesn't intervene.

When students are comfortable playing the introductory version, encourage them to try the Playing to 2 version, which uses both sheets of the gameboard and all the Fraction Cards, including those greater than 1 (but not the percent cards).

Session 6 Follow-Up

Homework

The Fraction Track Game Students take home their own Fraction Track Gameboard and Student Sheet 15, How to Play the Fraction Track Game, to teach the game to their families. They should still have the deck of Fraction Cards they took home during Investigation 1. Advise students to be patient teachers, as this game is challenging for many adults. (Keep in mind that you will continue to need completed gameboards for playing in class.)

DIALOGUE BOX

Playing the Fraction Track Game

This teacher is observing students as they play the Fraction Track Game. The first group is engaged in the Playing to 1 version.

Sofia: I drew 1/6. *[She moves it on the sixths track.]*

Lindsay: There's not much else you can do, just half of a third, which is impossible. *[Draws a card.]* I've got 1/8. Same for me *[meaning, no choice but to move it on the eighths track].*

Manuel: Mine's 2/5. I'll go 1... 2 tenths... no, 4 tenths.

Sofia: *[She draws 2/2.]* I've got a half here [on the halves track] for a chip, and then I'll move 5 tenths for the other half.

Lindsay: How come? Oh, right. One-half is lined up with 5/10. I get it. OK, my turn. *[Takes a card.]* I picked 4/4. A whole 1. Well, I can move 1 fourth to get a chip. Then I think I'll do 1 half, and that leaves me with 1 more fourths.

Sofia: You can't do fourths again. You can do 2 eighths.

These students are figuring out equivalents and becoming familiar with the gameboard. The teacher plans to look in on them again a bit later and encourage them to try Playing to 2.

The next group has moved on to Playing to 2. The teacher has suggested that whenever the players move on more than one track, they record their play as an equation. They are helping one another split their moves.

Noah: OK, I picked 7/10. I think I'll move 1 third. Now I have 1 third left.

Alani: 1/3 and 1/3 is 7/10? That doesn't sound right.

Noah: Let me check. *[He holds a straightedge at 7/10, perpendicular to the tracks, and 2/3 doesn't quite line up.]* Nope.

Alani: Yeah—7/10 is 70 percent, and 2/3 is 66 2/3 percent, so 7/10 is more.

Jasmine: It's 7/10, right? There's 5 tenths in a half, so maybe we can start with 1/2.

Yu-Wei: If it's tenths, we could do fifths, too.

Noah: *[Checks the gameboard with the straightedge.]* 2/10 is 1/5.

Yu-Wei: No, 1/5 is half of a tenth, isn't it?

Noah: No, look: 1 fifth and 2/10 line up. You got it backwards. So let's move 1 fifth. Now I have 5/10 left over. That's a half, and we could move a half almost anywhere. So I'm going to do 3 sixths to get a chip. *[He records 7/10 = 1/5 + 3/6.]* You're up, Yu-Wei.

Yu-Wei: I picked 6/4. I'm going to move 1 fourth first to get to the end. *[He moves a chip from 1 3/4 to 2.]* Now, I'll move 6 eighths. That's equal to 3 fourths. So I have 4 fourths used up so far... and 1 half left. That's easy. I can do it anywhere... 3 sixths. Now, let's see... 1/4 and 2/4 [3/6] is 3/4 and another 3/4 [6/8] is 6/4. [*He records 6/4 = 1/4 + 6/8 + 3/6.]*

Jasmine: OK, 14/10. I'm going to move 2 tenths *[she moves the chip on the tenths track].* Then instead of 12 tenths I can do 6 fifths, and it's a chip.

Alani: Here's 3/3. I'm going to try to start with 1 sixth 'cause I get a chip... *[pause]* I need some help.

Yu-Wei: That counts for half of 1/3. *[He shows this by using his fingers as calipers, one on the 5/6 and the other on the 1, and then moving them to the thirds track.]*

Alani: Then I'll move 4 eighths, and 4/8 is... This is hard to think about in thirds! It's 1 third and then *[using her fraction strips]* another half of a third?

Yu-Wei: Right! So put the 2 halves of the thirds together, and that's another third, so you've done 2/3, and there's 1/3 left, and you can move it on the thirds line. You got a triple! *[Writes 3/3 = 1/6 + 4/8 + 1/3.]*