

Task

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Overview

# Table Tennis

*Long Task*

## Task Description

This task asks students to determine how many matches and how much time are needed to run a round-robin table tennis tournament, in which each player is matched in turn against every other player.

## Assumed Mathematical Background

It is assumed that students have had experience conducting systematic investigations.

## Core Elements of Performance

- design a method for determining the number of games in a round-robin tournament
- analyze and convert among units of measure to determine the amount of time needed for a tournament

## Circumstances

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**Grouping:** Following a class introduction, students complete an individual written response.

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**Materials:** No special materials are needed for this task.

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**Estimated time:** 45 minutes

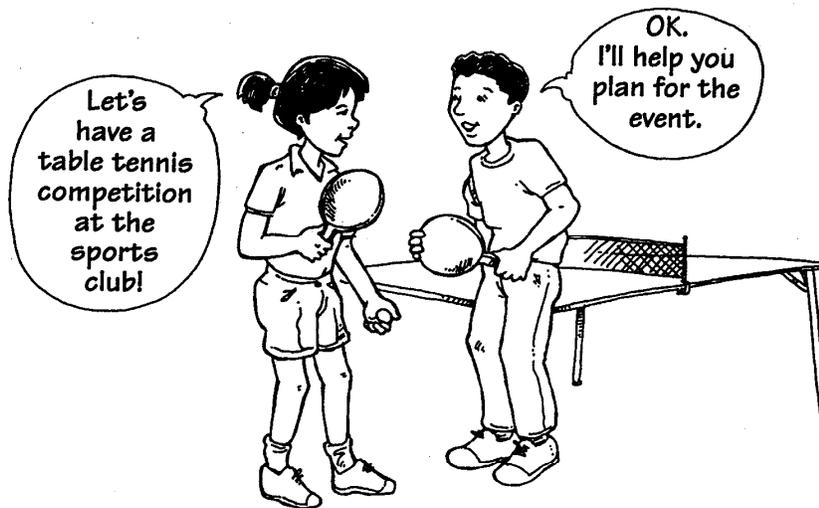
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# Table Tennis

## As a class

You have the job of organizing a round-robin table tennis competition for some students in your class. All the matches are singles—one against one.



A round-robin competition means that every player has to play every other player once.

You find out that there are four tables available, in the large hall at the local sports club. Individual table tennis matches normally take about half an hour.

Imagine there are just three people in the competition. Each person has to play every other person once.

How many matches will be played in the tournament? \_\_\_\_\_

Middle Grades Package 1

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Name \_\_\_\_\_

Date \_\_\_\_\_

**This problem gives you the chance to**

- *design a method for finding the number of games*
- *reason with units of measure*

**On your own**

1. Ten people want to sign up to be in the competition.

- a. How many matches will be played altogether? \_\_\_\_\_
- b. Explain how you worked out your answer.

2. Individual table tennis matches usually take half an hour.

Remember there are four tables available. Determine the shortest amount of time for the competition. (Show all of your work.)

3. Suppose two additional students decide to join the tournament.

- a. How long will the tournament now take? \_\_\_\_\_
- b. Explain how you worked out your answer.

# A Sample Solution

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1a. 45 matches.

1b. Here are three possible methods for determining how many matches will be played.

i. An organized list could be used.

We could label the players A, B, C, D, E, F, G, H, I, and J.

AB, AC, AD, AE, AF, AG, AH, AI, AJ

BC, BD, BE, BF, BG, BH, BI, BJ

CD, CE, CF, CG, CH, CI, CJ

DE, DF, DG, DH, DI, DJ

EF, EG, EH, EI, EJ

FG, FH, FI, FJ

GH, GI, GJ

HI, HJ

IJ

ii. A second method is to make a chart using an "X" to keep track of the matches.

	A	B	C	D	E	F	G	H	I	J
A		X	X	X	X	X	X	X	X	X
B			X	X	X	X	X	X	X	X
C				X	X	X	X	X	X	X
D					X	X	X	X	X	X
E						X	X	X	X	X
F							X	X	X	X
G								X	X	X
H									X	X
I										X
J										

## Table Tennis ■ A Sample Solution

iii. The third method is to “reason through.”

Player A plays 9 others; B has already played A but has 8 others to play; C has played A and B, but has 7 others to play, and so on. The total number of games =  $9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 45$ .

2. If 4 matches can be played simultaneously in one half hour, then 8 matches can be played in 1 hour. Since there are 45 matches:  
 $45 \text{ matches} \div 8 \text{ matches/hour} = 5 \text{ hours with a remainder of 5 matches.}$   
If 40 matches take 5 hours and the remaining 5 matches take 1 additional hour, then the total tournament time is 6 hours.

OR

$45 \text{ matches} \div (4 \text{ matches/half hour}) = 11 \text{ half hours with a remainder of 1 match.}$   
If 44 matches take  $5\frac{1}{2}$  hours and the remaining match takes one half hour, then the total time for the tournament is 6 hours.

- 3a. For 12 players (using any of the methods for solutions to question 1) there are 66 total matches.

- 3b.  $66 \text{ matches} \div 8 \text{ matches/hour} = 8 \text{ hours with a remainder of 2 matches.}$

If 64 matches take 8 hours and the remaining 2 matches take an additional half hour, then the total time for the tournament is  $8\frac{1}{2}$  hours.

OR

$66 \text{ matches} \div 4 \text{ matches/half hour} = 16 \text{ half hours with a remainder of 2 matches.}$   
If 64 matches take 8 hours and the remaining 2 matches take one half hour, then the total time for the tournament is  $8\frac{1}{2}$  hours.

Task

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### Table Tennis

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## Using this Task

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Read and discuss the first page of the activity with the class. You may need to explain the idea of a round-robin competition, in which everyone plays everyone else. One way to increase the students' understanding of the situation is to have them role play and act out a three-person tournament, keeping track of which players play each other and how many total matches are played.

When it is clear to you that students understand the context, begin the individual assessment by reviewing with students the aims of the assessment given in the box at the top of the page entitled, *On your own*. Remind the students that only four tables can be used at any one time.

You may wish to extend this task by asking students to try to match up players to see which 4 pairs will play simultaneously during each half hour. This is a tricky problem because although each player plays every other player once, he or she can only play one game per half hour. Below is a list of possible match-ups for each set of 4 matches (numbered 1–12). You may want to challenge your students by asking them to create such a list.

	Table 1	Table 2	Table 3	Table 4
Match 1	B & I	C & H	D & G	E & F
Match 2	A & I	B & H	C & J	D & F
Match 3	A & H	B & J	C & I	D & E
Match 4	A & G	B & F	C & E	D & J
Match 5	A & F	B & G	D & I	E & J
Match 6	A & E	C & G	D & H	F & J
Match 7	A & D	C & F	E & I	G & J
Match 8	A & C	B & E	F & I	H & J
Match 9	A & B	C & D	E & H	G & I
Match 10	A & J	B & D	F & G	H & I
Match 11	B & C	E & G	F & H	I & J
Match 12	G & H			

## Middle Grades Package 1

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