

SET Card Game

Grade level: 7-9 (the game itself); 9-12 (minimum cards to guarantee a set; magic squares)

Materials: 1 SET card game per group of 4 students, 1 copy of student worksheet per student. Colored markers (to draw possible sets) may be helpful, but not necessary.

Learning goals: Younger students should be able to understand the rules of the game, recognize patterns in the cards, and see ‘sets’ in the groups of cards. Older students should be able to reason why 12 cards are not necessarily enough to guarantee a set (post-Algebra II students should be able to outline the sketch of a proof); understand what a magic square is; apply the rules of magic squares to the SET game; create their own SET magic squares.

NCTM Standards Correlation:

- Algebra (pattern recognition)
- Data analysis (older students: guarantee of a set in 12 cards)
- Problem solving (‘optimal’ methods of pattern recognition)
- Reasoning and Proof (older students: guarantee of a set in 12 cards)
- Communication (playing the game; discussions of pattern recognition. Older students: explanations of magic squares)
- Connections (worksheet, wrap-up questions)

Preparation: Pre-sort cards to be used in discussions of magic squares. In order to facilitate the discussion on 12 cards “guaranteeing” a set, it may be useful to ensure that there will be at least one set within the initial 12 cards (if students see that 12 cards yields a set right away, it may lead to more critical thinking about the problem). It may also be useful to have a few examples of valid sets (and some of invalid sets) in order to demonstrate the rules to students unfamiliar with the game.

Before the game, students should have some introduction to patterns and pattern-recognition. Older students should have experience with matrix logic and magic squares.

Directions: See worksheet for game rules. Explain that students must call “SET” before picking up cards, that they must wait until all cards are on the table before calling “SET” and that they must have seen a set before calling “SET” (i.e. no calling and then using the time to search the cards for a set).

Plan: Explain the rules of the game. Work through the first 4 questions to check that students understand the directions. Break the class up into groups of 3-5 people, and allow each group to play the game. For younger students, the class period should be spent playing the game, with time for discussion at the end. Students who can pick up the patterns more quickly than others should be moved into groups of students with similar strengths to allow others chances to participate.

Older students should play a few rounds of the game, and then move on to the later questions on the worksheet.

Wrap-up Discussion Questions:

What kinds of patterns can you think of in everyday life? Are there any games you can think of to find them like in SET?

Could you make SET magic squares that are larger than 3x3? How would you have to modify the 'rules' of a magic square to do so?

Additional Material: <http://www.setgame.com/>

Play until *eight* sets have been found.

Describe your method of finding sets.

(example: did you pick one element and look for sets based off of that one?)

In the original layout of twelve cards, are you guaranteed a set? Why or why not? Explain.

Magic Squares:

1. How would you best describe a magic square?

2. Can you think of any examples or games which utilize magic squares?

SET Magic Squares:

1. What do you think a SET magic square consists of?

2. Construct a sample magic square using only *SOLID* and *RED* cards. Draw your solution on a separate sheet of paper.

3. Build a magic square using only *SOLID* cards, any color. Draw your solution on a separate sheet of paper.

4. Build a magic square using any cards from the SET deck. Draw your solution on a separate sheet of paper.

Student Activity Sheet (solutions!): SET Card Game

Directions:

The aim of SET is to identify a 'set' of three cards from twelve cards laid out on the table. Each card has four features, defined as follows:

- shape*: either oval, squiggle, or diamond
- color*: either red, green, or purple
- number*: either one, two, or three
- shading*: either solid, outline, or striped

A 'set' consists of three cards in which each of the card's features are either all the *same* or all *different*. If only 2 of the 3 cards are the same in any feature, then it is not a 'set.'

The dealer shuffles and lays twelve cards face up, from which players call out "SET!" when they spot one. Each set is then checked by the other to ensure accuracy. More cards are dealt so that twelve cards are consistently on the table. If no set is found amongst the twelve, three more at a time may be dealt, until another set is found. The player with the most sets when the deck has been fully dealt wins.

Draw or give an example of a set where...

1. Only one element differs:



Example:

(all are red, all have 2 shapes, all are ovals; the shading differs)

2. Two elements differ:



Example:

(all are red and outlined; all have different numbers and shapes)

3. Three elements differ:



Example:

(different colors, different shapes, different numbers; the shading is the same)

4. Every element differs, no feature is the same:



Play until *eight* sets have been found.

Describe your method of finding sets.

(example: did you pick one element and look for sets based off of that one?)

Discussion: is one method more effective than another? Can these methods of pattern-searching be applied in other instances?

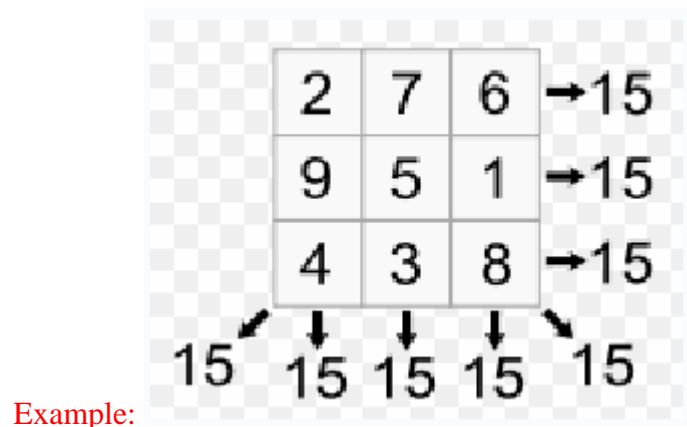
In the original layout of twelve cards, are you guaranteed a set? Why or why not? Explain.

No! This can be demonstrated during play, if no one can find a set in a group of 12 cards; the minimum number of cards needed to guarantee a set is 21 (see website for rigorous mathematical proof <http://www.setgame.com/>). Proof is especially clear if students have been exposed to matrix-logic problems.

Magic Squares:

1. How would you best describe a magic square?

A magic square is one where each row, column, and diagonal sums to the same constant.



2. Can you think of any examples or games which utilize magic squares?

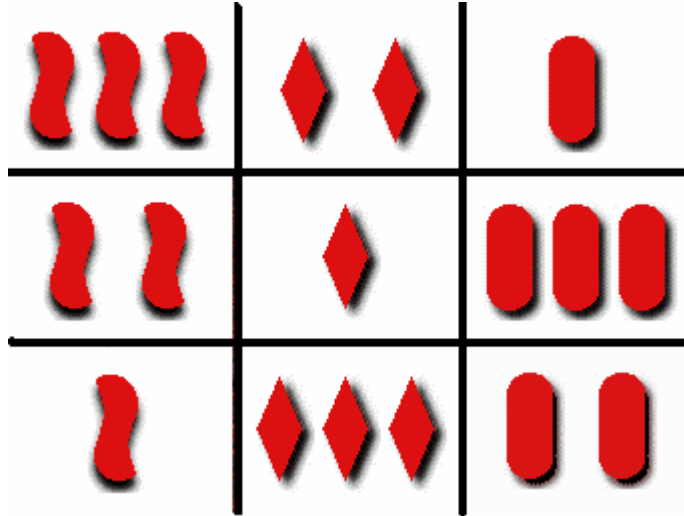
Sudoku

SET Magic Squares:

1. What do you think a SET magic square consists of?

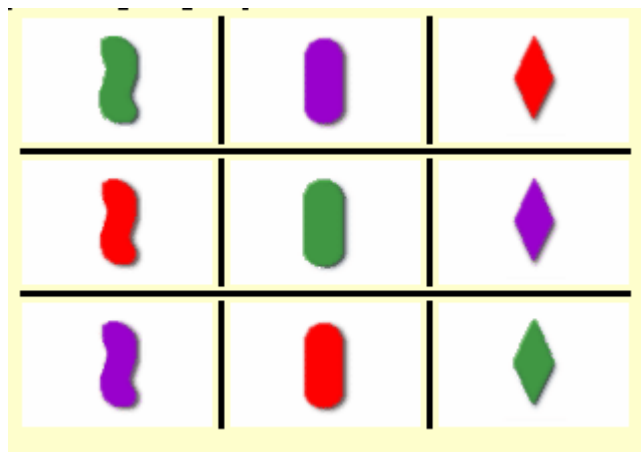
A SET magic square is one where each row, column, and diagonal consists of a valid set.

2. Construct a sample magic square using only *SOLID* and *RED* cards. Provide pre-sorted cards for students.



Example:

3. Build a magic square using only *SOLID* cards, any color.



Example:

4. Build a magic square from scratch.

All images taken from <http://www.setgame.com/>