# 4.4 Game of SET          Date : ....................
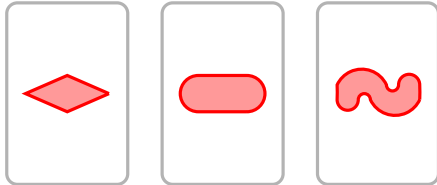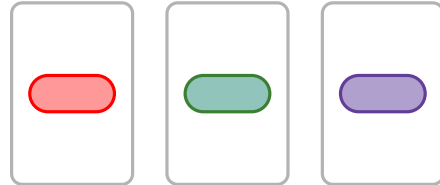
Set is a multi-player game played with a special deck of cards. Each card is uniquely determined by four features : number, color, shape and shading which can vary as follow:
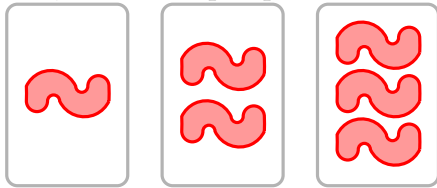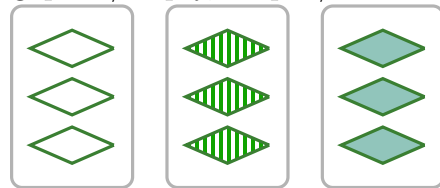
shape  diamond, oval and squiggle

color  red, green or purple.

number  1, 2 or 3 shapes per card

shading  plain/empty, striped/hashed or solid/full.

> A SET is a collection of three cards such that for each feature, either all the cards in the trio share the same value for that feature, or else no two have the same value for it.

For example, "one plain green diamond", "two striped red squiggles", and "three solid purple ovals" form a set.
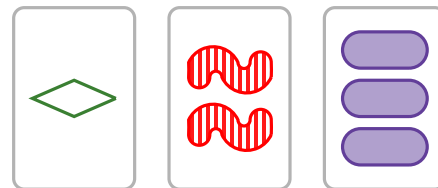
1) Complete to form a SET with the same shape, the same color, the same number of symbols and all different shading.

2) Complete to form a SET with different shapes, different colors, and different numbers of symbols and the same shading.
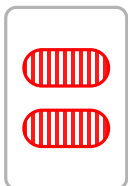
3) Find a card to form a SET.

4) Explain why it is a SET.

5) Find a card to form a SET.

6) Explain why it is a SET.

**Listening comprehension**  https://youtu.be/NzXDfSFQ1c0 (2'30")

The object of the game is to have the highest score at the end of multiple rounds.

Setup. _____ the deck and lay out 12 cards face up in a 4 by 3 grid so all players can see them.

Each card has 4 features.

**Symbols**  Each card has ovals, squiggles or diamonds on it.

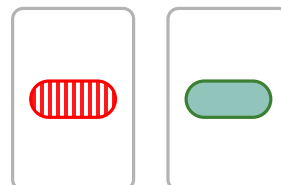**Colors**  The symbols are red, green or purple.

**Number**  They are either one, two or three symbols on each card.

**Shading**  The symbols are either _____, _____, or _____. description

There is no turn order. All play is simultaneous. All players look at the face of grid of cards looking for SETs. A SET consists of three cards in which each of card features, looked at one by one, are the same on each card, or are different on each card. All the features must separately satisfy this rule.

- The shape must be either the same or different on all three cards.
- The color must be either the same or different on all three cards.
- The number must be either the same or different on all three cards.
- The shading must be either the same or different on all three cards.

When a player recognizes a SET, they say SET, and tap the three cards in the set. The other players verify that it is _____ a set, and the player that recognized them picks up the cards and collects them. The dealer replaces the taking cards with new ones from the deck.

When a player calls SET, play is paused until that player picks up the cards. Then the play _____. If a player calls SET, and does not have one, they lose 1 point an play continues.

If among the cards all the players agree there is no SET visible, then the dealer flips over three more cards. When a set is found the three extra cards are not replaced until the total number of cards on the table is fewer than 12 or if there is no SET visible.

Play continues until deck is _____ and no more sets can be made. Each player scores one point for each SET they made. The cards are all gathered, and the dealer then pass the deal to the left. The new dealer shuffles and lays out cards and another round is played.

Continue playing until every player has been the dealer once. Then the game ends and the player with the most points wins.

**Vocabulary**

1) **to deplete, depleted, depleted**

The lake was depleted of water. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

2) **to resume, resumed, resumed**  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

3) **to stripe, striped, striped**

Zebras have unique striped pattern. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

4) **to strip, stripped, stripped**

The tank was stripped down piece by piece . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

The general was stripped of his rank. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

> **Instructions**
>
> To play, we start with a shuffled deck and the dealer deals 12 cards face up on the table. Your goal, as a player, is to find a SET. Once you find one, you call it out, collect the SET (assuming that it is a legitimate one), and the dealer deals 3 more cards. The object of the game is to collect the most SETs. One point is given for each SET. Highest score wins.
>
> A player must call SET before picking up the cards. There are no turns, first player to call SET has few seconds to pick his cards. If the SET is incorrect, he/she loses one point.
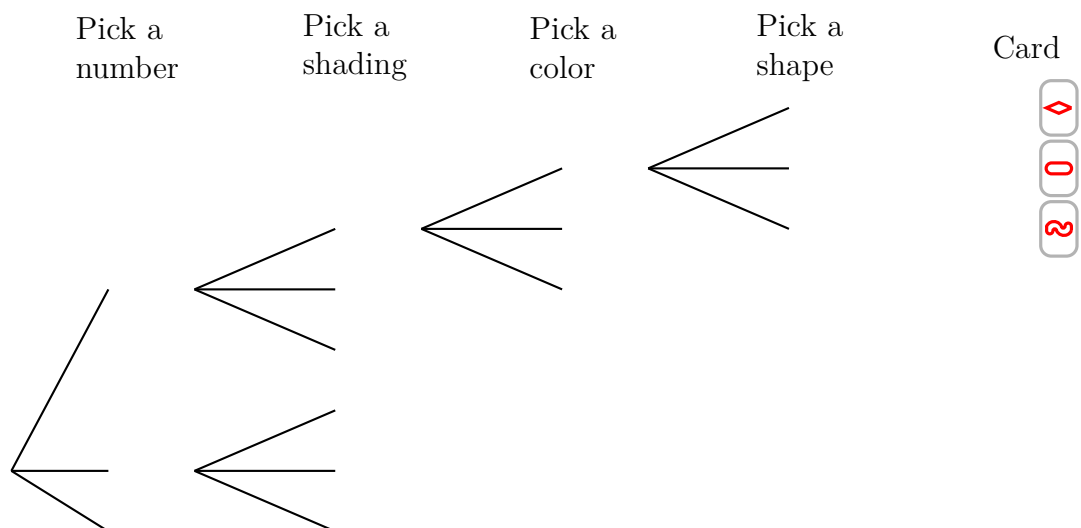
**Daily Set challenge**  https://www.setgame.com/set/puzzle

1) How many different cards in a SET deck?

To make a card we ................................ characteristics (to pick/picking/picked).

Each characteristic has .......................................................................

We can draw a ...............................to count all ................................

There are a total of ...........................................................................



| Pick a number | Pick a shading | Pick a color | Pick a shape | Card |

> **Fundamental Rule**
>
> A number of multiple choices are to be made. There are $m_1$ possibilities for the first choice, $m_2$ for the second, $m_3$ for the third, etc. If these choices can be combined freely, then the total number of possibilities for the whole set of choices is equal to _____

2) Show that for every two cards there is a unique third card that will make a set.

(different from/same/similar/similarly). Take the characteristic _____. Either the first two cards have the same _____ , and the third card must have _____. Either the first two cards have _____, and then the third card must have _____

and there is _____ possibility for that.

_____ for the other three characteristics.

3) If you draw three cards at random, what is the probability that they form a SET?

   Since any two cards _____ a Set, if you draw two cards, then _____ of the remaining _____ cards will join with the first two cards to make a Set. The probability of such a drawing _____ .

4) How many different ordered SETS are there?

   We can use a _____ to count all **ordered** SETS.
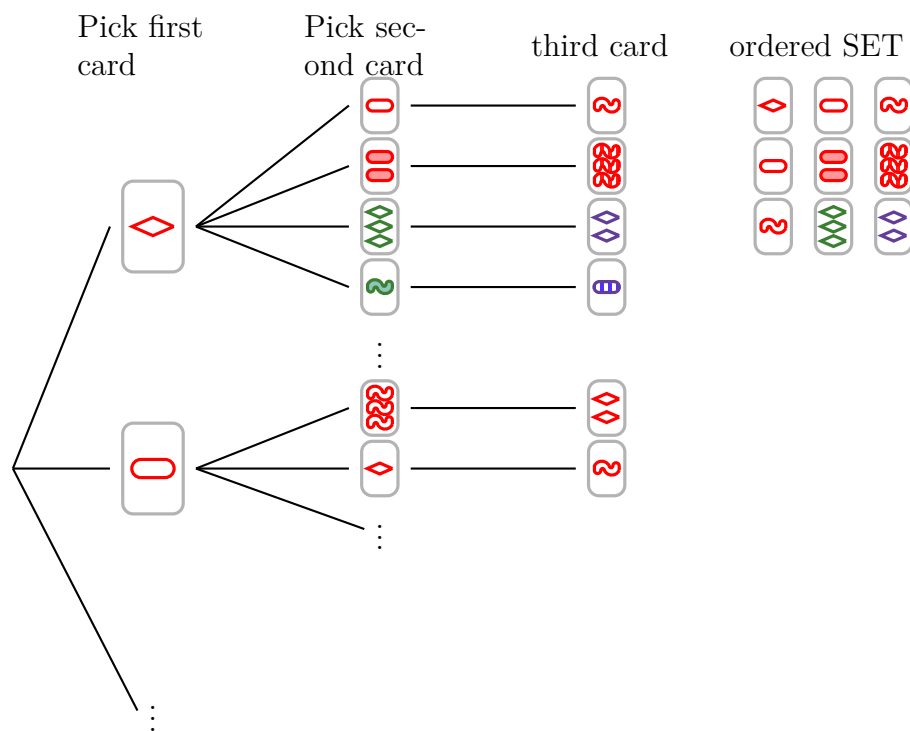


   To make a Set, we need to pick 3 cards. There are _____ choices for the first card, _____ choices for the second card, and _____ choice for the third card.

   The number of **ordered SET** is _____

   > This is called "Sampling without repetition and with ordering"

5) Use a tree diagram to find out in how many ways we can order the 3 cards set  .

6) How many different SETS are there?

Since the order of cards in a Set doesn't matter, we should divide by _____ . Thus there are_____ different Sets.

> This is called "Sampling without repetition and without ordering"

7)   a) How many cards share no characteristics with [⬧] ?

To make such a card, we have to pick among _____ possible choices for number, _____ possible choices for shape, _____ possible choices for shading, and _____ possible choices for color. There are _____ possible cards.

   b) How many cards share exactly 1 characteristics with [⬧] ?

To make a card sharing only a same color, we have to pick among _____ possible choices for number, _____ possible choices for shape and _____ possible choices for shading. This makes a _____ possible cards.

Similarly, we have _____ cards sharing only a same number, as well as _____ cards sharing only a same shape, and _____ cards sharing only a same shading.

The total of cards sharing one same characteristic is _____.

   c) How many cards share exactly 3 characteristics with [⬧] ?

To pick a card sharing same color, number and shape but different shading, we have to pick among _____ possible choices.
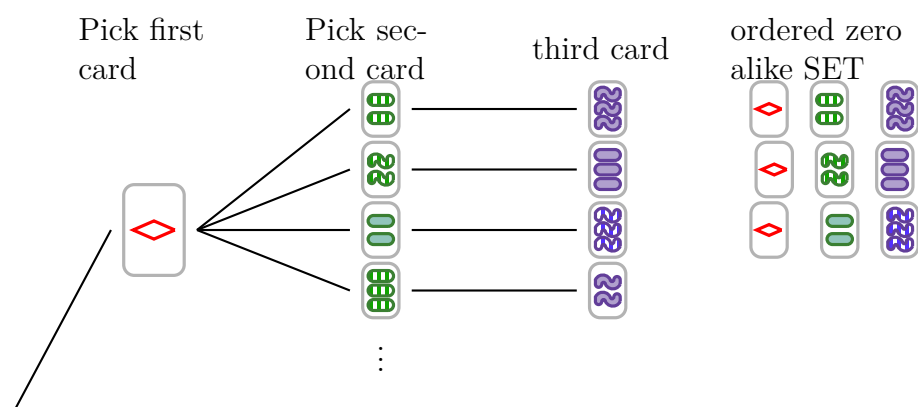
The total number of cards sharing 3 characteristics with [⬧] is _____.

   d) How many cards are left? How many characteristics do they share with [⬧] ?

........................................................................................................

8) Figure out the percentage of none-alike Sets.

We can use a _____ to count all **ordered** SETS.
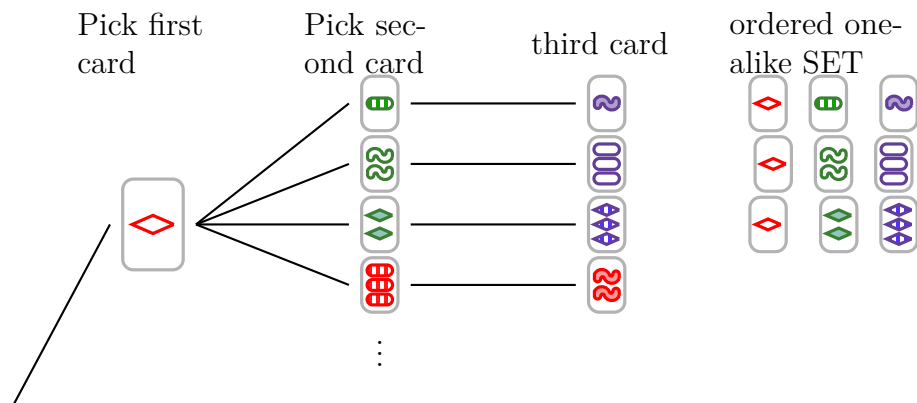


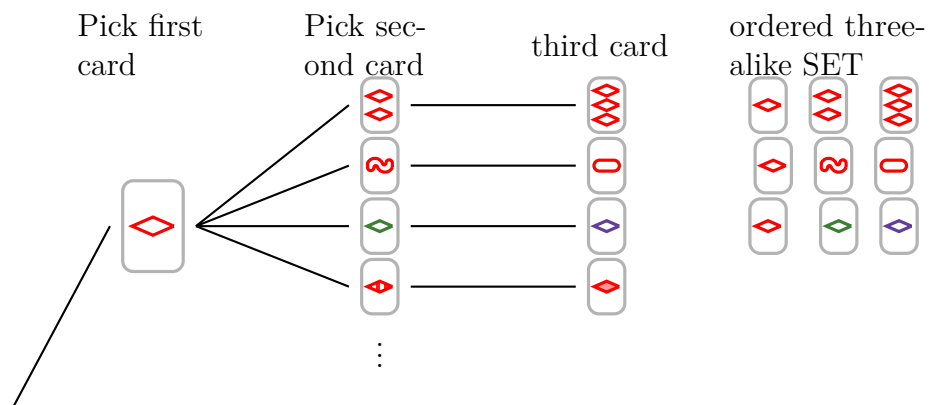By the fundamental rule, the total number of ordered zero-alike sets is ____×____×____=____

Since the order of cards in a Set don't matter, there are _____ different none-alike Sets.

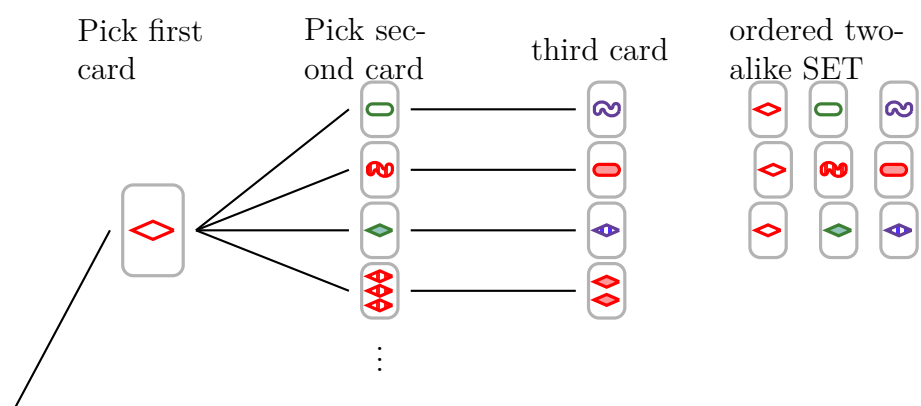The percentage among all Sets is _____ ≈ _____%.

9) Figure out the percentage of one-alike Sets, two-alike Sets and three-alike Sets among all Sets.



By the fundamental rule, the total number of ordered one-alike sets is _____×_____×_____=_____



By the fundamental rule, the total number of three-alike sets is _____×_____×_____=_____



By the fundamental rule, the total number of ordered two-alike sets is _____×_____×_____=_____

Percentage of three-alike sets :_____

Percentage of none-alike sets :_____

Percentage of two-alike sets :_____

Percentage of one-alike sets :_____

## Variant : Rules for SETUP

**OBJECT**   To play a card from your hand that does not make a 'set' with the cards already played on the table.

**THE DEAL**   Four cards are dealt to each player, which are held in the players' hands. The remainder of the deck is placed on the table in a stack.

**THE PLAY**   Each player must place a card face up on the table during his/her turn. The card played is then checked by all other players to see if it makes a 'set' with the cards already on the table. A 'set' must be seen before the next person in turn plays a card. If a 'set' is seen on the table that does not use the last card played, it does not count and play continues as if it did not exist. If the card played is found by any of the other players to make a 'set' with two other cards on the table, the player who put the card down receives all of the cards currently on the table. They are not used in play again, but count against the player at the end of the hand. As each player plays a card, he/she draws a replacement from the deck. After players try to make a 'set' with the last card played, (which may or not be possible), the next player in turn puts down a card, and the play continues until all the cards in the deck are played. Note, as more cards are laid on the table, it is more and more likely that a 'set' will be made. It is difficult to have more than twelve cards (and impossible to have more than 21 cards) on the table without a 'set' being made by the next player, so check carefully and bluff convincingly.

**SCORING**   After all of the cards in the deck are used, the player who has to take the most cards from the table loses.

## Variant : Rules for ChipSET

**Object**   To make the most 'sets' by using at least one card in your hand and the cards on the table. By doing so the player wins all the chips in the pot.

**NUMBER OF PLAYERS**   2 or more.

**THE DEAL**   One card is dealt face up in the center, then one face down to each player. A second card is dealt face up in the center, then one face down to each player. After each SHOWDOWN (see below), if no player shows, an additional card is dealt face up in the center.

**THE SHOWDOWN**   If a player has a 'set' he may or may not show it at this time. If he does show, then every player who has not previously dropped must expose his cards face up on the table. Whichever of these players has the highest number of 'sets' wins. All 'sets' must use at least one card from the player's hand.

**Answers**

1) How many different cards in a SET deck?

   Since there are three possible values for each of the four characteristics, there are a total of $3^4 = 81$ cards in a Set deck.

2) Show that for every two cards there is a unique third card that will make a set.

   Take the characteristic NUMBER. If the first two cards have the same number, then the third card must have that same number. If the first two cards have different numbers, then the third card must have a number different from the first two and there is only one possibility for that. Similarly for the other three characteristics.

3) If you draw three cards at random, what is the probability that they form a SET?

   Since any two cards uniquely determine a Set, if you draw two cards, then exactly one of the remaining 79 cards will join with the first two cards to make a Set. The probability of drawing it is 1/79.

4) How many different SETS are there?

   There are 81 choices for the first card, 80 choices for the second card, and one choice for the third card. Since the order of cards in a Set don't matter, we should divide by $3! = 6$. Thus there are $81 \times 80/6 = 1080$ different Sets.

5) After playing a few rounds of Set, you will notice that there are different kinds of SETS. What are they? Which kinds do you think are the most and least common? Which seem to be the trickiest to spot?

   There are actually four different kinds of Sets. They can be classified according to how many characteristics the cards share: zero, one, two, or three. The three-alike Sets are easiest to spot. An example of a three-alike Set is "one plain red squiggle," " two plain red squiggles," and "three plain red squiggles." The none-alike or all-different Sets are the most challenging to find. An example of an all-different Set is "one plain red oval," "two striped green squiggles," "three solid purple diamonds."

6) Figure out the percentage of three-alike Sets, two-alike Sets, one-alike Sets, and all-different Sets. If your calculation is correct you should have found that out of the 1080 total possible Sets the number of three-alike Sets is 108, or 10%, the number of two-alike Sets is 324, or 30%, the number of one-alike Sets is 432, or 40%, and the number of all-different Sets is 216 or 20%.