

HTO - Hundreds, Tens, Ones

Two-Three Players

Required Materials:

- one deck of cards with face cards and tens removed
- an HTO game sheet for each player

HTO Activity Sheet

Students put the highest card in the Hundreds column to make the largest number.

| Hundreds | Tens | Ones |
|----------|------|------|
| | | |

One player deals three cards to each player. Player 1 turns over one of Player 1’s three cards, and places it on Player 1’s activity sheet. Once a card is placed it cannot be moved. Player 2 turns over one of that player’s cards and places it on Player 2’s activity sheet.

This continues, with the students taking turns turning over cards, until all of the cards are turned over. The student with the highest number on the ‘HTO’ game sheet wins all of the cards from that round. The students continue playing until all of the cards have been used. The winner of the activity is the student with the most number of cards at the end.

For example:

| | Hundreds | Tens | Ones |
|----------|----------|------|------|
| Player 1 | 5 | 4 | 3 |
| Player 2 | 6 | 2 | 4 |
| Player 3 | 7 | 1 | 4 |

Player 3 has the highest number (714) and wins all the cards.

When playing with older students, use a washer as a decimal point. This washer can be placed between any of the place value columns to have the students practice understanding of decimal numbers.

The National Council of Teacher of Mathematics Standards connections with this activity are available in a PDF file. See the inside back cover for download information.

Stages of Learning in ‘HTO’

Students who begin to use this mathematical activity should have a fairly good understanding of the value of each digit. They should understand which digits are greater than others, and the order of numbers when reading a two or three digit number.

When first using this activity, it is recommended that the hundreds column be covered over. This allows students the opportunity to understand the rules of the game and to experience some immediate success in creating and reading greater numbers. Once students understand the basics of the activity, the hundreds column may be introduced.

Students may begin by placing the cards at random on the activity sheet. Which player wins will be entirely due to probability. Students may place the cards left to right, or right to left, or in no particular order. Adults should watch for the development of strategies in the card placement. For example, if students are placing ‘one’ cards in the left hand column, when there are other columns available, it demonstrates a lack of understanding of the different values of the columns in a two or three digit number. Students who do this should not be corrected. It is enough if the students are able to correctly state the two or three digit number.

Students may also have difficulty in comparing the final numbers created. This demonstrates a lack of understanding of the different values represented by each column. Students should be allowed to discuss their opinions, using the activity boards and stating the numbers that each student feels has been created. It is important for the adults to listen for mistakes in reading the numbers, and in comparing the values of two numbers. Adults should only get involved in the discussion when students reach an incorrect final opinion on the values of the numbers.

As with any other activity, adults should attempt to intervene by asking questions, instead of providing answers. As they use the activity, students begin to realize that they have a better chance of winning if they are careful where they place their cards.

Cards high in value will be placed more frequently into the left-hand columns. Cards that are lower in value will be placed in the right-hand columns.

At this stage of understanding, adults should watch for improvements in the methods the students use in comparing the two numbers. Eventually, students compare numbers from left to right. As soon as one student has a digit of greater value than that of the other student, the remaining part of the number should be deemed unimportant. This understanding is often also observable during the game, by watching the reaction of the students when the left hand columns have been filled in.

Older students can continue to use the game of ‘HTO’ by introducing the decimal point. A small object, such as a washer or a dime, can be placed between two columns of the activity board. Students can now use the activity to develop and strengthen their understanding of the tenths, hundredths, and thousandths columns.

As with the mathematical activity of ‘HTO’, the next activities of ‘Double Up’ and ‘Squared’ require the students to have an understanding of the individual values of numbers. However, instead of dealing with place value, these activities provide the opportunity for students to develop their understanding of number operations.

Double Up

Two Players

Required Materials:

- one deck of cards with face cards removed

One student flips over a card. The first player to correctly say the double of the number on that card, wins the card. The activity continues until all of the cards have been used. The winning player is the one with the most cards at the end of the activity. To avoid disagreements about fairness, have the students take turns flipping over the cards.

The National Council of Teacher of Mathematics Standards connections with this activity are available in a PDF file. See the inside back cover for download information.

Stages of Learning in ‘Double Up’

The activity of ‘Double Up’ allows students to increase their understanding of basic addition skills. Often, doubled numbers are taught (e.g., $1+1$, $2+2$) so that students will understand the relative values of numbers, and so that they can use this understanding to determine the results of other addition sentences. For example, if students understand that $5 + 5 = 10$, then those students can use this understanding to figure out $5 + 6$, by knowing that the answer is ‘one more than’ $5 + 5$ (or $5 + 5 + 1 = 11$).

Most students will begin adding the numbers by using the picture representations. For example, when adding $4 + 4$, students may count the pictures once for the first four, and then add on the second four by counting the pictures again. Both students playing the activity will use the picture representations on the card, so it is important that they do not cover the card with their hands or any other way. There will often be disagreements about the totals, which should be solved with a recount.

Students will likely progress to the stage of using the card only to count the second part of the addition sentence. For example, in the same example of $4 + 4$, students may not need to count the first four. These students will instead start at four and count on to add the second four (5, 6, 7, 8). Students will be motivated to do this, since the reduced time needed to count will increase their likelihood of saying the answer first. Students may also use their fingers to add on this second number, since it would be faster and easier than using the pictures on the cards.

Finally, students will progress to completing the addition mentally. The speed that the students do this indicates the amount of mental calculation needed to find the answer. Eventually, it should become quick as the students recall the addition facts, rather than calculating them.

Once students have developed an understanding of doubled numbers, they may be introduced to mathematical activities that allow for practice of related addition facts, such as the next activities of ‘Speed’ and ‘Salute.’

Squared (Multiplication)

Two Players

Required Materials:

- one deck of cards (face cards removed)

One student flips over a card. The first player to correctly say the square of the number on the card, wins that card. The activity continues until all of the cards have been used. The winning player is the one with the most cards at the end of the activity. To avoid disagreements about fairness, have the students take turns flipping over the cards.

The National Council of Teacher of Mathematics Standards connections with this activity are available in a PDF file. See the inside back cover for download information.

Stages of Learning in ‘Squared’

As with the use of doubling to teach addition, teachers will often use the squared numbers first to help students develop their understanding of multiplication. If students understand that $6 \times 6 = 36$, they can extend this understanding to questions such as 5×6 , and 7×6 by either taking away or adding on, one group of six.

Students who are learning the mathematical activity of ‘Squared’ should have a good understanding of addition, and have had some discussion of repeated addition (for example: 3×3 is the same as $3 + 3 + 3$).

When first learning the activity, most students will use the picture representations on the card to perform the repeated addition.

For example, on the ‘five’ card, the students point to each picture, while counting by fives. This would get them the correct answers, and reinforces multiplication as repeated addition. Some students may start at the earlier stage of recounting the pictures for each grouping. These students would be observed to count each picture separately to five and then track this one group of five (by perhaps using a finger). They would then add on the following groups of five by counting the picture for each group. This method will get the students the correct answer, but is often quickly abandoned as it is very slow.

As in the activity of ‘Double Up’, students may begin to use their fingers instead of the card to do the repeated addition. This is an effective strategy, since it allows the students to continue to use a real object for counting, while still speeding up the calculation.

Eventually, the students begin to recall the multiplication answers mentally as they repeatedly practice them. At this stage, the adults can observe the amount of time the students take finding the solution. If the students take more than the expected time to find the answer, this indicates that there is still more than the desired amount of mental calculation taking place. If students state an answer quickly, then those students are recalling the facts that they have previously learned.

Once students have developed a good understanding of the squared numbers, they are ready to practice the related multiplication facts through the use of the multiplication versions of the next activities, ‘Speed’ and ‘Salute.’

Speed

Two Players

Required Materials:

- one deck of cards (face cards removed)

Each student gets half the deck. When one student says ‘go’ each flips over the card. The first student to correctly give the sum (by adding them) wins the cards. At the end of the activity, the students add up the number of cards that they have to see who has won. The same activity can be played in older grades by having the students multiply instead of add.

The National Council of Teacher of Mathematics Standards connections with this activity are available in a PDF file. See the inside back cover for download information.

Stages of Learning in ‘Speed’ (Addition)

Students using the addition version of ‘Speed’ should understand the value of the individual numbers and the relationship between the digit and the picture value shown on the card. It would also be beneficial for students to have some understanding of doubled numbers (e.g., $1 + 1$, $2 + 2$, $3 + 3$). The mathematical activity of ‘Speed’ allows students to extend this understanding into other addition facts.

Students who are first learning the activity of ‘Speed’ will usually start by finding the total

amount by counting the pictures on both playing cards. For example, if the two cards were a ‘five’ and a ‘four’ the students first count through the ‘five’ card, and then add on by counting the ‘four’ card to get the total count of nine.

This demonstrates a strong awareness of the one-to-one relationship between the pictures and the number, but some difficulty in understanding the permanent value of the number on each card.

Students will usually progress to the stage where they are starting with the number shown on one card and counting on the second number.