Coordinating groups

Students able to coordinate groups...

are capable of double counting. This is particularly useful in multiplication and division tasks. Using a double count, the student is able to keep track of the multiple sequence at the same time as keeping track of the number of groups without relying on material or markers to represent the groups.

In response to the question, *There are twelve children in a room and four children at each table. How many tables are used?* a student needs to treat four as a unit (group) as well as coordinate the count of groups.

Students need to move from coordinating composite units to using multiplication and division as operations. At this level the student can immediately recall, or easily derive a wide range of multiplication and division facts. In doing this, the student uses multiplication and division as inverses of each other.

The idea of coordinating groups is also fundamental to place value. Students at this level are moving towards an understanding of using tens and hundreds as composite units. Significant opportunities to use regrouping of units, tens and hundreds, should be presented to the students.

Students need to move to using hundreds, tens and ones in standard decomposition and be able to count forwards and backwards by tens on and off the decade and by hundreds, on or off the hundred. Increasing or decreasing numbers by tens and hundreds supports the use of what the Dutch call *jump methods* to solve addition and subtraction tasks mentally. With this strategy, the student builds on one number by counting on by hundreds, then tens and finally units.

Using a collection-based strategy of separating both numbers into hundreds, tens and ones for an addition or subtraction task and then regrouping, is described as the *split method.* This strategy does not rely on incrementing and, where used successfully, shows that students have a part-whole knowledge of numbers to 1000.

The type of questions we pose will influence students' choice of the strategy they use. For a student to have a sound knowledge of place value, he or she needs to analyse a problem and, having a range of strategies to choose from, decide which would be the most appropriate.

Coordinating images and actions through a series of procedures is also important in spatial mathematics. Students' imagery will develop as they experiment with dynamic changes to shapes, patterns and objects. It also becomes fundamental to later geometry work.

Imagine a square pushed over to form a rhombus. The new shape can be described as having different angles from the first shape but keeping the same length sides. The opposite sides remain parallel and the diagonally opposite angles are still equal. Both the original square and the new rhombus have essentially the same properties with the exception that the square has all angles equal.

Coordinating images is also important to the development of measurement concepts. Students need to visualise how units can be joined together to form larger units or patterns of units. As well, students need to visualise how changing the size of the unit affects the quantity of units needed to measure an object and be able to explain this relationship.

Index of activities

Spin and multiply

Where are they now?

Students are able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Spin and multiply, page 320

How?

Organise the students into small groups. Prepare a spinner or die displaying the numerals one to ten. Tell the students which multiple will be practised in this activity. Provide the students with a strip of paper on which to record five numbers from the nominated multiple sequence. Do not tell the students the multiple sequence. Allow the students to recall or determine the appropriate numbers to record. Have the students take turns to spin a number on the spinner. The student then multiplies the number by the nominated multiple. If the student has this number on the paper strip, he or she may cross it off. The winner is the first person to cross off all five numbers. Provide the group with a calculator to confirm any disputed answers.

Variations

All students in the group may cross off the answer as it is spun.

Place numeral cards 1–10 into a box and draw out a numeral. This replaces the spinner.

Why?

Students need to be able to recall or easily derive multiplication and division facts if they are to move to solving problems involving more than one step.

Race around the world

Where are they now?

The student is able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

The student recalls multiplication and division facts.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Race around the world, page 321

How?

Prepare an adequate supply of baseboards. Organise the students into pairs and provide them with two numeral dice and a marker for each player. Have the students place their markers on the starting position. Ask the students to take turns to roll the dice and multiply both numbers rolled to determine the total. The student then moves his or her marker to the first corresponding numeral on the baseboard. If the student is unable to move forward to a numeral, the marker is moved backwards to the first corresponding numeral or alternatively, misses a turn. The first player to reach the final number at the centre of the board wins.

Variations

Once reaching the number at the centre of the board, the students continue playing and return from the centre number to the starting position.

Change the numerals on the baseboard to suit the multiples the students are currently working with.

Why?

Recall of multiplication and division number facts are useful in solving problems involving more than one step. Students also need to be able to use multiplication and division as inverse operations.

Una pizza per favore! (Pizza please!)

Where are they now?

Students are able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.

Allowing the students to choose which multiple to work with, allows students of mixed ability to work together.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

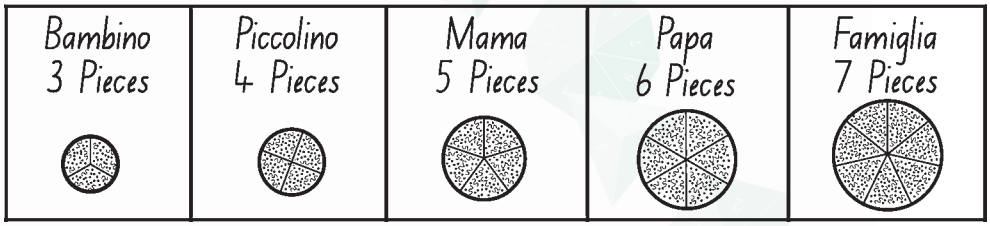
Building multiplication and division through equal grouping: level 5

BLM

Una pizza per favore!, page 322

How?

Organise the students into small groups and provide each group with a worksheet and a die. Have the students take turns to roll the die. The student then chooses a type of pizza from the menu board:



After choosing a type of pizza the student multiplies the number of pieces on the pizza by the number rolled to determine the total and records the answer on the worksheet. Encourage the students to work together until all of the boxes on the worksheet are completed.

Variation

For students needing to use material to determine the totals, encourage them to use the diagrams at the top of the worksheet to assist their counting. Alternatively, provide six picture cards displaying the slices of pizza for each sized pizza.

Why?

Students need to be able to recall or easily derive multiplication and division facts to move to problems involving more than one step.

Chords

Where are they now?

Students are able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.

TP

Two students may need to hold either end of the chord.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

How?

Prepare a length of chord or ribbon with ten knots tied at equal distances apart. Attach numeral cards 1–10 at each of the knots. Also, organise a set of numeral cards for the nominated multiple to be practised. Distribute the cards to the students and tell them which multiple will be practised. Call out a number between one and ten. The students multiply the called number by the nominated multiple and determine the total. The student with the corresponding numeral card takes the card to the knotted chord, and stands at the appropriate spot in the sequence. Alternatively, the card could be attached to the knotted chord.

Why?

Students need to be able to recall or easily derive multiplication and division facts if they are to move to solving problems involving more than one step.

Multiplication memory

Where are they now?

Students are able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.

TP

Prepare the question cards and the answer cards on cardboard of two different colours. The students will then easily be able to turn over one card from each set.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

How?

Select a multiple to be practised. Prepare 40 cards, 10 multiplication question cards and 10 division question cards for the selected multiple and 20 appropriate answer cards. Have the students shuffle the cards and place them face down on the floor in four or five rows. The students then take turns to flip over two cards. If a student turns over a question card and the correct answer card then he or she keeps the cards. All players must agree that the cards are a "match". If the cards do not match then the student flips the cards back over. The player with the most cards wins.

Variation

Have the students create their own set of cards for other multiples.

Why?

Recall of multiplication and division number facts are useful in solving problems involving more than one step. Students also need to be able to use multiplication and division as inverse operations.

Students could record the number sentences as the cards are matched.

Honey jumbles

Where are they now?

Students are able to use skip counting or repeated addition to solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

PAS2.1: Generates, describes and records number patterns using a variety of strategies and completes simple number sentences by calculating missing values

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

How?

Collect a bundle of popsticks. On each one write four numbers that are the factors and product to a multiplication fact. For example, 4, 8, 3, 2 could be written for the multiplication fact 4 x 8 = 32. Place the popsticks into a jar such as a honey pot. Have the students take turns to pick a stick from the "honeypot" and write a division or multiplication fact for the numerals written on the popstick.

Variations

Have the students make their own "honey pot" popsticks to give to other students.

Have the students write both the multiplication and division number sentence for each popstick.

Why?

Recall of multiplication and division number facts are useful in solving problems involving more than one step. Students also need to be able to use multiplication and division as inverse operations.

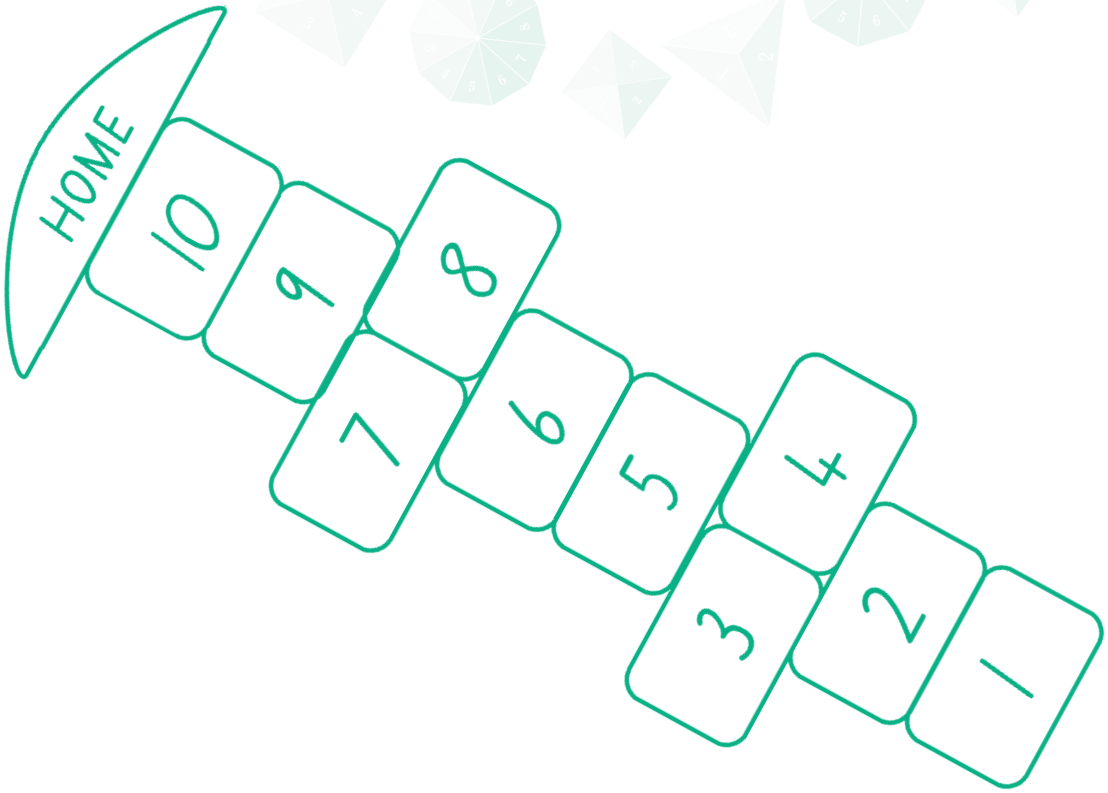
Hopscotch

Where are they now?

Students are able to use skip counting or repeated addition to mentally solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts.



Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Hopscotch, page 323

How?

Prepare a *Hopscotch* baseboard for each pair of students. The students will also need a die or spinner marked 1–10, ten counters of one colour for each player and a calculator. The players take turns to roll or spin up a number and place a counter on the corresponding number on the hopscotch board. The student's partner then asks a multiplication question up to 10 x 10, using the calculator as verification. If the first student answers correctly, he or she leaves the counter on the grid. If the student answers incorrectly, then he or she must remove the counter. Play continues until one player has a counter on each numbered section of the "hopscotch".

Variations

Students ask division or multiplication questions.

Students have one counter each and move one space on the hopscotch board each time a question is correctly answered.

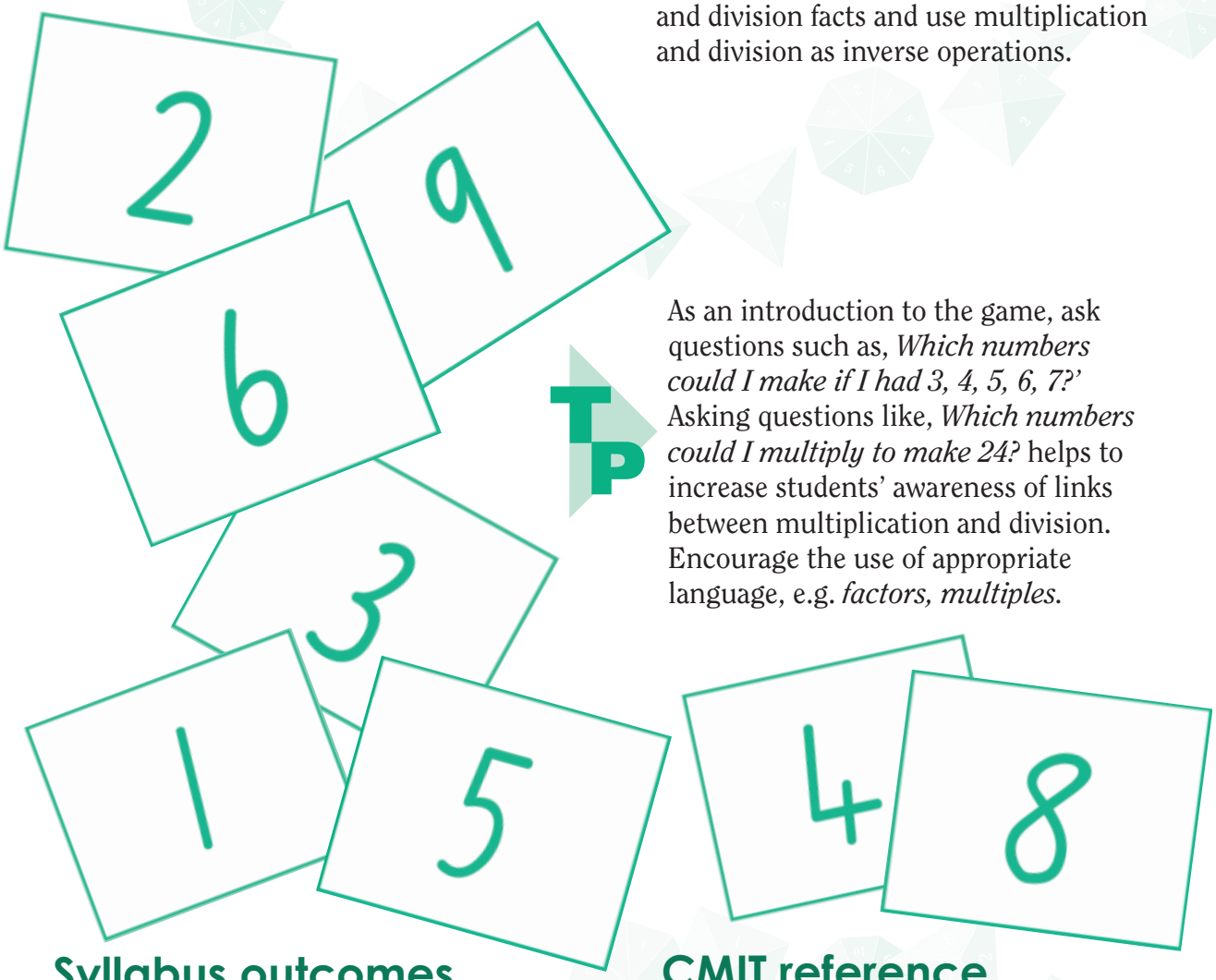
Why?

Recall of multiplication and division number facts are useful in solving problems involving more than one step.

Multiplication game board

Where are they now?

Students are able to use skip counting or repeated addition to mentally solve multiplication and division problems.



Where to next?

Students are able to recall multiplication and division facts and use multiplication and division as inverse operations.

TP

As an introduction to the game, ask questions such as, *Which numbers could I make if I had 3, 4, 5, 6, 7?'* Asking questions like, *Which numbers could I multiply to make 24?* helps to increase students' awareness of links between multiplication and division. Encourage the use of appropriate language, e.g. *factors, multiples.*

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

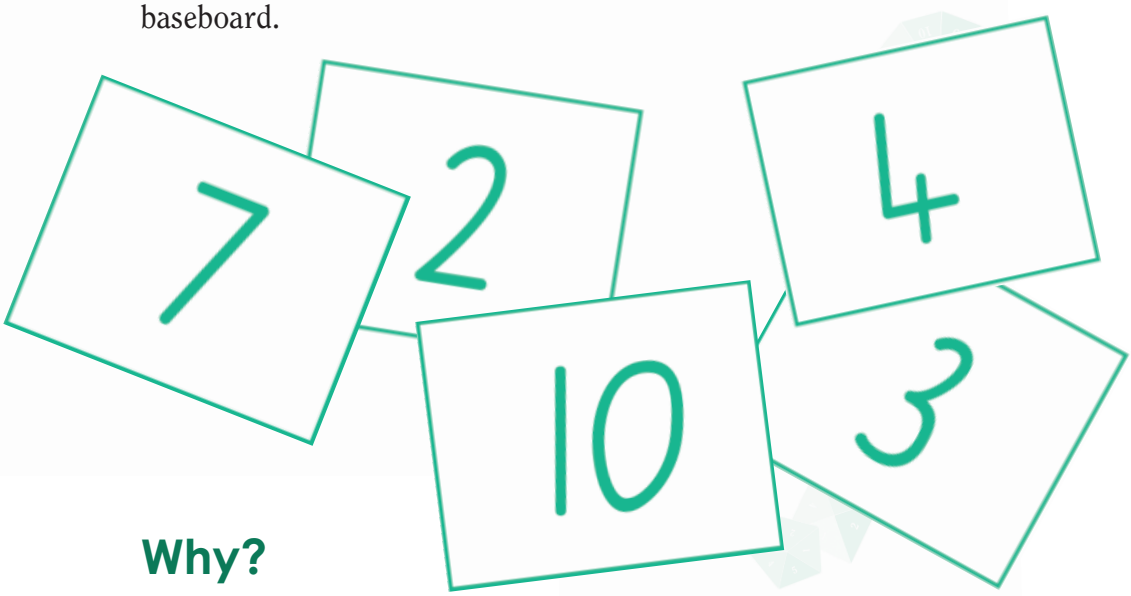
BLM

Multiplication game board, page 324

How?

Organise the students into groups of three or four. Provide each group with a copy of the multiplication game board, a set of numeral cards numbered 1–10 (three or four of each numeral) and sets of coloured counters; one colour per student. In groups of four, each student needs 11 counters. In a group of three, each student needs 14 counters.

To begin the activity, the students are dealt five cards each. The first student multiplies two of his or her cards together (say 9 x 5) and then covers the corresponding number on the baseboard. The student then picks up another two cards so that there are always five cards with each student. The winner is the first player to cover four squares in a row horizontally, vertically, diagonally or to form a square. Each number on the board may only be covered with one counter. All players must agree with the calculation before the player may place a counter on the baseboard.



Why?

This activity provides students with the opportunity to recall and practise all multiplication tables from 1 x 1 to 10 x 10.

Set the rules

Where are they now?

Students are able to use skip counting or repeated addition to mentally solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts and use multiplication and division as inverse operations.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Hundred chart, page 238

How?

Organise the students into small groups or pairs and provide them with a hundred chart, a die or spinner and a marker each. (Ensure the squares on the chart are large enough to fit the markers.) Have the students take turns to roll the die and starting at one, move their markers a corresponding number of spaces around the hundred chart. Have the students set say three or four rules for each game before playing. The rules must be based on a multiple. For example, *Land on a multiple of 5, lose a turn. Land on a multiple of 6, move ahead four spaces. Land on a multiple of 4, move to the number which is the reverse of the number you are currently on.*

The student reaching 100 first, wins.

Why?

Recall of multiplication and division number facts are useful in solving problems

Self-correcting facts

Where are they now?

Students are able to use skip counting or repeated addition to mentally solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts and use multiplication and division as inverse operations.

TP

Have the students prepare their own "fact sheets" for others to use.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

PAS2.1: Generates, describes and records number patterns using a variety of strategies and completes simple number sentences by calculating missing values

WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Self-correcting facts, pages 325 and 326

How?

Prepare a multiplication and division fact sheet for the multiples to be practised and a cover board. A sheet for multiples of eight and nine is included in the BLM section. Cut out the rectangles from the cover board and fold the fact sheet and cover board. Display the covered fact sheet to the class. Reveal the top multiplication or division question, keeping the tab down, covering the end number. Ask the students to provide the answer and describe how they solved the question if they did not automatically recall the fact. Progressively reveal the remaining questions. Encourage students to discuss how they are determining the total. Allow the students to work in pairs and repeat the activity.

Why?

Recall of multiplication and division number facts are useful in solving problems.

Hand multiplication

Where are they now?

Students are able to use skip counting or repeated addition to mentally solve multiplication and division problems.

Where to next?

Students are able to recall multiplication and division facts and use multiplication and division as inverse operations.

TP

Students may discover that it is possible to ensure an even number each time. Discuss why this is possible and then have the class establish a way of resolving the problem.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

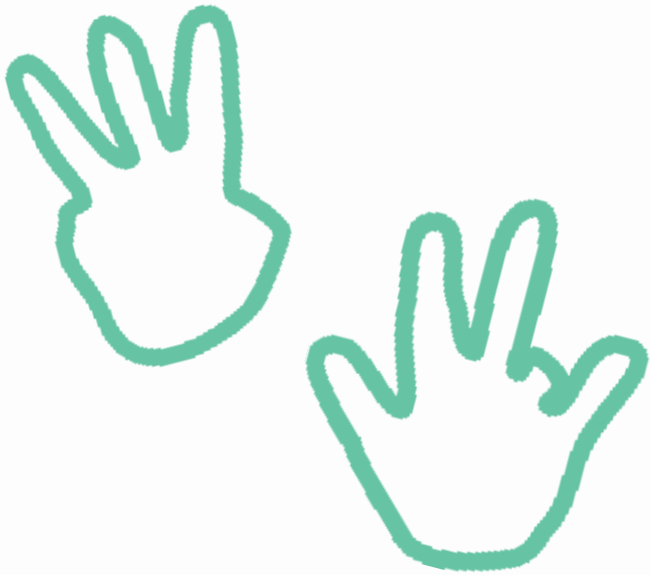
WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Building multiplication and division through equal grouping: level 5

How?

Organise the students into pairs and have them decide who is to be "even" and who is to be "odd". To play the game both students put their hands behind their backs and on a count of three bring out their hands, raising some fingers. Multiply the numbers represented and decide if the answer is even or odd. If the answer is odd then the "odd" person scores a point. If the answer is even then the "even" person scores a point. Play ten rounds and record the points. Discuss with the students if there were more even or odd numbers and if there is a reason for this result?



Why?

Recall of multiplication and division number facts are useful in solving problems.

Ten-strip division challenge

Where are they now?

Students use a variety of strategies to solve division problems.

Where to next?

Students use a variety of strategies to solve division problems with remainders.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas

CMIT reference

Building multiplication and division through equal grouping: level 3, 4 and 5

Recording symbols

BLM

Ten-strip division challenge, page 327

How?

Provide the students with a collection of ten-strips and a numeral die and ask them to represent a nominated number using the ten-strips. For example, "40" could be represented using four ten-strips. Each student then rolls his or her die to determine the number of equal groups to form from the nominated number. The student then determines how many would be in each group and if there are any remainders. Have the students share their findings and their methods of solution.

Variation

Have the students roll the die a second time and redistribute the number into the new number of groups. Discuss the students' methods of solution.

Why?

Students should be exposed to problems that deal with both equal groups and equal groups with remainders.

Have the students record their method of solution to share with others.

Saucy sixes

Where are they now?

Students are able to use mental strategies to solve division problems.

Where to next?

Students are able to mentally solve division problems with remainders.

TP

Discuss how multiplication will assist in solving these division tasks.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Saucy sixes, page 328

How?

Organise the students into pairs and provide them with a copy of the baseboard grid, 18 counters each (use two different colours) and a numeral die marked 1–6. The aim is to be the player with the most numbers covered on the grid. To cover a number, the students take turns to roll the die. The number that is rolled represents a "remainder". The student then chooses a number on the baseboard that when divided by "6" would leave a remainder corresponding to the number rolled on the die. For example, if a "3" is rolled, then "3" is the "remainder". The student could place a counter on 9, 15, 21 or 27 on the baseboard as each of these numbers, when divided by "6", leaves a remainder of "3". If a "6" is rolled the student misses a turn. Only one counter may be placed on each numeral. Continue until all numbers on the board are covered.

Variations

Have the students work together to cover the board, rather than competing against each other. Change the die to one displaying numerals 1–5.

Have the students develop a new baseboard by writing in suitable numerals for a different dividing number.

Why?

Students need to be able to see the relationship between division and multiplication and develop the ability to flexibly use these as inverse operations when solving problems.

If the students are unable to automatically recall the division facts, encourage them to work out the solution on paper. Students' recordings could be used as work samples for assessment purposes.

Remainders count

Where are they now?

Students are able to use mental strategies to solve division problems.

Where to next?

Students are able to mentally solve division problems with remainders.

TP

Discuss strategies for solving division problems such as recalling a multiplication fact to help solve a division task.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

How?

Provide each pair of students with three numeral dice and paper to record on. In turns, students roll the dice and using the three numbers shown make a division number sentence. For example if a 6, 4 and 5 were rolled then a student could make 46 ÷ 5. The student determines the answer and keeps a tally of any remainders; in this case the remainder would be "one". However, if the student makes the sentence 45 ÷ 6, the remainder would be "three". The remainders become the student's score. The winner is the first to reach a score of 20.

Variation

Once the dice have been rolled, the student's partner decides on the division question. In this way the students can try to give each other questions that will not give a remainder in the answer or give the lowest possible remainder.

Why?

Students should be exposed to problems that deal with both equal groups and equal groups with remainders.

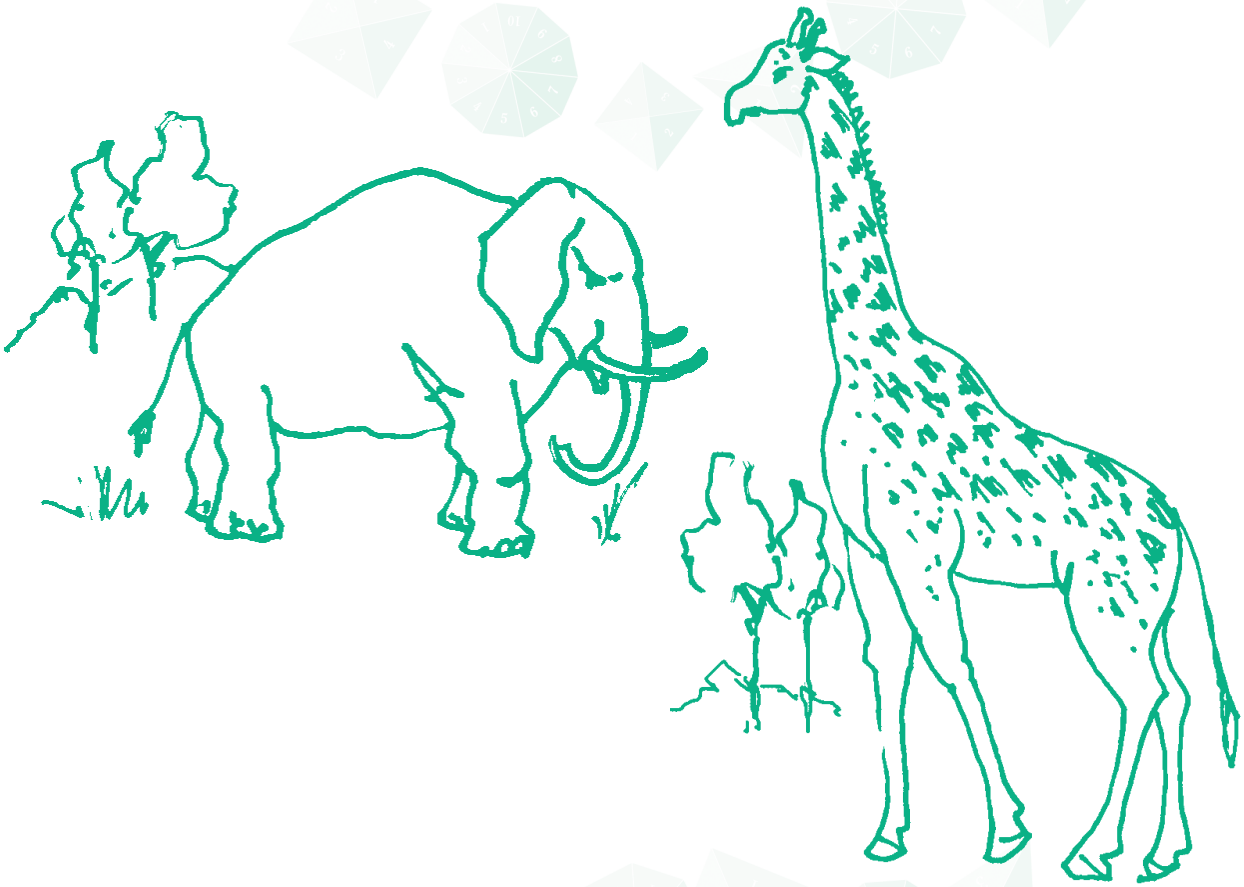
Safari

Where are they now?

Students are able to use mental strategies to solve division problems.

Where to next?

Students are able to mentally solve division problems with remainders.



Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Safari, page 329

How?

Organise the students into small groups and provide them with a copy of the *Safari* baseboard, a die and a marker for each player. To begin the game, each player takes a turn to throw the die and move his or her marker forward a corresponding number of spaces. On the same player's next turn, (and all subsequent turns) he or she throws the die and divides the number his or her marker is on by the number rolled on the die. The student then calculates the answer and determines if there is a "remainder". The player then moves his or her counter forward the same number of spaces as the "remainder". Play continues until a player reaches the finish line. Alternatively, the exact remainder must be used to reach the finish line.

Why?

Students should be exposed to problems that deal with both equal groups and equal groups with remainders.

Froggy

Where are they now?

Students are able to use mental strategies to solve division problems.

Where to next?

Students are able to mentally solve division problems with remainders.

Syllabus outcomes

NS2.3: Uses mental and informal written strategies for multiplication and division

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building multiplication and division through equal grouping: level 5

BLM

Froggy, page 330

How?

Organise the students into small groups and provide them with a copy of the *Froggy* baseboard, two numeral dice and a marker each.

To begin, the players place their markers on the frog. The first player rolls the dice to make a two-digit number. He or she then divides this number by six and if there is a remainder the student moves to the closest lily pad displaying the same numeral as the remainder. If six divides equally into the number, the player moves his or her marker one space backwards. The winner is the first person to land on the last lily pad.

Variation

Choose a different multiple to use and continue the game in the same manner. Note: the numerals on the lily pad will need to be modified.

Why?

Students should be exposed to problems that deal with both equal groups and equal groups with remainders.

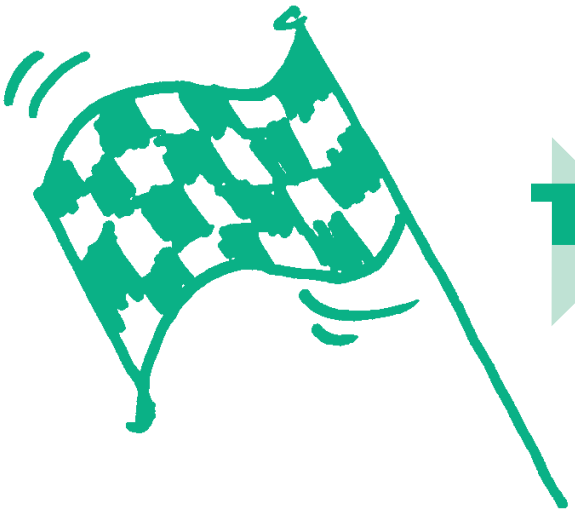
Race to 1000

Where are they now?

The student is able to find the total of two, two-digit numbers by counting by tens and ones, with or without the use of materials.

Where to next?

The student is able to use hundreds, tens and units to mentally add and subtract reasonable combinations to 1000.



TP

Model strategies such as grouping hundreds, tens and units and bridging to the next decade as a way of completing an addition problem.

Syllabus outcomes

NS2.2: Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building place value through grouping: level 3

Combining and partitioning

BLM

Race to 1000, pages 331 and 332

How?

Organise the students into pairs and provide them with two sets of cards in the range 0–9 and a sheet for recording. Have the students spread the cards out face-up in front of them. The first player chooses any two cards to make a two-digit number and records the number on the recording sheet. He or she then discards one of the digits and returns the other to the displayed cards. In turns, the players then select two cards, make a two-digit number, add the number to the previous total and record the new total. Encourage the students to explain their counting strategies to each other. Play continues until a player reaches a total of "1000". If the total falls between 990 and 999, then a player may take a single-digit number to reach 1000. If the total does not add to 1000 exactly, then the highest total wins or, alternatively, the game is a draw and the winner is the best of three games.

Variation

Start at 1000 and subtract the numbers. The aim is the first to reach zero.

Why?

Students should have the opportunity to develop mental strategies for solving addition and subtraction problems and to record their thinking before introducing algorithmic procedures.

How many more?

Where are they now?

The student is able to find the total of two two-digit numbers by counting by tens and ones, with or without the use of materials.

Where to next?

The student is able to use hundreds, tens and units to mentally add and subtract reasonable combinations to 1000.

- Have the students complete activities involving counting forwards and backwards by tens off the decade.
- Discuss and model partitioning and combining numbers to ten and to one hundred.

Syllabus outcomes

NS2.2: Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building place value through grouping: level 3

Combining and partitioning

BLM

How many more? page 333

How?

Organise the students into pairs and provide them with a copy of the worksheet and a set of numeral cards 0–6. Instruct the students to take turns to draw six numeral cards from the pile and make two, three-digit numbers. The students may choose any combinations from drawn cards. The student then records these two, three-digit numbers onto their recording sheet. The student may decide in which order to record the numbers as this will determine if the task will be an addition or a subtraction. The student then determines the number of tens and units that would need to be added to, or taken away from, the first number to equal the second number.

Variation

Increase the range of numeral cards. The BLM may need to be modified to record the solution in terms of hundreds, tens and ones.

Why?

Students should have the opportunity to develop mental strategies for solving addition and subtraction problems and to record their thinking before introducing algorithmic procedures.

Snake eyes

Where are they now?

The student is able to find the total of two, two-digit numbers by counting by tens and ones, with or without the use of materials.

Where to next?

The student is able to use hundreds, tens and units to mentally add and subtract reasonable combinations to 1000.

- Demonstrate the strategy of building-on a number by tens and ones prior to this activity.
- Use two different coloured dice to make it easier to nominate which is the "tens" die and which is the "ones" die.

Syllabus outcomes

NS2.2: Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Building place value through grouping: level 3

How?

Organise the students into small groups and provide each group with two dice and a recording sheet. One die represents "tens" and the other die represents "ones". Each player may throw the two dice any number of times when it is his or her turn, endeavouring not to roll the "venomous" number (refer to later explanation). On the first throw the player states and records the number formed by the dice (tens and ones). On each subsequent throw the player adds the tens to the tally and then the units. For each game a "venomous" number is chosen, say number "6". If the "venomous" number is rolled on either die then the player forfeits the points rolled for that turn and it is the next player's turn. (That is, the player goes back to his or her previous total.) If a "double one" (snake eyes) is rolled then the player loses all of their points (accumulated total) and it is the next player's turn. It is up to each player to decide how many times to roll the die. The aim is to stop before a "venomous" number or "snake eyes" is rolled while trying to accumulate the highest total. As each player rolls the dice he or she adds the number to the total of their last throw. The winner is the first to 1000.

Variations

Start at 1000 and subtract the numbers rolled. The winner is the first to zero.

Discard the "venomous" number and only play with the "snake eyes" number.

Why?

Students should have the opportunity to develop mental strategies for solving addition and subtraction problems and to record their thinking before introducing algorithmic procedures.

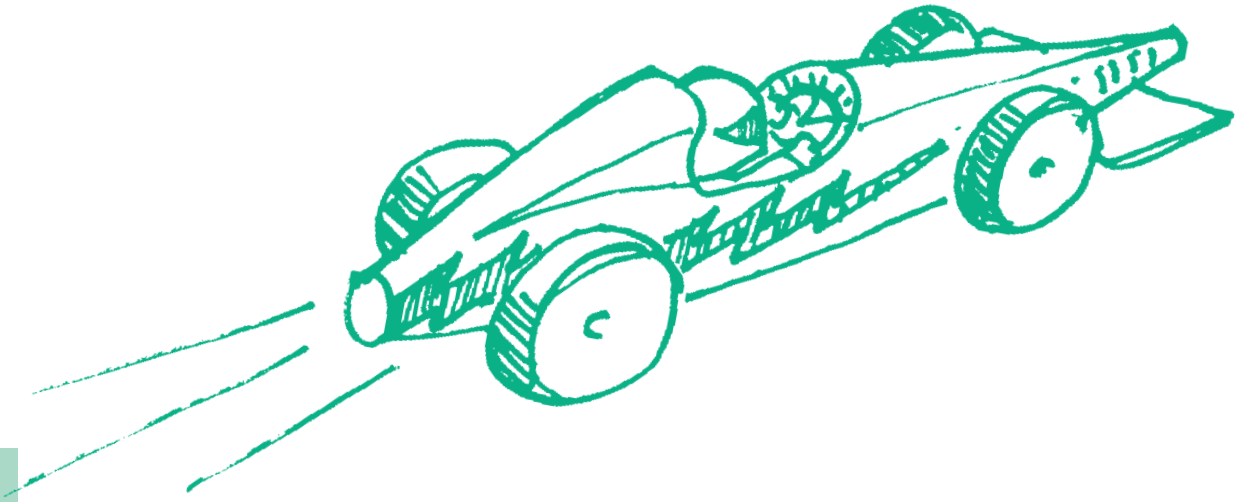
Highway racer

Where are they now?

The student uses mental strategies to solve two-digit addition and subtraction problems.

Where to next?

The student can add and subtract reasonable numbers to 1000 using strategies such as incrementing by hundreds and tens mentally. The student has a *part-whole* knowledge of numbers to 1000.



Syllabus outcomes

NS2.2: Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content

CMIT reference

Building place value through grouping: level 2, 3

BLM

Highway racer, page 334

How?

Have the students work in pairs so that each student can explain and verify calculations. Prepare *Highway racer* worksheets for each pair of students. To complete the worksheet, the students take turns to mentally calculate, and record, the number needed to be added or subtracted in order to move to the total written in the next box.

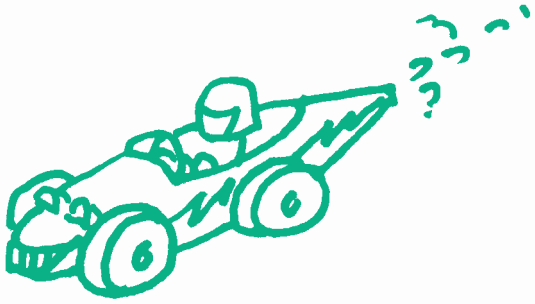
Variations

Have the students create their own "race tracks" for others to solve.

Have the students verify their partner's answers using a calculator.

Have one of the players time his or her partner from "start" to "finish" and then swap roles.

Have the students "race the clock". For example, *How far can you move along the track in 60 seconds?*



Why?

Students should learn place value concepts through explicit teaching of its use in mental addition and subtraction.

Shhh! It's a secret!

Where are they now?

The student can perform calculations on whole numbers and has an understanding of place value of whole numbers.

Where to next?

The student demonstrates an understanding of positional value of decimals.

TP Tell the students that they can tell how close they are to the secret number by how close the decimal is to "one".

Syllabus outcomes

NS2.4: Models, compares and represents commonly used fractions and decimals, adds and subtracts decimals to two decimal places, and interprets everyday percentages

WMS2.4: Checks the accuracy of a statement and explains the reasoning used

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Building place value through grouping: level 4

How?

Organise the students into pairs and provide each pair with a basic calculator. The first student enters a number onto the calculator without his or her partner seeing the number. It may be advisable to begin with a two-digit number. After entering the number the student then needs to press the following keys:

Press [÷]

Press [÷]

Press [=]

Keep pressing [=] until a "**0**" is displayed.

The first student then hands the calculator to his or her partner who tries to guess the original number and enters it into the calculator. He or she then presses [=] and a decimal notation will be displayed. If this decimal notation is greater than "1', then the guessed number was greater than the secret number. If the decimal is less than "1", then the guessed number was less than the secret number. When the secret number is guessed correctly and entered, then a "1" will be displayed.

Why?

Students need to develop an understanding of the positional value of decimals. For example, 0.8 is taken to be of greater magnitude than 0.75 because of the positional value of the digits.

Large and small

Where are they now?

Students know how measurement units are repeated and structured and are able to use one unit to work out how many will be needed altogether when making indirect comparisons of area.

Where to next?

Students are able to explain the relationship between unit size and the number of units used to measure area.

Syllabus outcomes

MS1.2: Estimates, measures, compares and records areas using informal units

SGS2.2: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas

CMIT reference

Count Me Into Measurement: level 3.2

How?

Show students a tessellating pattern made from hexagons or parallelograms. Give the student a suitable triangular tile and ask the students to determine how many triangular tiles would be needed to cover the pattern. Have the students share their method for solving the problem.

Variation

Provide the students with a large rectangle, covered with large squares. Provide the students with a suitable small square and ask them to work out how many small squares would be needed to cover the area of the rectangle.

Why?

Students should be able to see and explain the relationship between unit size and number of units needed to cover an area.

WR

Students could draw the triangular pattern needed to cover the shapes.

Chessboard

Where are they now?

Students know how measurement units are repeated and structured and are able to use one unit to work out how many will be needed altogether when making indirect comparisons of area.

Where to next?

Students are able to explain the relationship between unit size and the number of units used to measure area.

TP

This activity could be integrated into a visual arts lesson.

Syllabus outcomes

MS1.2: Estimates, measures, compares and records areas using informal units

SGS2.2a: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas

CMIT reference

Count Me Into Measurement: level 3.2

How?

Provide the students with a chessboard or a similar grid. Ask the students to make a "tile" so that they would only need one quarter of the number of tiles to cover the board. The students could then create the board from coloured paper tiles. Have the students share their models and methods for solving the problem.

Why?

Students should be able to see and explain the relationship between unit size and number of units needed to cover an area.

Hidden squares

Where are they now?

Students know how measurement units are repeated and structured and are able to use one unit to work out how many will be needed altogether when making indirect comparisons of area.

Where to next?

Students are able to:

- explain the relationship between unit size and the number of units used to measure area
- measure the area of a surface using square centimetres.

Syllabus outcomes

MS2.2: Estimates, measures, compares and records the areas of surfaces in square centimetres and square metres

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Count Me Into Measurement: level 3.2

How?

Provide the students with prepared rectangular shapes and 1 cm grid paper. The rectangles should be covered with squares or tiles that are an integral multiple of the centimetre units. For example, 2 x 2 cm squares. Have the students place each shape on the grid paper and determine the number of hidden squares and the area of each shape in square centimetres.

Why?

Students should be able to see and explain the relationship between unit size and number of units needed to cover an area.

Students could record their mental strategies they used to determine the area of the shape. Use these as models for discussion.

Crazy skyscrapers

Where are they now?

Students know how measurement units are repeated and structured and are able to use one unit to work out how many will be needed altogether when making indirect comparisons of area.

Where to next?

Students are able to:

- explain the relationship between unit size and the number of units used to measure area
- measure the area of a surface using square centimetres.

Syllabus outcomes

MS2.2: Estimates, measures, compares and records the areas of surfaces in square centimetres and square metres

SGS2.1: Makes, compares, describes and names three-dimensional objects including pyramids, and represents them in drawings

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Count Me Into Measurement: level 3.2

Count Me Into Space: efficient strategies

How?

Provide the students with 2 cm grid paper. Tell the students they are to design a floor for a new building and that each floor must cover the same area, say 64 square centimetres. Using the 2 cm grid paper, have the students draw a floor plan. Have several students then combine their floor plans to make a multi-story building. Have the students determine what the building constructions would look like to accommodate the various floor plans. Students could use building blocks to make the building.

Why?

Students should be able to see and explain the relationship between unit size and number of units needed to cover an area.

Digi squares

Where are they now?

Students know how measurement units are repeated and structured and are able to use one unit to work out how many will be needed altogether when making indirect comparisons of area.

Where to next?

Students are able to explain the relationship between unit size and the number of units used to measure area.

Syllabus outcomes

MS2.2: Estimates, measures, compares and records the areas of surfaces in square centimetres and square metres

NS2.4: Models, compares and represents commonly used fractions and decimals, adds and subtracts decimals to two decimal places, and interprets everyday percentages

NS2.1: Counts, orders, reads and represents two- and three-digit numbers

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Count Me Into Measurement: level 3.2

BLM

Digi squares, page 335

How?

Provide the students with 1 cm grid paper and pencils. Instruct the students that they are to create a graphic design or representation of a two-digit number. Each numeral is to cover the same number of 1 cm grid squares that it represents. For example, in the number 24, 20 grid squares must be used to make the number 2 and 4 grid squares must be used to make the number four. Discuss with the students how they may need to colour in half or quarter of squares. An example is provided in the BLM section.

Why?

Students should be able to see and explain the relationship between unit size and number of units needed to cover an area.

Measuring area with one tile

Where are they now?

The student uses an array structure to compare different areas.

Where to next?

The student moves and aligns a single unit in a systematic way.

The student explains the relationship between unit size and the number of units.

Syllabus outcomes

MS2.2: Estimates, measures, compares and records the areas of surfaces in square centimetres and square metres

WMS2.4: Checks the accuracy of a statement and explains the reasoning used

CMIT reference

Count Me Into Measurement: level 3.1, 3.2

BLM

Measuring area with one tile, page 336

How?

Present the students with a copy of the shapes on the worksheet. Have the students firstly predict which shape has the largest area and explain their reasoning. Ask the students to then use a unit square to determine which shape has the largest area. Discuss how the students determined their answer and how they could check for accuracy? Provide other shapes for students to explore and compare areas.

Why?

Students should be able to use one unit to work out how many will be needed altogether when making indirect comparisons.

Geoboard triangles 2

Where are they now?

The student is able to predict changes to shapes by mentally visualising and modifying the image of the shape.

Where to next?

The student selects effective strategies to make changes needed to achieve a planned product.

Syllabus outcomes

SGS2.2a: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content

WMS2.2: Selects and uses appropriate mental or written strategies, or technology, to solve problems

CMIT reference

Count Me Into Space: Orientation and motion: coordinating images and actions

Bank of instructions

- Rotate 45º, 90º, 180º
- Flip the triangle over its base, apex
- Flip the triangle to the right or left
- Stretch one of the points of the triangle
- If the triangle has a right angle: Change the right angle into a smaller angle
- If the triangle doesn't have a right angle: Turn one of the angles into a right angle.

How?

Provide each pair of students with a geoboard, rubber bands and paper. Have the first student make a triangle on the geoboard with a rubber band. The student then gives his or her partner two or three instructions regarding the orientation or shape of the triangle. For example, *Make each side half as big*.

The second student then draws the triangle in the new orientation after the sequence of instructions has been given. The first student can complete the same instructions using the geoboard to verify the answer.

Why?

Students need to explore shapes to help them develop strong concept images that focus on the properties that make up the shape, such as angles and sides.

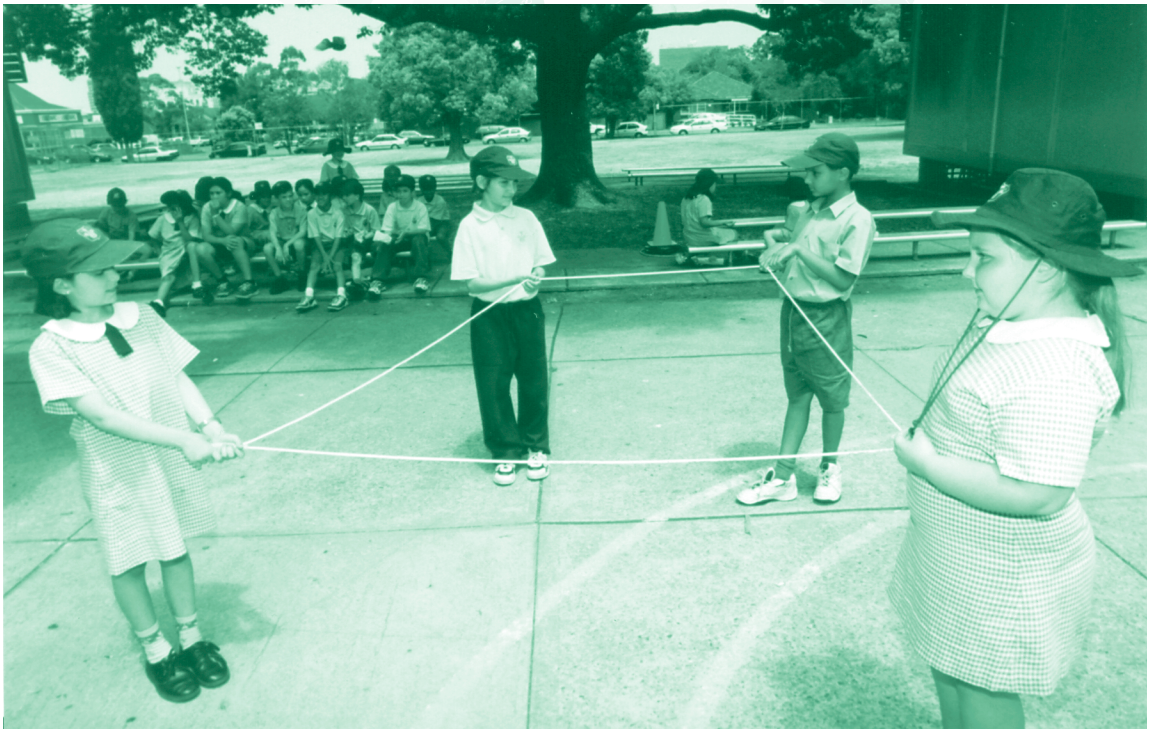
Silent string shapes

Where are they now?

The student is able to predict changes to shapes by mentally visualising and modifying the shape.

Where to next?

The student selects effective strategies to make changes needed to achieve a planned product.



Syllabus outcomes

SGS2.2a: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Count Me Into Space: Orientation and motion: coordinating images and actions

How?

This activity may need to be completed outside the classroom. Organise the students into small groups and provide them with a length of string (long enough for the groups to hold, say 5 metres) tied to form a loop. Tell the students that when they are holding the string they are not allowed to speak to each other. Call out a nominated shape that the students are to make by holding the string and moving such as an isosceles triangle, rhombus or trapezium. Allow them to discuss how they will move the string prior to picking up the string. After they have made the shape with the string, the students place the string on the ground and walk around the shape. Call another shape. Again the students can discuss the changes that will need to be made to the existing shape. However, once they pick up the string they must be silent. The students change the shape they are holding to form the new shape, then place it on the ground and trace. Have the students share with other groups how they modified each shape to form the new shape.

Why?

Students need to explore shapes to help them develop strong concept images that focus on properties that make up the shape such as angles and sides.

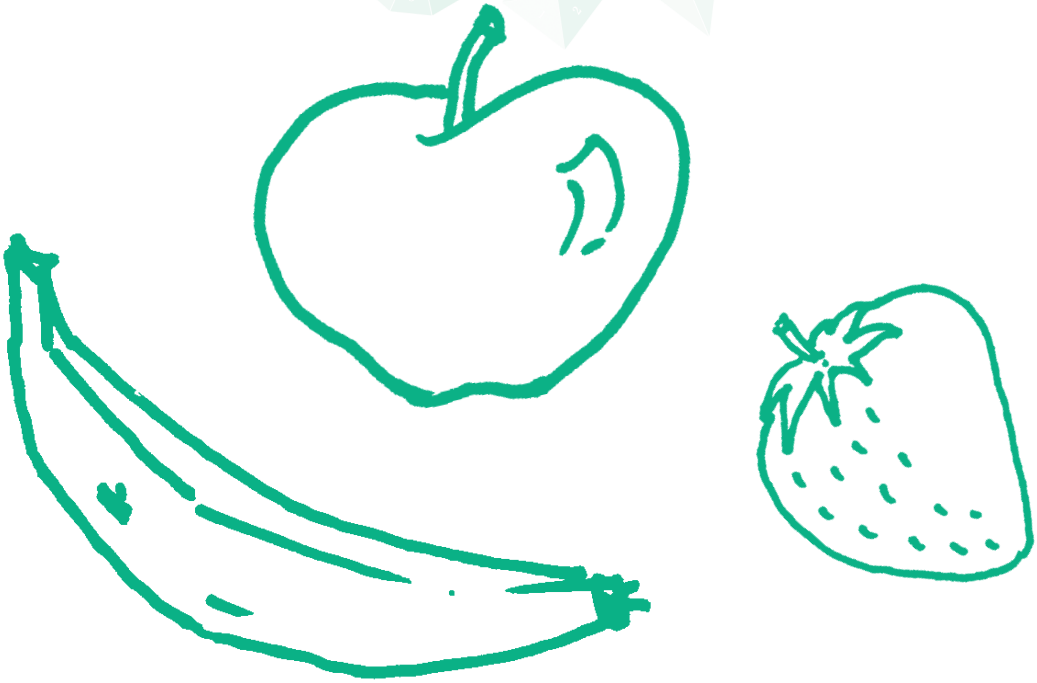
Food rainbow

Where are they now?

The student is able to predict changes to shapes by mentally visualising and modifying the shape.

Where to next?

The student selects effective strategies to make changes needed to achieve a planned product.



Syllabus outcomes

SGS2.1: Makes, compares, describes and names three-dimensional objects including pyramids, and represents them in drawing

WMS2.3: Uses appropriate terminology to describe, and symbols to represent, mathematical ideas

CMIT reference

Count Me Into Space: Part-whole relationships: coordinating images and actions

BLM

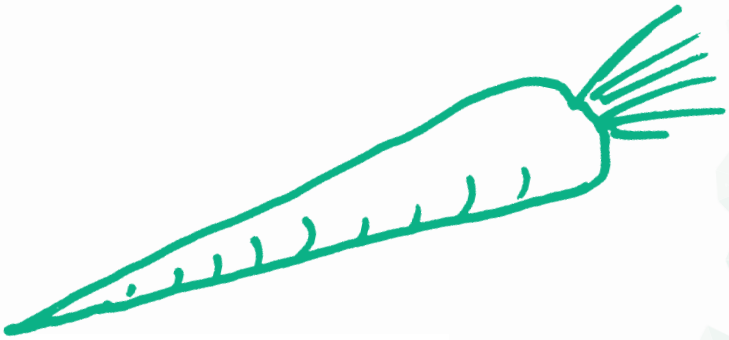
Food rainbow, page 337

How?

Organise the students into groups and provide each group with a type of food that will be used to cut cross-sections. For example, celery, potato, carrot, apple, banana and strawberry could be used. Each group will become "experts" in discovering the cross-section of one of the solids and then share their discoveries with the other groups. In each group have the students firstly predict and draw the cross-section of the selected food items when cut in the following ways:

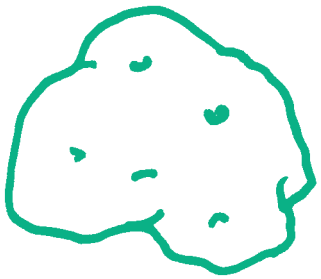
- from top to bottom
- from left to right
- from left to right on an angle.

With supervision, have the students cut and draw the three cross-sections onto the worksheet. Discuss the students' drawings. Rearrange the groups so that one person from each "expert" group forms a new "rainbow" group. Have each person in the "rainbow" group present the diagrams of the cross-sections from his or her "expert group".



Why?

Students need to explore shapes and objects to help them visualise properties of three-dimensional objects.



Symmetry building

Where are they now?

The student is able to generate static visual images of shapes and objects in a variety of orientations.

Where to next?

The student is able to mentally modify images of shapes and objects.

Syllabus outcomes

SGS2.1: Makes, compares, describes and names three-dimensional objects including pyramids, and represents them in drawing

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Count Me Into Space: Part-whole relationships: coordinating images and actions

How?

Provide the students with a supply of building material and ask them to construct an interesting model. However, the model must be symmetrical in shape. When the model is finished, have each student draw one half of the symmetrical model. Give the drawing to a friend (not the original partner) to complete the drawing without seeing the model. When finished, compare the drawing to the model.

Variation

Display a collection of building blocks and other suitable equipment. Have the students draw a symmetrical model based on the collection of material. Have the students choose a friend to make the model from the drawing.

Why?

Students need to investigate the properties of shapes and objects. They need to develop concepts to effectively plan and generate models and new shapes.

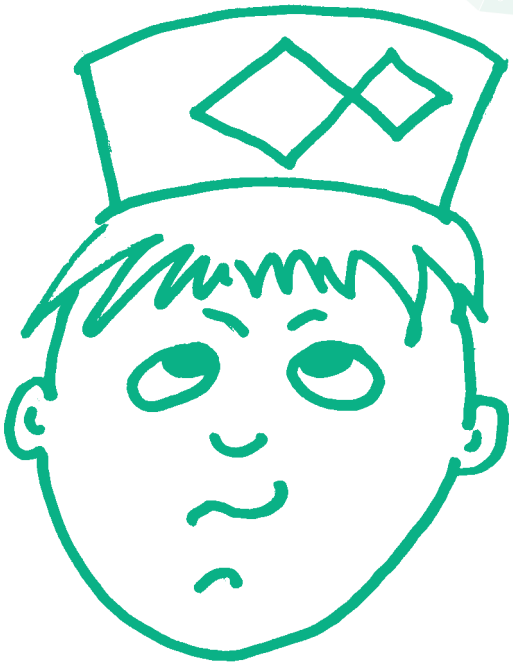
What's my shape?

Where are they now?

The student is able to predict changes to shapes by mentally visualising and modifying the image of the shape.

Where to next?

The student selects effective strategies to make changes needed to achieve a planned product.



TP

Prior to commencing the activity, practise describing different shapes. Discuss properties such as number of sides, types of angles, types of lines as well as the orientation of the shape.

Syllabus outcomes

SGS2.2a: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Count Me Into Space: Part-whole relationships: efficient strategies

BLM

What's my shape?, pages 338 and 339

How?

Have one student wear a headband to which a selected shape card can be attached. Sample shape cards are provided in the BLM section. Do not let the student see the shape card. The student then asks the class questions about the shape or shapes on the card to try and name each shape and its orientation or position in relation to another shape. The class may only answer yes or no. Once the student thinks he or she knows one of the shapes, he or she draws it on the board. A signal can be given, such as a shake of a tambourine, to let the student know that the drawn shape is the correct shape but in the incorrect orientation. A different signal could indicate correct shape and correct orientation. The teacher, or a nominated student, may describe the shape, or its orientation, rather than give a "yes" or "no" response.

Variations

When students are guessing the number of sides of the shape, the class could give hints such as "hotter" or "colder".

Let the student choose someone from the class for the clue. The teacher could also expand on the clue.

Why?

Students need to investigate the properties of shapes and objects. They need to develop concepts to effectively plan and generate models and new shapes.

Guess and draw

Where are they now?

The student is able to predict changes to shapes by mentally visualising and modifying the image of the shape.

Where to next?

The student selects effective strategies to make changes needed to achieve a planned product.

Syllabus outcomes

SGS2.2a: Manipulates, compares, sketches and names two-dimensional shapes and describes their features

WMS2.1: Asks questions that could be explored using mathematics in relation to Stage 2 content

WMS2.5: Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content

CMIT reference

Count Me Into Space: Part-whole relationships: efficient strategies

How?

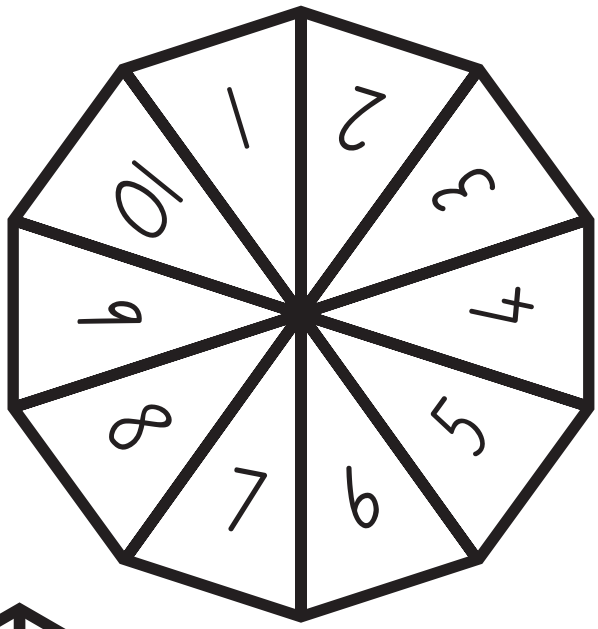
Organise the students into pairs. Each student will need two pieces of paper and a pencil. Place a barrier between pairs of students. Have the students sit opposite each other so that they can talk to each other but not see each other's drawings. On one piece of paper each student makes a drawing from simple lines and shapes. On the other piece of paper, each student tries to draw exactly the same drawing as his or her partner. To do this the student must ask questions about the drawing that can only be answered with a "yes" or "no" response. Remind the students to ask questions about straight, curved and parallel lines; whether a drawing or a shape is symmetrical; the number of sides a shape has and its position in relation to another shape. When the student thinks the drawing is complete, he or she shows it to his or her partner for comparison with the original drawing.

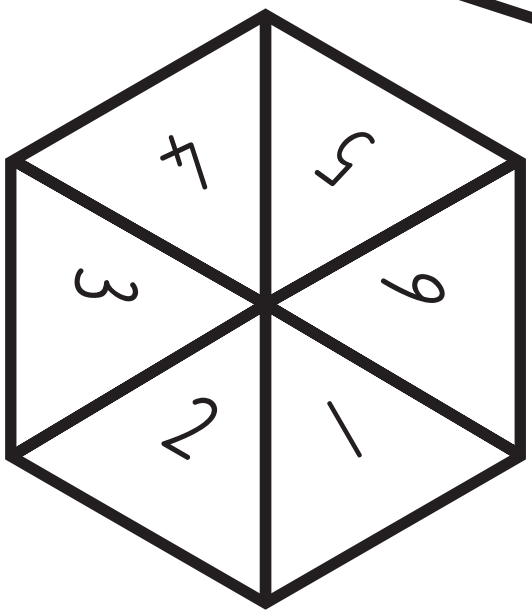
Why?

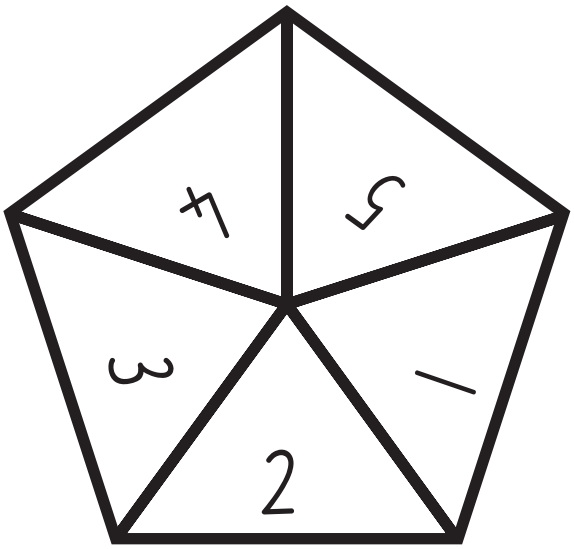
Students need to investigate the properties of shapes and objects. They need to develop concepts to effectively plan and generate models and new shapes.

Coordinating groups blackline masters

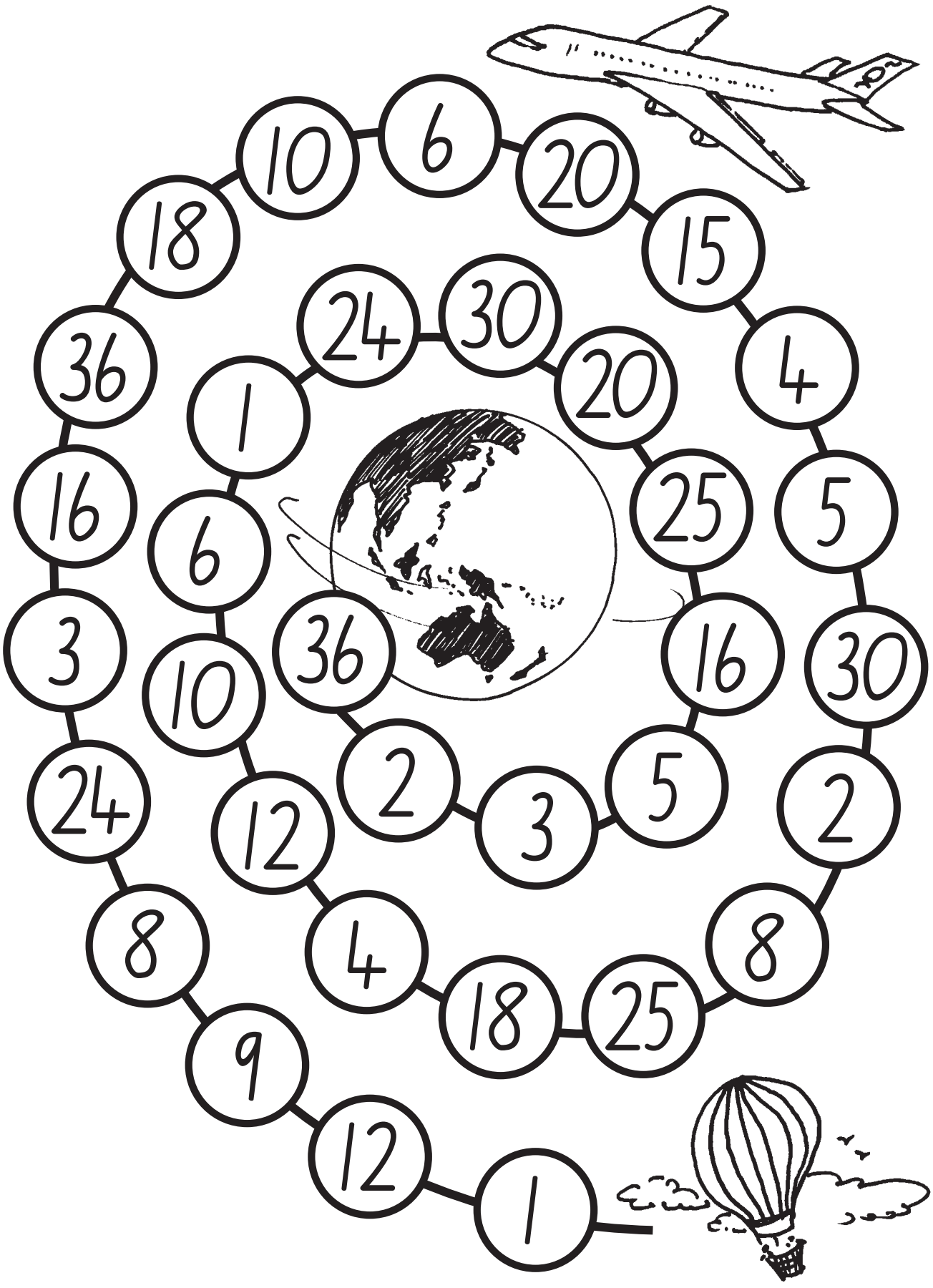
Spin and multiply



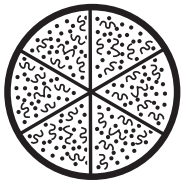
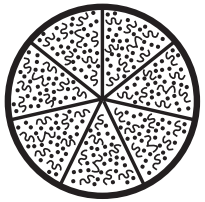




Race around the world



Una pizza per favore!

	Bambino 3 Pieces 	Piccolino 4 Pieces 	Mama 5 Pieces 	Papa 6 Pieces 	Famiglia 7 Pieces 
1					
2					
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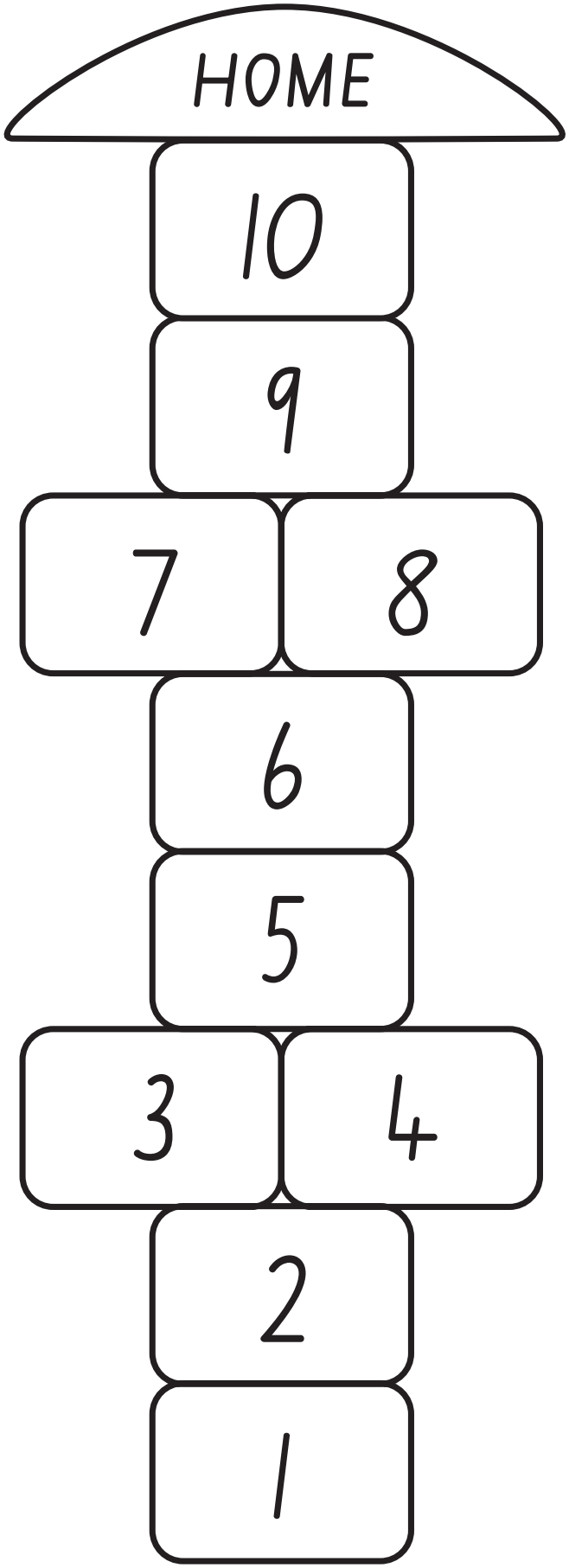
Hopscotch



Multiplication game boards

1	2	3	4	5	6
7	8	9	10	12	14
15	16	18	20	21	24
25	27	28	30	32	35
36	40	42	45	48	49
50	54	56	60	63	64
70	72	80	81	90	100

Cut out rectangle and discard

Cut out rectangle and discard

fold

fold

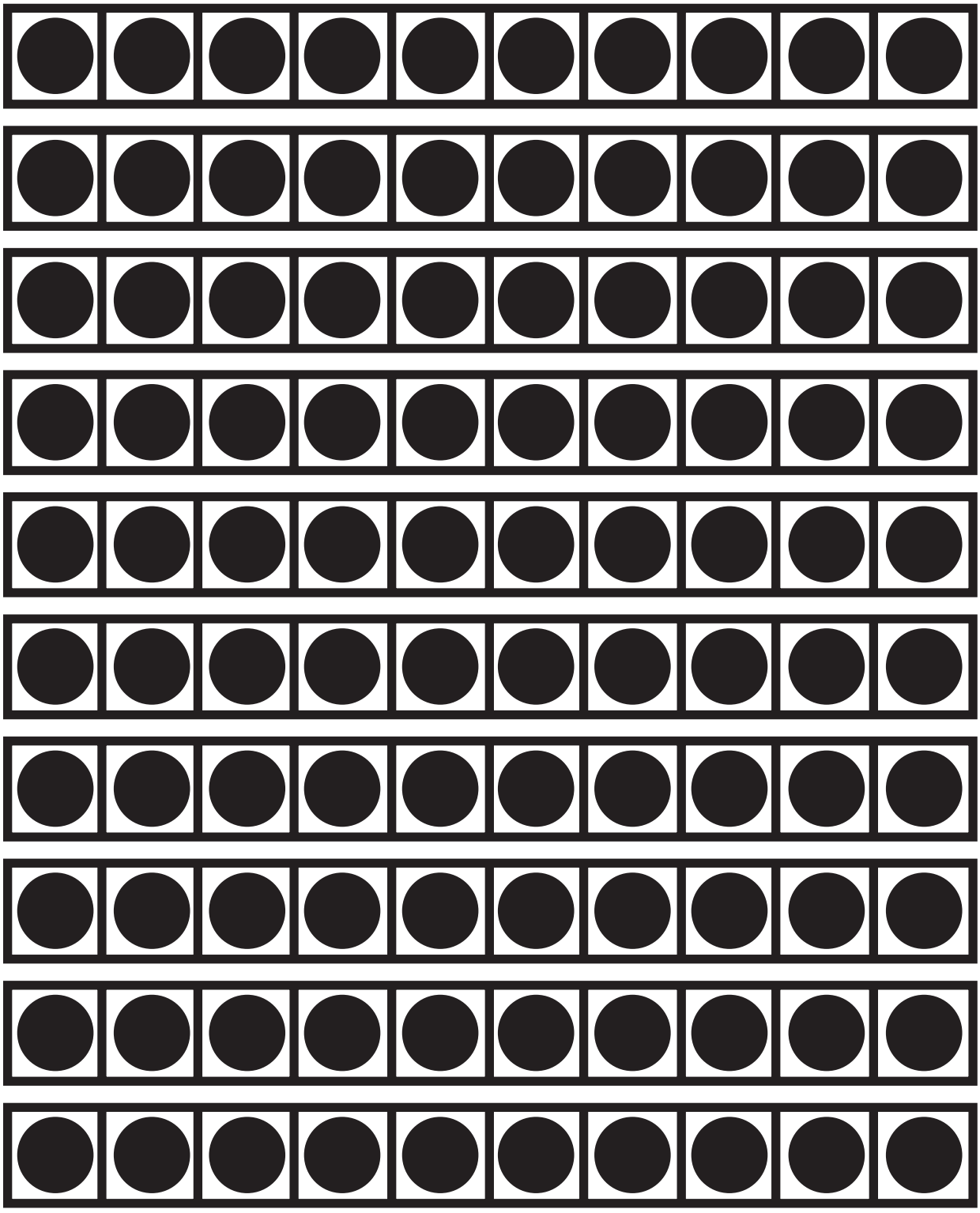
fold

Self-correcting facts

7 x 8 = 56	48 ÷ 8 = 6
4 x 8 = 32	72 ÷ 8 = 9
9 x 8 = 72	32 ÷ 8 = 4
6 x 8 = 48	64 ÷ 8 = 8
8 x 8 = 64	56 ÷ 8 = 7
6 x 9 = 54	81 ÷ 9 = 9
4 x 9 = 36	63 ÷ 9 = 7
9 x 9 = 81	36 ÷ 9 = 4
7 x 9 = 63	72 ÷ 9 = 8
8 x 9 = 72	54 ÷ 9 = 6

fold

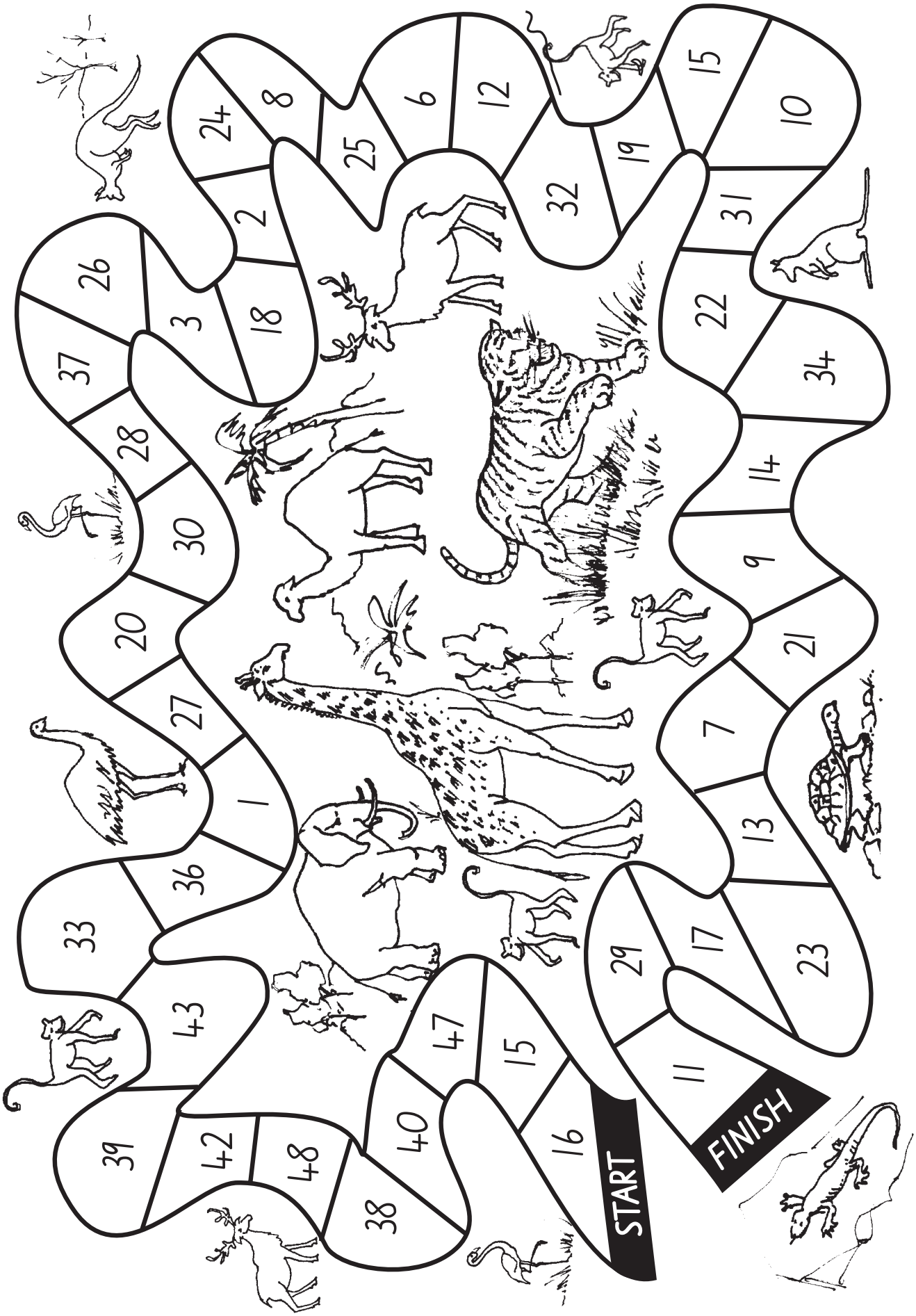
Ten-strip division challenge



Saucy sixes

17	26	8
7	9	14
19	23	25
11	16	27
35	20	10
22	15	21

Safari


START
FINISH
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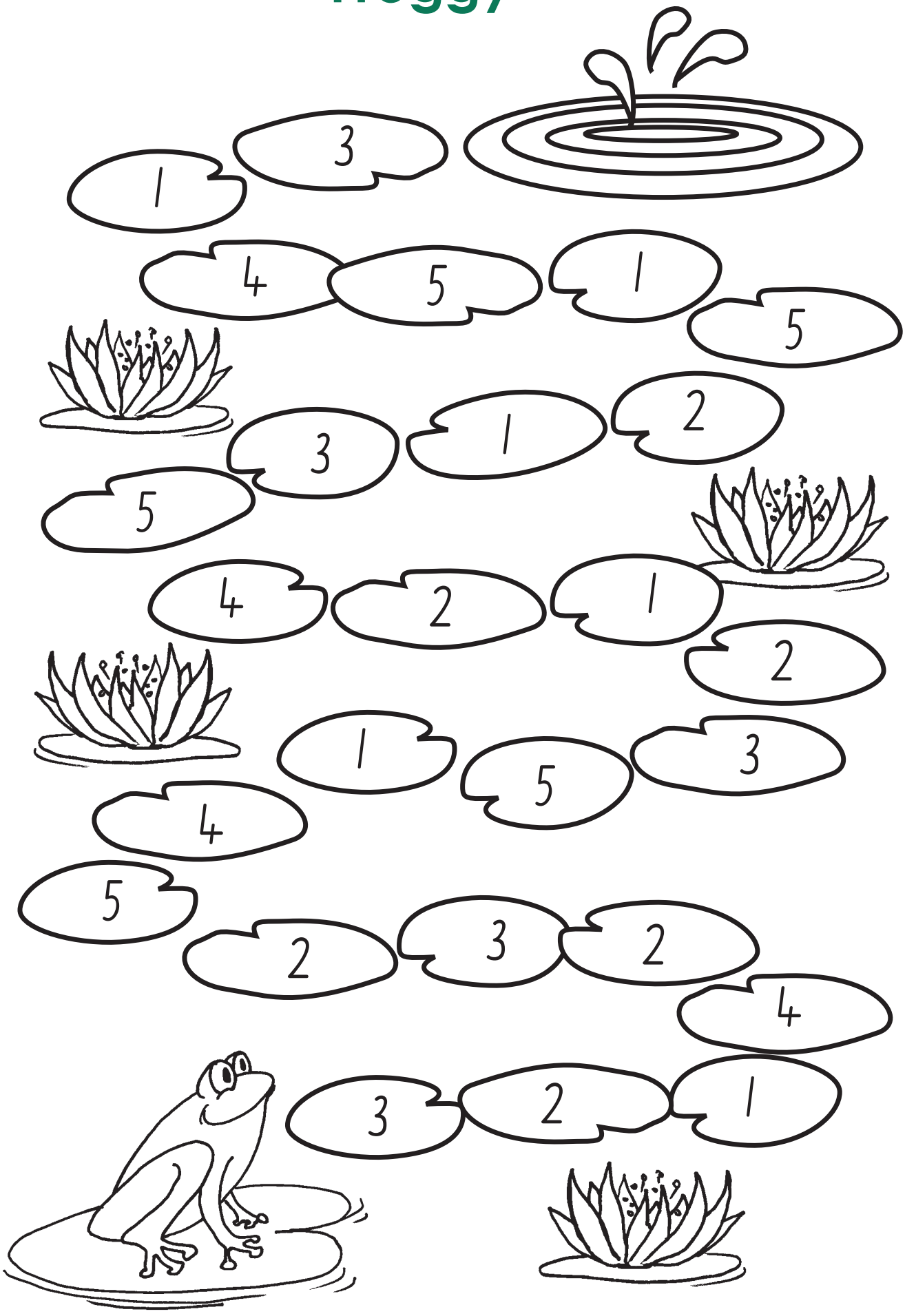
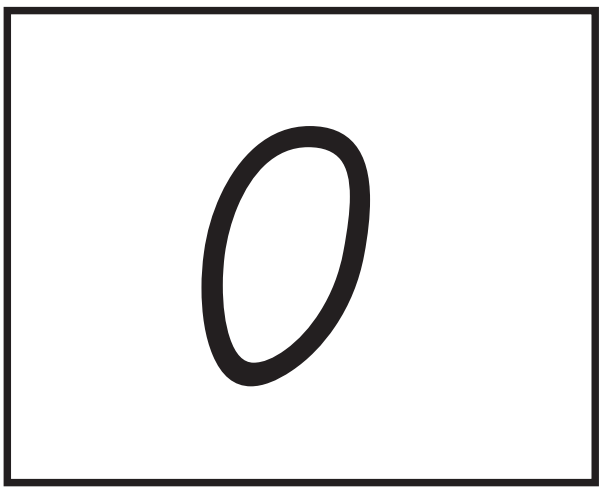
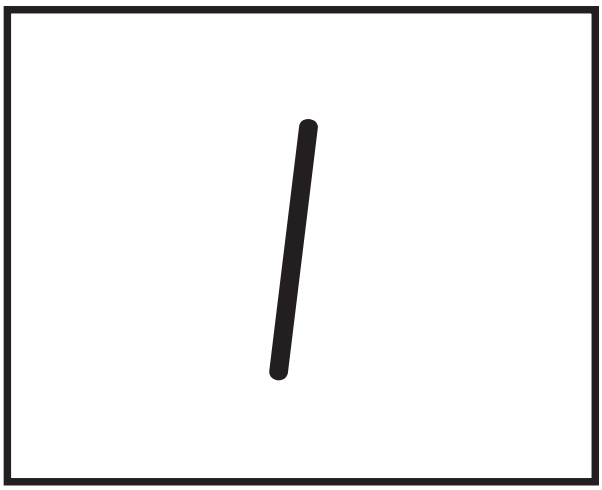
48

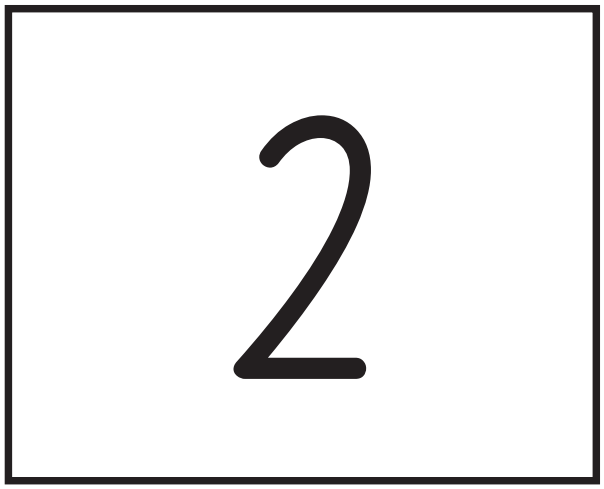
Froggy

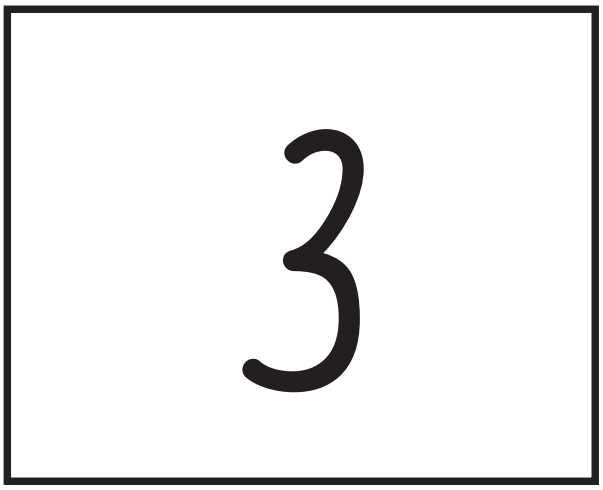


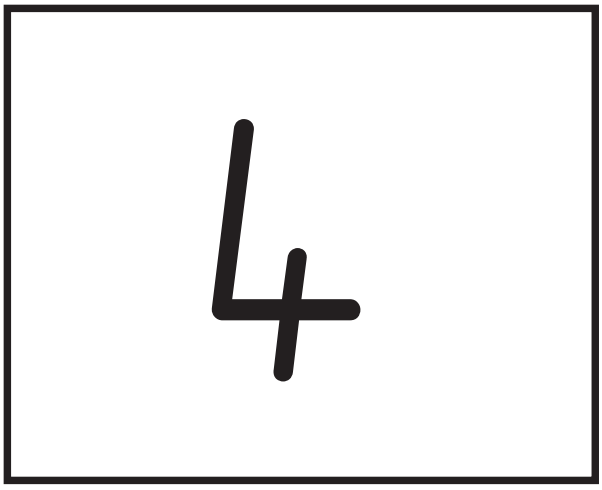
Race to 1000











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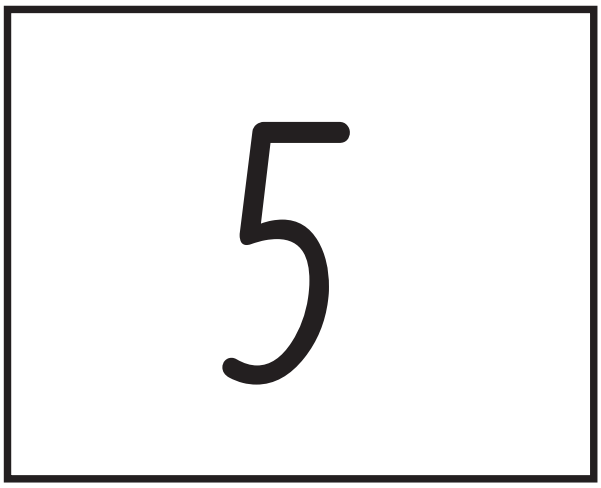
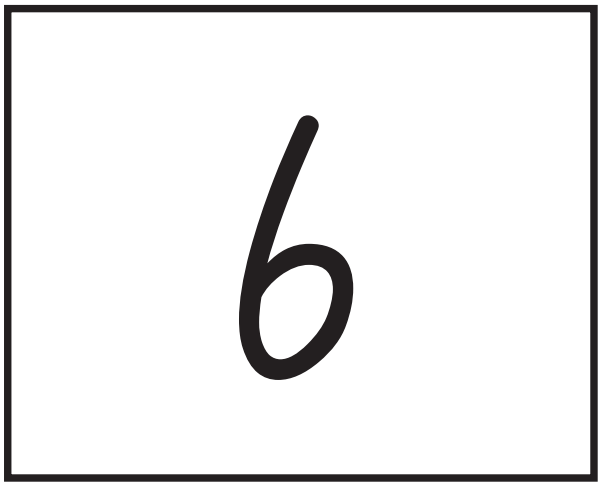
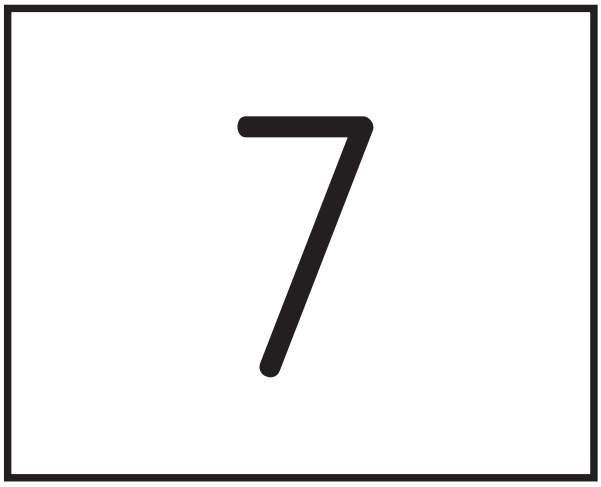
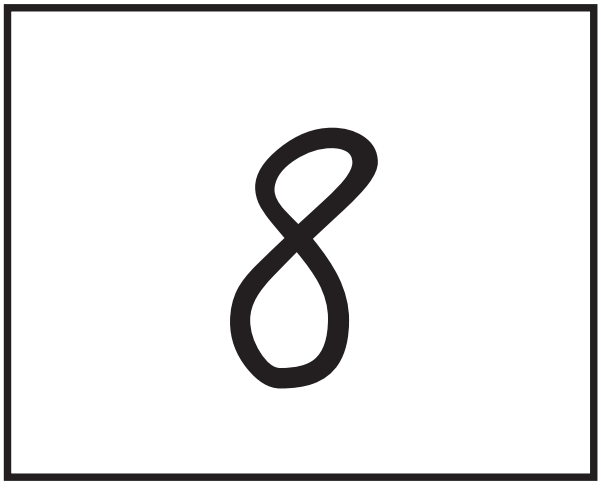




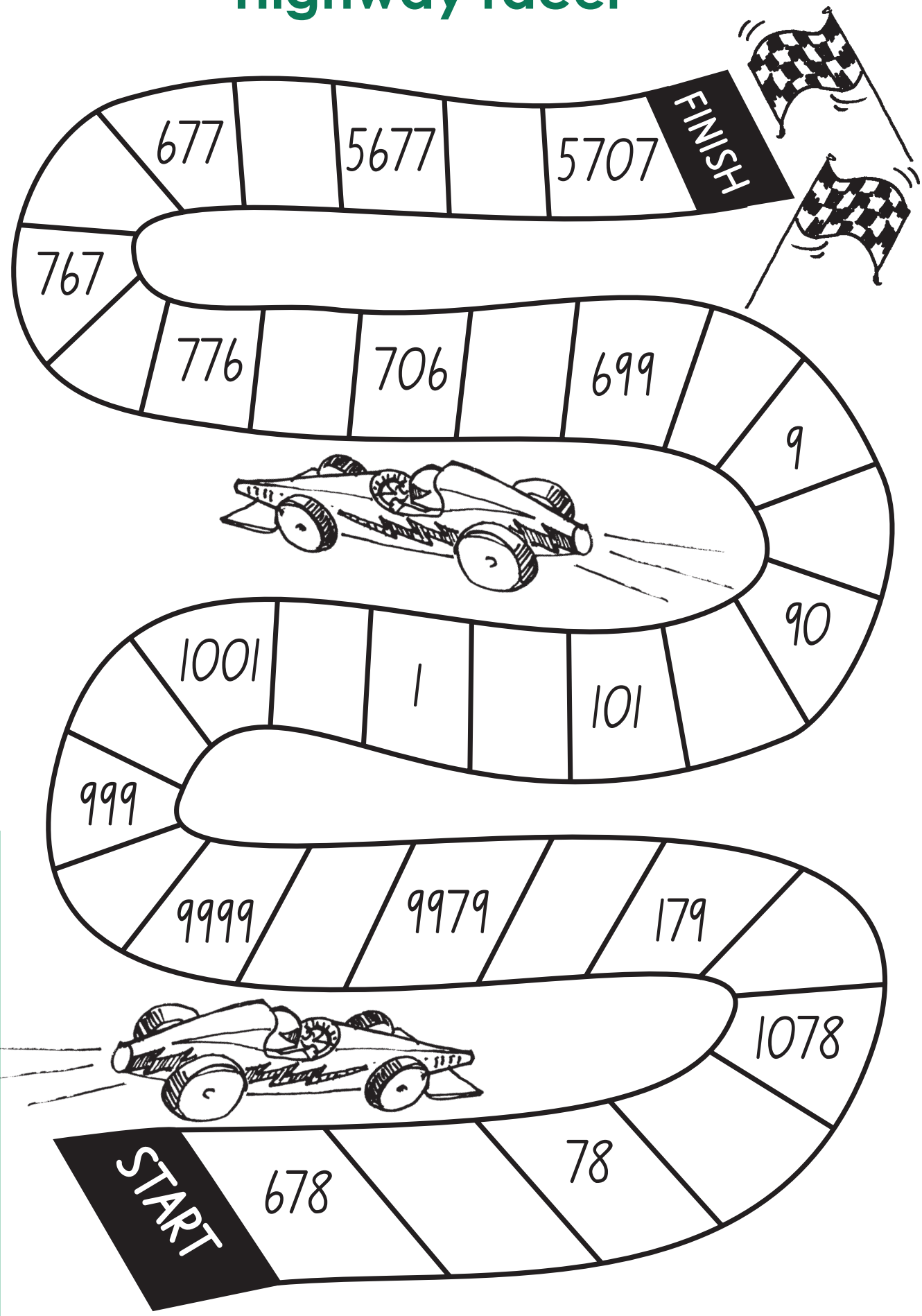




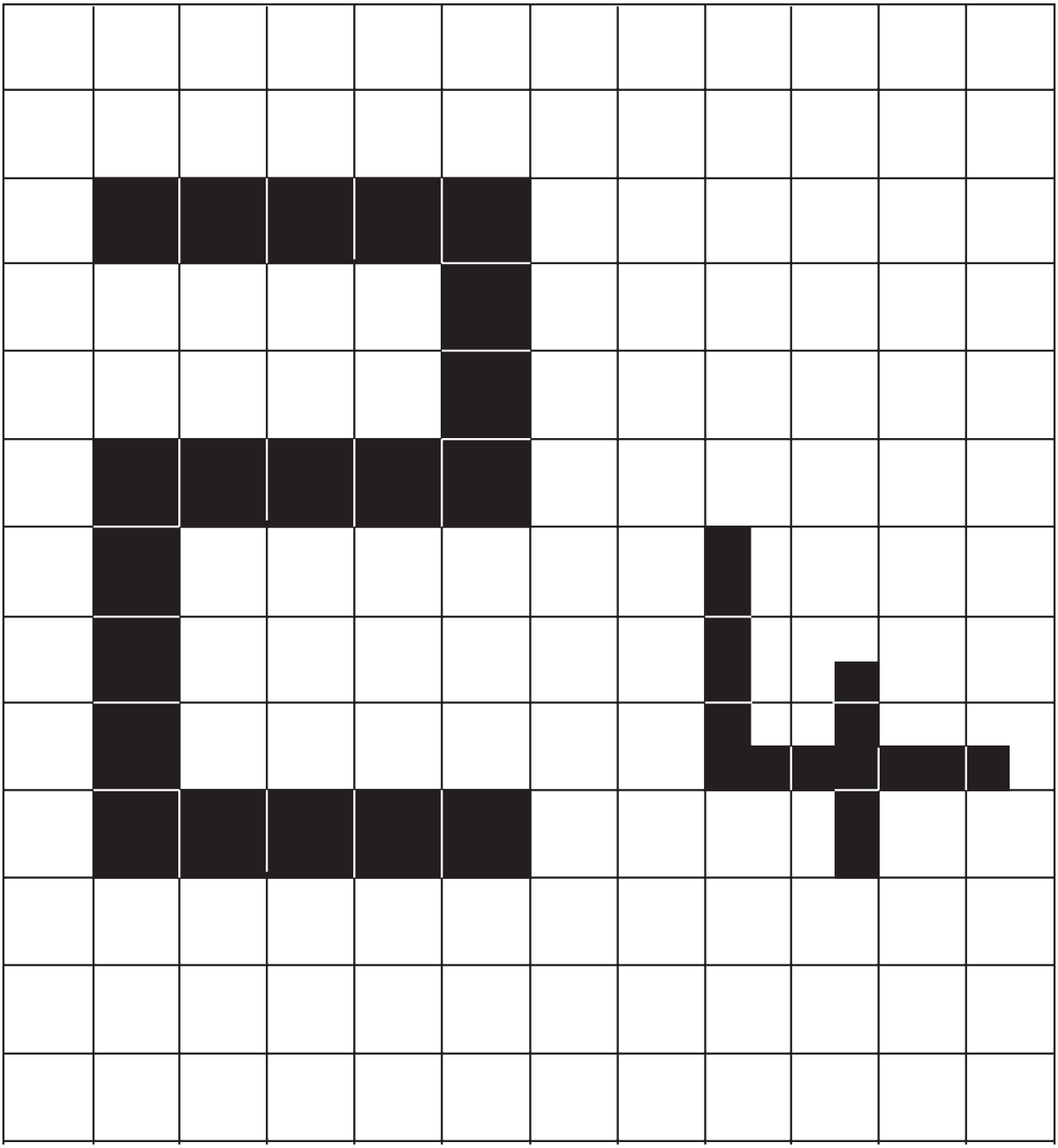
How many more?

First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones
First number	Second number	Tens	Ones

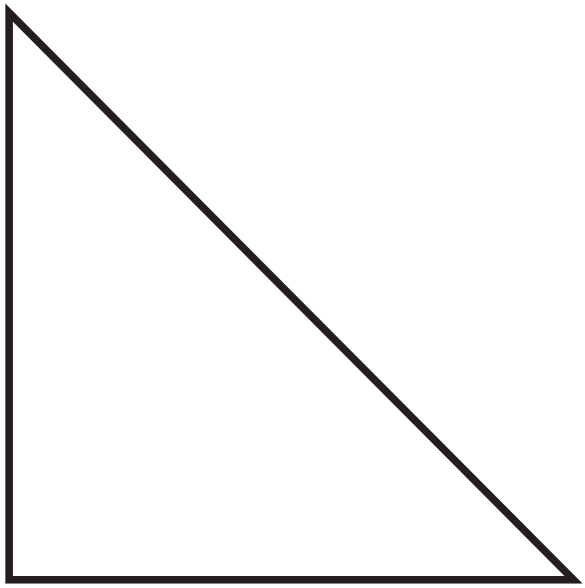
Highway racer

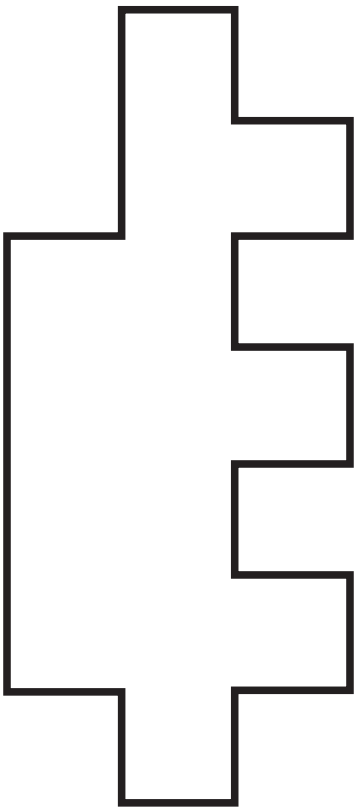


Digi squares

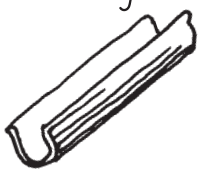


Measuring area with one tile

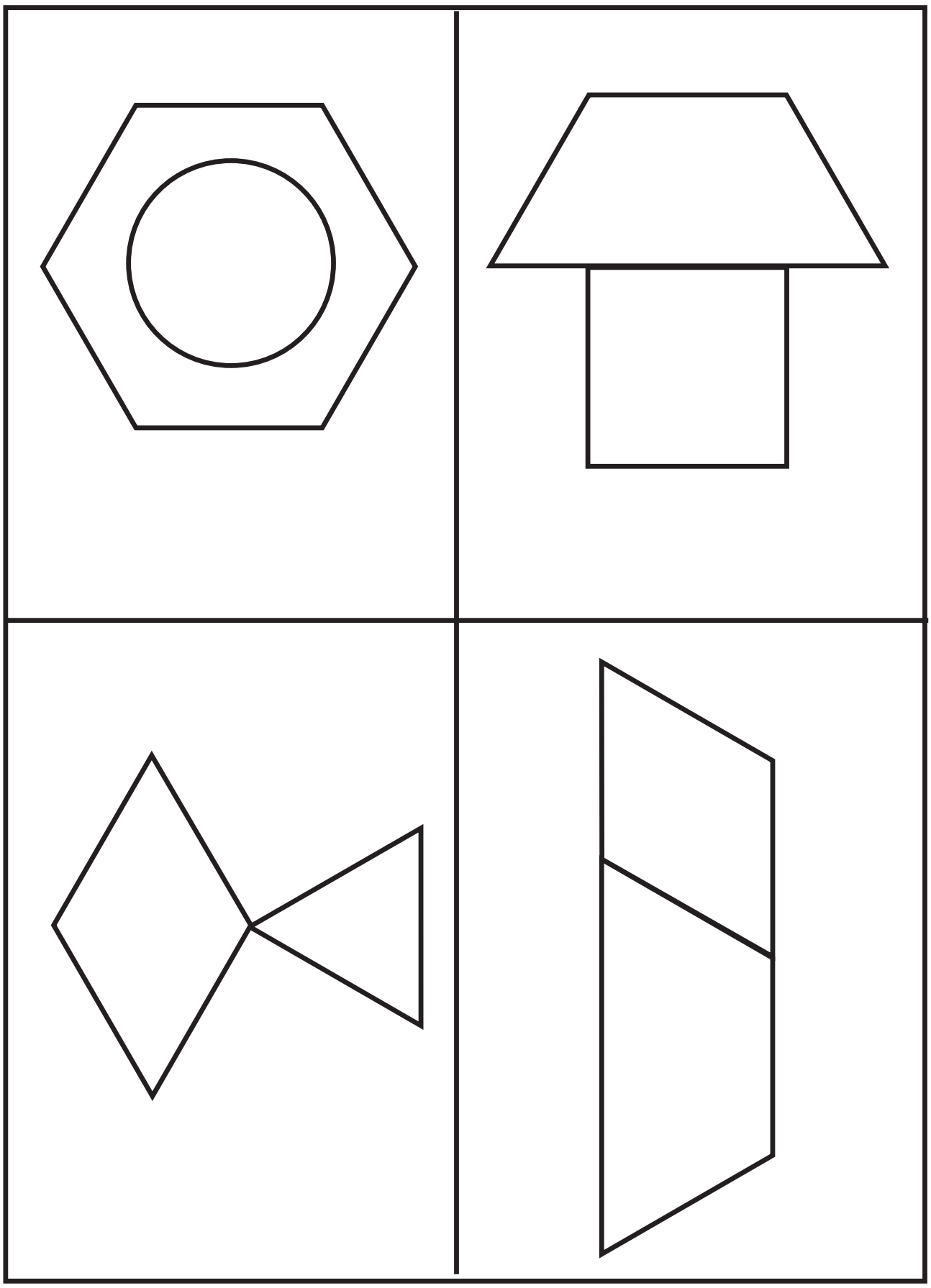




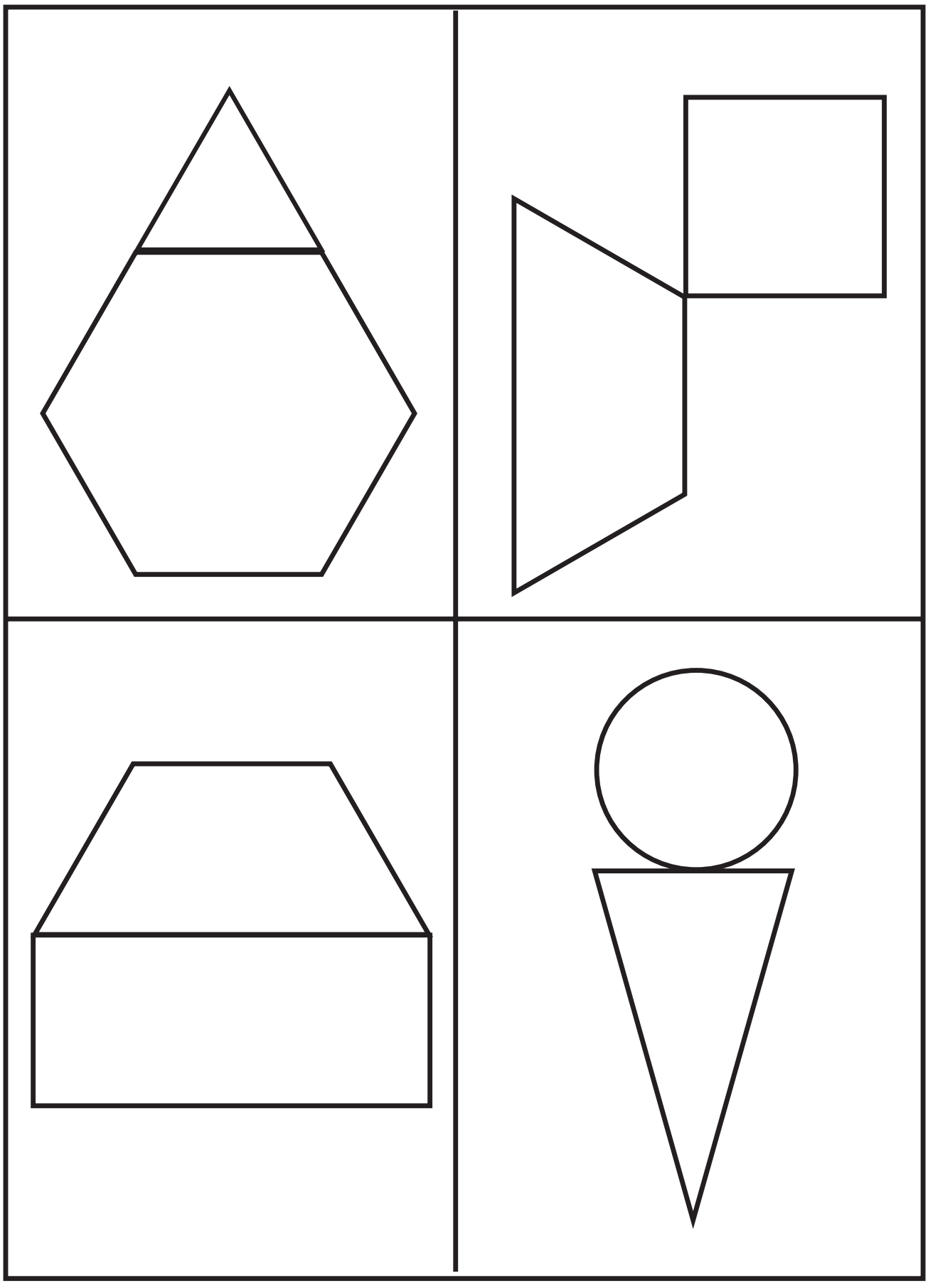
Food rainbow

SHAPE	CROSS-SECTION (top to bottom)		CROSS-SECTION (left to right)		CROSS-SECTION (diagonal)	
	prediction	actual	prediction	actual	prediction	actual
Potato 						
Apple 						
Banana 						
Strawberry 						
Celery 						
Carrot 						

What's my shape?



What's my shape?



Assessment tasks

Task	Student response	Assessment
T: *Start counting from 367 and count on by 10s.*	Counts from 367 to 417	Did the student successfully count on by tens over the hundred?
T: *What is the answer to this?* **8 x 4** T: *If you know the answer to that is 32, what would 32 divided by 8 equal?* **32 ÷ 8** T: *How did you know?*	Correctly solves the multiplication and division tasks without the use of equipment.	Did the student automatically recall the facts? Did the student refer to the inverse operation?
T: *I've got 27 cakes. Six cakes fit into a box. How many boxes do I need? Why?*	Automatically calculates the division question and states the remainder.	Did the student explain why there is a remainder?
T: *How many tens are in 302?*	Correctly states the number of tens.	Did the student state the number of units? Is the student able to treat 100 as ten groups of 10?

Task	Student response	Assessment
Give the student a sheet of 2 cm grid paper. T: *Draw a large rectangle on this paper and tell me how many squares are needed to cover it. If each side of the square was twice as long, how many would you need to cover the rectangle? How did you know?*	Draws a rectangle and calculates the number of squares needed to cover the area. Sees the relationship between the unit size and the number of squares needed.	How did the student determine the number of squares needed? Did the student refer to unit size and quantity?
Place a square pyramid on its base in front of the student. T: *If I stand this pyramid on its point what shape will the top face be? Draw how the triangle facing you will look if, after I stand it on its point, I rotate it 90° to the right.*	States that the top face will be a square. Draws a triangle in correct orientation.	Was the student able to draw the shape without manipulating the object? Did the student draw the correct type of triangle?

Maths bites

Using a hundred chart

- Provide each student with one or two different numeral cards in the range 1–100. Ask the class to construct a hundred chart on the floor made from the individual numeral cards. Discuss where to place each card when some of the numerals are missing. Determine the missing numbers.

- On a large hundred chart, shade in the multiples for a given number. Discuss the patterns created.

- Use the hundred chart to discuss the relationship between multiplication and division.

- Look at the "squares" or outlines around the numerals on the hundred chart. Use this concept to reinforce the structure of arrays.

- Use the hundred chart to show that the digits of multiples of "nine" add to "nine" e.g. 3 x 9 = 27; 2 + 7 = 9

- Shade patterns on the hundred chart for a multiple, say "two" and then discuss doubling to show the multiples for "four".

- Trace around a 3 x 3 square on a hundred chart. (Any nine numbers.) Look for a relationship between the four corner numbers and the centre number. Try other 3 x 3 squares and see if a similar relationship exists.

- Prepare a large blank hundred chart. Write some numbers in the chart as clues. Write other numbers in the range 0–100 on sticky notes. Ask individual students to post the notes onto the correct square in the hundred chart. Discuss quick ways of determining where the number belongs.

- Modify two egg cartons so that they have ten compartments each. Write a numeral inside each compartment in the range 0–9. Place a counter inside each egg carton. Label one carton "tens" and the other carton "ones". Shake each carton and open to discover which number the counter has landed in. Ask the students to determine the total of both cartons, by stating how many tens, how many ones and how many altogether. Find or mark the number on the hundred chart.

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