

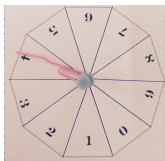
**ROUNDING AND ESTIMATION is the theme
for this INCLUSION AND HOME LEARNING GUIDE**

This Guide suggests related learning activities for all ages from 4 to 17+

Just choose whatever seems suitable for your group of learners

The TARGET 10 THOUSAND activity was designed
for Upper Primary and Lower Secondary

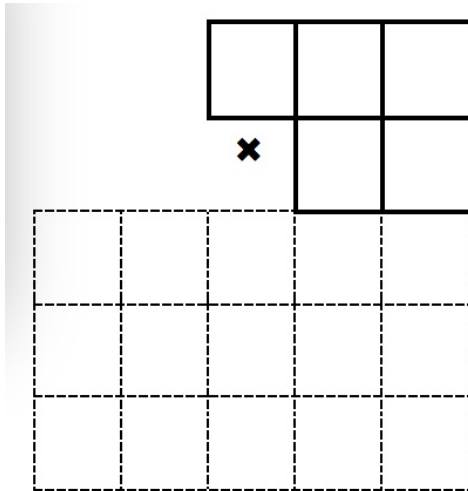
TARGET 10 THOUSAND



LESSON STARTER GAME FOR THE WHOLE CLASS

You will need a 0 to 9 spinner or special die.
See instructions for making spinners below.

Each player draws a grid like the one shown.



Spin the spinner and all the players must write
the digit in one of the top five boxes.

Once a number is written it cannot be changed.

Repeat four more times.

Then the learners multiply the 3-digit number by
the 2-digit number and write the answer on the
bottom line.

The player (or players) with the answer closest
to 10,000 wins.

Score 1 point for a win.

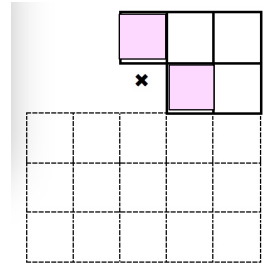
ALTERNATIVE VERSION OF THE TARGET 10 THOUSAND GAME.

The players write down all 5 numbers and then at the end decide where to place
them. This is a game of skill that involves mathematical thinking and not luck.

GAME FOR 2 PLAYERS Each player draws a grid like the one shown. They take turns to
spin the spinner and each player decides which of their 5 cells to fill in. You can't
change the position of the number once it is written in. After 5 spins each player
multiplies their 3-digit number by their 2-digit number and writes the answer on the
bottom line. The players check each other's answers and agree on who has won that
round. They need to understand that they must each find the difference (positive or
negative) between their answer and 10,000 and compare their difference with the
other player's difference.

HELP

To get near the target of 10 thousand, if you round the top number to the nearest hundred and the bottom number to the nearest 10 then you can estimate the product. Another method is to think about the numbers in the two shaded boxes and put numbers in the shaded boxes that have a product of 8 or 9.



For example: $1 \times 8 = 8$ or $2 \times 4 = 8$ or $3 \times 3 = 9$ and then you will get calculations like

$$127 \times 83 = 10541$$

$$256 \times 43 = 10922$$

$$314 \times 35 = 10990$$

NEXT

Start with any 5 numbers and decide where to place them in the grid to get the answer as close as possible to the target.

For example for 2, 3, 4, 5 and 6 the best answer is

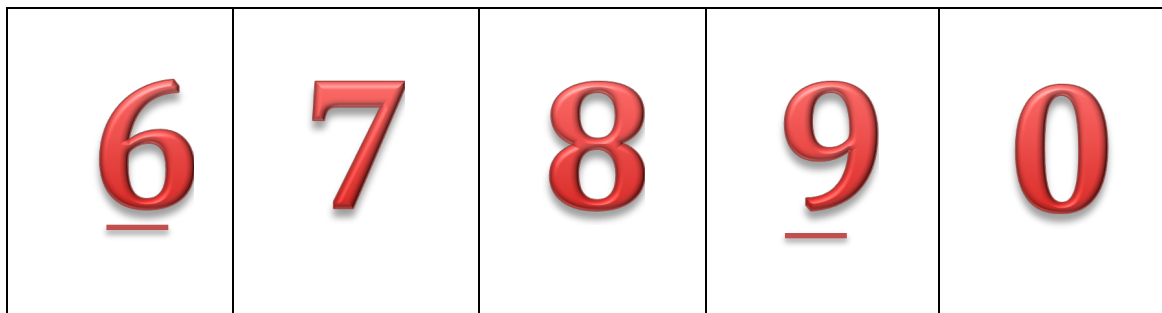
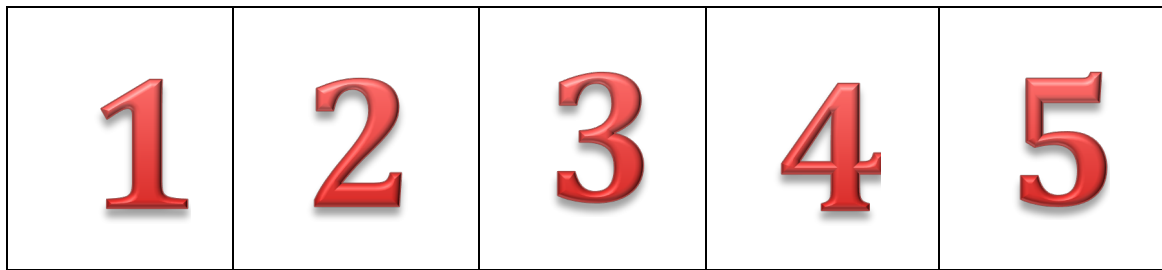
$$456 \times 23 = 10488 \text{ (approximately } 500 \times 20)$$

and for 1, 2, 5, 7 and 9 the best answer is

$$527 \times 19 = 10013 \text{ (also approximately } 500 \times 20).$$

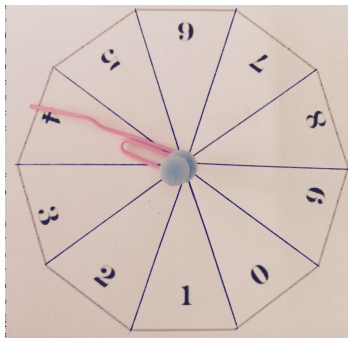
Change the target or change the grid to make it suitable for a different calculation and play the game for your chosen new target or calculation.

Alternatively make 10 cards that can be shuffled so the you can draw one digit randomly from the pack of ten. **In the Target 10 Thousand game the zero is not used.**

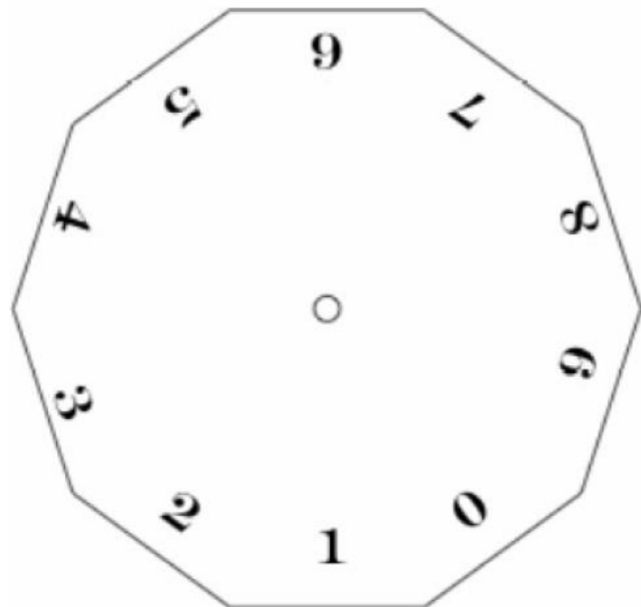


Choose the game that best suits the ages of the players. All the games are played in the same way but there are variations of scoring systems.

MAKE A 0 – 9 SPINNER



To make your own spinner you will need a paper clip and a pin.














Mark in the lines in the template on the right as in the diagram and cut it out.

Open up the paper clip and pin the paper clip and the template down on a flat surface so that the paper clip spins easily.

If you want to make a spinner without using a pin you can hold down the template and the paper clip with the point of a pencil

See below for the cards for playing the Target Game – see page 8.

0	+1	+2	+3	+4
+5	+6	+7	+8	+9
-1	-2	-3	-4	-5
-6	-7	-8	-9	 MINIMUM
 NEAREST TO -10	 NEAREST TO +75	 NEAREST TO 0	 NEAREST TO -7	 MAXIMUM
 NEAREST TO -35	 NEAREST TO -60	 NEAREST TO +15	 NEAREST TO +45	 NEAREST TO +8

INCLUSION AND HOME LEARNING GUIDE

THEME: ROUNDING AND ESTIMATION

HOW TO WIN

All the games offer number skill practice and an incentive to improve those skills in order to win.

Chance is a big factor. Players need to think for example ‘if I put this number in that box how likely am I to get a better number for that position on the remaining throws?’ Learners get experience of reasoning about probabilities before meeting a formal definition of probability.

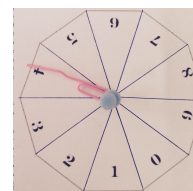
Early Years

SPIN HIGH

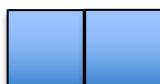
<https://aiminghigh.aimssec.ac.za/years-3-8-spin-high-or-low/>

The **TARGET** is to get the highest possible number.

You will need a 0-9 spinner like the one in the picture, or a pack of cards numbered 0 to 9.



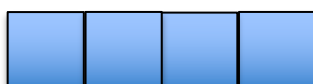
SPIN HIGH can have grids of 2, 3 or 4 squares.



2-digit numbers



3-digit numbers



4-digit numbers

Spin 2, 3 or 4 times. The player with the highest number wins.

Lower Primary

TARGET 50 (or 100)

<https://aiminghigh.aimssec.ac.za/years-4-5-target-100/>

This game could be played by 7 or 8 year olds. Players start with **TARGET 50**. They will need to put low numbers in the tens column to stop the total getting much bigger than 50.

The strategy is different when they progress to **TARGET 100**.

	H	T	U
+			

Upper Primary and Lower Secondary

See the game described on pages 1 and 2.

Start with the diagnostic quiz. Then ask the learners to write out in full the solution to 237×15 to check that they will know how to do the multiplications when playing the game.

This is a game for 1 player or 2, or a larger group.

If the group want to play in pairs then each pair needs a spinner.

To play the game, first copy the grid. Then one person spins the spinner 5 times and calls out the numbers one by one, and everyone writes that number in one of the cells in their grid. Once written in the position of a digit cannot be changed. When everyone has filled in 5 digits they must multiply their 3-digit number by their 2-digit number. Then they must find out how close their answer is to 10,000 by working **out the difference between their answer and 10,000**.

People who have got an answer near the target number have to show and explain their working. If anyone has got closer to the target they can make a challenge and show their working. The closest to 10 thousand wins a point and the game is repeated. The first player to get 5 points is the winner of the match.

For one player alone, and similarly if more players are involved, after deciding on the winner everyone thinks about the question: ***if we had known all the numbers BEFORE filling in any numbers could we have got closer.***

Players could use a different way of scoring. They could get penalty points for the difference between their total and the target number and add up their penalty points. They should play a few games until one of the players gets 1000 penalty points and loses the match.

You might vary the game by making the target bigger, for example 20,000.

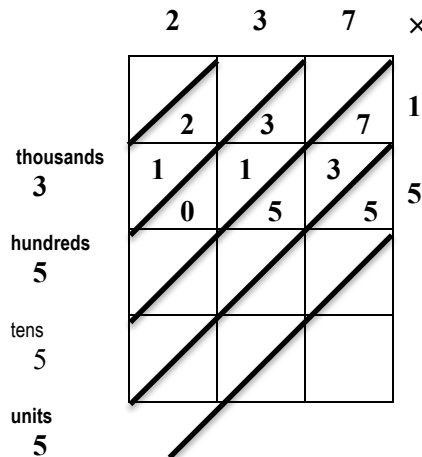
You could also suggest using another method of calculation to check answers. The learners could practise both methods

<p>For example the grid method for multiplication:</p> <p>Using 1, 2, 5, 6 and 8 how close can you get to 10 thousand?</p>	×	500	60	2	Totals	×	800	10	6	Totals
	10	5000	600	20	5620	20	16000	200	120	16320
	8	4000	480	16	4496	5	4000	50	30	4080
	Totals	9000	1080	36	10,016	Totals	20000	250	150	20,400
	<p>Getting close to 10,000:</p> $(500+60+2) \times (10+8) = 562 \times 18$ $= 10,016$					<p>Getting close to 20,000:</p> $(800+10+6) \times (20+5) = 816 \times 25$ $= 20,400$				

To review what has been learned in this session you might like the class to discuss the reasons why the two methods of multiplying 3 digit numbers by 2 digit numbers illustrated below work.

Then you might like them to discuss strategies for placing the digits to be multiplied so as to get a product as close to ten thousand as possible

×	200	30	7	totals
10	2000	300	70	2370
5	1000	150	35	1185
	3000	450	105	3555



Key questions

- Can you round that number to the nearest 100?
- Can you round that number to the nearest 10?
- OK, now can you estimate what answer you would get if you multiplied those two numbers together?
- Suppose you multiply by 50, about how big should the other number be to get 10,000?
- Suppose you multiply by 50, about how big should the other number be to get 20,000?

Upper Secondary

TARGET GAME <https://aiminghigh.aimssec.ac.za/years-7-10-target-game/>



In this game players combine two given numbers to get as close to a target as possible by choosing one of the operations: addition +, subtraction -, or multiplication \times , and each number once and only once. For example, combining (-3) and (-5) to get as close as possible to the target of -10 the best answer is $(-3) + (-5) = -8$.

For -7 and +9, the nearest to a target -35 is $(-7) - (+9) = (-16)$ and the nearest to 0 is $(+9) + (-7) = (+2)$. To hit the maximum and minimum targets: use $(+9) - (-7) = +15$ for the maximum and $(+9) \times (-7) = (-63)$ to hit the minimum.

Find the best answers for:

1. Target -60 with (-6) and (+9);
2. Target +45 with (-5) and (-9);
3. Target the minimum number with (-9) and (+2).

Now you are ready to play the game. Cut out the cards on page 2. This game can be played by a whole class and then the teacher decides on the best answer, or it can be played by any number of players when they need to agree between themselves on the best answer for each round.

0	+1	+2	+3	+4
+5	+6	+7	+8	+9
-1	-2	-3	-4	-5
-6	-7	-8	-9	MINIMUM
NEAREST TO -10	NEAREST TO +75	NEAREST TO 0	NEAREST TO -7	MAXIMUM
NEAREST TO -35	NEAREST TO -60	NEAREST TO +15	NEAREST TO +45	NEAREST TO +8

RULES FOR THE TARGET GAME

The aim is to get as close to the target as possible.

Players score 5 points if they hit the target.

If nobody hits the target players getting nearest to the target score 2 points.

Mix up the numbered cards and place them face down.

Mix the target cards and place them face down.

Turn over the top two number cards and one target card.

All the players must write down the two numbers and choose an operation to combine them to get as near to the target as possible.

Then check your answers with each other.

Agree on the points to be awarded and record the scores.

The first player to reach 20 points wins the game.

Why do this activity?

The game develops the learners' number sense and gives practice in estimating the results of calculations. Doing well in this game depends on an understanding of place value and how and why the multiplication algorithm works.

When learning how to do such calculations the game will help to deepen the learners' understanding of the method as well as giving practice. Subsequently the game can be used from time to time to give learners practice in doing calculations. Players should check their own calculations and each others' calculations without using a calculator. You might introduce additional penalty points for incorrect calculations to give extra incentive to work accurately.

Teachers can combine this game with work on rounding numbers to the nearest 10 and to the nearest 100 and then estimating the answer to a calculation.

Teachers can plan a lesson to combine this game with practising other multiplication methods such as the grid method.

The game also develops an appreciation of probability as it requires judgement about where to place the numbers in the grid and whether a 'better' number for that position is likely to come up.

Learning objectives

In doing this activity students will have an opportunity to:

- develop numeracy and skills at performing multiplication of 3 digit numbers by 2 digit numbers;
- deepen their understanding place value and methods of calculation;
- develop skills of rounding numbers to the nearest 10 and to the nearest 100;
- develop skill of estimating the answer to a calculation.

Generic competences

In doing this activity students will have an opportunity to **think flexibly**, be creative and innovative and apply knowledge and skills.

DIAGNOSTIC ASSESSMENT This can be done as a group as described below or the question can be answered individually.

Show this question and say:

"Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D".

$$\begin{array}{r} 237 \\ \times 15 \\ \hline \end{array}$$

What number will be in the ones column of the final answer?

A 2 B 35 C 3 D 5

1. Notice how the learners respond. Ask them to explain why they gave their answer and DO NOT say whether it is right or wrong, simply thank the learner for the answer.

2. It is important for learners to explain the reason for their answer so that, by putting their thinking into words, they develop communication skills and gain a better understanding.

3. With a group, make sure that other learners listen to these reasons and try to decide if their own answer was right or wrong.

4. Ask the learners to vote again for the right answer by putting up 1, 2, 3 or 4 fingers. Look for a change and who gave right and wrong answers.

The correct answer is:

D. is the correct answer.

Common Misconceptions

A. Probably a guess

B. They may have given this answer because $5 \times 7 = 35$

C. Probably a guess

<https://diagnosticquestions.com>

Follow up

Play these games first:

Target 1000 <https://aiminghigh.aimssec.ac.za/years-4-7-target-1000/> and

Target Multiplication

<https://aiminghigh.aimssec.ac.za/years-4-7-target-multiplication/>

Then play the games involving division:

Target Division <https://aiminghigh.aimssec.ac.za/targetdivision/>

Target 4 by 2 Division

<https://aiminghigh.aimssec.ac.za/years-6-7-target-4-by-2-division/>



Go to the **AIMSSEC AIMING HIGH** website for lesson ideas, solutions and curriculum links: <http://aiminghigh.aimssec.ac.za>

Subscribe to the **MATHS TOYS YouTube Channel**

<https://www.youtube.com/c/mathstoys>

Download the whole AIMSSEC collection of resources to use offline with the AIMSSEC App see <https://aimssec.app> Find the App on Google Play.

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and school years up to Secondary 5 in East Africa.

New material will be added for Secondary 6.

For resources for teaching A level mathematics (Years 12 and 13) see <https://nrich.maths.org/12339>

Mathematics taught in Year 13 (UK) & Secondary 6 (East Africa) is beyond the SA CAPS curriculum for Grade 12

	Lower Primary Approx. Age 5 to 8	Upper Primary Age 8 to 11	Lower Secondary Age 11 to 15	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13