AIMSSEC

**AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES**
**SCHOOLS ENRICHMENT CENTRE (AIMSSEC)**

**AIMING HIGH**

**Logical thinking is the theme**
**for this INCLUSION AND HOME LEARNING GUIDE**

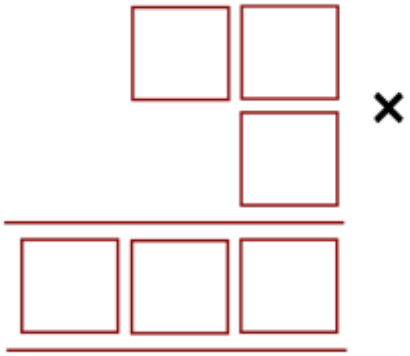
This Guide suggests related learning activities for all ages from 4 to 17+

**Just choose whatever seems suitable for your group of learners**

The MULTIPLICATION ACTIVITY was designed for Lower Secondary

## MULTIPLICATION CHALLENGE

Use the digits 1 to 6, only once, in the six boxes to make the multiplication correct.



How many ways can you do this?

How can you be sure?

## HELP

How are you going to solve this problem?

Are you going to use trial and error to solve this problem?

Can you think of a systematic way of finding the answer(s)? Remember you can only use the numbers 1 to 6 once.

Thinking systematically means you have a plan to look at all the possibilities in an ordered way.

For example, you might start with the two digit numbers that begin with the number 1.

11, 12, 13, 14, 15, 16

Already we can see that 11, is not possible, as you can only use the digit 1 once. Now what digits will we multiply these numbers with?

Remember the answer must be a three-digit number.

If I multiply each of these numbers by the largest number 6, what do I find?

I cannot multiply 16 by 6 as I can only use the number 6 once.

The other numbers multiplied by 6 have answer with two digits. We need the answer to have three digits so none of these numbers are possible.

Now thinking systematically, list all of the numbers that could start with 2.

21, 22(no-only allowed one 2), 23, 24, 25, 26

Now remember the answer must result in a three-digit number and you are only allowed to

use the digits 1 to 6 once.

Good luck, I'm sure you can solve this problem.

**NEXT**

Congratulations you have solved the problem.
Now I want you to write down how you checked that you had all the possible solutions. Imagine you have to explain to the other learners how to solve the problem systematically. How did you do this?
You could look at the help section which introduces the idea of finding the answer(s) systematically.
Some of the other learners may be finding this quite difficult. How would you explain to them the systematic approach you used to find the answer(s).

## INCLUSION AND HOME LEARNING GUIDE

# THEME: Logical thinking

## Young Children



How many different ways can you arrange the three teddies?

Try this with 2 toys. Then try it with 4 toys. There are a lot of ways for 4 toys.

## Solution

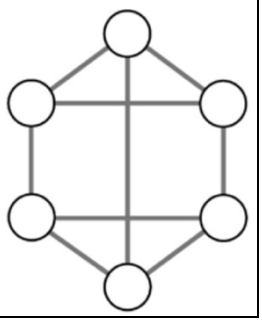
Six different ways for 3 toys and twenty four ways for 4 toys.

## Upper Primary

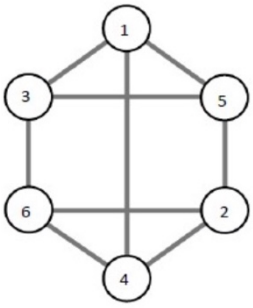
Use each of the numbers 1 to 6 once. Write one in each circle. Numbers next to each other must not be joined.

For example, 3 must not be joined to 2 or 4.

**1 2 3 4 5 6**



## Solution




## Lower Secondary and Upper Secondary

Multiplication Challenge on pages 1 and 2.

## Key Questions

- How are you going to solve this problem?

- Are you going to use trial and error to solve this problem?
- Can you think of a systematic way of finding all the possible solutions?
- Would you be able to explain your systematic approach to your fellow learners?

## SOLUTION

Possible two digits numbers

11, 12, 13, 14, 15, 16

21, ~~22~~, 23, 24, 25, 26

31, 32, 33, 34, 35, 36

41, 42, 43, 44, 45, 46

51, 52, 53, 54, 55. 56

61, 62, 63, 64, 65, 66

These numbers are not possible as you can only use the digits 1 to 6 once.

These numbers are not possible as they only have a two-digit answer when they are multiplied by the biggest digit 6.

For the remaining numbers;

Check that the answer has three digits

Check that the digits are not repeated between 1 and 6 in the sum or in the answer.

Check that the answer does not contain zero or a digit larger than 6.

For example, 51 × 1 = 51

51× 2 = 102

51× 3 = 153

51 × 4 = 204

51× 5 = 505

51× 6 = 256

You should find that the only solution is 54 × 3 = 162

## Why do this activity?

This activity encourages learners to think of a systematic approach to check all the possible permutations and hence find the solution to the problem. It also encourages learners to think through their approach by asking them to explain to their fellow learners how they solved the problem.

## Learning objectives

In doing this activity students will have an opportunity to:

- Practice multiplication skills;
- Develop a systematic approach to solving a problem;
- Explain their systematic approach to fellow learners.

## Generic competences

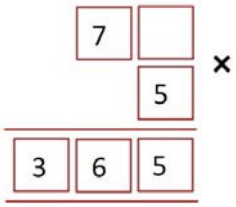
In doing this activity students will have an opportunity to:
think mathematically, reason logically and give explanations;
work in a team, collaborate and work with a partner or group;
communicate in writing, speaking and listening.

## Diagnostic Assessment

This quiz should take 5–10 minutes and should be used before the activity. Show the question to the learners and say:
**"Put up 1 finger if you think the answer is A, 2 fingers for B, 3 for C and 4 for D".**

Which digit can go in the box to make the calculation correct?

A. 1
B. 3
C. 5
D. 7




1.Notice how the learners respond. Ask them to explain why they gave their answers and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
2. It is important for learners to explain the reasons for their answers. Putting thoughts into words may help them gain better understanding and improve their communication skills.
3. Try to make sure that 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. Notice if there is a change and who gave right and wrong answers.

**The correct answer is B.**

**Possible misconceptions:**

A. C. and D. Either learners did not understand the question or they do not understand multiplication beyond the first column.

## Follow up

Target Multiplication
https://aiminghigh.aimssec.ac.za/years-4-7-target-multiplication/

Spot the Mistake https://aiminghigh.aimssec.ac.za/years-4-7-spot-the-mistake/

Two by Two Puzzle https://aiminghigh.aimssec.ac.za/years-4-7-two-by-two-puzzle/

MD https://aiminghigh.aimssec.ac.za/years-4-7-md/

Check-It Game with multiplication and division
https://aiminghigh.aimssec.ac.za/years-4-to-10-checkit-game/

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 or find it 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 |