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SA OLYMPIADS

GRADE 4 -7

MATHEMATICS OLYMPIADS SCOPE AND GUIDE

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A. Paper structure for the olympiad

It is important for teachers to read through the paper with the learners.

The are 20 questions with 15 being multiple choice and 5 being open ended.

Learners should be familiar with the following scope relevant to each Grade.

In order to become familiar, they can do practice questions or the past papers which are available on the website: www.saolympiads.co.za.

The aim should be for learners to demonstrate ability in the 8 levels of Mathematics:

SACMEQ 8 LEVELS MATHEMATICS

LEVEL	DESCRIPTION	ELABORATION
1	PRE-NUMERACY	APPLIES SINGLE STEP ADDITION AND SUBTRACTION
2	EMERGENT NUMERACY	APPLIES A 2 STEP ADDITION AND SUBTRACTION INVOLVE CARRYING
3	BASIC NUMERACY	TRANSLATE VERBAL INFORMATION INTO ARITHMETIC OPERATIONS
4	BEGINNING NUMERACY	TRANSLATES VERBAL OR GRAPHICAL INTO SIMPLE ARITHMETIC PROBLEMS
5	COMPETENT NUMERACY	TRANSLATES VERBAL, GRAPHIC OR TABULAR INFORMATION INTO ARITHMETIC FORM IN ORDER TO SOLVE A GIVEN PROBLEM.
6	MATHEMATICALLY SKILLED	SOLVES MULTIPLE-OPERATION PROBLEMS (USING THE CORRECT ORDER) INVOLVING FRACTIONS; RATIOS AND DECIMALS
7	CONCRETE PROBLEM SOLVING	EXTRACTS AND CONVERTS INFORMATION FROM TABLES, CHARTS AND OTHER SYMBOLIC PRESENTATIONS IN ORDER TO IDENTIFY AND THEN SOLVE MULTI STEP PROBLEMS
8	ABSTRACT PROBLEM SOLVING	IDENTIFIES THE NATURE OF AN UNSTATED MATHEMATICAL PROBLEM EMBEDDED WITHIN VERBAL OR GRAPHIC INFORMATION AND THEN TRANSLATESTHIS INTO SYMBOLIC, ALGEBRAIC OR EQUATION FORM IN ORDER TO SOLVE PROBLEMS

GRADE FOUR: SCOPE IN RESPECT OF MATHEMATICS OLYMPIAD

1. PATTERNS; NUMBERS; OPERATIONS

1.1 Number patterns (counting in any number and from any number)
1.2 Operations (addition and subtraction)
The use of letters shows the relationship with Algebra
1.3 Function Machines (Input and Output)

EXAMPLE ONE

What is the 10^{th} number of this addition sequence: 8; 13; 18; 23; … ?

EXAMPLE TWO

Find the value of A+ B +C if:

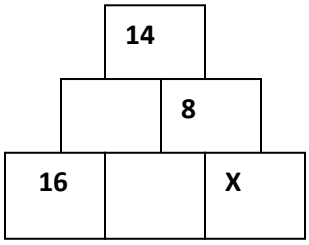
```
  A B C
    B C
  A B C
  7 9 5
```

2. PATTERNS; LINKS AND CHAINS

2.1 Non routine patterns including rectangular; triangular; square sequences - Pascal's Triangle.
2.2 Matching and solving equations.
2.3 Links and Chains - Fun Mathematics with rules for example: Pyramaths

EXAMPLE THREE

In the game below called "PYRAMATHS' the number on the left is halved and added to the number on the right to give the number in the box above it. Find the number that should replace x.



3 WORD PROBLEMS

3.1 Guess the number
3.2 Non routine problems including logic
3.3 Age problems
3.4 Time and calendar problems
3.5 Simultaneous type of equations

EXAMPLE FOUR

How many days are there from 18 July 2023 to 18 November 2023?

EXAMPLE FIVE

If the date on Saturday is 22nd then what is the date of the 3rd Thursday of the month?

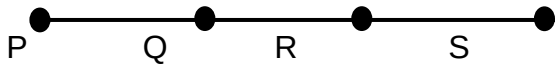
EXAMPLE SIX

Jen is the same age as Karina was 4 years ago. If Jen's age 4 years ago was 20 then what will Karina's age in 6 years' time, be?

4. MEASUREMENT

4.1 Perimeter
4.2 Area
4.3 Three Dimension Problems

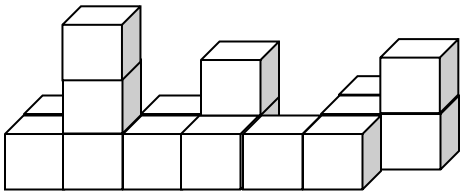
EXAMPLE SEVEN



Four houses P; Q; R and S are on a straight road. The distance from P to R is 160 metres. The distance from Q to S is 200 metres and from P to S is 260 metres.
What is the distance from Q to R?

EXAMPLE EIGHT

How many blocks were used to build this structure?



5. NON-NUMBER PATTERNS

EXAMPLE NINE

At a Christmas party each child took a gift for each of their friends. There were 132 gifts altogether. How many children were at the party?

GRADE FIVE: SCOPE IN RESPECT OF MATHEMATICS OLYMPIAD

1. PATTERNS; NUMBERS; OPERATIONS

1.1 Number patterns (counting in any number and from any number)
1.2 Operations (addition and subtraction):
The use of letters shows the relationship with Algebra)
1.3 Function Machines (input and Output)
1.3.1 Trial and improvement – solving equations
1.4 Consecutive numbers

EXAMPLE ONE

What is the 20^{th} number of this addition sequence: 9; 15; 21; 27; … ?

EXAMPLE TWO

Find the value of A+ B +C if:

```
  A B C
    B C
  A B C
  8 C 5
```

2. PATTERNS; LINKS AND CHAINS

2.1 Non routine patterns including rectangular; triangular; square sequences - Pascal's Triangle. Fibonacci Sequences.
2.2 Matching and solving equations.
2.3 Links and Chains: Fun Mathematics with rules - Pyramaths
2.4 Defined operations

EXAMPLE THREE

Find the value of: ☐

☐ + ☐ = 51 - ☐

EXAMPLE FOUR

Study the following problem. Do you know what © is doing to the 2 numbers?

4 © 3 = 9 3 © 1 = 8 6 © 2 = 16

After you have discovered what © does then find the answer to:

8 © 3

3. WORD PROBLEMS

3.1 Guess the number
3.2 Non routine problems including logic
3.3 Age problems
3.4 Time and calendar problems
3.5 Simultaneous type of equations
3.6 LCM type of problems

EXAMPLE FIVE

Guess the number I stand for:

- I am a 3 digit number.
- My ten's digit can be counted in 3's.
- The sum of my digits is 14.
- My hundred's digit is 2 less than my unit's digit.

EXAMPLE SIX

When Don counted the sweets in 5's he had 2 left. When he counted in 4's he had 3 left over. When he counted in 3's he had none left over. What is the smallest number of sweets Don had?

4. MEASUREMENT

4.4.1 Perimeter
4.4.2 Area
4.4.3 Three Dimension Problems

EXAMPLE SEVEN

The perimeter of a rectangular plot is 200m. If the length is 40m more than the width then determine the width.

5. NON-NUMBER PATTERNS

EXAMPLE EIGHT

Red and white beads totaling 75 are arranged as follows:

WW R WW RR WW RRR WW RRRR WW RRRRR ….

How many are red beads?

GRADE SIX: SCOPE IN RESPECT OF MATHEMATICS OLYMPIAD

1. PATTERNS; NUMBERS; OPERATIONS

1.1 Number patterns (Determination of any term of sequence)
1.2 Operations (addition and subtraction
The use of letters shows the relationship with Algebra and reverse process). Use of Short methods – Distributive property.
1.3 Function Machines (input and Output)
1.3.1 Trial and improvement – solving equations
1.4 Consecutive odd and even numbers
1.5 Fractions

EXAMPLE ONE

. Write down the 8th number of this addition sequence.
3; 3; 6; 9; 15;…

EXAMPLE TWO

Evaluate: 59 x 7015 + 42 x 7015 - 100 x 7015

2. PATTERNS; LINKS AND CHAINS

2.1 Non routine patterns including rectangular; triangular; square sequences - Pascal's Triangle and Fibonacci Sequences, etc. Use of rules to determine an unknown term.
2.2 Solving equations.
2.3 Links and Chains - Fun Mathematics with rules - Pyramaths and Arithmogons.
2.4 Defined operations

EXAMPLE THREE

In a 200 metre race Yolana beats Zola by 20 metres. If Zola was given a lead of 20 metres then determine by what distance Zola would have won the race.

3. WORD PROBLEMS

3.1 Guess the number
3.2 Non routine problems including logic
3.3 Age problems
3.4 Time and calendar problems
3.5 Simultaneous type of of equations
3.6 LCM and HCF type of problems
3.7 Clock arithmetic
3.8 Rate and Ratio

EXAMPLE FIVE

Penny has as many R2 coins as R5 coins. If the total value of the coins is R2100 then what is the value of R2 coins?

EXAMPLE SIX

It takes a cold water tap 10 minutes to fill a bathtub which has a capacity of 120 litres. It takes the hot water tap 20 minutes to fill the tub. How long will it take to fill the tub if both taps are open together? (The rate of flow from both taps is constant)

4. MEASUREMENT

4.1 Perimeter
4.2 Area
4.3 Three Dimension Problems

EXAMPLE SEVEN

The length of a rectangular garden is one and half times its width. If the perimeter is 1800 metres then find the width in metres.

5. NON-NUMBER PATTERNS

6. Data Handling - Fundamental counting methods.

EXAMPLE SEVEN

The Pancake Inn offers plain, blueberry and cinnamon pancakes. There are four types of syrup: maple, blueberry, strawberry and mulberry. The pancake can be ordered in plain or whole wheat flour. How many different orders can one place?

GRADE SEVEN: SCOPE IN RESPECT OF MATHEMATICS OLYMPIAD

1. PATTERNS; NUMBERS; OPERATIONS

1.1 Number patterns (Determination of any term of sequence)
1.2 Operations (addition and subtraction
The use of letters shows the relationship with Algebra and reverse process). Short methods – Distributive property.
1.3 Function Machines (input and Output)
1.3.1 Trial and improvement – solving equations
1.4 Consecutive odd and even numbers
1.5 Fractions including word problems.

EXAMPLE ONE

1125 beads are used to make 45 chains. How many beads are needed to make 28 such chains?

EXAMPLE TWO

After painting $\frac{5}{8}$ of the the hotel's doors Pete still had 36 doors to paint. How many doors were there altogether?

2. PATTERNS; LINKS AND CHAINS

2.1 Non routine patterns including rectangular; triangular; square sequences - Pascal's Triangle and Fibonacci Sequences, etc. Use of rules to determine an unknown term.
2.2 Solving equations.
2.3 Links and Chains - Fun Mathematics with rules - Pyramaths; Arithmogons and Geogons.

EXAMPLE THREE

Observe the following pattern: What is the 3rd number of the 30th row?

1
3 5
7 9 11
13 15 17 19
.....

EXAMPLE FOUR

If $\frac{8}{5} = 1 + \frac{1}{1+\frac{1}{1+\frac{1}{x}}}$ then find the value of x.

2.4 Defined operations

3. WORD PROBLEMS

3.1 Guess the number
3.2 Non routine problems including logic
3.3 Age problems
3.4 Time and calendar problems
3.5 Simultaneous type of of equations
3.6 LCM and HCF type of problems
3.7 Clock arithmetic
3.8 Foreign exchange type of problems.

EXAMPLE FIVE

The LCM of 2 numbers is 48. If the two numbers are in the ratio 2:3, then find the sum of the 2 numbers.

EXAMPLE SIX

Penny won an 800-metre race in 2 minutes. Calculate the average speed in km per hour.

4. MEASUREMENT AND BASIC GEOMETRY

4.1 Perimeter and Area
4.2 Properties of polygons and symmetry.
4.3 Volume

EXAMPLE SEVEN

A rectangular lawn had paving bricks around the border. The perimeter of the lawn is 40 metres and the area of the lawn is 96 m^2. Determine the longer side of the lawn.

5. NON-NUMBER PATTERNS

6. Data Handling - Fundamental counting methods.

EXAMPLE SEVEN

Determine the 2 digit number such that it is 3 times the sum of its digits.