



SHARP

**2022 Wits Mathematics Competition
Final Round
Upper Primary**

Instructions

This paper is 90 minutes long and consists of ten single answer questions (to be answered in the below table) and two proofs (to be answered on the pages they're written on).

If needed, additional sheets of blank paper may be used to finish your solutions.

Calculators may NOT be used. A ruler and compass may be used but all other geometric aids are NOT allowed. A translation aid (such as a dictionary) from English to another language is allowed.

Questions 1 – 3 are each worth 4 marks.

Questions 4 – 7 are each worth 5 marks.

Questions 8 – 10 are each worth 6 marks.

Questions 11 – 12 are each worth 10 marks.

The total number of marks available is 70.

”It requires a very unusual mind to undertake the analysis of the obvious.” - Alfred North Whitehead

Question	Answer
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

A. 4 point questions

1. Palesa wanted to multiply a number by 101 but she forgot the 0 and multiplied the number by 11 instead. The resulting number was 99. What should her answer have been?
2. What is the smallest ten-digit number that has exactly two digits that are the same and all other digits are different? Note: Numbers cannot start with zero!
3. In a soccer match between Kaizer Chiefs and Orlando Pirates, the final score is 3 : 2. How many possible scores are there at half-time?

B. 5 mark questions

4. Which number must replace the question mark if the total of the numbers in each row is the same?

1	2	3	4	5	6	7	8	9	10	199
11	12	13	14	15	16	17	18	19	20	?

5. Today is a Monday. Thabo starts to read a book with 290 pages today. On Mondays he reads 25 pages and on every other day he reads 4 pages. On which day of the week does he finish reading the book?
6. A box measures $2,8m \times 1,5m \times 2m$. What is the maximum number of smaller boxes measuring $0,3m \times 0,5m \times 0,7m$ that can fit into the bigger box?
7. There are 60 learners in a class. Always two students share a desk. Every boy shares a desk with a girl. Exactly half the girls share a desk with a boy. How many boys are in the class?

C. 6 mark questions

8. A series of 10 books were published at 2-year intervals. The sum of the publication years is 20000. When was the first book published?

9. If we add the digits of 2022 we get $2 + 0 + 2 + 2 = 6$. How many years between 2000 and 9999 (including 2022) have digit sum 6?

10. A cube is painted on the outside and then divided into unit cubes ($1 \times 1 \times 1$ cubes). The total number of painted faces equals the total number of unpainted faces. What was the side length of the cube before it was taken apart?

D. Proof questions, 10 marks each

11. Eight teams participate in a soccer tournament. Each team will play every other team in the tournament once in the group stage. After the group stage, the quarter finals will be played (1st vs 8th, 2nd vs 7th, etc), followed by the semi finals and a final. How many matches will be played in total? Show all your working.

12. The lengths of the sides of the compound shape below are eight different whole numbers with the longest side being equal to 10cm . What is the minimum area of the compound shape if $BC > AB > DC$ and $AH > ED$? Show all your working.

