



IMONST 2 2022 (PRIMARY)

READ THESE INSTRUCTIONS CAREFULLY:

1. **Time: 4 hours** (10.00 am to 2.00 pm, Saturday 30 July 2022).
2. The paper contains **six (6) problems**. Make sure you have the paper for the correct category. Each problem is worth 7 points.
3. You need:
 - (a) Internet access to download the question and submit your solution (not allowed during the contest period).
 - (b) A4 papers, pen, pencil, eraser, compass, ruler.
 - (c) A scanner or phone scanner app (e.g., Adobe Scan) to scan your solution.

Not allowed: Calculators, electronic/internet devices, books, printed materials.

4. Write the solution **by hand**. Do not use a computer.
5. Write your **full name, category, and school name** on **top of the first page**.
6. Work on your own. Any evidence of cheating will result in disqualification and ban from future IMONST events.
7. After the contest, scan your solution and save it as **one PDF file**, with filename:
(**Category**)\space(**Full name**) Example: (Primary) Muhammad Zafree Zaharidan.
8. Upload your solution at this link **before 2.30pm**:

<https://tinyurl.com/imonst2sub>

Late submission will be rejected.

GOOD LUCK

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Problem 1. Given a polygon $ABCDEFGHIJ$.

How many diagonals does the polygon have?

Diberi suatu poligon $ABCDEFGHIJ$.

Berapakah bilangan pepenjuru bagi poligon tersebut?

Problem 2. The following list shows every number for which more than half of its digits are digits 2, in increasing order:

2, 22, 122, 202, 212, 220, 221, 222, 223, 224, $\dots$

If the n th term in the list is 2022, what is n ?

Senarai berikut menunjukkan setiap nombor dengan lebih separuh daripada digitnya adalah digit 2, dalam susunan menaik:

2, 22, 122, 202, 212, 220, 221, 222, 223, 224, $\dots$

Jika sebutan ke- n dalam senarai itu ialah 2022, apakah nilai n ?

Problem 3. Prove that

$$1 \cdot 4 + 2 \cdot 5 + 3 \cdot 6 + \dots + n(n+3) = \frac{n(n+1)(n+5)}{3}$$

for all positive integer n .

Buktikan bahawa

$$1 \cdot 4 + 2 \cdot 5 + 3 \cdot 6 + \dots + n(n+3) = \frac{n(n+1)(n+5)}{3}$$

bagi semua integer positif n .

Problem 4. Given a circle and a quadrilateral $ABCD$ whose vertices all lie on the circle. Let R be the midpoint of arc AB . The line RC meets line AB at point S , and the line RD meets line AB at point T .

Prove that $CDTS$ is a cyclic quadrilateral.

Note: All vertices of a cyclic quadrilateral lie on a circle.

Diberi suatu bulatan dan suatu sisiempat $ABCD$ dengan kesemua bucuanya terletak pada bulatan tersebut. Andaikan R titik tengah bagi lengkok AB . Garis RC bersilang dengan garis AB pada titik S , dan garis RD bersilang dengan garis AB pada titik T .

Buktikan bahawa $CDTS$ adalah suatu sisiempat kitaran.

Nota: Semua bucu bagi suatu sisiempat kitaran terletak pada suatu bulatan.

Problem 5. Without using a calculator, determine which number is greater: 17^{24} or 31^{19} .

Tanpa kalkulator, tentukan nombor mana yang lebih besar: 17^{24} atau 31^{19} .

Problem 6. Given an integer n . We rearrange the digits of n to get another number m .

Prove that it is impossible to get $m + n = 999999999$.

Diberi suatu integer n . Kita mengubah kedudukan digit-digit bagi n untuk memperoleh suatu nombor m .

Buktikan bahawa adalah mustahil untuk memperoleh $m + n = 999999999$.

■ END OF PAPER ■

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