

Part of:



Organised by:



MEMO

Mentari Mathematics Olympiad

**SYLLABUS OF COMPETITION
AND SAMPLE PROBLEMS + SOLUTIONS
MENTARI MATHEMATICS OLYMPIAD
(MEMO) 2021**



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SYLLABUS OF COMPETITION LEVELS

MEMO Topic for Grade 3

1. Whole numbers
2. Number operations
3. Number patterns
4. Geometry
5. Fractions
6. Heuristic problem solving

MEMO Topic for Grade 4

1. Whole numbers
2. Number operations
3. Number patterns
4. Geometry
5. Fractions
6. Decimals
7. Heuristic problem solving

MEMO Topic for Grade 5

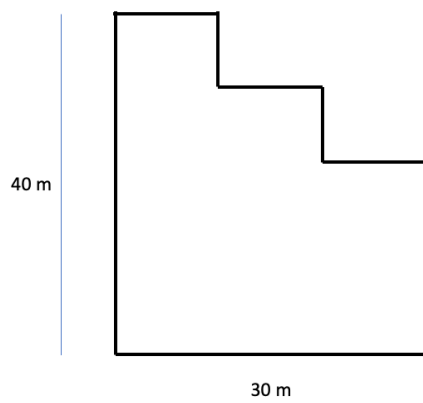
1. Whole numbers
2. Number operations
3. Number patterns
4. Fractions
5. Decimals
6. Percentages & Ratios
7. Geometry
8. Heuristic problem solving

MEMO Topic for Grade 6

1. Whole numbers
2. Number operations
3. Number patterns
4. Fractions
5. Decimals
6. Percentages & Ratios
7. Algebra
8. Geometry
9. Average and speed
10. Heuristic problem solving

3. There are 49 dogs signed up to compete in the dog show. There are 35 more small dogs than large dogs signed up to compete. How many small dogs are signed up to compete?

4. If all angles are right angles, find the perimeter of the figure below.



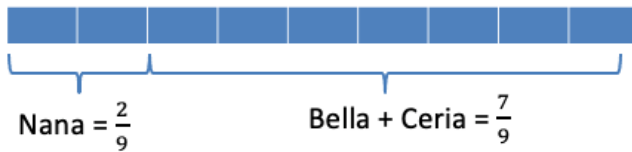
SOLUTIONS OF PROBLEMS FOR GRADE 3

1. $1 + 2 + 3 + \dots + 499$

$$\begin{aligned}
 &= 1 + 2 + 3 + \dots + 496 + 497 + 498 + 499 \\
 &= (1 + 2 + 3 + \dots + 496 + 497 + 498) + 499 \\
 &= [(1 + 498) + (2 + 497) + (3 + 496) + \dots + (249 + 250)] + 499 \\
 &= (499 + 499 + 499 + \dots + 499) + 499 \\
 &\quad \underbrace{\hspace{10em}} \\
 &\quad \quad \quad 249 \text{ terms}
 \end{aligned}$$

$$= 249 \times 499 + 499 = 499 \times (249 + 1) = \boxed{499 \times 250}$$

2.



Greatest portion of pizza that Bella could have eaten (more than Ceria)

Bella	0	1	2	3	4	5	6	7
Ceria	7	6	5	4	3	2	1	0

The greatest portion of pizza that Ceria could have eaten is $\boxed{\frac{3}{9}}$

3.



$$? + ? + 35 = 49 \text{ or } ? + ? = 49 - 35 = 14 \text{ or } ? = 14 : 2 = 7$$

Therefore, the number of small dogs signed up for competition is $7 + 35 = \boxed{42}$

4. Perimeter = $40 + 40 + 30 + 30 = \boxed{140 \text{ m}}$

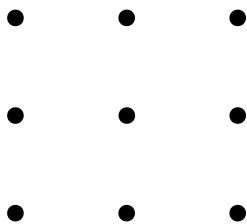
SAMPLE PROBLEMS FOR GRADE 4

1. Find the sum of the numbers $1 + 2 + 3 + \dots + 2021$ and leave your answer in the form of multiplication of two 4-digit numbers.

2. There are 9 lamp posts along a road 6 km long. The first lamp post is at 0 km and the 9th lamp post is at 6 km exactly. All lamp posts are equal distance from one another. How far is the third lamp post from the fifth lamp post?

3. Make two fractions from the numbers 2,3,4,5 so the difference between these two fractions is $\frac{7}{12}$.

4. If you draw the connected straight lines using a pen without lifting your pen, and all lines pass exactly through these 9 dots arranged as shown in the figure below, what is the smallest number of lines can you made?



SOLUTIONS OF PROBLEMS FOR GRADE 4

$$\begin{aligned}
 1. \quad & 1 + 2 + 3 + \dots + 2021 \\
 &= 1 + 2 + 3 + \dots + 2018 + 2019 + 2020 + 2021 \\
 &= (1 + 2 + 3 + \dots + 2018 + 2019 + 2020) + 2021 \\
 &= [(1 + 2020) + (2 + 2019) + (3 + 2018) + \dots + (1010 + 1011)] + 2021 \\
 &= (\underbrace{2021 + 2021 + 2021 + \dots + 2021}_{1010 \text{ terms}}) + 2021
 \end{aligned}$$

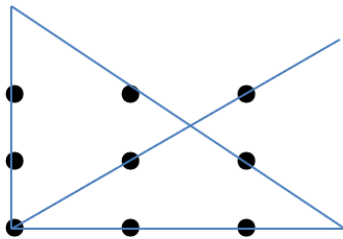
$$= 1010 \times 2021 + 2021 = 2021 \times (1010 + 1) = \boxed{2021 \times 1011}$$

2. The distance between two consecutive lamps is $6 \text{ km} : 8 = \frac{3}{4} \text{ km}$

$$\text{Distance of third lamp from the fifth lamp is } 2 \times \frac{3}{4} = \frac{3}{2} = \boxed{1.5 \text{ km}}$$

3. The two fractions are $\frac{5}{4}$ and $\frac{2}{3}$ as their difference is $\frac{5}{4} - \frac{2}{3} = \frac{15}{12} - \frac{8}{12} = \boxed{\frac{7}{12}}$

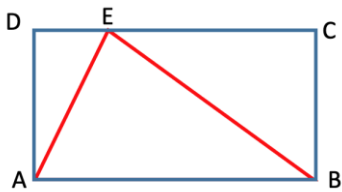
4. **4 (four)** straight lines.



SAMPLE PROBLEMS FOR GRADE 5

1. If c/d is exactly in the middle of the two fractions $3/7$ and $2/3$, what is the smallest possible value of whole number $(c + d)$?

2. ABCD is a rectangle with a certain area. ABE is a scalene triangle, and E is on DC. If the ratio of area ADE : BCE = 1 : 3, find the percentage of area BCE from the total area of ABCD.



3. What is the value of

$$\text{👍} \times \text{👍}$$

that satisfies

$$\text{👍} + \text{👍} = 11$$

$$\text{👍} - \text{👍} = 5$$

4. An ice cream cart sells three flavours of ice cream – coconut, vanilla and durian. There are two choices for toppings – sprinkles or nuts.

Each serving consists of two scoops of ice cream and a topping.

How many different servings of ice cream can this ice cream cart sell?

SOLUTIONS OF PROBLEMS FOR GRADE 5

1. $\frac{3}{7} = \frac{9}{21}$ and $\frac{2}{3} = \frac{14}{21}$

The fraction in the middle of $\frac{3}{7}$ and $\frac{2}{3}$ is $\frac{11.5}{21} = \frac{23}{42}$

Therefore, the smallest possible value of (c + d) is $23 + 42 = 65$

2. Area ABE = $\frac{1}{2}$ of Area ABCD

Therefore the ratio of Area ADE : Area ABE : Area BCE = 1 : 4 : 3

Percentage of area BCE from area ABCE is $\frac{3}{8} \times 100\% = 37.5\%$

3. Guess and check, the numbers are 3 and 8 as $3 + 8 = 11$ and $8 - 3 = 5$.

Hence $3 \times 8 = 24$

4. Ice cream: C, V, D. Topping: S, N

Each serving is 2 scoop ice cream and a topping

The possibilities are (make a list)

C-C-S, C-C-N, C-V-S, C-V-N, C-D-S, C-D-N

V-V-S, V-V-N, V-D-S, V-D,N

D-D-S, D-D-N

The total number of serving is 12 variant ice cream and topping.

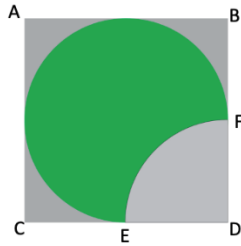
SAMPLE PROBLEMS FOR GRADE 6

1. ABCD is a square garden with $AB = 10$ m long.

DEF is a quarter circle with $DE = 5$ m long.

The green part represents circular green grass inside the square with diameter AB.

Find the area of green grass, and leave your answer in π



2. Anne, Beth, Charles and Dave go to mall and the want to by some meals and drinks. They saw the promo as advertised in the picture below. They want to spend exactly IDR 250,000 for meals and drinks for all of them.



The original price for a glass of milk tea is IDR 30,000 with a 50% discount. The discounted price for one small pizza is IDR 40,000. How many glasses of milk tea and pizzas they can get if each of them has at least one glass of milk tea, and at least two small pizzas to share among them all?

3. Car A and car B left the same car park at 5 pm to go to the same shopping mall. Both cars did not change the speeds throughout the journey. Car A travelled at constant speed of 60 km/h. When car A arrived at the shopping mall, car B was 3 km from the shopping mall. Find the speed of car B.

4. What is the value of

$$\text{👍} + \text{👏} + \text{👍}$$

that satisfies

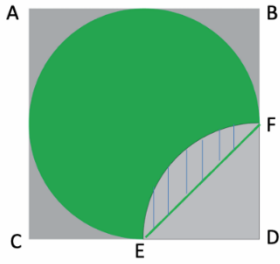
$$\text{👍} + \text{👏} = 11$$

$$\text{👏} + \text{👍} = 13$$

$$\text{👍} - \text{👍} = 2$$

SOLUTIONS OF PROBLEMS FOR GRADE 6

1.



$$\text{Area of circle} = \pi r^2 = \pi (5)^2 = 25\pi \text{ m}^2$$

$$\text{Area of sector DEF} = \frac{1}{4} \times \text{Area of circle} = \frac{25}{4}\pi \text{ m}^2$$

$$\text{Area of triangle DEF} = \frac{1}{2} \times 5 \times 5 = \frac{25}{2} \text{ m}^2$$

$$\text{Area of shaded part} = \text{Area of sector DEF} - \text{Area of triangle DEF}$$

$$= \frac{25}{4}\pi - \frac{25}{2} \text{ m}^2$$

$$\text{Area of green part} = \text{Area of circle} - 2 \times \text{Area of shaded part}$$

$$= 25\pi - 2 \times \left(\frac{25}{4}\pi - \frac{25}{2} \right) = \left(\frac{25}{2}\pi + 25 \right) \text{ m}^2$$

2. Total money = IDR 250,000 (Maximum amount of money spent)

$$\text{Milk tea} = 50\% \times \text{IDR } 30,000 = \text{IDR } 15,000 \text{ per glass}$$

$$\text{Pizza} = \text{IDR } 40,000$$

Each child has at least 1 glass of milk tea

Sharing pizzas for all of them is at least 2 small pizzas

$$1 \text{ glass of milk tea} = \text{IDR } 15,000.$$

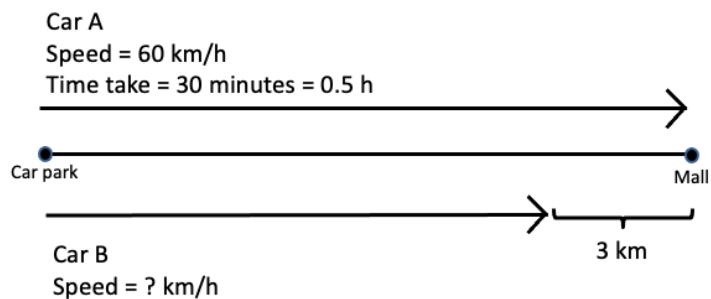
$$2 \text{ pizza} = 2 \times \text{IDR } 40,000 = \text{IDR } 80,000$$

Here are some of possibilities (Make a list)

No of milk tea	No of small pizza	Total money spent (IDR)
4	2	$60,000 + 80,000 = 140,000$
	3	$60,000 + 120,000 = 180,000$
	4	$60,000 + 160,000 = 220,000$
5	2	$75,000 + 80,000 = 155,000$
	3	$75,000 + 120,000 = 195,000$
	4	$75,000 + 160,000 = 235,000$
6	2	$90,000 + 80,000 = 170,000$
	3	$90,000 + 120,000 = 210,000$
	4	$90,000 + 160,000 = 250,000$
7	2	$105,000 + 80,000 = 185,000$
	3	$105,000 + 120,000 = 225,000$
8	2	$120,000 + 80,000 = 200,000$
	3	$120,000 + 120,000 = 240,000$
9	2	$135,000 + 80,000 = 215,000$
10	2	$150,000 + 80,000 = 230,000$
11	2	$165,000 + 80,000 = 245,000$

Therefore, they can buy 6 glasses of milk tea and 4 small pizzas.

3.



Distance covered by Car A = Speed x Time = $60 \times 0.5 = 30$ km

Distance covered by Car B = $30 - 3 = 27$ km

Speed Car B = Distance : Time = $27 : 0.5 = 54$ km/h

Therefore, the speed of Car B is **54 km/h.**

4. Guess and check, the numbers are 5, 6, 7 as $5 + 6 = 11$, $6 + 7 = 13$ and $7 - 5 = 2$

Hence $5 + 6 + 7 =$ **18**