



Till läraren

Välkommen till Kängurutävlingen – Matematikens hopp 2022 *Junior*

- Tävlingen genomförs under perioden 17 mars – 25 mars. *Uppgifterna får inte användas tidigare.*
- Sista dag för redovisning av antalet deltagare är den *1 april*. Du får då tillgång till facit och ett kalkylblad där du matar in elevernas svar och sedan får du en sammanställning av klassens resultat.
- Redovisa resultatet senast *29 april*.
- *Tävlingen är individuell* och eleverna får arbeta i 60 minuter. De tre delarna ska genomföras vid *ett och samma tillfälle*.
- Eleverna behöver ha tillgång till papper för att kunna göra anteckningar och figurer. Linjal behövs inte.
- *Miniräknare eller sax får inte användas. Observera att telefoner, datorplattor och datorer inte heller får användas.*
- Läs igenom problemen själv i förväg så att eventuella oklarheter kan redas ut.
- Kontrollera att kopiorna blir tillräckligt tydliga så att nödvändiga detaljer syns.
- Besök *Kängurusidan* på ncm.gu.se/kanguru där vi publicerar eventuella rättelser och ytterligare information. Där finns också information om hur kalkylbladet fungerar.
- Samla in problemformulären efter tävlingen. Problemen får inte spridas utanför klassrummet förrän efter 29 april, men ni får gärna arbeta med problemen i klassen.

Mikael Passares stipendium

Mikael Passare (1959–2011) var professor i matematik vid Stockholms universitet. Han hade ett stort intresse för matematikundervisning på alla nivåer och var den som tog initiativ till Kängurutävlingen i Sverige. Mikael Passares minnesfond har instiftat ett stipendium för att uppmärksamma elevers goda matematikprestationer. Information om hur du nominerar elever kommer tillsammans med facit och kommentarer.

Lycka till med årets Känguru!

e-post: kanguru@ncm.gu.se

För administrativa frågor, vänd dig till Ann-Charlotte Forslund:

Ann-Charlotte.Forslund@ncm.gu.se

031–786 69 85

För innehållsfrågor, vänd dig till Ulrica Dahlberg eller Johan Häggström:

ulrica.dahlberg@ncm.gu.se

johan.haggstrom@ncm.gu.se



Svarsblankett

Markera ditt svar i rätt ruta

| Uppgift | A | B | C | D | E | Poäng |
|---------|---|---|---|---|---|-------|
| 1 | | | | | | |
| 2 | | | | | | |
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| 24 | | | | | | |
| SUMMA | | | | | | |

Namn:.....

Klass:.....

Kängurutävlingen – Matematikens hopp 2022

Junior



Three points problems

- 1 Carola is forming the four-digit number 2022 using some matches from a box. The box originally contained 30 matches. She has already started and formed the first two digits, as shown in the diagram.



How many matches will remain in the box when she has finished forming 2022?

- A 20 B 19 C 10 D 9 E 5

[Estonia]

- 2 An equilateral triangle of side 12 has the same perimeter as a square of side x . What is the value of x ?

- A 9 B 12 C 16 D 24 E 36

[France]

- 3 On Nadya's smartphone, this diagram shows how much time she spent last week on each of her apps.

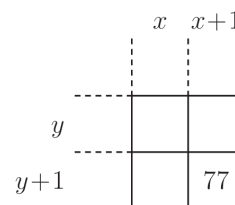


This week she halved the time spent on two of these apps, but spent the same amount of time on the other two apps. Which of the following could be the diagram for this week?



[Germany]

- 4 A square of numbers is taken out from a multiplication table. Only one number is visible. The integers x and y are both positive and x is greater than y . What is the value of x ?



- A 6 B 7 C 8 D 10 E 11

[France]

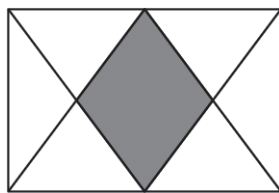
- 5 I am less than my half and greater than my double. The sum of me and my square is zero. Who am I?

- A -2 B -1 C 0 D 1 E 2

[France]



- 6 In the rectangle shown, the midpoints of the two longer sides are joined to all four vertices. What fraction of the rectangle is shaded?



- A $\frac{1}{5}$ B $\frac{1}{4}$ C $\frac{2}{7}$ D $\frac{1}{3}$ E $\frac{2}{5}$

[Germany]

- 7 There are five candidates in the school election. After 90% of the votes had been counted, the preliminary results were as follows:

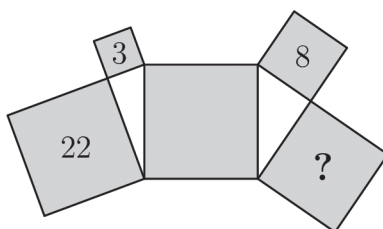
| | | | | |
|------|-------|--------|-------|------|
| Alex | Bella | Calvin | Diana | Eddy |
| 14 | 11 | 10 | 8 | 2 |

How many candidates still have a chance of winning the election?

- A 1 B 2 C 3 D 4 E 5

[USA]

- 8 Five squares and two right-angled triangles are arranged as shown. The numbers 3, 8 and 22 inside three of the squares indicate their areas in square metres. What is the area of the square containing the question mark?

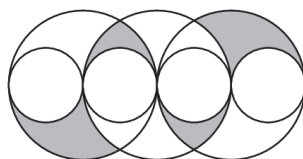


- A 14 B 15 C 16 D 17 E 18

[Greece]

Four points problems

- 9 The diagram shows three large circles of equal radius and four small circles of equal radius where the centers of all circles and all points of contact lie on one straight line. The radius of each small circle is 1. What is the shaded area?

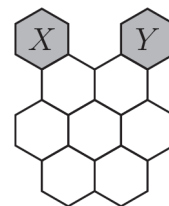


- A π B 2π C 3π D 4π E 6π

[Catalonia]



- 10 Apini moves from hexagon X to hexagon Y . She can only move from one hexagon to another if they have an edge in common. How many different routes are there from X to Y that pass through each of the seven white hexagons exactly once?



A 2 B 3 C 4 D 5 E 6

[France]

- 11 Eva puts 2022 tiles in a long line. Then Adam removes every sixth tile. Next Beata removes every fifth tile from those that remain. Then Calle removes every fourth tile. Finally, Doris removes all the remaining tiles. How many tiles does Doris remove?

A 0 B 337 C 674 D 1011 E 1348

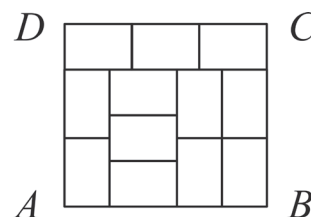
[Sweden]

- 12 Three children asked their grandmother how old she was. She replied by asking them to guess her age. One child said she was 75, one said she was 78 and one said she was 81. It turned out that one of the guesses was wrong by 1 year, one was wrong by 2 years and one was wrong by 4 years. What is the grandmother's age?

A 76 years B 77 years C 79 years D 80 years E can't be determined exactly

[Latvia]

- 13 The diagram shows a large rectangle $ABCD$ divided into 12 identical small rectangles. What is the ratio AD/DC ?



A $\frac{8}{9}$ B $\frac{5}{6}$ C $\frac{7}{8}$ D $\frac{2}{3}$ E $\frac{9}{8}$

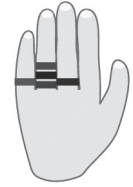
- 14 A rabbit and a hedgehog had a race around a 550 m long circular track. Both ran at constant speeds. The rabbit's speed was 10 m/s, and the hedgehog's speed was 1 m/s. They started at the same time. However, the hedgehog ran in the opposite direction to the rabbit. When they met, the hedgehog immediately turned round and ran after the rabbit. How long after the rabbit did the hedgehog reach the finish?

A 45 s B 50 s C 55 s D 100 s E 505 s

[Moldova]



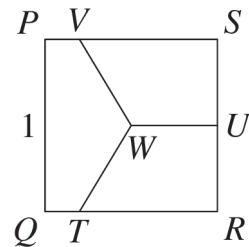
- 15 Veronica has five rings on her fingers, as shown in the diagram. She takes them off one at a time. In how many different ways can she do this?



A 16 B 20 C 24 D 30 E 45

[Germany]

- 16 The diagram shows square $PQRS$ of side-length 1. The midpoint of RS is marked U and the centre of the square is marked W . Line segments TW , UW and VW split the square into three regions of equal area. What is the length of SV ?

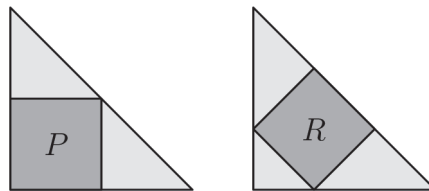


A $\frac{1}{2}$ B $\frac{2}{3}$ C $\frac{3}{4}$ D $\frac{4}{5}$ E $\frac{5}{6}$

[UK]

Five points problems

- 17 Two congruent isosceles right-angled triangles each have a square inscribed, as shown in the diagram. The square marked P has an area of 45. What is the area of the square marked R ?



A 35 B 40 C 45 D 50 E 60

[Puerto Rico]

- 18 Eight teams participate in a football tournament. All teams play against each other exactly once. In each match, the winner gets 3 points and the loser does not get any points, or if a match is drawn, each team gets 1 point. At the end of the tournament the total number of points obtained by all the teams is 61. What is the largest number of points that the champion team could have obtained?

A 21 B 19 C 18 D 17 E 16

[Catalonia]

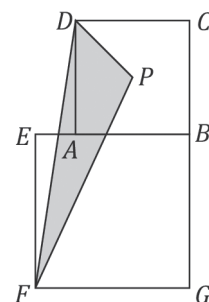
- 19 A ship with pirates divided 200 gold coins and 600 silver coins between them. Each officer received 5 gold and 10 silver coins. Each sailor received 3 gold and 8 silver coins. Each cabin boy received 1 gold and 6 silver coins. How many pirates are there on the ship?

A 50 B 60 C 72 D 80 E 90

[Greece]



- 20 The lengths of the diagonals of the squares $ABCD$ and $EFGB$ are 7 cm and 10 cm respectively. The point P is the intersection of the diagonals of the square $ABCD$. What is the area of the triangle FPD ?



A $14,5 \text{ cm}^2$ B 15 cm^2 C $15,75 \text{ cm}^2$ D $16,5 \text{ cm}^2$ E $17,5 \text{ cm}^2$

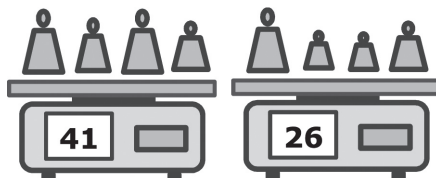
[Estonia]

- 21 The inhabitants of a city always speak by means of questions. There are two types of inhabitants: the "positives", who always ask questions for which the answer is "yes" and the "negatives" who always ask questions for which the answer is "no". I met Albert and Berta and Berta asked me "Are Albert and I both negative?". What type of inhabitants are Albert and Berta?

A Both are positives B Both are negatives
C Albert positive, Berta negative D Albert negative, Berta positive
E There are not enough information to decide

[Catalonia]

- 22 A grocer has twelve different integer weights from 1 kg to 12 kg. She splits them into three groups of four weights each. The total weight of the first group is 41 kg and of the second is 26 kg. Which of the following weights is in the same group as the weight of 9 kg?



A 3 kg B 5 kg C 7 kg D 8 kg E 10 kg

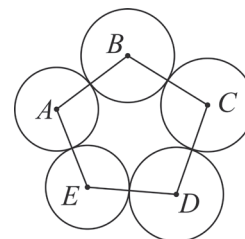
[Greece]

- 23 The positive integer N is such that the product of its digits is 20. Which of the following could not be the product of the digits of $N + 1$?

A 40 B 30 C 25 D 35 E 24

[Peru]

- 24 Five circles with centres A , B , C , D and E are arranged as shown in the diagram. Line segments are drawn to join the centres of adjacent circles. The lengths of segments are:
 $AB = 16 \text{ cm}$, $BC = 14 \text{ cm}$, $CD = 17 \text{ cm}$, $DE = 13 \text{ cm}$, $AE = 14 \text{ cm}$.
Which point is the centre of the circle with the largest radius?



A A B B C C D D E E