Till läraren

Välkommen till Kängurutävlingen – Matematikens hopp 2025
Student

- Tävlingen genomförs under perioden 20 – 28 mars. *Uppgifterna får inte användas tidigare.*
- Du får tillgång till facit och ett kalkylblad, lösenord finns på mailet du fått. Du matar in elevernas svar och sedan får du en sammanställning av klassens resultat.
- Redovisa resultatet senast *30 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 30 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:
ulrica.dahlberg@ncm.gu.se

Svarsblankett

Markera ditt svar i rätt ruta

Uppgift	A	B	C	D	E	Poäng
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Namn:.....

Klass:.....

Kängurutävlingen – Matematikens hopp 2025
Student

Three point problems

1. The year 2025 is a so-called perfect square year because $2025 = 45^2$.

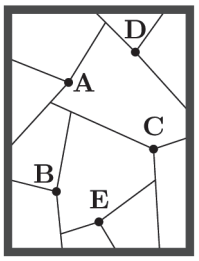
   How many years will pass before the next perfect square year?

   A: 25 B: 91 C: 121 D: 500 E: 2025

   [*Iraq*]

2. A student threw five rocks, one at a time, that hit a window at points *A*, *B*, *C*, *D*, and *E*. Where a rock hits the glass, linear cracks appear that either end at a previous crack or at the edge.

   In what order did the student throw the stones?



   A: *DACBE* B: *ABCDE* C: *BDACE* D: *BCDAE* E: *DCABE*

   [*Greece*]

3. Vasily has 20 colored balls that are either yellow, green, blue or black.
   Of these, exactly 17 are not green, 15 are not black and 12 are not yellow.

   How many balls are blue?

   A: 8 B: 7 C: 6 D: 4 E: 3

   [*Ukraine*]

4. In what interval does the value of the product of $88 \cdot 888$ lie?

   A: Between 8 and 88 B: Between 88 and 888 C: Between 888 and 8 888
   D: Between 8 888 and 88 888 E: Between 88 888 and 888 888

   [*Australia*]

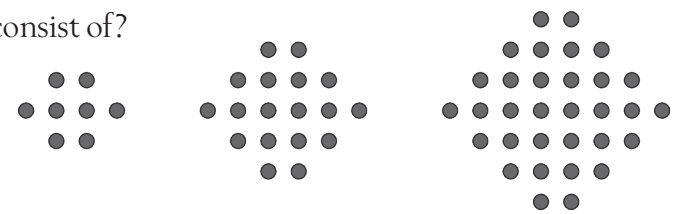
5. Which expression corresponds to the square root of 16^{16}?

   A: 4^4 B: 4^8 C: 4^{16} D: 8^8 E: 16^4

   [*United Kingdom*]

6. The three figures below show the first three in a sequence.

   How many dots does the fifth figure consist of?



   A: 72 B: 74 C: 76 D: 78 E: 80

   [*Spain*]

7. Mike gets a number x by dividing $\sqrt{11}$ by three.

   Where on the number line do you find the number x?

   A: Between 0 and 1 B: Between 1 and 2 C: Between 2 and 3

   D: Between 3 and 4 E: Between 4 and 5

[*Austria*]

8. Silia's favorite chocolate cookies are sold in packs. Each pack used to contain five chocolate bars, but now they only contain four and are sold at the same price.

   By how many percent has the price per chocolate bar increased?

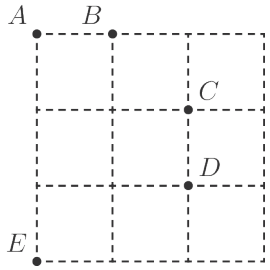
   A: 10 % B: 20 % C: 25 % D: 30 % E: 50 %

[*Germany*]

Four point problems

9. Robert wants to select four points so that the distances between each pair of points are different.

   Which of the points *A*, *B*, C, *D* or *E* must then be removed?

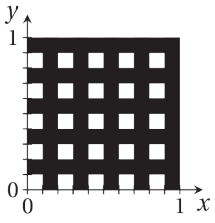


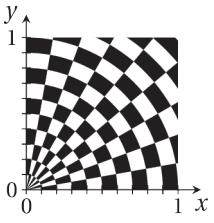
   A: *A* B: *B* C: C D: *D* E: *E*

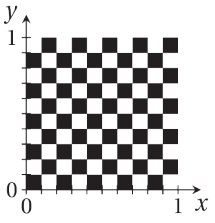
[*Finland*]

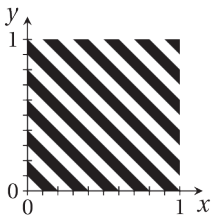
10. In the region defined by $0 \le x \le 1$, $0 \le y \le 1$ in the xy plane, some points are painted black. The point (x, y) is painted black if the first digit after the decimal point for both x and y is odd.

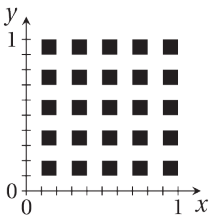
    What does the result look like?

A: 

B: 

C: 

D: 

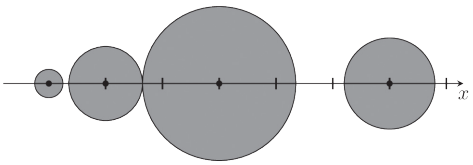
E: 

[*Finland*]

11. Four circles of radii r_1, r_2, r_3 och r_4 have their centers at (0, 0), (1, 0), (3, 0) and (6, 0).

The circles may touch each other but not overlap.

What is the largest possible value of $r_1 + r_2 + r_3 + r_4$?



A: 3 B: 4 C: 5 D: 6 E: There is no upper limit

[*Finland*]

12. Among ten different positive integers, there are exactly five that are divisible by 5 and exactly seven that are divisible by 7. Let M be the largest of these numbers.

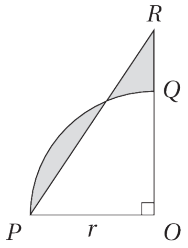
What is the smallest possible value of M?

A: 105 B: 77 C: 75 D: 63 E: another value

[*Afghanistan*]

13. The figure shows a quarter circle OPQ and a triangle OPR. The two shaded regions have equal area.

What is the length of OR?



A: $\frac{\pi r}{2}$ B: $\frac{3r}{2}$ C: πr D: $\frac{2}{\pi}$ E: $\frac{\pi}{2r}$

[*United Kingdom*]

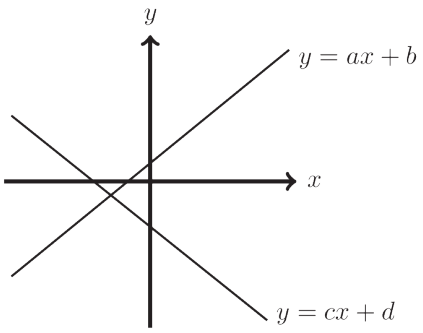
14. What is the smallest positive integer N such that $\sqrt{2\sqrt{3\sqrt{N}}}$ is an integer?

A: $2^{12} \cdot 3^6$ B: $2^4 \cdot 3^{14}$ C: $2^4 \cdot 3^6 \cdot 5^8$ D: $2^4 \cdot 3^2$ E: $2^4 \cdot 3^6$

[*Greece*]

15. The graphs of two linear functions are drawn in a coordinate system.

What is always true about the expression $ab + cd - (ac + bd)$?



A: The expression is always negative.

B: The expression is always non-positive.

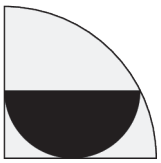
C: The expression is always positive.

D: The expression is always zero.

E: None of the other options are true.

[*Poland*]

16. The area of the black semicircle is 12 cm².



What is the area of the grey quarter circle?

A: 42 cm² B: 36 cm² C: 32 cm² D: 30 cm² E: 25 cm²

[*Germany*]

Five point problems

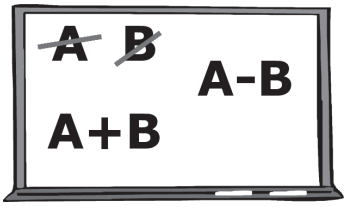
17. When grandma started knitting woolen socks, she had a large ball of yarn with a diameter of 30 cm. After knitting 70 socks, she still has the same ball of yarn but now with a diameter of 15 cm.

How many more socks can Grandma knit with the remaining yarn?

A: 70 B: 50 C: 30 D: 20 E: 10

[*Finland*]

18. A student starts with two numbers written on the board. He then erases them and writes the sum of the numbers as well as the positive difference between the numbers. He continues the same process with the new numbers. He starts with the numbers 3 and 5 and repeats the process 50 times.



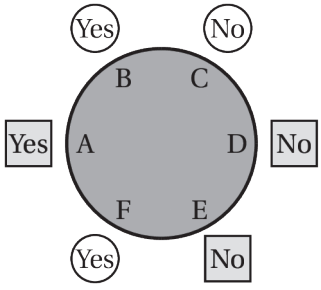
What two numbers will he end up with?

A: 3^{25} and 5^{25} B: 3^{50} and 5^{50} C: $2 \cdot 3^{25}$ and $2 \cdot 5^{25}$

D: $3 \cdot 2^{25}$ and $5 \cdot 2^{25}$ E: none of the other options

[*Greece*]

19. A group of three square men from Mars and a group of three circular men from Jupiter sit around a table. One of the six has the key to a flying saucer. All members of one group always tell the truth, and all members of the other group always lie. All six were asked: "Does the person sitting next to you have the key?" Their answers are shown in the picture.



Who has the key?

A: *A* B: *B* C: C D: *D* E: *E*

[*Greece*]

20. Julia and her little sister Paula go on a bike ride together. Both cycle at a constant speed: Julia at 18 km/h and Paula at 12 km/h, and they follow the same path. Julia gets tired after 20 minutes and decides to turn back. When she meets Paula, Julia tells her to turn around as well, and both cycle home at their respective speeds.

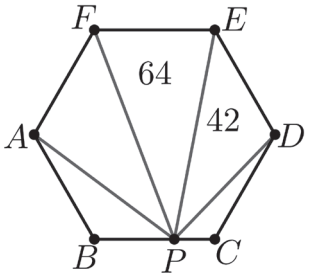
How many minutes later than Julia does Paula come home?

A: 4 B: 6 C: 8 D: 10 E: 15

[*Catalonia*]

21. The image shows a regular hexagon $ABCDEF$. Point P lies on BC such that the area of $\triangle PEF$ is 64 and the area of $\triangle PDE$ is 42.

What is the area of $\triangle APF$?



A: 53 B: 54 C: 56 D: 60 E: 64

[*China*]

22. Three boxes contain three balls each. The texts on the lids show the contents of each box. The lids have been repositioned so that none of them display the contents correctly.

Mike wants to put the lids on the correct box by picking up as few balls as possible. He chooses a box, takes a ball out of it at random and notes its color without putting it back.

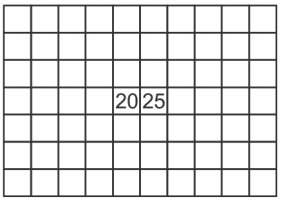
What is the minimum number of balls that Mike needs to remove in order to determine the contents of each box?

A: 0 B: 1 C: 2 D: 3 E: 4

[*Bulgaria*]

23. Patricia has written an integer in each box of a 7 × 10 grid. The sum of all the numbers in any 3 × 4 or 4 × 3 rectangle is zero. The numbers in two of the boxes are shown in the image.

What is the sum of all the numbers in the table?

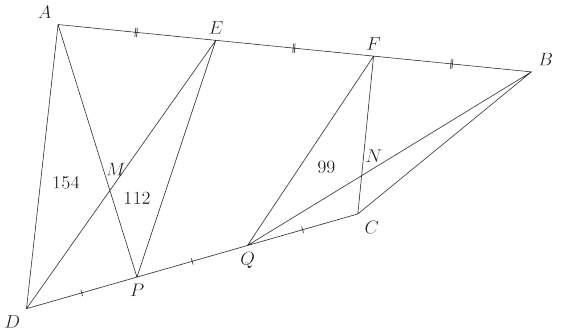


A: -5 B: -20 C: -25 D: -45 E: impossible to determine

[*Estonia*]

24. The sides AB and CD of the convex quadrilateral the angle $ABCD$ is each divided into three parts by the points E, F, P, and Q so that $AE = EF = FB$ and $DP = PQ = QC$. The diagonals of $AEPD$ and $FBCQ$ intersect at M and N, respectively. The areas of triangles AMD, EMP, and FNQ are 154, 112, and 99, respectively.

What is the area of triangle BCN?



A: 57 B: 70 C: 72 D: 86 E: 141

[*Tunisia*]