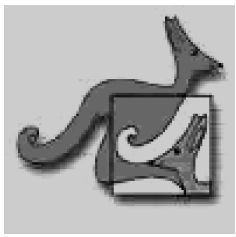
KÄNGURU DER MATHEMATIK 2025
20th March 2025

Level: Junior, Grade: Schulstufe 9 - 10

Full name:	
School:	
Class:	



Time: 75 min.

each correct answer to questions 1 – 10: 3 points
each correct answer to questions 11 – 20: 4 points
each correct answer to questions 21 – 30: 5 points
each questions left unanswered: 0 points
each incorrect answer: minus ¼ of the points for the question
30 base points

Please write the letter (A, B, C, D, E) of your answer in the square under the question number (1 bis 30). Write clearly and carefully!

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

21	22	23	24	25	26	27	28	29	30

Zustimmungserklärung zur Datenverarbeitung für den österreichischen Wettbewerb „Känguru der Mathematik“

☐ **(bitte ankreuzen) (check this box)**

JA, ich stimme mit meiner Unterschrift zu, dass meine angeführten personenbezogenen Daten (Vor- und Zuname, Klasse, Schulstufe, Schulstandort und Schulart) zum Zweck der Organisation und Durchführung des Wettbewerbs, der Auswertung der Wettbewerbsergebnisse (Ermitteln der erreichten Punkte und Prozentzahlen), des Erstellens von schulweiten Reihungen, sowie zur Erstellung und Veröffentlichung der Siegerlisten auf unserer Vereinshomepage (sofern mindestens 50 % der zu erreichenden Punktezahl erlangt werden bzw. ich unter den besten 10 einer Kategorie liege) verwendet werden dürfen.

Betroffenenrechte

Die Verwendung dieser Daten ist bis 31. Dezember des 2. Folgejahres gestattet. Nach diesem 31. Dezember werden Vor- und Zuname, die Klasse und der Schulstandort gelöscht, wobei dieser durch die Angabe des Bundeslandes ersetzt wird. Die Verwendung der auf diese Art anonymisierten Daten ist nur mehr für statistische Zwecke auf der Grundlage der DSGVO erlaubt.

Ich habe ein Recht auf Auskunft über meine gespeicherten personenbezogenen Daten, sowie das Recht auf Berichtigung, Datenübertragung, Widerspruch, Einschränkung der Bearbeitung sowie Sperrung oder Löschung unrichtig verarbeiteter Daten.

Ich kann die erteilte Einwilligung jederzeit auf der Homepage des Vereines Känguru der Mathematik unter www.kaenguru.at mittels des dafür bereitgestellten Formulars mit Wirkung für die Zukunft widerrufen (Art. 21 Abs. 1 DSGVO).
Ein Widerruf hat zur Folge, dass die personenbezogenen Daten nach gegenseitiger Rücksprache innerhalb von 31 Tagen gelöscht werden.
Durch den Widerruf wird die Rechtmäßigkeit der aufgrund der Einwilligung bis zum Widerruf erfolgten Verarbeitung nicht berührt. (Art. 7 Abs. 2 DSGVO)

Unterschrift (Signature)

Information über den Känguruwettbewerb: www.kaenguru.at
Wenn du mehr in dieser Richtung machen möchtest, gibt es die Österreichische Mathematikolympiade. Infos: www.oemo.at

Känguru der Mathematik 2025
Level Junior (Schulstufe 9 and 10)
Austria – 20th March 2025

3 Points

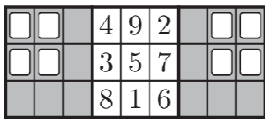
1. In which of the following hexagons is exactly one third of the area black and half of the area white?

(A)  (B)  (C)  (D)  (E) 

2. The base of a triangle is extended by 50% and its height is reduced by one third.
What is the ratio of the area of the new triangle to the area of the original triangle?

(A) 2:1 (B) 1:1 (C) 1:2 (D) 1:3 (E) 1:4

3. The left and right part of a three-part brochure each contain four transparent windows. If these two parts are folded onto the middle part, some of the numbers written on the middle part are visible through the windows.
What is the sum of the visible numbers when the brochure is folded?



(A) 7 (B) 9 (C) 12 (D) 14 (E) 15

4. Every year, the third Thursday in March is Kangaroo Day.
What is the earliest calendar day that can be a Kangaroo Day?

(A) March 14th (B) March 15th (C) March 20th (D) March 21st (E) March 22nd

5. In a recipe, Ruben needs $1\frac{1}{2}$ cups of water for 1 cup of rice. Ruben wants to use $1\frac{1}{2}$ cups of rice.
How many cups of water does he need?

(A) 1 (B) $1\frac{1}{4}$ (C) $1\frac{3}{4}$ (D) $2\frac{1}{4}$ (E) $2\frac{1}{2}$

6. Lisa has four wooden digits. She can use them to make the number 2025.
How many different numbers greater than 2025 can she make with these digits?

(A) 3 (B) 6 (C) 8 (D) 9 (E) 11

7. Sarah has a bag of 18 balls numbered from 1 to 18. What is the smallest number of balls Sarah must remove from the bag to be sure that she has removed at least three prime numbers?

(A) 11 (B) 12 (C) 13 (D) 14 (E) 15

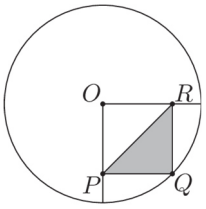
8. Luka has dogs, rabbits and cats as pets. Eight of these pets are not dogs, five of these pets are not rabbits and seven of these pets are not cats.
How many pets does Luka have?

(A) 10 (B) 11 (C) 15 (D) 16 (E) 20

9. Katrin and Thomas are both celebrating their birthday today. Thomas notices that $\frac{1}{19}$ of Katrin's age is the same as $\frac{1}{17}$ of his. Together they are older than 40 years and younger than 100 years.
How old is Katrin?

(A) 19 (B) 34 (C) 38 (D) 57 (E) 76

10. Consider a circle with centre *O* and radius 10 cm. A square *OPQR* is drawn inside the circle so that *Q* lies on the circle (see diagram).
What is the area of the grey triangle *PQR*?

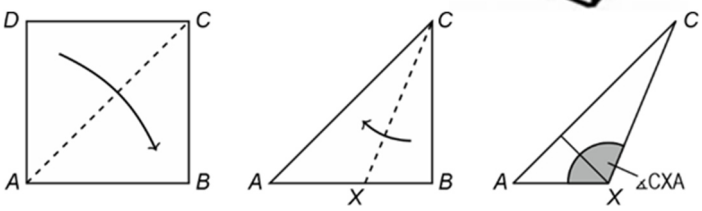


(A) 12.5 cm^2 (B) 25 cm^2 (C) 50 cm^2 (D) 75 cm^2 (E) 100 cm^2

4 Points

11. On a standard die, the sum of the number of points on opposite sides is always 7. We want to tilt the die shown several times along its edges so that all six sides are on top once. Which of the given sequences of top numbers is **not** possible?

(A) 3-5-1-2-6-4 (B) 3-2-5-1-6-4 (C) 3-1-2-6-5-4
(D) 3-1-5-6-2-4 (E) 3-6-2-1-5-4

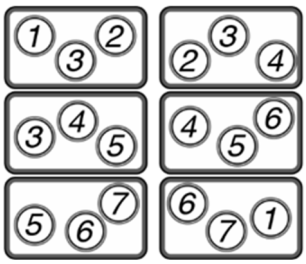


12. Alexander folds a square sheet of paper along its diagonal to form a triangle. He then folds the paper again so that one of the two shorter sides of the triangle lies on the longer side of the triangle to form the smaller triangle *AXC* (see diagrams).
What is the size of the angle $\angle CXA$?

(A) 108° (B) 112.5° (C) 120° (D) 145° (E) 157.5°

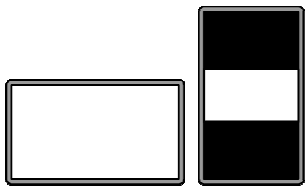
13. The four-digit number $80\square\square$ is missing its last two digits. We know that this number is divisible by 8 and 9.
What is the product of the last two digits?

(A) 6 (B) 16 (C) 20 (D) 24 (E) 48



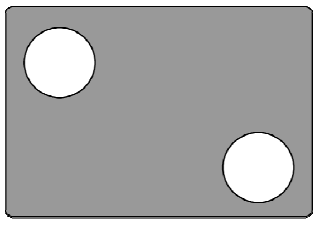
14. An athlete has a collection of 2 gold medals and 5 silver medals. They are numbered in a certain order from 1 to 7. The images show black and white pictures of the medals. Each of the six pictures shows exactly one gold medal.
What is the sum of the numbers on the two gold medals?

(A) 7 (B) 8 (C) 9 (D) 10 (E) 11



15. Anna is looking at a picture on her smart phone. The format is 16:9 and fills the entire screen. If she turns the smart phone, the picture becomes smaller. What proportion of the screen is needed for the smaller picture?

(A) $\frac{3}{4}$ (B) $\frac{9}{16}$ (C) $\frac{27}{64}$ (D) $\frac{32}{81}$ (E) $\frac{81}{256}$



16. Paul shoots a ball at two targets (see diagram) a total of 27 times.
When he aims for the upper left target, he hits 50% of the time, and when he aims for the bottom right target, he hits 80% of the time. In total, 9 of his shots miss their target.
How many times does Paul hit the top left target?

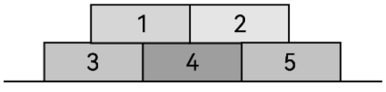
(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

17. There are some cards on a table with various different positive integers written on them. All of these are smaller than 20 and their product is 2025.
What is the maximum number of cards on the table?

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

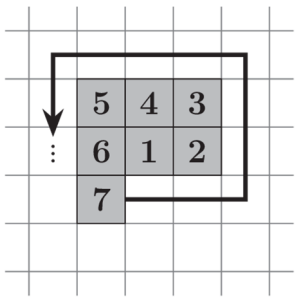
18. The number *N* is the largest 6-digit number, for which the product of all its digits is 180.
What is the sum of the digits of the number N?

(A) 21 (B) 22 (C) 23 (D) 24 (E) 25



19. Five bricks form a wall (see figure). Peter can only remove a brick if there is no other brick directly above it. On each turn, he randomly selects one of the removable bricks with equal probability and removes it.
What is the probability that the brick numbered 4 is the third to be removed?

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$ (E) $\frac{1}{8}$

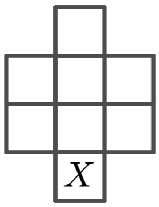


20. Daniel numbers some squares on a piece of squared paper. He starts with a random square and numbers the squares 1, 2, 3, 4, 5, ..., 2025 anti-clockwise (see illustration). At the end he considers the figure that results from all 2025 numbered squares. Each square has a side length of 0.5 cm.
What is the perimeter of the figure?

(A) 25 cm (B) 45 cm (C) 80 cm (D) 90 cm (E) 180 cm

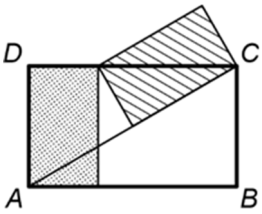
5 Points

21. We want to place the numbers 1 through 8 in the eight squares of the figure shown in such a way that consecutive numbers are never in adjacent squares (not even diagonally adjacent). Which numbers can we write in the square marked with an *X*?



(A) 1 or 8 (B) 2 or 7 (C) 3 or 6 (D) 4 or 5 (E) 7 or 8

22. The two small rectangles in the diagram are congruent and each has an area of 4 cm^2. What is the area of rectangle *ABCD* in cm^2?

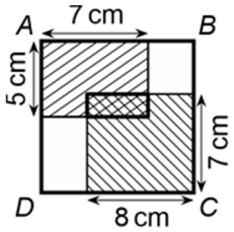


(A) 10 (B) $8 \cdot \sqrt{3}$ (C) 8 (D) 12 (E) $4 \cdot \sqrt{3}$

23. The product of three prime numbers is 11 times their sum. What is the maximum sum of the three numbers?

(A) 14 (B) 17 (C) 21 (D) 25 (E) 26

24. The square *ABCD* contains two shaded rectangles (see diagram). The dimensions are as shown and the area of the overlapping region is 18 cm^2. What is the perimeter of the square *ABCD*?



(A) 28 cm (B) 34 cm (C) 36 cm (D) 38 cm (E) 40 cm

25. A four-digit number $\overline{ABCD}$ is multiplied by its units digit $\overline{D}$. The result is a different four-digit number $\overline{DXYA}$, whose units- and thousands- digits are swapped compared to the original number (see illustration). Different letters can stand for the same digits.

$$\begin{array}{l} ABCD \cdot D \\ \hline DXYA \end{array}$$

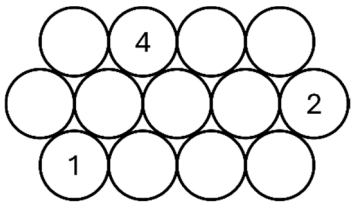
How many four-digit numbers $\overline{ABCD}$ have this property?

(A) 1 (B) 2 (C) 9 (D) 10 (E) 11

26. The six-digit number $\overline{ABCDEF}$ consists of the digits 1, 2, 3, 4, 5 and 6, with each digit occurring exactly once. The number $\overline{AB}$ consisting of the first two digits is a multiple of 2. The number $\overline{ABC}$ is a multiple of 3. The number $\overline{ABCD}$ is a multiple of 4. The number $\overline{ABCDE}$ is a multiple of 5 and the entire number $\overline{ABCDEF}$ is a multiple of 6. What values can the digit F take?

(A) only 2 (B) only 4 (C) only 6 (D) 2 and 4 are possible (E) 4 and 6 are possible

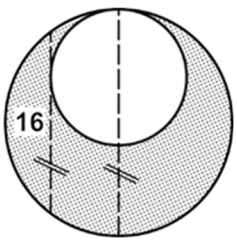
27. A number is to be written in each circle of the diagram in such a way that the sum of the numbers in three touching circles is always the same. Some of the numbers are already given. What is the sum of all the numbers in the middle row?



(A) 3 (B) 8 (C) 13 (D) 18 (E) 23

28. In the diagram we see two touching circles and the diameter through their common point. The outer circle has a chord parallel to this diameter with length 16, which touches the inner circle.

What is the area of the grey region?



(A) 36π (B) 49π (C) 64π (D) 81π
(E) It cannot be uniquely determined from this information.

29. The number 8 and another number *x* are written on a board. Eight children go to the board, one after the other. Each child writes down the average of all the numbers already on the board. The last child writes the number 26. What is the value of *x*?

(A) 28 (B) 32 (C) 38 (D) 44 (E) 50

30. There are 12 children at a party, including 3 pairs of twins. How many different ways are there to distribute six blue hats and six red hats to the children, so that each pair of twins wears hats of the same colour?

(A) 72 (B) 86 (C) 92 (D) 102 (E) 132