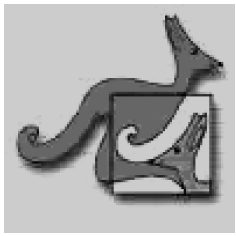
KÄNGURU DER MATHEMATIK 2025
20th March 2025

Level: Student, Grade: Schulstufe 11–13

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 - 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 Student (Schulstufe 11, 12 and 13)
Austria – 20th March 2025

3 Points

1. The number of the year 2025 is a perfect square, because $2025 = 45^2$.
How many years will pass until the next year whose number is a perfect square?
(A) 25 (B) 91 (C) 121 (D) 500 (E) 2025

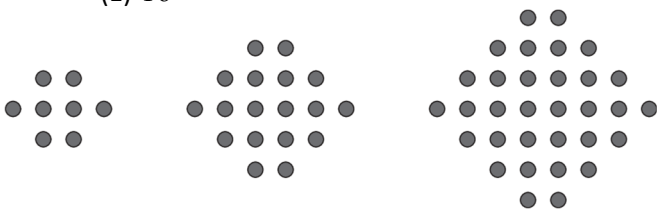
2. Mike obtains a number *x* by dividing the number $\sqrt{11}$ by 3.
Where is the number *x* located on the number line?
(A) between 0 and 1 (B) between 1 and 2 (C) between 2 and 3
(D) between 3 and 4 (E) between 4 and 5

3. Vasily has 20 balls. Each ball is either yellow, green, blue or black. Of the balls, exactly 17 are not green, exactly 15 are not black, and exactly 12 are not yellow. How many of his balls are blue?
(A) 8 (B) 7 (C) 6 (D) 4 (E) 3

4. Which interval contains the value of the product $77 \cdot 777$?
(A) between 7 and 77 (B) between 77 and 777 (C) between 777 and 7 777
(D) between 7 777 and 77 777 (E) between 77 777 and 777 777

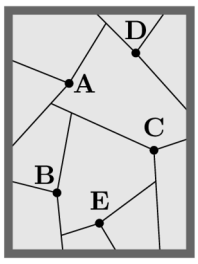
5. Which of the following expressions has the same value as the square root of 16^{16}?
(A) 4^4 (B) 4^8 (C) 4^{16} (D) 8^8 (E) 16^4

6. The pictures shown are the first three pictures in a sequence. How many dots does the fifth picture in the sequence consist of?



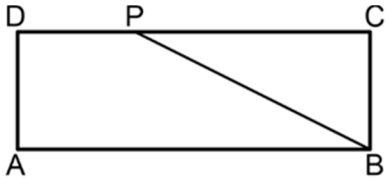
(A) 72 (B) 74 (C) 76 (D) 78 (E) 80

7. A student throws five stones in turn, hitting a window at points *A*, *B*, *C*, *D*, and *E*. Whenever a stone hits the window, it creates cracks starting from that point. These cracks end either at the edge of the window or at an existing crack.
In which order did he throw the stones?
(A) *DACBE* (B) *ABCDE* (C) *BDACE* (D) *BCDAE* (E) *DCABE*

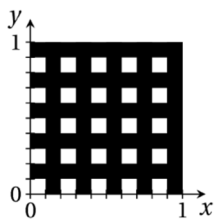


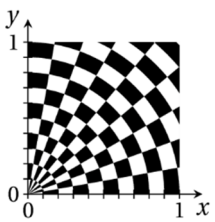
8. Silvia's favourite chocolate bars are sold in packets. There used to be five bars in each packet. Now there are only four in each packet, but the packets still cost the same. By how many percent has each bar become more expensive?
(A) by 10% (B) by 20% (C) by 25% (D) by 30% (E) by 50%

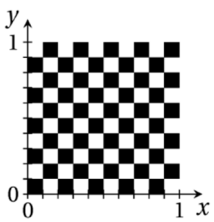
9. *ABCD* is a rectangle (see diagram). The area of the quadrilateral *ABPD* is 4 cm² and $DP = \frac{1}{3} \cdot CD$.
What is the area of the rectangle *ABCD*?
(A) 5 cm² (B) 5.5 cm² (C) 6 cm² (D) 6.5 cm² (E) 7 cm²

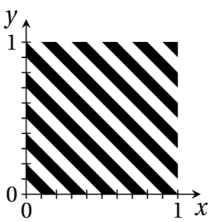


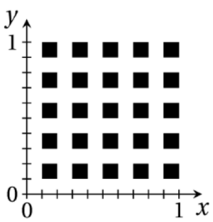
10. In the *xy* plane, some points in the range $0 \le x \le 1$, $0 \le y \le 1$ are coloured black. A point $(x|y)$ is coloured black if and only if the first decimal digit of both *x* and *y* after the decimal point is odd. What does the result look like?

(A) 

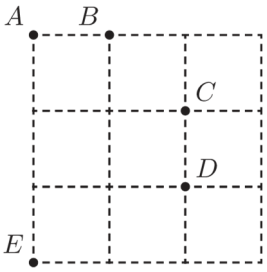
(B) 

(C) 

(D) 

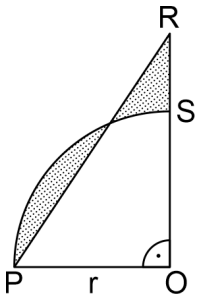
(E) 

4 Points

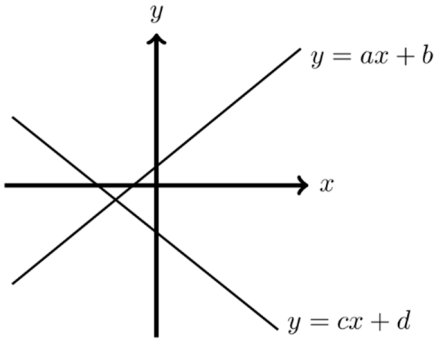


11. Robert wants to choose four points in such a way that the distances between any two of them are different. Which one of the points *A*, *B*, *C*, *D* or *E* must he remove?
(A) *A* (B) *B* (C) *C* (D) *D* (E) *E*

12. Among 10 different given positive integers, exactly five are divisible by 5 and exactly seven 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) a different value

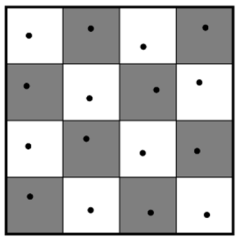


13. In the diagram we see a quarter circle *SP* with centre *O* and radius *r,* as well as a triangle *ORP*. The two grey regions have the same area.
How long is the segment *OR*?
(A) $\frac{\pi r}{2}$ (B) $\frac{3r}{2}$ (C) πr (D) $\frac{2}{\pi}$ (E) $\frac{\pi}{2r}$



14. A student draws the graphs of two linear functions in a coordinate system as shown. What is certain about the expression $ab+cd-(ac+bd)$?
(A) It is negative. (B) It is not positive. (C) It is positive.
(D) It is equal to zero. (E) None of these four statements is definitely true.

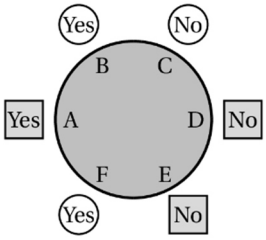
15. When Grandma started knitting wool socks, she had a ball of wool with a diameter of 30 cm. After she has finished knitting 70 socks, the remaining ball of wool has a diameter of 15 cm.
How many more socks can Grandma knit?
(A) 70 (B) 50 (C) 30 (D) 20 (E) 10



16. We consider a giant 4×4 chessboard. A kangaroo is standing on each of the 16 squares. On each move, each kangaroo jumps to an adjacent square (up, down, left or right, but not diagonally). All kangaroos stay on the chessboard. Several kangaroos can be on one square at the same time.
What is the maximum number of unoccupied squares that we can have after 100 moves?
(A) 15 (B) 14 (C) 12 (D) 10 (E) 8

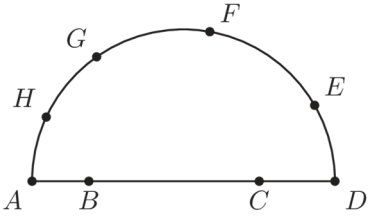
17. The five-digit number $\overline{N18NN}$ is divisible by 18. Which of the following statements is true for the digit *N*?
(A) There is exactly one such *N*. (B) There are exactly two such *N*.
(C) There are exactly three such *N*. (D) There are no such *N*.
(E) There are more than three such *N*.

18. The area of the black semicircle shown is 12 cm².
What is the area of the large quarter circle?
(A) 42 cm² (B) 36 cm² (C) 32 cm² (D) 30 cm² (E) 25 cm²



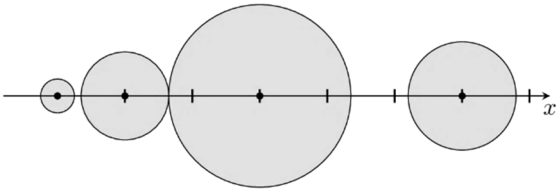
19. Three square Martians and three round Jupiterians are sitting at a table as shown. One of the six has the key to the spaceship. Everyone from one planet always tells the truth, and everyone from the other planet always lies. When asked "Does any of your neighbours have the key?" all six answer as shown.
Who has the key?
(A) *A* (B) *B* (C) *C* (D) *D* (E) *E*

20. Points *B* and *C* lie on the diameter of a semicircle with diameter *AD*, and points *E*, *F*, *G* and *H* lie on the arc.
How many triangles exist, whose vertices are three of these eight points?
(A) 15 (B) 50 (C) 51 (D) 52 (E) 54



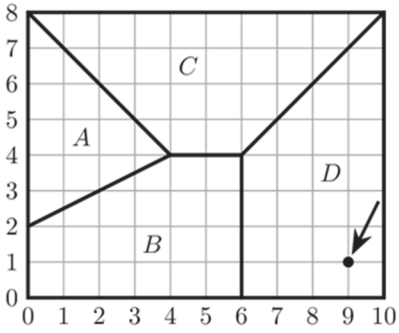
5 Points

21. Four circular discs with radii r_1, r_2, r_3 and r_4 have their centres at the points (0|0), (1|0), (3|0) and (6|0). The discs may touch each other but may 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.

22. On the map shown on the right, we see a city in which there are four schools. Regions *A*, *B*, *C* and *D* each consist of the points for which the relevant school is closest. The coordinates of the school in region *D* are (9|1).
What are the coordinates of the school in region *A*?



(A) (0|4) (B) (1|4) (C) (1|5) (D) (1|6) (E) (2|4)

23. What is the smallest positive integer *N* such that the expression $\sqrt{2\sqrt{3\sqrt{N}}}$ has an integer value?

(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) an other number

24. Fritz fills out a table with two columns and 51 rows. In the first row, he writes 5 on the left and 3 on the right. In each subsequent row he writes the sum of the two numbers from the row above on the left and the positive difference of these two numbers on the right. Which two numbers does he write in the bottom row?

(A) 5^{25} and 3^{25} (B) 5^{50} and 3^{50} (C) $2 \cdot 5^{25}$ and $2 \cdot 3^{25}$ (D) $5 \cdot 2^{25}$ and $3 \cdot 2^{25}$ (E) other numbers

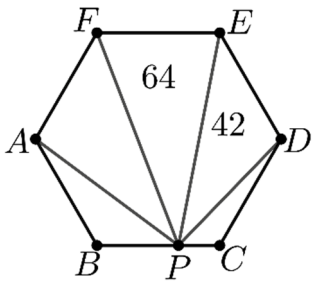
25. John writes a two-digit number on the board. If he erases the ones digit, the value of the number is reduced by *p*%. Which of the following numbers is closest to the largest possible value of *p*?

(A) 10 (B) 50 (C) 90 (D) 95 (E) 99

26. Julia and her little sister Paula start a bike ride together. Julia cycles at a constant speed of 18 km/h and Paula at a constant speed of 12 km/h. They cycle along the same route. After 20 minutes, Julia is tired and turns around. When she meets Paula, she also turns around and they both cycle home at their respective speeds. How many minutes does Paula arrive later than Julia?

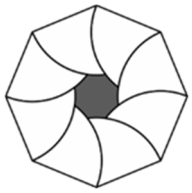
(A) 1 (B) 6 (C) 8 (D) 10 (E) 15

27. In the diagram we see a regular hexagon *ABCDEF*. The point *P* lies on *BC* in such a way that the area of the triangle *PEF* is 64 and the area of the triangle *PDE* is 42. What is the area of the triangle *APF*?



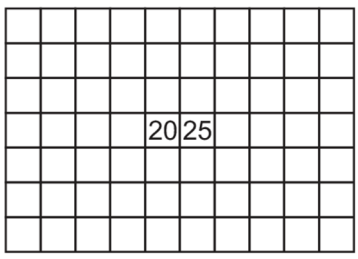
(A) 53 (B) 54 (C) 56 (D) 60 (E) 64

28. In the picture we see a regular octagon with a side length of 1 cm. Eight circular arcs with a radius of 1 cm and with centres at the corners were drawn as shown. What is the perimeter of the dark area?



(A) π cm (B) $\frac{2\pi}{3}$ cm (C) $\frac{8\pi}{9}$ cm (D) $\frac{4\pi}{5}$ cm (E) $\frac{3\pi}{4}$ cm

29. Patricia has written a number in each box of a 7×10 table. The sum of the numbers in each rectangle of size 3×4 or 4×3 is zero. Patricia reveals two of the numbers, as shown in the diagram. What is the sum of all the numbers in the table?



(A) 45 (B) 5 (C) -5 (D) -45
(E) It cannot be determined from this information.

30. Mike has three bags. Each bag contains three balls. On one bag there is a sign saying "1 white, 2 black", on the second a sign saying "2 white, 1 black" and on the third a sign saying "3 white". However, the signs have been swapped so that none of them is correct now. On each turn, Mike chooses a bag that still contains balls, draws one blindly and places it visibly next to the bag. What is the minimum number of balls that he has to draw to know for sure which sign should have been on which bag?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4