Mathematical Kangaroo 2014
Group Kadett (Grade 7 and 8)
Austria - 20.3.2014

- 3 Point Questions -

1. The Mathematical Kangaroo takes place each year on the third Thursday of March. What is the latest possible date on which the competition could take place?
(A) 14 March   (B) 15 March   (C) 20 March   (D) 21 March   (E) 22 March

2. How many quadrilaterals of any size are to be found in the diagram pictured.
(A) 0   (B) 1   (C) 2   (D) 4   (E) 5

**3.** What is the answer to $2014 \times 2014 \div 2014 - 2014$?

(A) 0   (B) 1   (C) 2013   (D) 2014   (E) 4028

4. The area of rectangle $ABCD$ in the diagram is 10. M and N are the midpoints of the sides sides AD and BC respectively. How big is the area of the quadrilateral $MBND$?
(A) 0·5   (B) 5   (C) 2·5   (D) 7·5   (E) 10

5. The product of two natural numbers is 36, and their sum 37. How big is the (positive) difference between the two numbers?
(A) 1   (B) 4   (C) 10   (D) 26   (E) 35
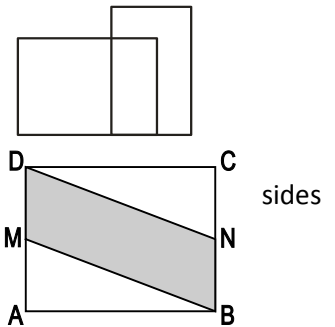
6. Wanda has lots of pages of square paper, whereby each page has an area of 4. She cuts each of the pages into right-angled triangles and squares (see the left hand diagram). She takes a few of these pieces and forms the shape in the right hand diagram. How big is the area of this shape?
(A) 3   (B) 4   (C) $\frac{9}{2}$ (D) 5   (E) 6
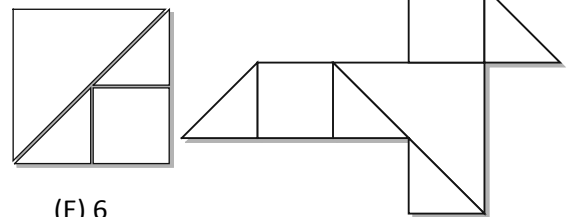
7. A bucket is filled halfway with water. A cleaning liquid fills another 2 litres of liquid into the bucket. Now the bucket is three-quarters full. How many litres of water in total can fit into the bucket?
(A) 10 Litre   (B) 8 Litre   (C) 6 Litre   (D) 4 Litre   (E) 2 Litre

8. George builds the sculpture shown from seven cubes each of edge length 1. How many more of these cubes must he add to the sculpture so that he builds a large cube of edge length 3?
(A) 12   (B) 14   (C) 16   (D) 18   (E) 20
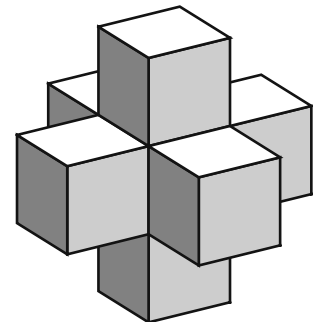
9. Which of the following sums gives the biggest answer?
(A) 44×777 (B) 55×666 (C) 77×444 (D) 88×333 (E) 99×222

10. Gray and white pearls are threaded onto a string.

Tony pulls pearls from the ends of the chain. After pulling off the fifth gray pearl he stops. At most, how many white pearls could he have pulled off?
(A) 4   (B) 5   (C) 6   (D) 7   (E) 8

11. Max has a one hour piano lesson twice a week, Hanna only has a one hour lesson every second week. The piano lessons run over a particular number of weeks. How many weeks is this, if during this time Max has 15 more hours of lessons than Hanna?

(A) 30 Weeks   (B) 25 Weeks   (C) 20 Weeks   (D) 15 Weeks   (E) 10 Weeks

12. Five circles each with an area of 1 cm^2 overlap each other to form the figure in the diagram. The sections where two circles overlap, each have an area of $\frac{1}{8}$ cm^2. How big is the area, which is completely covered by the figure in the diagram?
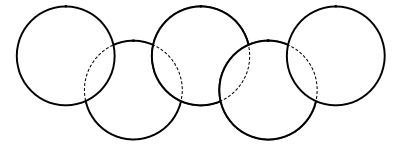
(A) $4\,cm^2$ (B) $\frac{9}{2}cm^2$ (C) $\frac{35}{8}cm^2$ (D) $\frac{39}{8}cm^2$ (E) $\frac{19}{4}cm^2$

13. A grandmother, her daughter and her granddaughter find that the sum of their ages is 100. Also each age is a power of two (that is, several two's multiplied together). How old is the granddaughter?

(A) 1   (B) 2   (C) 4   (D) 8   (E) 16

14. 5 congruent rectangles are positioned in a square with side length 24 as shown in the diagram. How big is the area of one of these rectangles?

(A) 12 cm^2 (B) 16 cm^2 (C) 18 cm^2 (D) 24 cm^2 (E) 32 cm^2
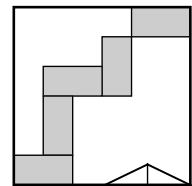
15. In the following figure, the heart and the arrow are arranged as pictured. At the same moment the heart and the arrow begin to move. The arrow moves around the figure 3 spaces clockwise and the heart 4 spaces anticlockwise and then they stop. This process repeats itself over and over again. After how many repetitions does the arrow find itself for the first time in the same triangle as the heart?
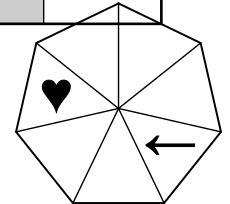
(A) 7   (B) 8   (C) 9   (D) 10   (E) That will never happen
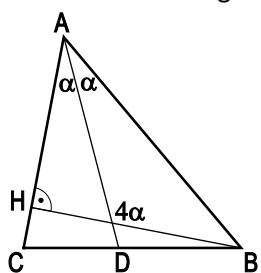
16. In triangle *ABC* (see sketch) *AD* is the angle bisector of the angle at *A* and *BH* is the height from side *AC*. The obtuse angle between *BH* and *AD* is four times the size of angle ∠*DAB*. How big is the angle ∠*CAB*?

(A) 30°   (B) 45°   (C) 60°   (D) 75°   (E) 90°

17. Six boys live together in an apartment, which has two bathrooms. Each morning from 7:00 they use both of the bathrooms before breakfast whereby they are 8, 10, 12, 17, 21, and 22 minutes respectively, constantly alone in one of the two bathrooms. What is the earliest time that all six boys can have breakfast together?

(A) 7:45   (B) 7:46   (C) 7:47   (D) 7:48   (E) 7:50

18. The sides of a rectangle are 6cm and 11cm long. You select one of the long sides. Then the angle bisectors of the angles at the ends of this side are drawn. They split the opposite long side into three pieces. How long are these pieces?

(A) 1 cm, 9 cm, 1 cm   (B) 2 cm, 7 cm, 2 cm   (C) 3 cm, 5 cm, 3 cm   (D) 4 cm, 3 cm, 4 cm   (E) 5 cm, 1 cm, 5 cm

19. Captain Sparrow and his pirates loot some gold coins. They share the coins equally amongst themselves. If they were four pirates less they would each get 10 coins more. If the number of coins was 50 less, they would each get 5 coins less. How many coins did they share between themselves?

(A) 80   (B) 100   (C) 120   (D) 150   (E) 250

20. The average value of two positive numbers is 30% less than one of the two numbers. By which percentage is the average value bigger than the other number?

(A) 75%   (B) 70%   (C) 30%   (D) 25%   (E) 20%

21. Andy fills a 3×3 table with all the digits from 1 to 9 so that each cell only contains one digit. He has already put the digits 1, 2, 3 and 4 in the table as shown in the diagram. Two numbers are 'neighbouring' when the cells they are in share one side. After he had finished filling in the table he noticed: The sum of the numbers neighbouring 9 equals 15. How big is the sum of the numbers neighbouring 8?


(A) 12   (B) 18   (C) 20   (D) 26   (E) 27

22. A set of scales does not always show the correct mass. If something is less than 1000g they show the exact mass. When something weighs 1000g or more, they show some mass over 1000g. You have 5 balls with the masses A g, Bg, C g, D g and E g each less than 1000g. When you weigh these in pairs the scales show the following: $B + D = 1200$, $C + E = 2100$, $B + E = 800$, $B + C = 900$, $A + E = 700$. Which ball is the heaviest?

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

23. The quadrilateral *ABCD* has right angles only in corners *A* and *D*. The numbers in the diagram give the respective areas of the triangles in which they are located. How big is the area of *ABCD*?
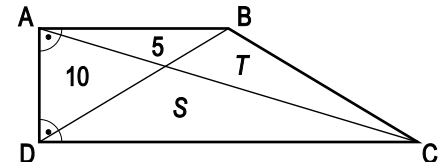
(A) 60   (B) 45   (C) 40   (D) 35   (E) 30

24. Jan and Eva undertake a challenge to solve mathematics questions. They each get an identical list of 100 questions. For each correctly solved question, the first to solve it gets 4 points while the slower person gets 1 point. Jan solved 60 questions and Eva also solved 60 questions. Together they score 312 points. How many questions were solved by both Jan and Eva?
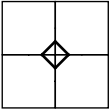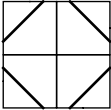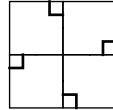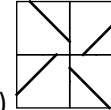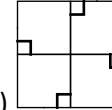
(A) 53   (B) 54   (C) 55   (D) 56   (E) 57

25. David cycles from Edinburgh to his aunty who lives outside of Edinburgh. He wants to arrive at exactly 15:00 hours. After 2/3 of his planned travel time he had covered 3/4 of the way. Therefore he began to cycle slower and arrived exactly on time at his destination. In which ratio are the average speeds of the two sections of his journey?

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

26. Four identical cubes (see diagram) were fitted together. If the resulting shape is viewed from the front you see a black circle (picture on the right). What will you see on the back of the shape?

Ansicht von vorne
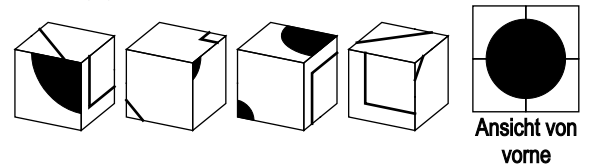
(A)   (B)   (C)   (D)   (E)

27. A group of 25 people is made up of knights, rascals and shilly-shalliers. The knights always tell the truth, the rascals are always untruthful, and the shilly-shalliers answer alternately truthfully and falsely (or the other way around).

After the first question asked to everybody, "are you a knight?" 17 of them answered "yes!"

After the second question asked to everybody "are you a shilly-shallier?" 12 of them answered "yes!"

After the third question asked to everybody "are you a rascal?" 8 of them answered "yes!"

How many knights are in this group of people?

(A) 4   (B) 5   (C) 9   (D) 13   (E) 17

28. Lots of different positive whole numbers were written on a blackboard. Exactly two of these numbers are divisible by 2 and exactly 13 of these numbers are divisible by 13. The biggest number on the board is *M*. What is the smallest value that *M* can have?
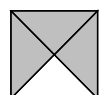
(A) 169   (B) 260   (C) 273   (D) 299   (E) 325

29. On a pond 16 lilly pads are arranged in a 4×4 grid as can be seen in the diagram. A frog sits on a lilly pad in one of the corners of the grid (see picture). The frog jumps from one lilly pad to another horizontally or vertically. In doing so he always jumps over at least one lilly pad. He never lands on the same lilly pad twice. What is the maximum number of lilly pads, including the one he is sitting on, on which he can land?
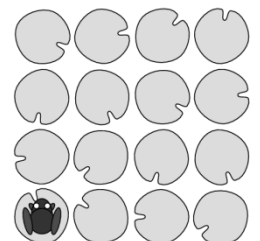
(A) 16   (B) 14   (C) 8   (D) 6   (E) 4

30. A 5×5 square is covered with 1×1 tiles. The design on each tile is made up of three dark triangles and one light triangle (see diagram). The triangles of neighbouring tiles always have the same colour where they join along an edge. The border of the large square is made of dark and light triangles. What is the smallest number of dark triangles that could be amongst them?

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