MATHEMATICS KANGAROO 2013
Austria - 21.3.2013

Group: Kadett, Grades: 7-8

Name:	
School:	
Class:	

Time allowed: 75 min.
Each correct answer, questions 1.-10.:   3 Points
Each correct answer, questions 11.-20.:   4 Points
Each correct answer, questions 21.-30.:   5 Points
Each question with no answer given: 0 Points
Each incorrect answer: Lose ¼ of the points for that question.
You begin with 30 points.

Please write the letter (A, B, C, D, E) of the correct answer under the question number (1 to 30). Write neatly 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

Mathematical Kangaroo 2013
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- 3 Point Questions -

1. Triangle ABC is equilateral and has area 9. The dividing lines are parallel to the sides, and divide the sides into three equal lengths. What is the area of the grey shaded part of the triangle?

(A) 1　　　　(B) 4　　　　(C) 5　　　　(D) 6　　　　(E) 7

2. We know that $\frac{1111}{101} = 11$. How big is the sum $\frac{3333}{101} + \frac{6666}{303} = ?$

(A) 5　　　　(B) 9　　　　(C) 11　　　　(D) 55　　　　(E) 99

3. In sea water the ratio of Salt to fresh water is 7 : 193. How many kilograms of salt will be found in 1000kg of sea water?

(A) 35　　　　(B) 186　　　　(C) 193　　　　(D) 200　　　　(E) 350

4. Melanie has a square piece of paper with a 4x4 grid drawn on it. She cuts along the gridlines and cuts several shapes out which all look either the same as the one pictured, or the same as its mirror image. How many squares are left over if she cuts out as many shapes as possible?
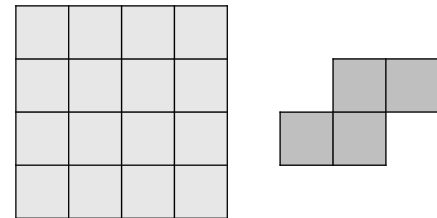
(A) 0　　　　(B) 2　　　　(C) 4　　　　(D) 6　　　　(E) 8

5. Matthias catches fish. If he had caught three times as many fish as he has actually caught, he would have 12 fish more. How many fish has he caught?

(A) 7　　　　(B) 6　　　　(C) 5　　　　(D) 4　　　　(E) 3

6. A sack contains marbles in five different colours: 2 red, 3 blue, 10 white, 4 green, and 3 black marbles. You take marbles out of the bag without looking and without putting them back. What is the smallest number of marbles you must remove from the sack to be sure of having two of the same colour?

(A) 2　　　　(B) 12　　　　(C) 10　　　　(D) 5　　　　(E) 6

7. Alex lights a candle every 10 minutes. Each candle burns for 40 minutes before going out. How many candles are burning 55 minutes after he lit the first candle?

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

8. Marie calculates the average number of children in families in her village. Five families live in the village. Which answer could she not get?

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

9. Tom and Laura stand directly opposite each other around a circular well. At the same time, they begin to run clockwise around the well. Tom's speed is $\frac{9}{8}$ of Laura's speed. How many time full laps of the well will laura run before Tom catches her for the first time?

(A) 4　　　　(B) 8　　　　(C) 9　　　　(D) 2　　　　(E) 72

10. For the positive whole numbers *x, y, z* the following is true: $x \times y = 14$, $y \times z = 10$ und $z \times x = 35$. What is the value of $x + y + z$?

(A) 10　　　　(B) 12　　　　(C) 14　　　　(D) 16　　　　(E) 18
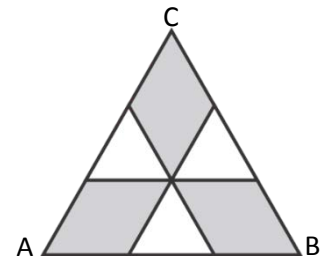
11. Anne plays 'sink the ship' with a friend, on a 5×5 grid. She has already drawn in a 1×1 ship and a 2×2 ship (as shown in the picture). She must also draw a (rectangular) 3×1 ship. Ships may be neither directly nor diagonally adjacent to each other. How many possible positions are there for the 3×1 ship?
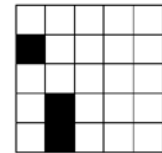
(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

12. In the diagram pictured, $\alpha = 55°$, $\beta = 40°$ and $\gamma = 35°$. How big is δ?

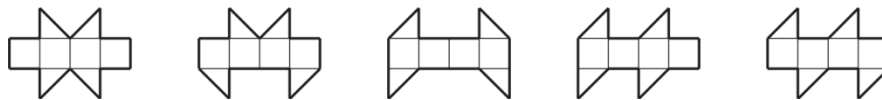(A) 100° (B) 105° (C) 120° (D) 125° (E) 130°
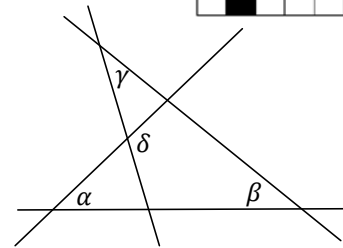
13. The perimeter of a trapezium is 5, and the side lengths are whole numbers. How many degrees do the smallest angles measure?

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

14. The five shapes pictured were cut out of paper. Four of them can be folded to form a cube. For which shape is this not possible.

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

15. Willi wrote down a few consecutive whole numbers. A certain percentage of these numbers are odd. Which of the following values cannot be the calculated percentage?

(A) 40% (B) 45% (C) 48% (D) 50% (E) 60%

16. Aron, Ben and Carl always lie. Each of them picks a red or a green stone.

Aron says: "My stone has the same colour as Bens stone."
Ben says: "My stone has the same colour as Carls stone."
Carl says: "Exactly two of us have red stones."
Which of the following is correct?

(A) Arons stone is green. (B) Bens stone is green. (C) Carls stone is red.
(D) Arons stone and Carls Stone have different colours. (E) None of the possibilities are correct.

17. All four digit positive numbers, which have the same digits as 2013 were written on a blackboard in ascending order. Determine the largest possible difference between two consecutive numbers on the blackboard.

(A) 702 (B) 703 (C) 693 (D) 793 (E) 198

18. In the 8×6 grid pictured, there are 24 squares that have not been cut by either of the two diagonals. Now we draw the two diagonals on a 10×6 grid. How many squares in this grid will not be cut by either of the two diagonals?
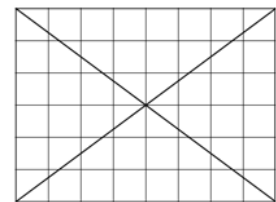
(A) 28 (B) 29 (C) 30 (D) 31 (E) 32

19. Andi, Berti, Christa, Doris and Edi were born on the following days; 20.02.2000, 12.03.2000, 20.03.2000, 12.04.2000 and 23.04.2000 respectively. Andi and Edi have their birthday in the same month. Berti and Christa also have their birthday in the same month. Andi and Christa were born on the same day in different months. Doris and Edi were also born on the same day in different months. Which of these children is the youngest?

(A) Andi (B) Berti (C) Christa (D) Doris (E) Edi

20. Johann stacked 1×1 cubes on the squares of a 4×4 grid. The diagram on the right shows the number of cubes that were stacked on top of each other above each square. What will Johann see if he looks from the back (hinten) at the tower?

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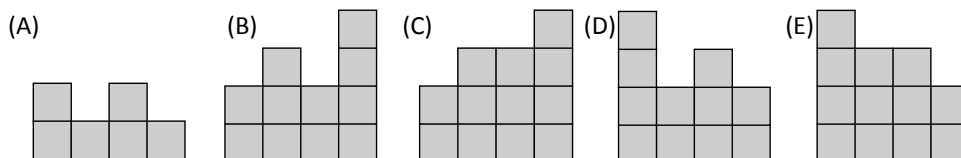
HINTEN

4	2	3	2
3	3	1	2
2	1	3	1
1	2	1	2

VORNE

21. Ralf wants to say a number to Karl, such that the product of its digits is exactly 24. What is the digit sum of the smallest number that Ralf can say?

(A) 6   (B) 8   (C) 9   (D) 10   (E) 11

22. The sides of the rectangle ABCD are parallel to the co-ordinate axes. The rectangle is positioned below the x-axis and to the right of the y-axis, as shown in the picture. The co-ordinates of the points A, B, C, D are whole numbers. For each of the points we calculate the value of (y co-ordinate) ÷ (x co-ordinate). Which of the points will give the smallest value?
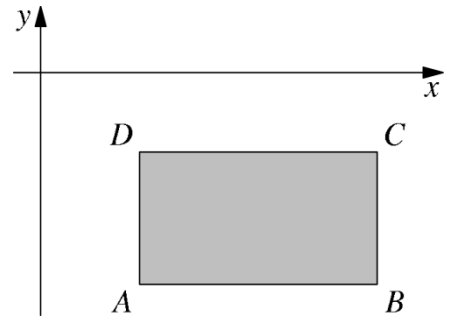
(A) A   (B) B   (C) C   (D) D
(E) It depends on the rectangle.

23. On a sheet of paper a grid is drawn such that each of the squares has sides 2cm long. How big is the area of the grey shaded quadrilateral ABCD?
(A) 96 cm^2 (B) 84 cm^2 (C) 76 cm^2 (D) 88 cm^2 (E) 104 cm^2
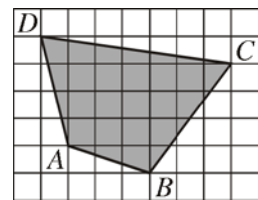
24. Robert chose a five digit positive number. He removed one of the digits so that a four digit number remained. The sum of this four digit and the original five digit number is 52713. What is the digit sum of the original five digit number?

(A) 26   (B) 20   (C) 23   (D) 19   (E) 17

25. A gardener wants to plant a row of 20 trees (linden and oak) in a park. There must never be exactly three trees between any two oak trees. What is the maximum number of the 20 trees which could be oak?

(A) 8   (B) 10   (C) 12   (D) 14   (E) 16

26. In the finishing order of a cross country race, there are twice as many runners behind Alex as there are before Daniel, and 1·5 as many behind Daniel as before Alex. Alex finished in 21st place. How many runners finished the race?

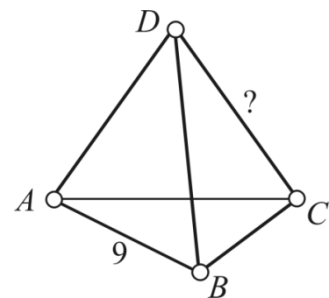(A) 31   (B) 41   (C) 51   (D) 61   (E) 81

27. A sequence of numbers begins with 1, -1, -1, 1, -1. Each new number is found by taking the product of the two preceding numbers. For instance the sixth number is the product of the fourth and fifth numbers. What is the sum of the first 2013 numbers?
(A) −1006   (B) −671   (C) 0   (D) 671   (E) 1007

28. Dad made 6 pancakes, one after the other, and numbered them 1 to 6 in the order that they were made. Sometimes while he did this his children ran into the kitchen and ate the hottest pancakes. In which of the following orders could the pancakes not have been eaten.
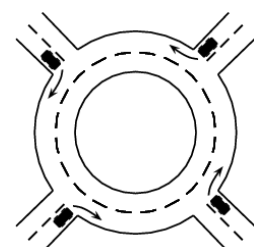(A) 123456   (B) 125436   (C) 325461   (D) 456231   (E) 654321

29. Each of the 4 vertices and 6 edges of a tetrahedron is labelled with one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 11. (The number 10 is left out). Each number is only used once. The number on each edge is the sum of the numbers on the two vertices which are connected by that edge. The edge AB has the number 9. With which number is the edge CD labelled?
(A) 4   (B) 5   (C) 6   (D) 8   (E) 11

30. Four cars drive into a roundabout at the same point in time, each one coming from a different direction (see diagram). No car drives all the way around the roundabout, and no two cars leave at the same exit. In how many different ways can the cars exit the roundabout?
(A) 9   (B) 12   (C) 15   (D) 24   (E) 81