Mathematical Kangaroo 2014
Group Junior (Grades 9. und 10.)
Austria - 20.3.2014

- 3 Point Questions -

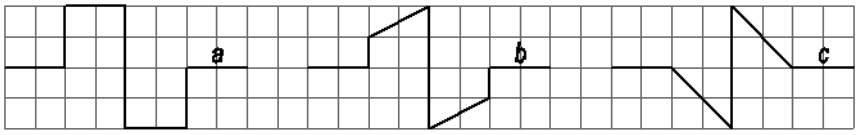
1. The Kangaroo competition takes place each year on the third Thursday of March. Which day is the earliest possible date for the competition?

(A) 14/3. (B) 15/3 (C) 20/3 (D) 21/3 (E) 22/3.

2. The container ship MSC Fabiola carries 12500 identically long containers. When put next to each other in a row they make a 75km long container line. Roughly, how long is one container?

(A) 6 m (B) 16 m (C) 60 m (D) 160 m (E) 600 m

3. a, b and c show the lengths of the different of pieces of wire pictured. Which of the following inequalities is correct?



(A) $a<b<c$ (B) $a<c<b$ (C) $b<a<c$ (D) $b<c<a$ (E) $c<b<a$

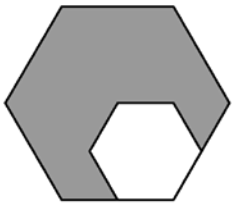
4. Which number is an equal distance from $\frac{2}{3}$ and $\frac{4}{5}$ on the number line?

(A) $\frac{11}{15}$ (B) $\frac{7}{8}$ (C) $\frac{3}{4}$ (D) $\frac{6}{15}$ (E) $\frac{5}{8}$

5. In the year number 2014, the last digit is bigger than the sum of the three other digits. How many years ago did this last happen?

(A) 1 (B) 3 (C) 5 (D) 7 (E) 11

6. The side lengths of the large regular hexagon are twice the length of those of the small regular hexagon. What is the area of the large hexagon if the small hexagon has an area of 4 cm^2?



(A) 16 cm^2 (B) 14 cm^2 (C) 12 cm^2 (D) 10 cm^2 (E) 8 cm^2

7. Which statement is definitely correct if the following statement is false: „Everybody has solved more than 20 problems.“

(A) Nobody has solved more than 20 problems.
(B) Somebody has solved less than 21 problems.
(C) Everybody has solved less than 21 problems.
(D) Somebody has solved exactly 20 problems.
(E) Somebody has solved more than 20 problems.

8. Tom draws a square on the co-ordinate plane. One diagonal sits on the x-axis. Its endpoints are (−1,0) and (5,0). Which of the following points is also a corner point of the square?

(A) (2,0) (B) (2,3) (C) (2,−6) (D) (3,5) (E)(3,−1)

9. In Kangaroo city there are m men, f women and k children. It is true that $m : f = 2 : 3$ and $f : k = 8 : 1$. In what ratio is the number of adults (men and women) to the number of children?

(A) 5 : 1 (B) 10 : 3 (C) 13 : 1 (D) 12 : 1 (E) 40 : 3

10. The circumference of the large wheel measures 4·2m, and that of the small wheel 0·9m. To begin with the valves on both wheels are at the lowest point, and then the bicycle moves to the left. After a few metres both valves are again at the lowest point at the same time. After how many metres does this happen for the first time?

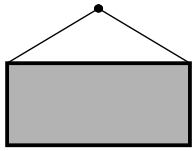
(A) 4·2 m (B) 6·3 m (C) 12·6 m (D) 25·2 m (E) 37·8 m

- 4 Point Questions -

11. A Grandmother, her daughter and her Granddaughter each have their birthday in February. They can say that they are in total 100 years old and that each persons age is a power of 2. In which year was the granddaughter born?

(A) 1998 (B) 2006 (C) 2010 (D) 2012 (E) 2013

12. Paul hangs rectangular pictures on a wall. For each picture he hammers a nail into the wall 2·5m above the floor. He ties a 2m long string to the upper corners of each picture (see diagram). which picture size (width in cm $\times$ height in cm) has its lower edge nearest to the floor?

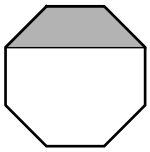


(A) 60×40 (B) 120×50 (C) 120×90 (D) 160×60 (E) 160×100

13. In a shared apartment where six girls live there are 2 bathrooms. Each morning from 7:00 the girls use the bathrooms before breakfast whereby they are 9, 11, 13, 18, 22 and 23 minutes respectively, constantly alone in one of the two bathrooms. What is the earliest time that all six girls can have breakfast together?

(A) $7:48$ (B) $7:49$ (C) $7:50$ (D) $7:51$ (E) $8:03$

14. The shaded part of the regular octagon has an area of 3 cm^2. How big is the area of the octagon?



(A) $8+4\sqrt{2}$ cm^2 (B) 9 cm^2 (C) $8\sqrt{2}$ cm^2 (D) 12 cm^2 (E) 14 cm^2

15. The length of the tail of the biggest crocodile in a zoo is one third of the total length of the crocodile. The head is 93cm long and makes up one quarter of the length of the crocodile without its tail included. How long is the crocodile?

(A) 558 cm (B) 496 cm (C) 490 cm (D) 372 cm (E) 186 cm

16. If you add the numbers on opposite faces of this special die, you will get the same total three times. The numbers on the hidden faces of the die are prime numbers. Which number is on the face opposite to 14?

(A) 11 (B) 13 (C) 17 (D) 19 (E) 23

17. Anna walks a distance of 8 km at a speed of 4 km/h. Then she runs for a while at 8 km/h. How many minutes must she run for, so that she has been underway with an overall average speed 5 km/h?

18. (A) 15 min (B) 20 min (C) 30 min (D) 35 min (E) 40 min

19. A chess player plays 40 matches and gains from these 25 points, whereby a win gives 1 point, a draw $\frac{1}{2}$ point, and a loss 0 points. How many more matches does he win than he loses?

(A) 5 (B) 7 (C) 10 (D) 12 (E) 15

20. The triplets Meike, Monika and Zita each want to buy equally expensive hats. However, Meike's savings were $\frac{1}{3}$, Monika's $\frac{1}{4}$ and those from Zita $\frac{1}{5}$ smaller than the price of a hat. After these hats were reduced by €9·40, the triplets put their savings together and they each bought a hat. Not a single cent was left over. How much had a hat cost originally?

(A) 12 € (B) 16 € (C) 28 € (D) 36 € (E) 112 €

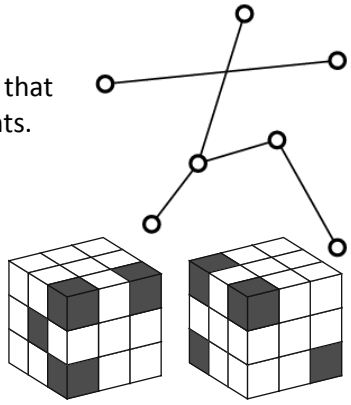
21. p, q und r are positive whole numbers where $p+\dfrac{1}{q+\frac{1}{r}}=\dfrac{25}{19}$. The value of the product pqr is then equal to;

(A) 6 (B) 10 (C) 18 (D) 36 (E) 42

- 5 point questions-

22. In the equation $N \times U \times (M + B + E + R) = 33$ each letter represents a different digit (0, 1, 2, …, 9).
In how many different ways can the letters, be replaced by different digits?
(A) 12 (B) 24 (C) 30 (D) 48 (E) 60

23. In the diagram Karl wants to add lines joining two of the marked points at a time, so that each of the seven marked points is joined to the same number of other marked points. What is the minimum number of lines he must draw?
(A) 4 (B) 5 (C) 6 (D) 9 (E) 10



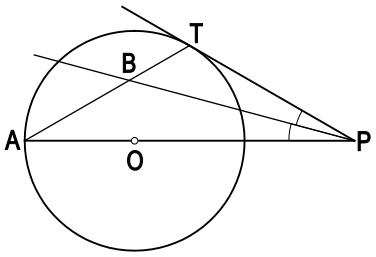
24. The diagram shows two different views of the same cube. The cube is made from 27 small cubes, which are either white or black. At most how many black cubes are there?
(A) 5 (B) 7 (C) 8 (D) 9 (E) 10

25. On an island the frogs are either green or blue. The number of blue frogs increases by 60%, and the number of green frogs decreases by 60%. This has the effect that the new ratio of the number of blue frogs to the number of green frogs, matches the original ratio of the number of green frogs to the number of blue frogs. By what percentage has the total number of frogs changed?
(A) 0% (B) 20% (C) 30% (D) 40% (E) 50%

26. Tom has written down a few different positive whole numbers which are all smaller than 101. The product of the numbers is not divisible by 18. At most how many numbers could he have written down?
(A) 5 (B) 17 (C) 68 (D) 69 (E) 90

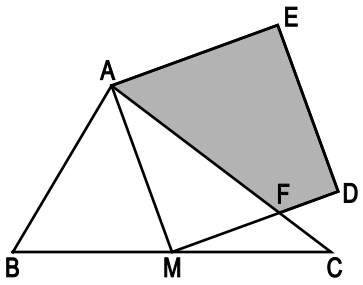
27. Every group of three vertices of a cube form a triangle. How many such triangles are there, such that the vertices do not all belong to the same face of the cube?
(A) 16 (B) 24 (C) 32 (D) 40 (E) 48

28. *PT* is the tangent to a circle *O*, and *PB* is the angle bisector of the angle *TPA* (see diagram). How big is the angle *TBP*?
(A) 30° (B) 45° (C) 50° (D) 75°
(E) It depends on the location of point P



29. We consider all 7 digit numbers that result, when for each number you use all the digits from 1 to 7. We write these numbers down in increasing order of size and split the list exactly in the middle, so that two lists of equal size result. What is the last number of the first of these ordered lists?
(A) 1234567 (B) 3765421 (C) 4123567 (D) 4352617 (E) 4376521

30. In triangle *ABC*, $AB = 6$ cm, $AC = 8$ cm and $BC = 10$ cm. *M* is the midpoint of the side *BC*. *AMDE* is a square and *MD* intersects *AC* at point *F*.
What is the area of the quadrilateral *AFDE* in cm^2?
(A) $\frac{124}{8}$ (B) $\frac{125}{8}$ (C) $\frac{126}{8}$ (D) $\frac{127}{8}$ (E) $\frac{128}{8}$



31. 2014 people stand next to each other in a row. Each person is either a liar (who always lie) or a knight (who always tell the truth). Each person says "to the left of me are more liars than to the right of me there are knights." How many liars are in the row?
(A) 0 (B) 1 (C) 1007 (D) 1008 (E) 2014