wizPROF 2014

wereldwijde wiskundewedstrijd

W4Kangoeroe

www.w4kangoeroe.nl

March 20th 2014

Good luck and most of all have fun.

© Stichting Wiskunde Kangoeroe

calculators are not allowed

you may use 75 minutes

Only a pencel, an eraser and scribbling paper are allowed

results and prizes will arrive at school in May

answers will be posted on the website March 27th

solutions will be posted on the website April 20th

wizPROF
havo 4 & 5
vwo 3, 4, 5 & 6

1. Every year the Kangaroo contest takes place on the third Thursday of March.
On which date will the Kangaroo *never* take place?

A. 14 March   **B.** 15 March   **C.** 16 March   **D.** 17 March   **E.** 18 March

---

2. *Fabiola* is the largest container ship allowed to sail into San Francisco Bay.
It can carry 12500 containers.
Placed side by side, these containers would form a row of 75 km.
What is the length of such a container (in meters)?

A. 6   **B.** 16   **C.** 60   **D.** 160   **E.** 600

---

3. The last digit of the number 2014 is greater than the sum of the other three digits.
How many years ago did it occur for the last time that the last digit of the year had that same property?

**A.** 1   **B.** 3   **C.** 5   **D.** 7   **E.** 11

---

4. What is the difference between the largest 3-digit multiple of 13 and the smallest 4-digit multiple of 13?

A. 3   **B.** 6   **C.** 12   **D.** 13   **E.** 26

---

5. We put the line segments in order, from shortest to longest.
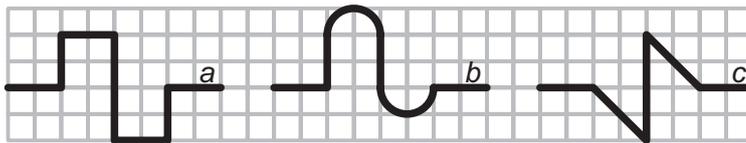
What is the correct order?

A. *a*, *b*, *c*   **B.** *a*, *c*, *b*   **C.** *b*, *a*, *c*   **D.** *b*, *c*, *a*   **E.** *c*, *b*, *a*

---

6. The large hexagon has sides twice the length of those of the small hexagon.
The area of the small hexagon is 4 cm².
How many cm² is the area of the grey region?

A. 8   **B.** 10   **C.** 12   **D.** 14   **E.** 16

---
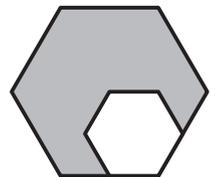
7. *Ria* claims: 'We have all solved more than 20 exercises.'
If *Ria's* claim is not correct, then which of these is *certainly* true?

A. None of us has solved more than 20 exercises.
B. At least one of us has solved fewer than 21 exercises.
C. We have all solved fewer than 21 exercises.
D. At least one of us has solved exactly 20 exercises.
E. At least one of us has solved more than 20 exercises.

---

8. The straight line connecting *A* and *B* is 20 cm long.
The zigzag line connecting *A* and *B* is made out of 7 equilateral triangles.
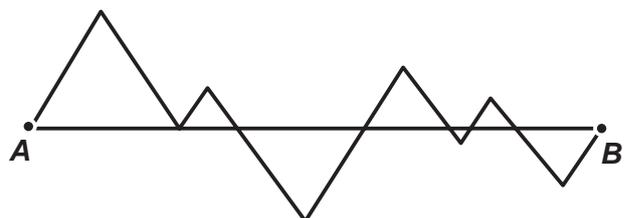
How long (in cm) is the zigzag line?

A. 40   **B.** $20 + 20\sqrt{3}$ **C.** $40\sqrt{2}$ **D.** $40\sqrt{3}$ **E.** 60

9. The ratio of **number of adult men** to **number of adult women** in some village is 2:3.
The ratio of **number of adult women** to **number of children** is 8:1.
What is the ratio of **number of adults (men and women)** to **number of children**?

A. 10:3   **B.** 5:1   **C.** 12:1   **D.** 13:1   **E.** 40:3

---

10. The circumference of the large wheel of this bicycle is 4.2 meters.
The circumference of the small wheel is 0.9 meters.
At a certain moment the valves of both wheels are simultaneously at
the very bottom.

After riding how many meters are both valves for the first time again at
the very bottom at the same time?

A. 4.2   **B.** 6.3   **C.** 12.6   **D.** 25.2   **E.** 37.8

---

11. A grandmother, her daughter, and her granddaughter all had their birthdays yesterday
(March 19, 2014). If you add their ages today, the result is 100.
The ages of each of them are a *power* of 2 now.
What was the granddaughter's year of birth?

A. 1998   **B.** 2000   **C.** 2006   **D.** 2010   **E.** 2012

---

12. *Rachida* has mounted five photo's in rectangular frames.
For each picture she has put one nail in the wall at 2.5 m height
above the ground. Each frame is hanging from a wire of 2 m length, as shown.
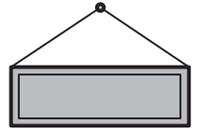
Which of the following photo's (width x height in cm) reaches closest to the floor?

A. 60 × 40   **B.** 120 × 50   **C.** 120 × 90   **D.** 160 × 60   **E.** 160 × 100

---

13. A chess player has played 40 games and scored 25 points.
Winning a game yields 1 point, each draw yields half a point, and losing a game 0 points.
How many more games did he win than lose?

A. 7   **B.** 10   **C.** 12   **D.** 14   **E.** 15

---

14. Six girls share a flat with two showers.
Every morning from 7:00 am they take showers separately.
It takes them respectively 9, 11, 13, 18, 22 and 23 minutes.
What is the earliest time they can all be ready?

A. 7:48   **B.** 7:49   **C.** 7:50   **D.** 7:51   **E.** 8:03

---

15. The grey area in the octagon shown here measures 3 cm² .
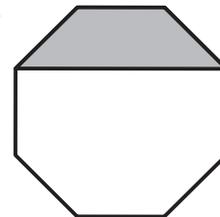
How many cm² is the area of the octagon?

A. $10\frac{1}{2}$ **B.** $8\sqrt{2}$ **C.** 12   **D.** $8 + 4\sqrt{2}$ **E.** 14

---

16. *Sem* has caught a big crocodile in Africa.
The length of its tail is a third of its full length.
His head measures 93 cm, which is a quarter of the length of the crocodil without tail.
What is the length of the crocodil in cm?

A. 186   **B.** 279   **C.** 372   **D.** 496   **E.** 558

17. We have some special dice, see picture.
The numbers on opposite faces always have the same sum.
The numbers not shown in the picture are prime numbers
(whole numbers greater than 1 and only divisible by 1 and by the number itself).
Which number will be opposite the number 14?

A. 23   **B.** 29   **C.** 31   **D.** 37   **E.** 41

18. *Anna* has just finished an 8 km walk with a speed of 4 km/h.
Next she will be jogging for a while with a speed of 8 km/h.
She would like to do this until her average speed over the whole distance (walking and jogging) will reach 5 km/h.
For how many minutes will *Anna* have to keep jogging?

A. 15   **B.** 20   **C.** 30   **D.** 35   **E.** 40

19. The triplets *Janneke*, *Daniëlle* and *Anna* were in a hat store. They would all like to buy the same hat. *Janneke* was one third short of the price, *Daniëlle* one quarter and *Anna* one fifth.
During a sale, the hats were reduced in price by € 9,40 each.
The three sisters put their money together and appeared to be able to buy exactly one hat for each of them. There was no money left.
What was the price of a hat before the sale?

A. 12   **B.** 16   **C.** 28   **D.** 36   **E.** 112

20. p, q and r are positive whole numbers with $p + \dfrac{1}{q + \frac{1}{r}} = \dfrac{25}{19}$.
What is their product?

A. 6   **B.** 10   **C.** 18   **D.** 36   **E.** 42

21. In the equation $G \times E \times (T + A + L) = 25$ each letter represents a digit, in such a way that the equality holds, while different letters represent different digits.
In how many different ways can this be done?

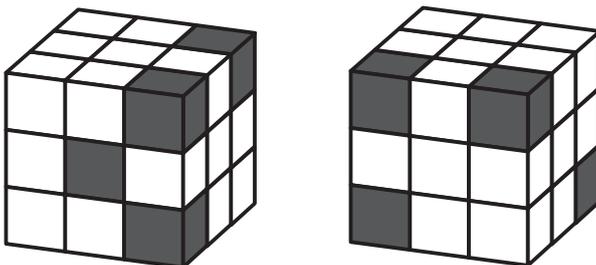**A.** 12   **B.** 24   **C.** 30   **D.** 48   **E.** 60

22. *Ismael* would like to complete this drawing in a way that the number of lines that leave a node (to another node) is the same for every node. (A node is represented by O.)
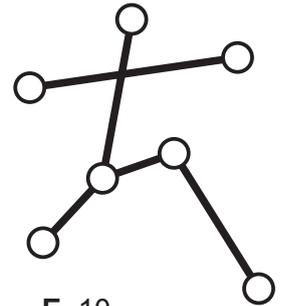
What is the smallest number of lines he has to add?

A. 4   **B.** 5   **C.** 6   **D.** 9   **E.** 10

23. The picture shows a cube from two sides.

The cube is made out of 27 small cubes, each totally black or totally white.
What is the largest number of black cubes that can have been used?

A. 5   **B.** 7   **C.** 8   **D.** 9   **E.** 10

24. On an island all frogs are either green or blue. Compared to last year, the number of blue frogs has increased by 60%, the number of green frogs has decreased by 60%. It turns out that the fraction $\frac{\text{number of blue}}{\text{number of green}}$ of last year equals the fraction $\frac{\text{number of green}}{\text{number of blue}}$ now.
By what percentage did the total number of frogs change?

A. 0   **B.** 20   **C.** 30   **D.** 40   **E.** 50

---

25. Side by side, 2014 persons form a row. Each of them is either a liar (who always lies) or a knight (who always speaks the truth). Every person says: 'to the left of me there are more liars than there are knights to the right of me.'
How many liars are there in this row?

**A.** 0   **B.** 1   **C.** 1007   **D.** 1008   **E.** 2014

---

26. *Tom* has written down several different positive whole numbers, none exceeding 100.
Their product is not divisible by 18.
What is the maximum number of numbers he can have written down?

A. 68   **B.** 69   **C.** 72   **D.** 78   **E.** 90

---

27. Every three vertices of a cube form a triangle.
Some of these triangles are *not* inside one of the six faces of the cube.
How many of these are there?

A. 16   **B.** 24   **C.** 32   **D.** 40   **E.** 48

---

28. *M* is the centre of the circle,
P is a point outside the circle.
PT is a line tangent to the circle,
so *MT* is perpendicular to *PT*.
*PB* is a bisector of angle *TPA*.
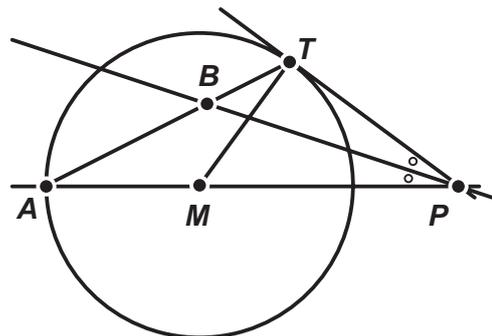
How big is angle *TBP?*

A. $37\frac{1}{2}°$ **B.** 40°   **C.** $42\frac{1}{2}°$ **D.** 45°   **E.** $47\frac{1}{2}°$

---

29. We write down all 7-digit numbers that can be made by using each of the digits 1, 2, 3, 4, 5, 6 and 7 only once. Next we order them in a sequence from smallest to largest.
We split this sequence of numbers exactly in the middle.
What is the largest number of the first half?

A. 1234567   **B.** 3765421   **C.** 4123567   **D.** 4352617   **E.** 4376521

---

30. *ABC* is a triangle with *AB* = 6, *AC* = 8 and *BC* = 10.
M is the midpoint of *BC*. *AMDE* is a square, *F* is the intersection of *AC* and *MD*.
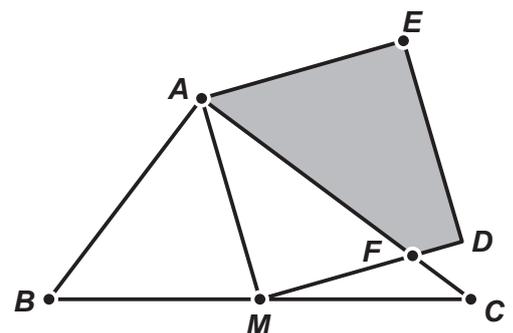
What is the area of the grey quadrilateral *AFDE?*

A. $\frac{124}{8}$ **B.** $\frac{125}{8}$ **C.** $\frac{126}{8}$ **D.** $\frac{127}{8}$ **E.** $\frac{128}{8}$