Kangaroo Junior, answer sheet
Upper Secondary 1st year

MAUNULAN YHTEISKOULU
Helsingin matematiikkalukio

NAME _____ CLASS/GROUP _____

Points _____ **Kangaroo leap** _____

Unfasten this answer sheet.

Write your answer under the problem number.
Leave the space empty if you do not know the answer.
It is not a good idea to guess, a wrong answer will cause a deduction of 1/4 of the max points!

Problem	1	2	3	4	5	6	7	8	9	10
Answer										

Problem	11	12	13	14	15	16	17	18	19	20
Answer										

Problem	21	22	23	24	25	26	27	28	29	30
Answer										

Vocabulary

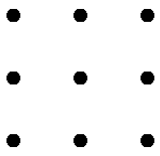
English	suomi	svensk
averige	keskiarvo	medelvärde
bisector	puolittaja	bisektris
cell	solu, ruutu	cell, ruta
collinear	samalla suoralla	på en rät linje
column	sarake	kolumn
cube	kuutio	kub
cuboid	suorakulmainen särmiö	rätvinklig parallellepiped
decimal fraction	desimaaliluku	decimaltal
decimal representation	kymmenjärjestelmän luku	decimalsystem
difference	etäisyys lukusuoralla	distans på tallinjen
dissect	leikata	skära
divisible	jaollinen	delbar
divisor	jakaja	delare, divisor
draught	nappula	bricka, spelmärke
even	parillinen	jämn
face	tahko	sidoyta, (sida)
hoop	rengas	ring
horizontal	vaakasuora	horisontal
infinite	ääretön	oändlig
inscribe	lisätä	inskriva
integer	kokonaisluku	heltal
intersect	leikata	skära
measure	pinta-ala	yta
median	keskijana	median
multiple	monikerta	multipel
odd	pariton	udda
omit	jättää pois	lämna ut
origin	origo	origo
perfect square	kokonaisluvun neliö	kvadrat av ett heltal
plane	taso	plan
prime number	alkuluku	primtal
queue	jono	kö
ratio	suhde	ratio
row	rivi	rad
shaded	varjostettu	skuggad
solid	kappale	kropp, rymdfigur
square	neliö	kvadrat
triangular	kolmion muotoinen	triangelformad
triple	kolminkertainen	tredubbel
vertex	kärki	hörn
vertical	pystysuora	lodrät, vertikal

3-Point-Problems

1. Which among these numbers is a multiple of 3?

(**A**) 2009 (**B**) $2+0+0+9$ (**C**) $(2+0)\cdot(0+9)$
(**D**) 200^9 (**E**) $200-9$

2. What is the smallest number of points in the figure one needs to remove so that no 3 of the remaining points are collinear?



(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 7

3. 2009 people have participated in a popular race. The number of people that John has won is three times the number of people that have won John. In what place has John been classified in the race?

(**A**) 503 (**B**) 501 (**C**) 500 (**D**) 1503 (**E**) 1507

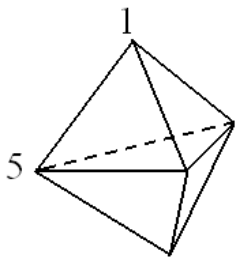
4. What is the value of the $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$ of $\frac{7}{8}$ of $\frac{8}{9}$ of $\frac{9}{10}$ of 1000?

(**A**) 250 (**B**) 200 (**C**) 100
(**D**) 50 (**E**) None of these

5. A long sequence of digits has been composed by writing the number 2009 repeatedly 2009 times. The sum of those odd digits in the sequence that are immediately followed by an even digit is equal to

(**A**) 2 (**B**) 9 (**C**) 4018 (**D**) 18072 (**E**) 18081

6. The picture shows a solid formed with 6 triangular faces. At each vertex there is a number. For each face we consider the sum of the 3 numbers at the vertices of that face. If all the sums are the same and two of the numbers are 1 and 5 as shown, what is the sum of all the 5 numbers?

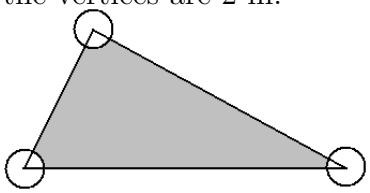


(**A**) 9 (**B**) 12 (**C**) 17 (**D**) 18 (**E**) 24

7. How many positive integers have equally many digits in the decimal representation of their square and their cube?

(**A**) 0 (**B**) 3 (**C**) 4
(**D**) 9 (**E**) infinitely many

8. The area of the triangle of the picture is 80 m^2 and the radii of the circles centered at the vertices are 2 m.



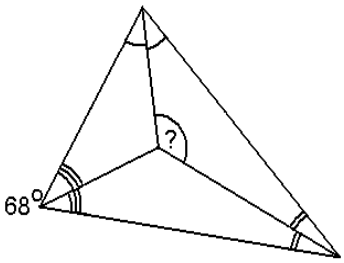
What is the measure, in m^2, of the shaded area?

(**A**) 76 (**B**) $80 - 2\pi$ (**C**) $40 - 4\pi$ (**D**) $80 - \pi$ (**E**) 78π

9. Leonard has written a sequence of numbers, such that each number (from the third number in the sequence) was a sum of previous two numbers in the sequence. The forth number in the sequence was 6 and the sixth number in the sequence was 15. What was the seventh number in the sequence?

(**A**) 9 (**B**) 16 (**C**) 21 (**D**) 22 (**E**) 24

10. A triangle has an angle of 68°. The three angle bisectors are drawn. How many degrees is the angle with the question mark?



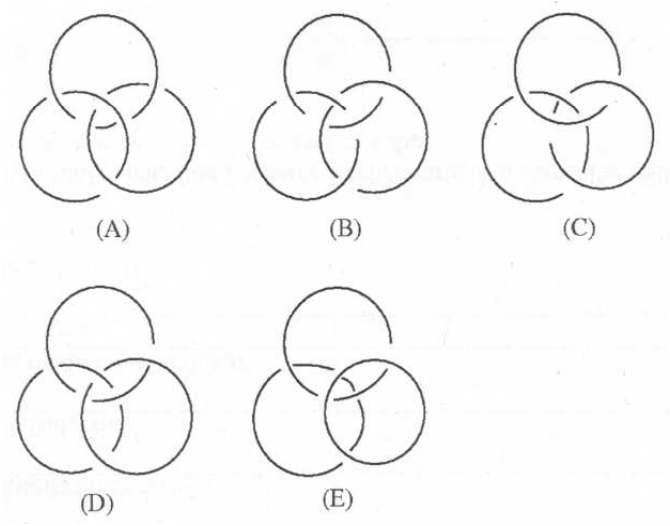
(**A**) 120° (**B**) 124° (**C**) 128° (**D**) 132° (**E**) 136°

4-Point-Problems

11. At each test, you can get 0, 1, 2, 3, 4 or 5 points. After 4 tests, the Mary's average is 4. One of the sentences cannot be true. Which is it?

(**A**) Mary got 4 points in each test.
(**B**) Mary got 3 points exactly twice.
(**C**) Mary got 3 points exactly 3 times.
(**D**) Mary 1 point exactly once.
(**E**) Mary 4 points exactly twice.

12. The Borromean rings have the surprising property that the three of them cannot be separated without destroying them but once one of them is removed (regardless which one), the other two are not linked anymore. Which of the following figures shows the Borromean rings?



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

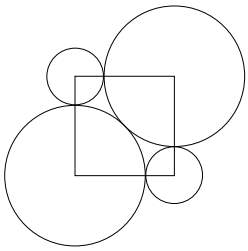
13. On the island of nobles and liars 25 people are standing in a queue. Everyone, except the first person in the queue, said that the person before him in the queue is a liar, and the first man in the queue said that all people standing after him are liars. How many liars are there in the queue? (Nobles always speak the truth, and liars always tell lies.)

(**A**) 0 (**B**) 12 (**C**) 13
(**D**) 24 (**E**) impossible to determine

14. If $a\square b = ab + a + b$, and $3\square 5 = 2\square x$, then x equals

(**A**) 3 (**B**) 6 (**C**) 7 (**D**) 10 (**E**) 12

15. Around the vertices of a square circles are drawn: 2 large and 2 small ones. The large circles are tangent to each other and to both the small circles. What is the ratio of the radius of the large circle to the radius of the small circle?



(**A**) $\frac{2}{9}$ (**B**) $\sqrt{5}$ (**C**) $1+\sqrt{2}$ (**D**) $2,5$ (**E**) $0,8\pi$

16. The distance on the number line between $\sqrt{n}$ and 10 is less than 1. How many such integer n exist?

(**A**) 19 (**B**) 20 (**C**) 39 (**D**) 40 (**E**) 41

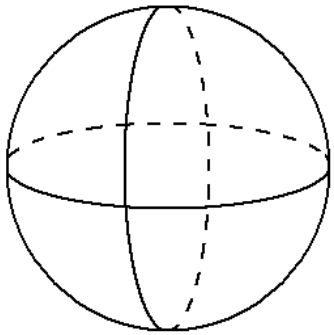
---

17. Man Friday wrote down in a row several different positive integers not exceeding 10. Robinson Crusoe examined these numbers and noticed with satisfaction that in each pair of neighbouring numbers one of the numbers is divisible by another. At most how many numbers did Man Friday write down?

(**A**) 6 (**B**) 7 (**C**) 8 (**D**) 9 (**E**) 10

---

18. 3 circular hoops are joined together so that they intersect at right angels as shown. A ladybird lands on an intersection and crawls around the hoop as follows : she travels along a quarter-circle, turns right 90°, travels along a quarter-circle and turns left 90°. Proceeding in this way, how many quarter-circles will she travel along before she first returns to her starting point?



(**A**) 6 (**B**) 9 (**C**) 12 (**D**) 15 (**E**) 18

---

19. How many zeros should be inscribed in place of $*$ in the decimal fraction $1.*1$ in order to get a number that is less than $\frac{2009}{2008}$ but greater than $\frac{20009}{20008}$?

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

---

20. If $a = 2^{25}$, $b = 8^8$ and $c = 3^{11}$, then

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

5-Point-Problems

---

21. How many ten-digit numbers only composed of 1, 2 and 3 exist, in which any two neighbouring digits differ by 1?

(**A**) 16 (**B**) 32 (**C**) 64 (**D**) 80 (**E**) 100

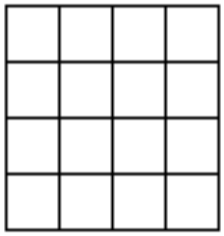
---

22. Young Kangaroo has 2009 unit $1 \times 1 \times 1$ cubes that he has placed forming a cuboid. He has also 2009 stickers 1×1 that he must use to color the outer surface of the cuboid. Young Kangaroo has achieved its goal and has stickers left. How many stickers has he left?

(**A**) more than 1000 (**B**) 763
(**C**) 476 (**D**) 49
(**E**) It is not true that the Kangaroo can achieve his goal

---

23. Bob wants to place draughts into cells of 4×4 board so that the numbers of the draughts in any row and in any column will be different (more than one draught can be placed into one cell as well as the cell can be empty). What is the smallest possible number of draughts placed on the board?



(**A**) 13 (**B**) 14 (**C**) 17 (**D**) 19 (**E**) 20

---

24. Some oranges, peaches, apples and bananas were put in a row, so that somewhere in the row each type of fruit can be found next to each other type of fruit. What is the least number of fruits in the row?

(**A**) 4 (**B**) 5 (**C**) 8
(**D**) 11 (**E**) this situation is impossible

---

25. What is the least integer n, for which $(2^2-1)\cdot(3^2-1)\cdot(4^2-1)\cdot\ldots(n^2-1)$ is a perfect square?

(**A**) 6 (**B**) 8 (**C**) 16 (**D**) 27 (**E**) other answer

---

26. All divisors of the number N, not equal to N or 1, were written in line. It occurred, that the greatest of the divisors in the line is 45 times as great as the least one. How many numbers satisfy this condition?

(**A**) 0 (**B**) 1 (**C**) 2
(**D**) more then 2 (**E**) impossible to determine

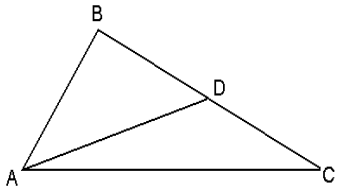
---

27. A kangaroo is sitting in the origin of a coordinate system. It can jump 1 unit vertically or horizontally. How many points are there in the plane where the kangaroo can be after 10 jumps?

(**A**) 100 (**B**) 121 (**C**) 400
(**D**) 441 (**E**) none of the others

---

28. Let AD be a median in the triangle ABC. The angle ACB has measure 30°, the angle ADB has measure 45°. What is the measure of the angle BAD?



(**A**) 45° (**B**) 30° (**C**) 25° (**D**) 20° (**E**) 15°

---

29. A square has been dissected into 2009 squares whose lengths of the sides are integers. What is the shortest possible length of the side of the original square?

(**A**) 44 (**B**) 45
(**C**) 46 (**D**) 503
(**E**) It is not possible to dissect a square into 2009 such squares

---

30. A prime number is defined as being "strange" if it is either a one digit prime or if it has two or more digits but both numbers obtained by omitting either its first or its last digit is also "strange". How many strange primes are there?

(**A**) 6 (**B**) 7 (**C**) 8 (**D**) 9 (**E**) 11
