**geometry problems from Olimpiada de Mayo, level 1, max 13 years old**
www.artofproblemsolving.com/community/c927574
by parmenides51, mathisreal

– level 1

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**1995.4** We have four white equilateral triangles of $3$ cm on each side and join them by their sides to obtain a triangular base pyramid. At each edge of the pyramid we mark two red dots that divide it into three equal parts. Number the red dots, so that when you scroll them in the order they were numbered, result a path with the smallest possible perimeter. How much does that path measure?

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**1995.5** A tortoise walks $60$ meters per hour and a lizard walks at $240$ meters per hour. There is a rectangle $ABCD$ where $AB = 60$ and $AD = 120$. Both start from the vertex $A$ and in the same direction ($A \to B \to D \to A$), crossing the edge of the rectangle. The lizard has the habit of advancing two consecutive sides of the rectangle, turning to go back one, turning to go forward two, turning to go back one and so on. How many times and in what places do the tortoise and the lizard meet when the tortoise completes its third turn?

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**1996.1** A terrain ( $ABCD$ ) has a rectangular trapezoidal shape. The angle in $A$ measures $90^o$. $AB$ measures $30$ m, $AD$ measures $20$ m and $DC$ measures 45 m. This land must be divided into two areas of the same area, drawing a parallel to the $AD$ side . At what distance from $D$ do we have to draw the parallel?
`https://1.bp.blogspot.com/-DnyNY3x4XKE/XNYvRUrLVTI/AAAAAAAAKLE/gohd7_S9OeIi-CVUVw-iM63uX`
`s400/image002.gif`

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**1997.2** In the rectangle $ABCD, M, N, P$ and $Q$ are the midpoints of the sides. If the area of the shaded triangle is $1$, calculate the area of the rectangle $ABCD$.
`https://2.bp.blogspot.com/-9iyKT7WP5fc/XNYuXirLXSI/AAAAAAAAKK4/10nQuSAYypoFBWGS0cZ5j4vn_`
`hkYr8rcwCK4BGAYYCw/s400/may3.gif`

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**1998.4** $ABCD$ is a square of center $O$. On the sides $DC$ and $AD$ the equilateral triangles DAF and DCE have been constructed. Decide if the area of the $EDF$ triangle is greater, less or equal to the area of the $DOC$ triangle.
`https://4.bp.blogspot.com/-o0lhdRfRxl0/XNYtJgpJMmI/AAAAAAAAKKg/lmj7KofAJosBZBJcLNHOJKjW3c`
`s1600/may4_2.gif`

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**1999.2** In a parallelogram $ABCD$ , $BD$ is the largest diagonal.
By matching $B$ with $D$ by a bend, a regular pentagon is formed.
Calculate the measures of the angles formed by the diagonal $BD$ with each of the sides of the parallelogram.

 

**1999.4** Ten square cardboards of $3$ centimeters on a side are cut by a line, as indicated in the figure. After the cuts, there are $20$ pieces: $10$ triangles and $10$ trapezoids. Assemble a square that uses all $20$ pieces without overlaps or gaps.
https://cdn.artofproblemsolving.com/attachments/7/9/ec2242cca617305b02eef7a5409e6a6b482d6
gif

**2000.2** Let $ABC$ be a right triangle in $A$ , whose leg measures $1$ cm. The bisector of the angle $BAC$ cuts the hypotenuse in $R$, the perpendicular to $AR$ on $R$ , cuts the side $AB$ at its midpoint. Find the measurement of the side $AB$ .

**2001.2** Let's take a $ABCD$ rectangle of paper; the side $AB$ measures $5$ cm and the side $BC$ measures $9$ cm.
We do three folds:
1.We take the $AB$ side on the $BC$ side and call $P$ the point on the $BC$ side that coincides with $A$.
A right trapezoid $BCDQ$ is then formed.
2. We fold so that $B$ and $Q$ coincide. A $5$-sided polygon $RPCDQ$ is formed.
3. We fold again by matching $D$ with $C$ and $Q$ with $P$. A new right trapezoid $RPCS$.
After making these folds, we make a cut perpendicular to $SC$ by its midpoint $T$, obtaining the right trapezoid $RUTS$.
Calculate the area of the figure that appears as we unfold the last trapezoid $RUTS$.

**2002.2** A rectangular sheet of paper (white on one side and gray on the other) was folded three times, as shown in the figure:
Rectangle $1$, which was white after the first fold, has $20$ cm more perimeter than rectangle $2$, which was white after the second fold, and this in turn has $16$ cm more perimeter than rectangle $3$, which was white after the third fold. Determine the area of the sheet.
https://cdn.artofproblemsolving.com/attachments/d/f/8e363b40654ad0d8e100eac38319ee3784a7a
png

**2003.2** The triangle $ABC$ is right in $A$ and $R$ is the midpoint of the hypotenuse $BC$ . On the major leg $AB$ the point $P$ is marked such that $CP = BP$ and on the segment $BP$ the point $Q$ is marked such that the triangle $PQR$ is equilateral. If the area of triangle $ABC$ is $27$, calculate the area of triangle $PQR$ .

**2004.2** Inside an $11 \times 11$ square, Pablo drew a rectangle and extending its sides divided the square into $5$ rectangles, as shown in the figure.
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gif
Sofía did the same, but she also managed to make the lengths of the sides of the $5$ rectangles be whole numbers between $1$ and $10$, all different. Show a figure like the one Sofia made.

**2004.4** In a square $ABCD$ of diagonals $AC$ and $BD$, we call $O$ at the center of the square. A square $PQRS$ is constructed with sides parallel to those of $ABCD$ with $P$ in segment $AO, Q$ in segment $BO, R$ in segment $CO, S$ in segment $DO$. If area of $ABCD$ equals two times the area of $PQRS$, and $M$ is the midpoint of the $AB$ side, calculate the measure of the angle $\angle AMP$.

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**2005.4** There are two paper figures: an equilateral triangle and a rectangle. The height of rectangle is equal to the height of the triangle and the base of the rectangle is equal to the base of the triangle. Divide the triangle into three parts and the rectangle into two, using straight cuts, so that with the five pieces can be assembled, without gaps or overlays, a equilateral triangle. To assemble the figure, each part can be rotated and / or turned around.

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**2006.2** A rectangle of paper of $3$ cm by $9$ cm is folded along a straight line, making two opposite vertices coincide. In this way a pentagon is formed. Calculate your area.

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**2007.5** You have a paper pentagon, $ABCDE$, such that $AB = BC = 3$ cm, $CD = DE = 5$ cm, $EA = 4$ cm, $\angle ABC = 100^o, \angle CDE = 80^o$. You have to divide the pentagon into four triangles, by three straight cuts, so that with the four triangles assemble a rectangle, without gaps or overlays. (The triangles can be rotated and / or turned around.)

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**2008.4** Let $ABF$ be a right-angled triangle with $\angle AFB = 90$, a square $ABCD$ is externally to the triangle. If $FA = 6$, $FB = 8$ and $E$ is the circumcenter of the square $ABCD$, determine the value of $EF$

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**2009.4** Three circumferences are tangent to each other, as shown in the figure. The region of the outer circle that is not covered by the two inner circles has an area equal to $2$ p. Determine the length of the $PQ$ segment .
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png

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**2010.1** A closed container in the shape of a rectangular parallelepiped contains $1$ liter of water. If the container rests horizontally on three different sides, the water level is $2$ cm, $4$ cm and $5$ cm. Calculate the volume of the parallelepiped.

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**2011.3** In the rectangle $ABCD, BC = 5, EC = 1/3CD$ and $F$ is the point where $AE$ and $BD$ are cut. The triangle $DFE$ has area $12$ and the triangle $ABF$ has area $27$. Find the area of the quadrilateral $BCEF$ .
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s400/may%2B2011%2Bl1.png

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**2012.3** From a paper quadrilateral like the one in the figure, you have to cut out a new quadrilateral whose area is equal to half the area of the original quadrilateral.You can only bend one or more times and cut by some of the lines of the folds. Describe the folds and cuts and justify that the area is half.

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s400/may%2B2012%2Bl1.png

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**2013.3** Let $ABCD$ be a square of side paper $10$ and $P$ a point on side $BC$. By folding the paper along the $AP$ line, point $B$ determines the point $Q$, as seen in the figure. The line $PQ$ cuts the side $CD$ at $R$. Calculate the perimeter of the$PCR$ triangle.
https://3.bp.blogspot.com/-ZSyCUznwutE/XNY7cz7reQI/AAAAAAAAKLc/XqgQnjm8DQYq6Q7fmCAKJwKt3i
s400/may%2B2013%2Bl1.png

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**2014.4** Let $ABC$ be a right triangle and isosceles, with $\angle C = 90^o$. Let $M$ be the midpoint of $AB$ and $N$ the midpoint of $AC$. Let $P$ be such that $MNP$ is an equilateral triangle with $P$ inside the quadrilateral $MBCN$. Calculate the measure of $\angle CAP$

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**2015.3** In the quadrilateral $ABCD$, we have $\angle C$ is triple of $\angle A$, let $P$ be a point in the side $AB$ such that $\angle DPA = 90$ and let $Q$ be a point in the segment $DA$ where $\angle BQA = 90$ the segments $DP$ and $CQ$ intersects in $O$ such that $BO = CO = DO$, find $\angle A$ and $\angle C$.

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**2016.4** In a triangle $ABC$, let $D$ and $E$ point in the sides $BC$ and $AC$ respectively. The segments $AD$ and $BE$ intersects in $O$, let $r$ be line (parallel to $AB$) such that $r$ intersects $DE$ in your midpoint, show that the triangle $ABO$ and the quadrilateral $ODCE$ have the same area.

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**2017.3** Let $ABCD$ be a rhombus of sides $AB = BC = CD = DA = 13$. On the side $AB$ construct the rhombus $BAFC$ outside $ABCD$ and such that the side $AF$ is parallel to the diagonal $BD$ of $ABCD$. If the area of $BAFE$ is equal to $65$, calculate the area of $ABCD$.

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**2018.3** Let $ABCDEFGHIJ$ be a regular $10$-sided polygon that has all its vertices in one circle with center $O$ and radius $5$. The diagonals $AD$ and $BE$ intersect at $P$ and the diagonals $AH$ and $BI$ intersect at $Q$. Calculate the measure of the segment $PQ$.

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**2019.4** You have to divide a square paper into three parts, by two straight cuts, so that by locating these parts properly, without gaps or overlaps, an obtuse triangle is formed. Indicate how to cut the square and how to assemble the triangle with the three parts.

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**2020.3** A clueless ant makes the following route: starting at point $A$ goes $1$ cm north, then $2$ cm east, then $3$ cm south, then $4$ cm west, immediately $5$ cm north, continues $6$ cm east, and so on, finally $41$ cm north and ends in point $B$. Calculate the distance between $A$ and $B$ (in a straight line).

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**2021.1** In a forest there are $5$ trees $A, B, C, D, E$ that are in that order on a straight line. At the midpoint of $AB$ there is a daisy, at the midpoint of $BC$ there is a rose bush, at the midpoint of $CD$ there is a jasmine, and at the midpoint of $DE$ there is a carnation. The distance between $A$ and $E$ is $28$ m; the distance between the daisy and the carnation is $20$ m. Calculate the distance between the rose bush and the jasmine.

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**2021.4** Facundo and Luca have been given a cake that is shaped like the quadrilateral in the figure.
https://cdn.artofproblemsolving.com/attachments/3/2/630286edc1935e1a8dd9e704ed4c813c90038
png
They are going to make two straight cuts on the cake, thus obtaining $4$ portions in the shape of a quadrilateral. Then Facundo will be left with two portions that do not share any side, the other two will be for Luca. Show how they can cut the cuts so that both children get the same amount of cake. Justify why cutting in this way achieves the objective.

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**2022.5** Vero had an isosceles triangle made of paper. Using scissors, he divided it into three smaller triangles and painted them blue, red and green. Having done so, he observed that: • with the blue triangle and the red triangle an isosceles triangle can be formed, • with the blue triangle and the green triangle an isosceles triangle can be formed, • with the red triangle and the green triangle an isosceles triangle can be formed.
Show what Vero's triangle looked like and how he might have made the cuts to make this situation be possible.

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