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Handouts from the Canadian IMO Training Camps Recommendation Book I have taught classes on various math Olympics training programs. Here are some of my handouts and training materials. If you don't know where to start, I recommend a cyclical four-way-big picture and three Lemmas in geometry. Algebra Combinatorics geometry Lemmas in Euclidean geometry - Canadian 2007 Summer Training Collection of commonly encountered configurations in geometry problems. Cyclical Four-Sided - The Big Picture - Canadian 2009 Winter Training explores many of the properties of the full cyclical quadrilateral and its Miquel point, and discusses several useful geometric techniques. Three Lemms in Geometry (Solutions) - Canadian 2010 Winter Learning Point (Solutions) - UK Trinity Training 2011 (Mint Group) Circles - Canadian 2008 Summer Training contains a section on the specific configuration of the tangent circle, and another section on design geometry, poles and polar. Here are some extra foods for thought. Similarities - Canadian 2007 Summer Training applications have similar triangles and spiral similarities. Recommendations on number theory Here are some of my book recommendations for preparing for math competitions, to a roughly increasing degree of difficulty. Introductory Advanced The next 154 pages in this category, out of 154 total. Welcome here you can : find Euclidal geometry problem (with or without aops links) from magazines: download in PDF problem collections from mathematical reflections (MR) Romanian Mathematical Journal (RMM) So far here are collected problems from: x p/y x problem in y clock ALL - all the problems of the geometry of the Olympics, from the very beginning of the Multinational competition Of the Asia-Pacific Olympiad in mathematics (AP) 1989- 5 p/4 h Mathematical Competition 1978 - 2006 (continued MEMO) Balkan Mathematical Olympiad 1984- (also in Greek) Flux Mathematical Olympiad (BxMO) 2009- No4 p/ 4 1/2 h Caucasian Mathematical Olympiad 2015 - 4p/4h/2d Central American and Caribbean Mathematical Olympus. (OMCC) 1999- (as in IMO) Kono Sur Mathematics Olympiad / Southern Cone (OMCS) 1989- Czech-Polish-Slovak match 1995- (as in IMO) (started as a Czech-Slovak match) Czech -Polish Slovak Junior Match 2012- as in IMO European Youth Mathematical Olympiad (EGMO) 2012- as in IMO European Mathematical Cup (EMC) 2012- 4 p/4 h Mathematical Cup 2019- Francophone Mathematical Olympiad (OFM) 2020 Formula Of Unity / Third Millennium 2013- Persian Gulf Mathematical Olympics (GMO) 2012-American Mathematical Olympiad (OIM) 1985- International Mathematical Olympiad (IMO) 1959- (1959-92 also in Greek) International Mathematical Olympiad Shortlist (IMO SHL ISL) 1993 - 2018 (and years 1968-92) Iranian Geometry Olympics (IGO) 2014- 5 p / 4 1/2 h Junior Balkan Mathematical Olympiad with shortlist (JBMO) 1997- 4 p/ 4 1/2 h (years 2009-16 also in Greek) Lusophon Mathematical Olympiad (OM CPLP) 2011- Mathematical Ashes (UK v Australia) 2008- 3 p/ 4 1/2 h May Olympics (Mayo) 1995- Mediterranean Mathematical Competition (MMC) 1998- 4 p / 41/2 h Metropolis International Olympiad (IOM) 2016- No 8 from the same city : 2 days, 3 p/41/2 -6 h every day , also in computer science, chemistry, physics Middle European Mathematical Olympiad (MEMO) 2007- as individually: 4 p/ 5 h, as part of the team 6: 8 p/ 5 h' Scandinavian Mathematical Competition (NMC) 1987- No 4 r/ 4 h Pan-African Mathematics Olympiad (PAMO) 2000- Rijdeins Mathematical Olympiad Levels 1-3 (OMR) 1990- Romanian Master of Mathematics (RMM) 2008- (as in IMO) Sharygin Geometry Olympiad EN and RU 2005- Silk Road Mathematics Competition (SRMC) 2002- Tournament of Cities International Mathematics (ToT) 2001-10 (until 2001) Tuimaada International Olympiad 1994- 2 days, 4 p/5h, in addition, in computer science, chemistry, physics yautykov Olympiad International (IO) 2005- as in IMO, max 7 completely, maximum 3 in mathematics, max 2 in physics, maximum 2 in computer science (ALL) Page 2 1959 IMO Problem 4 Build the right triangle with this hypotenuse c so that the median facing the hypotenuse is the geometric average of the two legs of the triangle. 1959 IMO Problem 5 (ROM) (also) Arbitrary M item selected in the interior of the AB segment. The AMCD and MBEF squares are built on the same side of AB, with AM and MB segments as their respective bases. The circles circled by these squares, with the centers P and q, intersect on M, and at another point N. Let N q denote the crossing point of the AF and BC direct lines. (a) Prove that the N and N scores are the same. b) Prove that the straight lines of MN pass through the fixed point S regardless of the choice of M. c) Find the locus of the middle points of the segments of the PP, as M varies between A and B. Cesar Cosnita 1959 IMO Problem 6 (CSC) (also) Two aircraft, P and H, intersect along the line of the P. Point A is given in the P plane, and the point of the C in the plane, none of these points lies on the straight line. : Build isosceles trapezoidal ABCD (with AB parallel CD), in which the circle can be inscribed, and with vertices B and D lying in the planes P and q respectively. 1960 IMO Problem 3 (ROU) In this right abc triangle, hypotenuses BC, length a, is divided into n equal parts (n odd integer). Let there be a sharp subtending angle, from A to that segment that contains the middle of the hypotenuse. Let h be the height length of the hypotenuse triangle. Prove that $'tan omega frac4nh on the left (No. {2}-1 (right) Alpha $ George D. Simionescu 1960 IMO Problem 4 (HUN) Build the ABC Triangle, given the ha ,hb (heights from A and B) and ma, median from the top of A. 1960 IMO Problem 5 (CSU) (also) Consider the ABCDA'C'D' cube (with the face of ABCD directly above the face of A'B'C'D'). where X is any AC point and Y is any B'D'. b) Find locus dots that lie on XY segments (a) in a way that ZY 2 XZ. 1960 IMO Problem 7 (BUL) Isosceles trapezoidal with bases A and B and h height is given. a) On the axis of symmetry of this trapezoid, find all P points so that both feet are trapezoidal subtension right angles on P. b) Calculate the P distance from any base. (c) Determine under what conditions such P. points actually exist (Discuss the various cases that may occur). 1961 IMO 4 (GDR) Problem Consider the triangle P1P2P3 and point P in the triangle. P1P, P2P, P3P lines cross opposite sides in points No. 1, No. 2, No. 3, respectively. Prove that of the numbers, the frakP{1}PPC {1}, FrakP{2}PPH {2}, FrakPP{3} of the PP {3} at least one ≤ and at least one ≥ 2. 1961 IMO Problem 5 (CS) Build an ABC triangle if AC q b, AB and amb , where M is the middle segment of BC and q q zlt; 90o. Prove that the solution exists if and only $b if $b the harfi frac-omega {2} le c'lt.b$. In what case is equality? 1961 IMO Problem 6 (ROM) Consider the plane ε and three non-coulinar points A, B, C on the same side of the ε, let's assume that the plane is defined by these three points not parallel to ε. (We won't consider the positions of points A, B, C, for example, that points L, M, N do not form a triangle.) What is the locus of a G point like the q, B, C q. range yourself over the plane ε? Gheorghe D. Simionescu 1962 IMO Problem 3 (CCA) Consider the ABCDA Cube qB qC qD q (ABCD and A qB qC qD q are the upper and lower bases, respectively, and the edges of the AA, BB', CC q, DD q parallel). Point X moves at a constant speed around the perimeter of the ABCD square in the direction of ABCDA, and point Y moves at the same speed around the perimeter of the square B qC qCB in the direction of B qCB q. Points X and Y begin their movement at the same instant from the starting positions A and B respectively. Identify and draw a midpoint locus of XY segments. 1962 IMO Problem 5 (BUL) On circle K are given three distinct points A,B,C. Design (using only straightedge and compasses) the fourth point D on K so that the circle can be entered in a four-way thus received. 1962 Problem IMO 6 (GDR) Consider the triangle of isoceles. Let the r be the radius of its limited circle and the radius of its inscribed circle. Prove that the D distance between the centers of these two circles 1962 IMO Problem 7 (USS) Tetraedre SABC has the following property: there are five spheres, each tangent to the edges of SA, SB, SC, B.E., CA, AB or their extension. (a) Prove that SABC tetraedre is a regular one. (b) Prove, on the contrary, that there are five such spheres for every ordinary tetraedron. 1963 IMO Problem 2 (USS) Point No. Identify the locus points in the space that are vertices straight angles with one hand passing through the q, and the other side intersects segment B.C. 1963 IMO Problem 3 (HUN) In n-gon all the internal angles are equal, the length of successive sides meet the ratio of No. 1≥ No. 2 ≥ ... ≥ Yong. Prove that Nos. 1 and No.2... 1964 IMO Problem 3 (YUG) The circle is inscribed in the ABC triangle with sides A, b, C, Tangents to the circle parallel to the sides of the triangle built. Each of these tangents cuts off the triangle from the ABC Δ. Each of these triangles has a circle. Find the amount всех четырех вписанных кругов (с точки зрения a, b, c). 1964 ИМО Проблема 6 (POL) В тетраэдрон ABCD, вершина D связана с Do центроид Δ ABC. Линии, параллельные D Do, протягиваются через A, B и C: Эти линии пересекают плоскости BCD, CAD и ABD в точках A1, B1 и C1 соответственно. Докажите, что объем ABCD составляет одну треть объема A1B1C1Do. Является ли результат верным, если точка Do выбрана в любом месте в течение Δ ABC 1965 ИМО Проблема 3 (СЗС) Учитывая тетраэдр ABCD, чьи края AB и CD имеют длины и б соответственно. Расстояние между линиями перекоса AB и CD d, а угол между ними составляет . Tetrahedron ABCD делится на две твердые тела по плоскости ε, параллельно линиям AB и CD. Соотношение расстояний от ε AB и CD равно k. Вычислить соотношение объемов двух полученных твердых веществ. 1965 ИмО Проблема 5 (ROM) Рассмотрим Δ OAB с острым углом AOB: Через точку M ≠ O перпендикуляры обращается к OA и OБ, ноги которых P и Q соответственно. Точкой пересечения высот Δ является H. Что такое локус H, если M разрешено варьироваться над (a) боковой AB, b) интерьер Δ OAB? Георге Д. Симионеску 1966 ИМО Проблема 3 (BUL) Доказать: Сумма расстояний vertices регулярного тетраэдр из центра его ограниченной сферы меньше, чем сумма расстояния этих vertices от любой другой точки в пространстве. 1966 ИМО Проблема 6 (POL) В интерьере сторон до н.э., КАЛИФОРНИЯ, AB треугольника ABC, любые точки K, L, M соответственно, выбраны. Докажите, что площадь по крайней мере одного из треугольников AML, BKM, CLK меньше или равна одной четверти площади треугольника ABC. 1967 ИМО Проблема 1 (CS) Пусть ABCD будет параллелограмма с боковыми длинами AB No α, AD No 1, и с 0 так, что <BAD == ω.= if= Δabd= is= acute,= prove= that= the= four= circles= of= radius= 1= with= centers= a,b,c,d= cover= the= parallelogram= if= and= only= if = $a\le= \cos= \omega= +\sqrt{3}\sin= \omega$= 1967= imo= problem= 2= (pol) = prove= that= if= one= and= only= one= edge= of= a= tetrahedron= is= greater= than= 1,= then= its= volume= is= ≤= 1= 8.= 1967= imo= problem= 4= (ita) = let= ao= boco= and= a1b1c1= be= any= two= acute-angled= triangles.= consider= all= triangles= abc= that= are= similar= to= Δ= a1b1c1= (so= that= vertices= a1,b1,c1= correspond= to= vertices= a ,= b,= c = respectively)= and= circumscribed= about= triangle= aoboco = (where= ao= lies= on= bc,= bo = on= ca,= and= co= on= ab).= of= all= such= possible= triangles,= determine= the= one= with= maximum= area,= and= construct= it.= by= tullio= viola= 1968= imo= problem= 4= (pol) = prove= that= in= every= tetrahedron= there= is= a= vertex= such= that= the= three= edges= meeting= there= have= lengths= which= are= the= sides= of= a= triangle.= 1969= imo= problem= 3= (pol) = for= each= value= of= k=1,2,3,4,5 find= necessary= and= sufficient= conditions= on= the= number= a=> существует тетраэдр с k края длины, а остальные 6-k края </BAD>1. 1969 IMO Problem 4 (NET) Semicircular arc γ on AB as diameter. C is a point on γ other than A and B, and D is the foot perpendicular to C to AB. We consider three laps: No1, No2, No.3, all tangents to the line. Of these, No.1 is inscribed in the ABC Δ, while No.2 and No.3 are both concerning CD and γ, one on each side of the CD. Prove that No.1, No.2 and No.3 have a second tangent common. 1970 IMO Problem 1 (POL) Let M be a point on the AB ΔABC side. Let r1, r2 and r be the radius of the inscribed circles of triangles AMC, BMC and ABC. Let q1, q2 and q be radii of the excruges of the same triangles that lie at the angle of the ACB. Prove that $\frac{{{r}_{1}}}{{{q}_{1}}}\cdot \frac{{{r}_{2}}}{{{q}_{2}}}=\frac{r}{q}$ 1970 IMO Problem 5 (BUL) In the tetrahedron ABCD, angle BDC is a right angle. Suppose the H leg perpendicular from D to the ABC plane is crossing the heights ΔABC. Prove that (AB and BC) 2 ≤ 6 (AD2 and BD2 and CD2). Why does tetrahedra hold equality? 1971 IMO Problem 2 (USS) Consider the convex multi-adron P1 with nine vertices A1A2, ... A9. Let Pi be a polyhedron derived from the P1 translation that moves the top of the A1 to Ai (i No. 2, 3, ... 9): Prove that at least two of the polyhedra P1,P2, ... , P9 have an inner point in common. 1971 IMO Problem 4 (NET) All ABCD tetraedre faces are sharp angular triangles. We look at all closed polygonal pathways of the XY'TX form, defined as follows: X is a point on the edge of AB, different from A and B; similarly, Y, q, T are the inner dots of the edges of B.C., CD, DA respectively. Prove: a) If ≠ there are no minimum lengths among the polygonal paths among the polygonal paths, there is not a single minimum length among the polygonal paths. b) If there are infinitely many short-range polygonal pathways, their total length is 2AC of sin (a/2), where a zlt;BAC is a zlt; CAD and d'DAB. 1972 IMO Problem 2 (NET) Prove that if n ≥ 4, each four-sided that can be inscribed in a circle can be dissected in n four-sided each of which is indescribable in a circle. 1972 IMO Problem 6 (GBR) Given four different parallel planes, prove that there is a regular tetraedre with a top on each plane. 1973 IMO Problem 2 (POL) Determine whether there is a final set of M points in space not lying in the same plane, so for any two points A and B M, you can choose two other C and D M points, so that the AB and CD lines are parallel and do not match. 1973 G. IMO Problem 4 (YUG) Soldier should check the presence of mines in the region, which are shaped like an equilateral triangle. The radius of its detector is half the height of the triangle. The soldier leaves one top of the triangle. What path does he take to drive as little as possible and accomplish his mission? By George Dugosia 1975 Problem 3 (NET) On the sides of the arbitrary triangle ABC triangles ABR, BCP, C'A are built externally with zlt;CBP - qlt;CA - 450 , qlt;BCP - zlt;AC 300, zlt;ADB - zlt;BAR 150 . Prove that the RP 900 and the CD is RP. Jan van de Kraats 1976 IMO Problem 1 (CPC) In the plane bulging four-sided area 32, the sum length of the two opposite sides and one diagonal is 16. Identify all possible lengths of the other diagonal. 1977 IMO Problem 2 (NET) Equilateral Triangles ABK,BCL, CDM, DAN built inside the ABCD square: Prove that the middle points of the four segments of KL,LM, MN, NK and the middle points of the eight segments of AK, BK, BL, CL,CM, DM, DN,AN are twelve verticals of the usual dodecagon. Jan van de Kraats 1978 IMO Problem 2 (USA) P is a given point within this sphere. Three mutually perpendicular rays from P cross the sphere at points U, V and W, q denotes the top diagonally opposite P in a parallelepipede defined by PU, PV and PW. Find a locus for all such triads of rays from P. Murray Clumkin 1978 IMO Problem 4 (USA) In the Triangle ABC, AB and AC. The circle is tangential internally to the circle of the ABC triangle, as well as to the parties of AB, AC on P, q, respectively. Prove that the middle point of the PP segment is the center of the ABC triangle. Murray Clamkin 1979 IMO Problem 3 (USS) Two laps in the plane intersect. Let A be one of the crossing points. Starting simultaneously with two points to move at a constant speed, each point travels in its own circle in the same sense. These two points return to A at the same time after one revolution. Prove that there is a fixed P point in the plane, so that at any time the distances from P to moving points are equal. Nikolai Vasilyev and Igor F. Sharygin 1979 IMO Problem 4 (USA) Given the plane π, point P in this plane and the point is not π, find all R points in π so that the ratio of $fracPR $ is maximum. Murray Clamkin's 1981 IMO Problem 1 (GBR) P is the point inside this ABC triangle. D,E, F are feet perpendiculars from P to B.C. lines, CA, AB respectively. Find all the P for which the least of the least $'frac-BC-PD-FRAc-CA-PE-FRAc-AB-PF.$ David Monk 1981 IMO Problem 5 (USS) Three congruent circles have a common point O and lie inside this triangle. Each circle touches a pair of sides of the triangle. Prove that the center and circumference of the triangle and point O are collelar. 1982 ImO Problem 2 (NET) Non-isosceles triangle A1A2A3 is given with sides a1, a2, a3 (ay is the party opposite Ai). For all I th 1, 2, 3, Mi is the middle side of ai, and Ti is the point where the i circle touches the sides of ai. Denotes Si reflection Ti in the interior bisector angle Ai. Prove that the M1S1, M2S2 and M3S3 lines are simultaneous. Jan van de Kraats 1982 IMO Problem 5 The AC and CE of the usual ABCDEF hexagon are divided into internal points of M and N, respectively, so $'frac-AM-AC'FRAc-CN'CE'r$. Determine whether b,M and N collar are. Jan van de Kraats 1983 IMO Problem 2 (USS) Let it be one of two different crossing points of two unequal coplanary circles C1 and C2 with the centers O1 and O2, respectively. One of the common tangents to circles concerns C1 on P1 and C2 on P2, while the other touches C1 at No.1 and C2 on q2. Let the M1 be the middle point of P1'1 and M2 to be the middle point of P2'2. Prove that it's zlt;O1AO2 and M1AM2. Igor F. Sharygin 1983 IMO Problem 4 (BEL) Let THE ABC be an equilateral triangle and E set all points contained in three segments of AB, BC and CA (including A, B and C). Determine whether each section E contains two disparate subsets of at least one of the two subsets, the right-angle vertical triangle. Justify your answer. 1984 IMO Problem 4 (ROM) Let the ABCD be convex four-sided so that the CD line is tangent to circle on AB as diameter. Prove that the AB line is tangent to circle on a CD in diameter, if and only if the lines of B.C. and AD are parallel. According to Laurentiu Panaitopol 1985 IMO Problem 4 (GBR) Circle has a center on the AB side of the cyclical four-sided ABCD. The other three sides touch the circle. Prove that AD and B.C. and AB. Frank Budden 1985 IMO Problem 5 (USS) Circle with Center O runs through the vertices A and C triangles of ABC and crosses the segments ab and B.C. again at various points K and N respectively. The cropped circles of the ABC and EBN triangles intersect at exactly two different points B and M. Prove that the angle of the OMB is a right angle. Igor F. Sharygin 1986 IMO Problem 2 (CHN) Triangle A1A2A3 and Point P0 are given in the plane. We define th as an ace-3 for all ≥ 4. We're building a set of P1, P2, P3, ... He was a - he said . . . . He was a - he said , he said that I. Prove that if P1986 and P0, then the triangle A1A2A3 is equilateral. Gengzhe Chang and Dongxu Qi 1986 IMO Problem 4 (ICE) Let A, B be adjacent vertices regular n-gon (n ≥ 5) in a plane having a center on the O. Triangle XY, which coincides with the OAB and initially coincides with it, moves in a plane in such a way that Y and q each trace the entire boundary of the landfill, remaining inside the firing range. Find Locus X. Sven Sigursson 1987 IMO Problem 2 (USS) In the acute triangle ABC inner corner bisector intersects B.C. on L and crosses the ABC circle again on N. From point L perpendiculars to AB and AC, the legs of these perpendicular time K and M respectively. Prove that the four-way AKNM and the ABC Triangle have equal areas. I.A. Kushner 1988 1988 Problem 1 (LUX) Consider two concentric ranges of radii R and r (R zgt;r) with the same center. Let the P be a fixed point on a smaller circle and a B variable point on a large circle. The BP line again meets with a large circle on C. Perpendicular L to BP on P meets a smaller circle again on A. (If L concerning to the circle at P then ≡ P.) i) find a set of values BC2 and CA2 and AB2. (ii) Find the locus of mid-BC Lucien Kiefer 1988 IMO Problem 5 (GRE) ABC is a triangle right-field on, and D is a foot of height from the A. Direct Line, connect incenters of the triangles ABD, ACD crosses the sides of AB, AC on points K, L respectively. S and T denote areas of the ABC and AKL triangles respectively. Show that S ≥ 2T. Dimitris Kontogiannis 1989 IMO Problem 2 (AUS) In the sharp triangle ABC inner corner bic overream. B1 and C1 points are defined in the same way. Let the A0 be the crossing point of the AA1 line with the outer bic overs of B and C. Points B0 and C0 are defined equally. Prove this: (i) the A0B0C0 triangle area is twice the size of the AC1BA1CB1 hexagon. (ii) The area of the A0B0C0 triangle is at least four times the area of the ABC triangle. Esther Szekeres 1989 IMO Problem 4 (ICE) Let the ABCD be dished out four-sided in such a way that the sides of AB, AD, B.C. meet AB and BC. There is a P point inside the quadrilateral at a distance of H from the CD line so that the AP show that: ${1} sq'h'ge (frak{1} sqrt-{1} BC'$. Eggert Brie 1990 IMO Problem 1 (IND) Chords AB and CD circle intersect at point E inside the circle. Let M be the inside point of the EB segment. The touchline on E to circle through D, E and M crosses the B.C. and AC lines on F and G, respectively. If $'frac-AM'AB't$, find $'frac-EF'EG'$ in terms of t. C.R. Pranesachar 1991 IMO Problem 1 (USS) Given the ABC triangle, let me be the center of his inscribed circle. Internal 1C corners bisedators A,B,C meet opposite sides in A', B' , C' respectively. Prove that $'frac{1}{4}'lt'frac'AI'cdot BI'cdot CI'A'cdot BB'cdot CC'le 'frac{8}{27}$ Arkady Skopfenkov 1991 IMO Problem 5 (FRA) Let ABC be a triangle and P internal dot ABC . Show that at least one of the zlt;PAB, zlt;PBC, zlt;PCA is smaller or equal to 300. Johan Yebbou 1992 IMO Problem 1 (FRA) In the plane let C be circled, L line tangent to circle C and M point on L. Find the locus of all P points with the following property: there are two points, R on L so that M is the middle point of the CD and the C is inscribed by the circle of the PHA triangle. by Johan Yebbou Let $R $and $S $be distint points on the $8m circle and let $t $ label tangent up to $Omega$at a price of $$R. Item $R $1.5 billion is a reflection of the $$R in relation to the $$S. Item I is chosen at a smaller arc of $$RS-Omega$, so the circumference of the $-Gamma$ISR's triangle is crossed $t $2 at two different points. Labeled by Aa total item of $1,000 and t, which is closest to the $$R. Line $AI $200m Omega$1 $J the A2000, $JR ' on a tangent up to $Gamma$. Let $-Gamma$ be a circle of a sharp triangle ABC. The $$D and $$E points are on the $$AB and $$AC segments, respectively, $AD and AE$. Perpendicular bisectories of $$BD and $CE$$CE cross the minor arcs of the $$AB and AC-Gamma$in items of $$F and G respectively. Prove that $DE $$FG $either parallel or they are the same line. Silanos Brazitikos, Vangelis Psyxas and Michael Sarantis dished out four-way $ABCD $$AB'cdot CD and BC'cdot DA$. Item X is inside the $$ABCD, so $'angle (XAB) - angle (XXD) , text and four, angle (XBC) that for the shortlist corner (corner) DXC 180circ$ for shortlists: IMO Collection of challenges proposed for the International Mathematical Olympiads 1959-2009, 2nd edition download apk google play store versi terbaru. download apk google play store terbaru 2020. download google play store apk terbaru versi 4.4.21. download google play store apk terbaru versi 3.10.14. download google play store mod apk terbaru. download google play store terbaru 2018 apk. download layanan google play store terbaru apk. download google play store terbaru apkpure