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Geometry theorem relating the line segments created by intersecting chords in a circle $|AS| \cdot |SC| = |BS| \cdot |SD|$ $\{ \displaystyle |AS| \cdot |SC| = |BS| \cdot |SD| \}$ $|AS| \cdot |SC| = |BS| \cdot |SD| = (r+d) \cdot (r-d) = r^2 - d^2$ $\{ \displaystyle \begin{aligned} |AS| \cdot |SC| &= |BS| \cdot |SD| \\ &= (r+d) \cdot (r-d) = r^2 - d^2 \end{aligned} \}$ $\Delta A S D \sim \Delta B S C$ $\{ \displaystyle \triangle ASD \sim \triangle BSC \}$ In Euclidean geometry, the intersecting chords theorem, or just the chord theorem, is a statement that describes a relation of the four line segments created by two intersecting chords within a circle. It states that the products of the lengths of the line segments on each chord are equal. It is Proposition 35 of Book 3 of Euclid's Elements. More precisely, for two chords AC and BD intersecting in a point S the following equation holds: $|AS| \cdot |SC| = |BS| \cdot |SD|$ $\{ \displaystyle |AS| \cdot |SC| = |BS| \cdot |SD| \}$ The converse is true as well. That is: If for two line segments AC and BD intersecting in S the equation above holds true, then their four endpoints A, B, C, D lie on a common circle. Or in other words, if the diagonals of a quadrilateral ABCD intersect in S and fulfill the equation above, then it is a cyclic quadrilateral. The value of the two products in the chord theorem depends only on the distance of the intersection point S from the circle's center and is called the absolute value of the power of S; more precisely, it can be stated that: $|AS| \cdot |SC| = |BS| \cdot |SD| = r^2 - d^2$ $\{ \displaystyle |AS| \cdot |SC| = |BS| \cdot |SD| = r^2 - d^2 \}$, where r is the radius of the circle, and d is the distance between the center of the circle and the intersection point S. This property follows directly from applying the chord theorem to a third chord (a diameter) going through S and the circle's center M (see drawing). The theorem can be proven using similar triangles (via the inscribed-angle theorem). Consider the angles of the triangles ΔASD and ΔBSC : $\angle A D S = \angle C B S$ (inscribed angles over AB) $\angle A S D = \angle B S C$ (inscribed angles over CD) $\angle A S D = \angle B S C$ (opposing angles) $\{ \displaystyle \begin{aligned} \angle ADS &= \angle CBS \\ \angle ASD &= \angle BSC \\ \angle ASD &= \angle BSC \end{aligned} \}$ This means the triangles ΔASD and ΔBSC are similar and therefore $A S S D = B S S C = |A S| \cdot |S C| = |B S| \cdot |S D|$ $\{ \displaystyle \frac{AS}{BS} = \frac{SD}{SC} \}$ $\{ \displaystyle \frac{AS}{BS} = \frac{SD}{SC} \}$ $\{ \displaystyle \frac{AS}{BS} = \frac{SD}{SC} \}$ Next to the tangent-secant theorem and the intersecting secants theorem, the intersecting chords theorem represents one of the three basic cases of a more general theorem about two intersecting lines and a circle - the power of a point theorem. Paul Glaister: Intersecting Chords Theorem: 30 Years on. Mathematics in School, Vol. 36, No. 1 (Jan., 2007), p. 22 (JSTOR) Bruce Shawyer: Explorations in Geometry. World scientific, 2010, ISBN 9789813100947, p. 14 Hans Schupp: Elementargeometrie. Schöningh, Paderborn 1977, ISBN 3-506-99189-2, p. 149 (German). Schülerududen - Mathematik I. Bibliographisches Institut & P.A. Brockhaus, 8. Auflage, Mannheim 2008, ISBN 978-3-411-04208-1, pp. 415-417 (German) Intersecting Chords Theorem Archived 2020-12-01 at the Wayback Machine at proofwiki.org Weisstein, Eric W. "Chord". MathWorld. Two interactive illustrations: [1] and [2] Retrieved from "The diagram below shows a circle with centre O and two chords PQ and RS. The chords PQ and RS meet at the point T. (a) Find the possible value(s) of Using the intersecting chord theorem which states that Fill in the information from the diagram Simplify Solve by factoring Consider if both answers are possible refers to a length, so cannot be zero(b) Hence, or otherwise, write down the simplified ratio of PT:RT.Method 1 Substitute the found value of into the expressions on the diagram for PT and RTWrite as a ratio PT:RTSimplifyMethod 2 Using the ratio form of the intersecting chord theorem, and the expressions on the diagramThis shows that the ratio of PT:RT is the same as the ratio of TS:TQPage 2 Find the value of θ in the diagram below.The lines ST and RT are both tangents to the circleThey meet the two radii on the circumference at the points S and TAngle TSO = angle TRO = 90°A radius and a tangent meet at right anglesUse vertically opposite angles to find the value of angle RTSAngle RTS = 25°Vertically opposite anglesMark these angles clearly on the diagramAngles in a quadrilateral add up to 360°Use this to form an equation for θ Angles in a quadrilateral sum to 360°SimplifySolvePage 3P, Q and R are points on a circle.RQ is a diameter.Find the value of θ .Give a reason for your answer.Use the fact that angles in a triangle add up to 180° and the circle theoremThe angle in a semicircle is 90°Write an equation for θ Solve for θ The angle in a semicircle is 90°Page 4 Find the value of θ in the diagram below. Give a reason for each step of your working. There are three radii in the diagram, AO, BO and COMark these as equal length linesNotice how they create two isosceles trianglesBase angles in isosceles triangles are equalAngle OAB = angle OBA = 60° (isosceles triangle)Use the circle theoremThe angle at the centre is twice the angle at the circumferenceForm an equation for θ Expand the brackets and solve the equationBase angles in isosceles triangles are equalThe angle at the centre is twice the angle at the circumferencePage 5 14 marks and are points on the circumference of a circle, centre O, and are tangents to the circle.Angle Work out the size of angle θ . Give a reason for each stage in your working.Did this page help you?25 marks and are points on the circumference of a circle, centre O, is a tangent to the circle. is a straight line.Angle Work out the size of the angle marked θ . Give reasons for your answer.Did this page help you?33 marks and are points on the circumference of a circle, centre O, is a diameter of the circle, and are tangents to the circle. Angle Work out the size of angle θ . Did this page help you?44 marks and are points on the circumference of a circle, centre O. Give a reason for each stage of your working.Did this page help you?54 marks and are points on the circumference of a circle, centre O, is a straight line. Angle Find the size of angle θ . Give a reason for each stage in your working.Did this page help you?65 marks The points A, B, C and D lie on a circle. is a straight line. Angle Work out the size of angle θ . You must give a reason for each stage of your working.Did this page help you?72 marks APB and CPD are chords of a circle.AP = 14 cm PB = 6 cm CP = 10 cmCalculate the length of PD.Did this page help you?83 marksA, B, D and E are points on a circle. EDC and ABC are straight lines.ED = 24 cm DC = 15 cm BC = 18 cmWork out the length of AB.Did this page help you?94 marks and are points on a circle, centre O is a diameter of the circle.Calculate the size of angle θ .Give a reason for each stage of your working.Angle DFG = Did this page help you?103 marks A chord of a circle is a chord of the circle.Calculate the radius of the circle..... cmDid this page help you?112 marks and are chords of a circle. = 9 cm = 6 cm = 8 cm Calculate the length of cmDid this page help you?124 marks is a quadrilateral.Prove that is not a cyclic quadrilateral.Did this page help you?132 marks and are points on a circle, and are tangents.Work out the size of angledegrees Did this page help you?142 marks and are points on a circle. Is the centre of the circle? Tick a box. Yes NoShow working to support your answer.Did this page help you?151 mark, and are points on a circle. is a straight line. is a tangent to the circle.Sam is trying to work out the size of angle θ . Here is his working..... angles in the same segment are equalangles at a point on a straight line add up to 180°Make a criticism of his working.Did this page help you?162 marks and are points on a circle, is a tangent to the circle.Write down the size of angle θ . Give a reason for your answer.....degrees Did this page help you?172 marks and are points on a circle.Circle the line that is a diameter of the circle.Did this page help you?184 marksIn the diagram, E, F and D are points on the circumference of the circle.G, D and H lie on a tangent to the circle.Angle FDE = 55°angle FDE = 43° Explain why angle HDE is 82°. Did this page help you?1942 marksThe diagram shows a circle, centre O. Points A, B, C and D lie on the circumference of the circle. EDF is a tangent to the circle. Angle ABC = 82° and angle ODC = 57°. Work out the value of x =19b3 marksWork out the value of y = Did this page help you?20a2 marksA, B, C and D are points on the circumference of a circle.PQ is a tangent to the circle at D. Angle BDO = 72° and angle ABD = 63°. Work out angle x . Give a reason for your answer.Angle x =° because20b2 marksWork out angle y . Give a reason for your answer.Angle y =° because Did this page help you?21a2 marksA, B, C and D are points on the circumference of a circle, centre O. Angle BAD = 52°. Work out angle x . Give a reason for your answer. x =° reason21b2 marksWork out angle y . Give a reason for your answer. y =° reason Did this page help you?13 marks and are points on the circumference of a circle, centre O, and are tangents to the circle.Angle Angle Work out the size of angle θ . Did this page help you?24 marks and are points on the circumference of a circle, centre O, intersect at E. Angle Angle Work out the size of angle θ . You must show all your working.Did this page help you?35 marks and are points on a circle, centre O, is a tangent to the circle.Angle Work out the size of angle θ . Give reasons for each stage of your working.Did this page help you?45 marks and are points on a circle, centre O, is a tangent to the circle. is a straight line. Angle Find the size of angle θ , in terms of x . Give your answer in its simplest form. Give reasons for each stage of your working.Did this page help you?63 marks and are four points on the circumference of a circle, and are straight lines. Prove that triangle and triangle are similar. You must give reasons for each stage of your working.Did this page help you?73 marksA, B and C are points on a circle. APB is a straight line. QCP is a tangent to the circle.AB = 10 cm BP = 8 cmWork out the length of CP.Did this page help you?85 marksA, B and C are points on a circle, centre O. OPC is a straight line. APB is a chord of the circle, and bisects OC at the point P.AP = 7.2 cm PB = 5.4 cm OP = PC.Work out the area of the circle.Give your answer correct to 3 significant figures.Did this page help you?9a3 marksThe points A, B, C and D lie on a circle.ABY and DCY are straight lines.AB = 13 cm BY = x cm DC = x cm CY = 9 cmShow that $x^2 + 4x - 81 = 0$ 9b4 marksFind the length of DY. Show your working clearly. Give your answer correct to 3 significant figures.Did this page help you?104 marks and are points on a circle, is the tangent at the circle. Angle Angle Work out the size of angle θ . Give reasons for your working.Did this page help you?114 marks and are points on a circle, and are straight lines. Prove that Did this page help you?123 marks and are points on a circle. bisects angle θ . is a tangent to the circle. Angle ABD = 58°. Angle CDB = 22°. Work out the sizes of angle ACD and ACB, giving reasons for your answers.Angle ACD =°14b3 marksAngle ACB =°Did this page help you?15 marks and are points on a circle, and are straight lines.Prove that triangle is similar to triangle . You must give reasons for your working.Did this page help you?2a3 marks and are points on the circumference of a circle, centre O, is a tangent to the circle.Show that You must give a reason for each stage of your working.2b1 markDylan was asked to give some possible values for θ . He said, " could be 200 and could be 110, because $200 - 110 = 90$ "Is Dylan correct? You must give a reason for your answer.Did this page help you?35 marks is a regular pentagon, and are points on a circle, and are tangents to the circle, is a straight line.Prove that Did this page help you?46 marksA, B, C and D are points on a circle. APB, CPD, and BD are chords of the circle. APB and CPD intersect perpendicularly at P.BD = 7 cm,AP = 5 cm,CP = 3 cm, PB = x cm, and PD = y cm.Work out the values of x and y . Show your working clearly. Give your answers correct to 3 significant figures.Did this page help you?56 marksA, B, C and D are points on a circle, centre O. APBE, COP and ODE are straight lines.AP = 4 cm, PB = 5 cm, CP = 10 cm, DE = 10 cm and BE = x cmWork out the value of x . Show your working clearly.Did this page help you?65 marks and are points on a circle, and are straight lines.Show that the length of is where and are integers whose values are to be found. Show your working clearly.Did this page help you?75 marks and are points on a circle. is a tangent to the circle. Angle Prove that angle Give reasons for each stage in your working.Did this page help you?84 marks and are points on a circle, , and are straight lines. Work out the size of angle θ . Show your working clearly. = Did this page help you?96 marks and are points on a circle, centre O, and are straight lines. Work out the value of θ . Show your working clearly..... Did this page help you?105 figures and are points on a circle. is the tangent at θ to the circle. is parallel to . Work out the size of angle θ . Give a reason for each stage of your working.Did this page help you?115 marks and are points on a circle with centre O. Angle The area of the shaded segment is 200cm²Calculate the radius of the circle. Give your answer correct to 3 significant figures..... cmDid this page help you? 124 marks and are three points on the circumference of a circle, centre O, and are tangents to the circle. is a kite. Angle is Prove that angle is Did this page help you?134 marks and are points on a circle. The tangent at is shown, and are straight lines.Prove that Did this page help you?14a4 marks and are points on a circle. is a tangent.Assume that triangle is isosceles with Prove that is parallel to .14b1 markIn fact, triangle is equilateral.Tick the two boxes for the statements that must be correct. is parallel to bisects angle bisects angle Did this page help you?154 marksHere is a cyclic quadrilateral Work out the size of angledegreesDid this page help you?164 marks and are points on a circle, and are straight lines.Work out the size of angle θ . You must show your working which may be on the diagramdegrees Did this page help you?17a4 marksA, B, C and D are points on the circumference of a circle, centre O.Angle BAD = 112° and angle DCO = 33°. Show that angle y = 35°. Give reasons for each stage of your working.17b3 marksWork out angle z . Give reasons for your answer.Angle z =° because Did this page help you?185 marksA, B, C and D are points on the circumference of a circle, centre O.Angle CAD = 28° and CD = 6.4cm. BD is a diameter of the circle.Calculate the area of the circle..... cm2 Did this page help you?Page 6Set Notation & Venn DiagramsSet Notation & Venn DiagramsCompound Interest & DepreciationCompound Interest, DepreciationSimplifying Surds, Rationalising DenominatorsUsing a CalculatorRatios & FDP, Multiple RatiosExchange Rates & Best BuysExchange Rates, Best BuysDirect & Inverse ProportionDirect Proportion, Inverse ProportionAlgebraic Roots & IndicesAlgebraic Roots & IndicesCompleting the SquareAlgebraic ProofSolving Linear EquationsFinding Gradients of TangentsArea & Volume of Similar ShapesSimilar Areas & Volumes3D Pythagoras & Trigonometry3D Pythagoras & TrigonometryDiscrete & Continuous Data, Mean, Median & Mode, Calculations with the Mean, Averages from Grouped Data, Range & Interquartile Range, Comparing Data Sets, Bar Charts & Pictograms, Two-Way Tables, Pie Charts, Reading & Interpreting Statistical Diagrams, Comparing Statistical DiagramsPage 7Exam code: 4MA1ITools designed specifically for the Edexcel IGCSE Maths A: Higher syllabus, to help you ace your exams, including: past papers, revision notes, and exam-style questions, created by our expert team of teachers and examiners[Exam specification aligned][Personalised feedback on exam answers][Written by teachers and examiners][Examiner tips and tricks][Exam practice with solutions][Downloads/Step-by-step mark schemesPage 8 { { 'ml-label-loading-course' | message } } arrow_right { { child.name } } { { child.label } } { { child.sublabel } } { { child2.name } } { { child2.label } } { { child2.sublabel } } arrow_right { { child3.label } } { { child3.sublabel } } { { 'ml-toc-proceed-mlc' | message } } { { 'ml-toc-proceed-tbs' | message } } Related Topics: More Lessons for High School Regents Exam Math Worksheets High School Math based on the topics required for the Regents Exam conducted by NYSED. Intersecting Chords Theorem If two chords intersect in a circle, the product of the lengths of the segments of one chord equal the product of the segments of the other. For example, in the following diagram AP \times PD = BP \times PC Segments in circles Proof of a theorem on product of segments of chords in circles. Show Step-by-step Solutions Intersecting chords of a circle Try out our new and fun Fraction Concoction Game. Add and subtract fractions to make exciting fraction concoctions following a recipe. There are four levels of difficulty: Easy, medium, hard and insane. Practice the basics of fraction addition and subtraction or challenge yourself with the insane level. We welcome your feedback, comments and questions about this site or page. Please submit your feedback or enquiries via our Feedback page. -> The SSC has released the exam calendar for various exams including CHSL 2025 Recruitment. As per the calendar, SSC CHSL Application process will be active from 23rd June 2025 to 18th July 2025. -> The Exam Date for the SSC CHSL 2025 will be from 8th September 2025 to 18th September, 2025. -> The SSC CHSL is conducted to recruit candidates for various posts such as Postal Assistant, Lower Divisional Clerks, Court Clerk, Sorting Assistants, Data Entry Operators, etc. under the Central Government. -> The SSC CHSL Selection Process consists of a Computer Based Exam (Tier I & Tier II). -> To enhance your preparation for the exam, practice important questions from SSC CHSL Previous Year Papers. Also, attempt SSC CHSL Mock Test. This is the idea (a, b, c and d are lengths): And here it is with some actual values (measured only to whole numbers): And we get 71 \times 104 = 7384 50 \times 148 = 7400 Very close! If we measured perfectly the results would be equal. Why not try drawing one yourself, measure the lengths and see what you get? Because there are similar triangles!Lookingbelow: The triangles may not be the same size, but they have the same angles ... so all lengths will be in proportion! One triangle has the ratio a/c, and the other has the matching ratio d/b: a/c = d/b a \times b = c \times d 15593, 15594, 15595, 15596, 15597, 15598, 15599, 15600 Copyright © 2024 Rod Pierce Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. 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