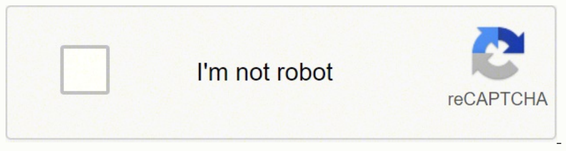

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Intersecting chord theorem questions printable worksheet answers

The perpendicular from the centre of a circle to a chord bisects the chord (splits the chord into two equal parts). [2 marks] The first circle theorem we're going to use here is: Rule 3, the angle at the centre is twice the angle at the circumference. [2 marks] If a question says "show our workings", you must state what circle theorem/geometry fact you use when you use it. In this case those two angles are angles BAD and ADB, neither of which know. Calculate the length of the line BE. There are also circle theorem worksheets based on Edexcel, AQA and OCR exam questions, along with further guidance on where to go next if you're still stuck. Below is a diagram showing the key parts of a circle for this theorem: The diameter of the circle is the width of a circle, through the centre. Calculate the length of BE marked x . To find CBA, we just need to subtract from 180\degree. What is the size of angle CBA? So we can use Rule 7, the angle in a semi-circle is a right-angle to deduce that \angle BAD = 90\degree. Level 6-7 GCSE Alternate Segment Theorem: The angle between the tangent and the side of the triangle is equal to the opposite interior angle. The angle in a semicircle is equal to 90° so angle AEB = 90° . Level 6-7 GCSE The perpendicular bisector of a chord passes through the centre of the circle. A line perpendicular and in the centre of a chord (a line drawn across the circle) will always pass through the centre of the circle. This also includes the inverse trigonometric functions. We now have Use Pythagoras' theorem or trigonometry to find the missing length. Find out more about our GCSE maths revision programme. Level 6-7 GCSE Opposite angles in a cyclic quadrilateral add up to 180\degree. As the tangent and the radius meet at 90° , the angle EBF = 90° . Angle ABC is, 180\degree-71\degree-23\degree=86\degree The Alternate Segment Theorem states the angle between the tangent and the side of the triangle is equal to the opposite interior angle, hence x\degree=\angle \text{ABC} = 86 \degree. As we know two sides of the right angle triangle AOB , we need to use Pythagoras' Theorem to find the value of x (the length of the chord AB). x=\frac{3}{\sin(45)}=3\sqrt{2} ABF = 90^{\circ} (BF is perpendicular to AD) BGA = 180 - 99 = 81^{\circ} (angles on a straight line total 180^{\circ}) AB = 9sin(81)=8.89cm (2dp) AC=\frac{8}{11}AB AC = 6.46cm (2dp) Chord of a circle GCSE questions 1. \textcolor{red}{x} = \textcolor{red}{x} Triangles drawn from the same chord will have the same angle when touching the circumference. Top tip: The word subtend is used a lot within circle theorems so make sure you know what it means. The line BF is a chord that is perpendicular to the diameter. The chord BD is perpendicular to the diameter AC at E . To find a third, simply observe that angles around a point sum to \textcolor{orange}{360\degree}: 360\degree - 126\degree = 234\degree Since the angles in a quadrilateral sum to \textcolor{orange}{360\degree}, we can find the angle we're looking for. (5 marks) (a) AE = CE = 5.4cm (1) BE=\sqrt{8.1^{2}-5.4^{2}} (1) BE = 6.04cm (2dp) (1) (b) ABE=\sin^{-1}(\frac{5.4}{8.1} (1) ABE = 41.8^{\circ} (1dp) (1) 3. To calculate the length of the chord BC , we need to use trigonometry as we know one side length and two angles where one angle is 90° . The line AB is a chord and CE is a radius. The lines CE and AB intersect at the point D at 90 degrees to one another because they are perpendicular.2We then draw the lines AC and BC. Here we can see that the radius CE bisects the chord AB at 90 degrees and the lengths AD = BD = x . The diagrams below show the inscribed angle subtended by arc AC from point B for two different circles. This means that AE = 6 + 3 = 9cm . Here we have: AC is a diameter BD is a chord, perpendicular to AC The line AB = 13cm The line OA = 6cm The line BE = x Use other angle facts to determine other necessary angles. Includes reasoning and applied questions. H=\frac{A}{\cos(\theta)} x=\frac{5}{\cos(71)} x=15.4cm (1dp) Below is a circle with centre O . As OE:OC = 1:1 , the line segments OE and OC are equidistant so OE is half of the radius and so OE = 3cm . The chord of a circle is a straight line that connects two points on the circumference of a circle. Points A, B, C, and D are on the circumference of the circle. The longest chord in a circle is the diameter of the circle. Level 6-7 GCSE Level 6-7 GCSE The radius will always meet a tangent to the circle at 90\degree. This means that we can calculate the angle ABE : \[ABE=90-77\\ ABE=13^{\circ}\] Use Pythagoras' theorem or trigonometry to find the missing length. Next, we recognise that ABDE is a cyclic quadrilateral. As angle ABG = 90° , angle BAG = 180 - (90 + 68) = 22° . AOB is equal to 90° as AC and BD are perpendicular. A tangent (a line touching a single point on the circumference) will always make an angle of exactly 90\degree with the radius. FG is a tangent at the point B and is parallel to the line AC . We can calculate the length of CE using the right angle triangle DEC as we know the hypotenuse, an angle and we are finding a missing side: \[CE=Hsin\times(\theta)\\ CE=8\times\sin(35)\\ CE=4.6cm (1dp)\] Below is a circle with centre O . Level 6-7 GCSE The tangents from the same point to a circle are equal in length. The angle at the centre is 126\degree, so; \angle BAD = 126\degree \div 2 = 63\degree. Use Pythagoras' theorem or trigonometry to find the missing length. Then, subtract 42 from both sides to get 2x = 180 - 42 = 138\degree, and divide both sides by 2 to get x = 69\degree. On a related note, the second circle theorem we're going to use is: opposite angles in a cyclic quadrilateral sum to 180. BG = 6.2cm . AB = BC Two tangents (a line touching a single point on the circumference) drawn from the same outside point are always equal in length. The diagram below shows a circle with the following information: Centre O AC is a straight line through B AD = CD DH = 3cm BH = 8cm Calculate the length of BC , labelled x . Below is a triangle inscribed in a circle with centre O . Incorrect trigonometric function The incorrect trigonometric function is used and so the side or angle being calculated is incorrect. Our first circle theorem here will be: tangents to a circle from the same point are equal, which in this case tells us that AB and BD are equal in length. Given that angle ADB, which is 69\degree, is the angle between the side of the triangle and the tangent, then the alternate segment theorem immediately gives us that the opposite interior angle, angle AED (the one we're looking for), is also 69\degree. Here we have: AC = BD is a diameter AC and BD are perpendicularThe line OC = 4cm The line AB = x Use other angle facts to determine other necessary angles. A, B, and D are points on the circumference. Level 6-7 GCSE The angle inscribed in a semicircle is always a right angle. A triangle drawn with the diameter will always make a 90\degree angle where it hits the circumference. Here we have: BD is a diameter AC is a chord, perpendicular to BD The angle ABF = 77° The line CE = 12cm The line BE = x Use other angle facts to determine other necessary angles. Now we can use our second circle theorem, this time the alternate segment theorem. We use essential and non-essential cookies to improve the experience on our website. You can say that a tangent and radius that meet are perpendicular to each other. Use the information in the diagram to calculate the value of x . We have a right angle triangle ABE and as the missing length can be found using the other two sides of the triangle, we will use Pythagoras' Theorem: \[x^2=13^2-9^2\\ x^2=169-81\\ x^2=88\\ x=9.38cm (2dp)\] A circle with centre O has the perpendicular diameters AC and BD . The endpoints of the diameter lie on the circumference of the circle. \textcolor{limegreen}{x}=\textcolor{limegreen}{x} \textcolor{red}{y}=\textcolor{red}{y} The angle between the tangent and the triangle will be equal to the angle in the alternate segment. Calculate the length of the diameter AD . \angle CBA = 180\degree - 23\degree - 90\degree = 67\degree Level 6-7 GCSE Below is a circle with centre C. The length AC = BC as they are both radii of the circle.Triangles ACD and BCD are therefore both right angles, their hypotenuse are equal and the line CD is the same as it is shared between both triangles. Calculate the length of the line BC correct to 1 decimal place. (5 marks) CDA = 90^{\circ} as the tangent meets the radius at 90^{\circ} and AHB = 90^{\circ} as BF is parallel to CE (1) AH = BH = 8cm AB=\sqrt{8^{2}+8^{2}}=8\sqrt{2} (1) AD = CD = 11cm Scale factor of enlargement: 11\div8=1.375 (1) AC=8\sqrt{2}\times{1.375}=11\sqrt{2} (1) 11\sqrt{2}-8\sqrt{2}=3\sqrt{2}cm (1) You have now learned how to: Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results Cyclic quadrilateralsAngles in a semicircleThe alternate segment theoremAngles in the same segmentTangent of a circle Prepare your KS4 students for maths GCSEs success with Third Space Learning. Practice chord of a circle questions AE = x BAE = 30^{\circ} (angles in the same segment are equal) x=\frac{2}{\tan(30)}=2\sqrt{3} AEB = 90^{\circ} (AC is perpendicular to BD) BAE = 40^{\circ} (angle in a semicircle is 90^{\circ} so BAD=90^{\circ}) ABD = 50^{\circ} (angles in a triangle total 180^{\circ}) x=\frac{10}{\tan(50)}=8.39\quad(2dp) CBG = 51^{\circ} (alternate angles in parallel lines are equal) BC = CD = x (BCD is an isosceles triangle) x=\frac{3}{\sin(51)}=3.86\quad(2dp) BEA = 90^{\circ} (AC is perpendicular to BD) BE = DE = 7cm (BD is bisected by the diameter) OE=\frac{3}{5}\times{10}=6 AE = 10 + 6 = 16cm x=\sqrt{7^{2}+16^{2}} x=17.46cm (2dp) OC = OD = x BOC = 90^{\circ} (AC and BD are perpendicular) where M is the midpoint of BC . In the diagram above, AB is a chord and CE is a radius. AC and BD are perpendicular lines. A, B, C, and D lie on the circumference. Related Topics Worksheet and Example Questions Drill Questions Here we will learn about circle theorems involving chords of a circle, including its application, proof, and using it to solve more difficult problems. Here we have: CD is a diameter AB is a chord, perpendicular to CD The angle ADE = 71° The angle BEC = 90° The line AE = 5cm The line BC = x 2Use other angle facts to determine other necessary angles. Locate the key parts of the circle for an appropriate circle theorem. As the perpendicular from the centre of a circle to a chord bisects the chord this means that the length AE is the same as the length CE . Subtended angles An angle within a circle is created by two chords meeting at a point on the circumference. The line AE is 5cm and angle ADE = 71° . Calculate the length of BE , correct to 1 decimal place. Incorrect assumption of isosceles triangles The intersection of the diameter and the chord at 90 degrees can be very close to the centre and so the two lengths coming from the point of intersection to the radius are assumed to be equal, but they aren't. You just need to be confident with angles in a triangle and congruence. This tells us that the angle between the tangent and the side of the triangle is equal to the opposite interior angle. OE:OC = 1:1 . We can also use that interior angles in a triangle add up to 180°, we find that, x=180\degree - 90\degree - 32\degree = 58\degree Firstly, recognise that since BD is a diameter, angle BAD is the angle in a semi-circle. Level 6-7 GCSE The angle at the centre is twice the angle at the circumference. The angle formed at the centre is exactly twice the angle at the circumference of a circle. As ADE is a right angle triangle with DE = 3cm and DAE = 22° , we can use trigonometry to calculate the side AD : \[H=\frac{Opp}{\sin(\theta)}\\ H=\frac{3}{\sin(22)}\\ H=8.0cm (1dp)\] Pythagoras' theorem missing side The missing side is calculated by incorrectly adding the square of the hypotenuse and a shorter side, or subtracting the square of the shorter sides. Weekly online one to one GCSE maths revision lessons delivered by expert maths tutors. Get your free Chord of a circle worksheet of 20+ questions and answers. This means that the triangles are congruent and so the line segment BD and the line segment AD are the same length or BD = AD. (This is the hardest rule and can be tricky to spot). Page 2 Page 3 GCSE 8 - 9AQAEdexcelOCRWJECAQA 2022Edexcel 2022OCR 2022 Level 6-7 GCSE Angles in the same segment are equal. You must show your workings. Also, as the perpendicular from the centre of a circle to a chord bisects the chord, the line BE is equal to AE , so BE = 5cm . Our circle theorems tell us that the angle in a semi-circle is a right-angle so BAD must be 90\degree. Find angle ABC. The line BC is parallel to the tangent DE . OA = OB = OC = OD are all radii and so we can state OA = OB = 4cm . DOWNLOAD FREE Below is a circle with centre C . To be able to prove this theorem, you do not need to know any other circle theorem. (b) Calculate the size of the angle ABE. \angle ABC= 360\degree - 33\degree - 63\degree - 234\degree = 30 \degree Level 8-9 GCSE Example Questions The angle at the centre is twice the angle at the circumference. Given that the angle formed at the centre, which in this case is 98\degree, is exactly twice the angle at the circumference of a circle at the same point. We simply have to divide the angle at the centre of the circle by two: x=98\degree \div 2 = 49\degree The angle in a semicircle is always a right angle. Given that any triangle drawn with the diameter will always make a 90° angle where it hits the opposite circumference. Locate the key parts of the circle for an appropriate circle theorem. As we now know this, we get that \text{Angle BAE } = 90 + 31 = 121 \degree. The diameter BD is perpendicular to the chord AC at point E. Another way of saying this is that a diameter 'subtends' a right-angle at the circumference. BD is a diameter of the circle, A is a point on the circumference. Here we have: AD is a diameter BF is a chord, perpendicular to AD The angle BGE = 112° The line DE = 3cm The line AD = x Use other angle facts to determine other necessary angles. As angles in the same segment are equal, angle ADE is equal to angle ABC so angle ABC = 71° . BD is a diameter of the circle, we know that triangle BAD is confined within the semi-circle. (3 marks) ABC = 55^{\circ} (alternate segment theorem) (1) AGB = 90^{\circ} (BC is perpendicular to AF) (1) x=\frac{6.2}{\cos(55)}=10.8cm\quad(1dp) (1) 2. Angle BAE (which we just worked out) is opposite to angle CDE, so \text{Angle CDE } = 180 - 121 = 59\degree Then, the final step to finding angle EDA will be subtracting the size of angle CDA from that of angle CDE to get \text{Angle EDA } = 59 - 18 = 41\degree. We now know two out of the four angles inside ABCD. As we know the side adjacent to the angle and we want to calculate the hypotenuse, we need to use \cos(\theta)=\frac{A}{H} with H as the subject. \[x^2=4^2+4^2\\ x^2=16+16\\ x^2=32\\ x=4\sqrt{2}cm\] The diagram below shows a semicircle. The diameter is twice the length of the radius of the circle. An arc is a part of the circumference. The major segment is the larger part of a circle when it is enclosed by a chord and the major arc.The minor segment is the smaller part of a circle when it is cut by a chord and the minor arc.The radius of a circle is the distance between the centre of the circle and the circumference of the circle. CE = 5.4cm and angle AB = 8.1cm. 3Use Pythagoras' theorem or trigonometry to find the missing length. Level 6-7 GCSE Level 6-7 GCSE Below is a circle with centre C. In order to find missing angles or the length of a chord: Locate the key parts of the circle for an appropriate circle theorem.Use other angle facts to determine any missing angles.Use Pythagoras' Theorem or Trigonometry to find the missing length. AEB is equal to 90° as the chord is perpendicular to the diameter. DOWNLOAD FREE x Get your free Chord of a circle worksheet of 20+ questions and answers. (a) The circle below has centre O. The radius OA = 6cm and the chord AB = 13cm . Write your answer to 1 decimal place. We now know Use Pythagoras' theorem or trigonometry to find the missing length. Calculate the length of AE , correct to 1 decimal place. Let the size of one of these angles be x, then using the fact that angles in a triangle add to 180, we get x + x + 42 = 180\degree. Please read our Cookies Policy for information on how we use cookies and how to manage or change your cookie settings.AcceptPrivacy & Cookies Policy We can calculate the length of the chord BE using the right angle triangle ABE as we know the opposite side to the angle ABE , the angle ABE and we are finding a missing adjacent side BE : BE=\frac{O}{\tan(\theta)} x=\frac{12}{\tan(13)} x=52.0cm (1dp) A, B, C, and D are points on the circle with centre O . Angles on a straight line total 180° , so BGA = 180 - 112 = 68° . Here we have: BD is a diameter AC is a chord, perpendicular to BD The angle CDE = 35° The angle CED = 90° The line CD = 8cm The line AE = x Use other angle facts to determine other necessary angles. StepDiagramDescription1Let's start with the circle with centre C. Angle \angle BCD is 126\degree and angle \angle CDA is 33\degree. The chord AB is perpendicular to the line CD at the point E . \textcolor{purple}{w}+\textcolor{red}{x}=180\degree \textcolor{blue}{y}+\textcolor{limegreen}{z}=180\degree This is a 4 sided shape with every corner touching the circumference of the circle. This means that ABD must be an isosceles triangle, and so the two angles at the base must be equal. Calculate the length of the line AB . Firstly, using the fact angles inside of a triangle add together to 180\degree.