Area of regular polygons worksheet answer key class 9 english

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Printable PDF, Google Slides & Easel by TPT Versions are included in this distance learning ready activity which consists of 11 area of Regular Polygons problems. It is a self-checking worksheet that allows students to strengthen their skills at solving for area in a regular polygon when only given either the Apothem or Radius.Distance learning?No problem! This activity now includes Google Slides & Easel by TPT digital options!Explore the ⌨ Distance Learning in my store for more digital resourcesThree Forms of Use IncludedPrintable PDFGoogle SlidesEasel by TPTThis maze is intended for use in a High School Geometry classroom.Please view the preview to ensure this product is appropriate for your classroom. The preview shows the entire maze.Answer key is included for easy grading.Not all boxes are used in the maze to prevent students from just trying to figure out the route. Students will have to successfully calculate 8 areas to complete the maze.Similar Activities• Click Here for more Calculating Area activities• Click Here for more Math Mazes• Click Here for more Geometry activitiesThis product is also part of the following money saving bundleHigh School Geometry Bundle - All My Geometry Products for 1 Low Price--Find the resource you need quickly & easily....Download the FREE Amazing Mathematics Resource Catalog Today!Sign up for my Secondary Math Newsletter to receive a Free Pi-Rate Plotting Points picture.--©Copyright Amazing Mathematics LLCThis product is to be used by the original purchaser only.This product can NOT be uploaded to the internet by the purchaser. Doing so is a violation of the copyright of this product.Copying for more than one teacher, or for an entire department, school, or school system is prohibited. This product may not be distributed or displayed digitally for public view, uploaded to school or district websites, distributed via email, or submitted to file sharing sites. The unauthorized reproduction or distribution of a copyrighted work is illegal. Criminal copyright infringement, including infringement without monetary gain, is investigated by the FBI and is punishable by fines and federal imprisonment. In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. Area of Regular Polygons using Apothem The printable worksheets for grade 7 and grade 8 provide ample practice in finding the area of a regular polygon using the given apothem. Find the area by computing the half of the product of perimeter and apothem. Area of Polygons using Side length Familiarize the students with the regular polygon area formula involving sides. Plug in the given side length in the formula to compute the area of the polygons featured here. Area of Irregular Polygons Decompose each irregular polygon in these pdf worksheets for 6th grade, 7th grade, and 8th grade into familiar plane shapes. Use the appropriate area formula to find the area of each shape, add the areas to find the area of the irregular polygons. Apothem using Side length and Area The area and the side length of the polygons are provided in these middle school worksheets. Find the perimeter, rearrange the area formula, making apothem the subject, plug in the values of the perimeter and area to determine the apothem. Apothem using Area / Perimeter / Radius Level up with this batch of high school worksheets on finding the apothem. Substitute the values of area, perimeter or radius of the polygons in relevant formulas to find the apothem. Find the Radius / Side length of the Polygons These printable polygon worksheets consist of two parts. Part A deals with finding the radius while Part B focuses on finding the side length using the area of the polygon provided. In this explainer, we will learn how to find areas of regular polygons given their side lengths using a formula.We recall that a regular polygon is a shape made of straight edges where all of the side lengths are equal and the internal angles are also equal. To find a formula to calculate the area of any regular polygon, we first note that we can split any regular *n*-sided polygon into *n* congruent triangles by connecting the vertices to the center. For example, in the following diagram, we connect the center of a regular pentagon of side length *x* to each of its vertices.To show that each of these triangles is congruent, we note that the line from the center to each vertex bisects the internal angle of the pentagon, and the center is equidistant from all of the vertices of the regular polygon. Hence, by the SSS criterion, the triangles are all congruent.Next, since each triangle has two equal angles, they are isosceles triangles, and given that we have congruent triangles, the final angles in each of the five shapes (at the center of the pentagon) must all be equal to each other. Finally, we know that each triangle has a corresponding side of length *x* as all of the triangles are congruent.The area of this regular pentagon is 5 times the area of one of the triangles. To find the area of one of the triangles, we recall that the area of a triangle with a base of length *b* and perpedincular height *h* is given by area=12*bh*.We can use the side with length *x* as the base, which means we then need to find the height of the triangle to determine its area.To find the value of *h*, we will find the angle at the center. The angles in the center are all corresponding angles in congruent triangles, and so they are equal. They also sum to give 360∘. Hence, in the example of the regular pentagon, the central angle is 3605=72∘∘.Since this is an isosceles triangle, the angle bisector at the central angle will bisect the base, giving us an angle of 722=36∘∘ and the length *x*2, as shown in the diagram.We can determine the value of *h* by applying trigonometry to the following right triangle.We know tan(36)∘ will be equal to the ratio of the opposite side's length divided by the adjacent side's length, giving tantan(36)=*hh*=*x*2(36).∘∘This means our 5 isosceles triangles are as shown.The area of this triangle is given by areaoftriangletantan=12*xx*2(36)=*x*4(36).∘∘Multiplying this by 5 and simplifying by using the reciprocal trigonometric identity cottan=1, we can find the area of the regular pentagon as follows: areaofpentagontancot=5*x*4(36)=5*x*(36)4.∘∘This method can be generalized to any regular *n*-sided polygon of side length *x*. We would still be able to split the regular polygon into right triangles in this form. There would be *n* isosceles triangles, and the central angle would be 3602*n*=180*n*∘∘. We can use this to find the height of the isosceles triangles, *h*, from the following right triangle.By applying trigonometry, we have *h*=*x*2,tan∘ and then the area of the isosceles triangles is then given by areaoftriangletancot=12*xx*2=*x*4.∘∘Finally, the regular polygon is constructed of *n* of these congruent isosceles triangles, so its area is given by areaofregularpolygoncotcot=*n*×*x*4=*nx*4180*n*.∘∘We can summarize this result as follows.The area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotFor example, if *n*=3, we have an equilateral triangle, and its area would be given by areaofequilateraltrianglecotcot=(3)*x*41803=3*x*4(60)=3*x*41√3=√34*x*.∘∘We can also find the area of a regular polygon when the angles are measured in radians; in this case, we have that 180∘ is radians, giving us the following.The area of a regular *n*-sided polygon of side length *x* is given by *nx*4*n*.cotLet's see an example of applying this formula to find the area of a regular hexagon.Find the area of a regular hexagon with a side length of 35 cm giving the answer to two decimal places.Answer There are a number of different methods of solving this problem. For example, a regular hexagon can be constructed from 6 equilateral triangles as shown.We could then find the area of any one these equilateral triangles as 12(35)(3560)=35√34sin∘. Since there are 6 of these triangles, the area of the hexagon is areacm=6×1225√34=3182.643…, which to two decimal places is 3 182.64 cm2.We can also find this area by using the formula for the area of a regular polygon. We recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotA hexagon has 6 sides, so we set *n*=6 and *x*=35cm. This gives us areacotcottan=6(35)41806=36752(30)=36752(30).∘∘∘We know that tan(30)=√33∘, which gives us 36752(30)=36752=3675√32=3182.643…,tancm∘√ which to two decimal places is 3 182.64 cm2.Hence, the area of a regular hexagon of side length 35 cm is 3 182.64 cm2 to two decimal places of accuracy.In our next example, we are tasked with finding the area of a regular 14-sided polygon. We could solve this with triangles; however, this would be much more cumbersome. Instead, we will just apply the formula to find the area of a regular *n*-sided polygon.Find the area of a regular 14-sided polygon given the side length is 21 cm. Give the answer to two decimal places.Answer We recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotIn our case, since this is a regular 14-sided polygon of side length 21 cm, the value of *n* is 14 and that of *x* is 21 cm. We substitute these values into the formula to get areacotcot=14(21)418014=30872907.∘∘Recall that cottan907=1∘∘, which gives us 30872907=30872=6762.515…,cottancm∘∘ which to two decimal places is 6 762.52 cm2.Hence, the area of a regular 14-sided polygon with a side length of 21 cm is 6 762.52 cm2 to two decimal places of accuracy.In our next example, we will use the perimeter of a regular polygon to determine its area.The perimeter of a regular pentagon is 85 cm. Find the area giving the answer to the nearest square centimetre.Answer We recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotWe can find the value of *x* by recalling that the perimeter of a polygon is the sum of its side lengths. Since this is a regular pentagon, there are five sides all of the same length, *x*; hence, the perimeter is 5*x*, giving us the equation 85=5*x*855=*xx*=17.cmWe substitute *x*=17cm and *n*=5 into the formula for the area of a regular polygon to get areacottancm=5(17)41805=14454(36)=497.217…,∘∘ which to the nearest square centimetre is 497 cm2.Hence, the area of a regular pentagon whose perimeter is 85 cm, to the nearest square centimetre, is 497 cm2.In our next example, we will use the area of a regular hexagon to find the length of its sides.A flower bed is designed as a regular hexagon with an area of 54√3 m2. Find the side length of the hexagon giving the answer to the nearest metre.Answer We recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotA hexagon has 6 sides, so we set *n*=6 and then the area must equal 54√3, giving us 54√3=6*x*41806.∘cotWe can then solve for *x*: 54√3=3*x*2(30)2×54√33(30)=*x*2×54√3×(30)3=*x*.mcotcottan∘∘∘Then, we cancel the shared factor of 3 and use the fact that tan(30)=√33∘ to get 36√3×√33=*x*, which simplifies to 36=*x*.Taking the square root of both sides, and noting that *x* must be positive and measured in metres, we have *x*=√36*x*=6.mHence, a regular hexagon with an area of 54√3 m2 has sides of length 6 m.In our next example, we will use the area of a regular polygon to determine its perimeter.The area of a regular decagon is 155.8 cm2. What is the perimeter of the decagon rounded to one decimal place?Answer We recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotA decagon has 10 sides, so we can set *n*=10, and then this expression must be equal to the area, 155.8 cm2, giving us 155.8=10*x*418010155.8=5*x*2(18).∘∘cotcotWe can then solve this equation for *x*, the side length of the regular decagon. We start be rewriting cot(18)∘ as 1(18)tan∘ to give us 155.8=5*x*2(18).∘tanThen, we solve for *x*: 155.8(18)25=*xx*=1558(18)25.tantan∘∘Finally, the perimeter is the sum of the side lengths of the polygon. Since this is a regular decagon, there are 10 sides all having the same length. We leave the side length as a surd to get an exact answer for the perimeter before rounding. So, the perimeter is 10*x*, which we can calculate as 10*x*=101558(18)25=44.998…,tancm∘ which to one decimal place is 45.0 cm.Hence, the perimeter of a regular decagon of area 155.8 cm2, to one decimal place, is 45.0 cm.In our final example, we will use the area formula for regular polygons to determine the area of a region represented in a diagram.Find the total area of the shaded regions in the regular polygons below, giving your answer to the nearest tenth.Answer To determine the area of the shaded regions in the diagram, we first note that all of the polygons are regular polygons of side length 39. We can find the area of each region separately. Let's start with the outer region.The outer region is the area between the regular hexagon and the regular pentagon, so we can calculate this area by finding the difference in the areas of the two shapes. To do this, we recall that the area of a regular *n*-sided polygon of side length *x* is given by *nx*4180*n*.∘cotWe can find the area of the hexagon as follows: areaofhexagoncottan=6(39)41806=3(39)2(30).∘∘Then, we use the fact that tan(30)=1√3∘ to write this as areaofhexagon=3(39)2=3(39)√32.√Similarly, we can find the area of the pentagon as follows: areaofpentagoncottan=5(39)41805=5(39)4(36).∘∘Then, the area of the outer region is the difference between these areas: outerareatan=3(39)√32−5(39)4(36)=1334.827….∘We can find the area of the inner shaded region in a similar manner.It is the area between a square and an equilateral triangle both with side lengths 39, so the inner region is the difference between their areas.We find the area of the square as areaofsquare=39.We then find the area of the equilateral triangle as follows: areaoftrianglecottan=3(39)41803=3(39)4(60)=3(39)4√3=3(39)4√3×√3√3=39√34.∘∘The difference between these values gives us the inner shaded area: innerarea=39−39√34=391−√34=862.387….Finally, we need to find the sum of the inner and outer shaded regions. We will use the exact values and then round at the end: totalshadedareaouterareainnerareatanareaunits=+=3(39)√32−5(39)4(36)+391−√34=2197.21…,∘ which to one decimal place is 2 197.2 area units.Let's finish by recapping some of the important points of this explainer.The area of a regular *n*-sided polygon of side length *x* when working in degrees is given by *nx*4180*n*.∘cotThe area of a regular *n*-sided polygon of side length *x* when working in radians is given by *nx*4*n*.cotThe area formula can be used to find the area of compound shapes constructed of one or more regular polygons.

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