

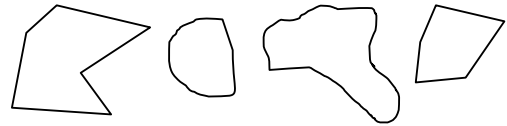
CH3 Test: Polygons, Quadrilaterals and Circles

Polygons

Definition – How do we define polygons?

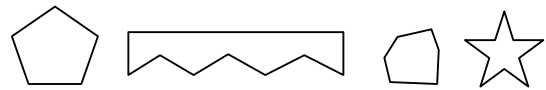
Vocabulary: Side, Vertex, Diagonal, Interior angle, Exterior angle; Regular polygon

Convexity and concavity of figures and polygons – what is a convex/non-convex figure? Make sure you know to classify figures such as those on the right.



Classification of polygons. How do we classify/name polygons? What is a regular polygon?

Interior angles sum. Find the sum of interior angles of (any) given polygon (see pictures). You also should be able to derive (justify) the formula for interior angle sum of a n -sided polygon. (Hint: recall #2 and 3 on pg.56)



Find an interior angle of a regular pentagon. (Hint: First find the sum of all interior angles in a pentagon and then calculate the measure of one angle.)

True or false? If it is false, draw a counterexample.

- A regular polygon is always equilateral.
- An equiangular polygon is also equilateral.
- Pentagon that has all sides congruent is a regular pentagon. Etc.

Quadrilaterals

Definition – How do we define quadrilaterals?

What do you know about the definitions of a trapezoid and kite? Each has two significantly different definitions - explain the difference ("modern" and "traditional").

Classification of quadrilaterals. Use Venn Diagram to classify quadrilaterals (use the traditional definitions of trapezoid and kite). Draw a typical representative in each region of your Venn Diagram. How would the diagram change if you were to use trapezoid's "modern" definition?

Answer the following questions or decide if the statements are true or false and justify your answer. Sometimes the fastest way to justify your answer is to give a few examples or a counterexample. (Use *inclusive* definitions of kite and trapezoid, e.g. "modern" ones, that include non-convex kites.)

- Is there a kite, which is a parallelogram but not a rhombus?
- All isosceles trapezoids are parallelograms.
- There is a square, which is not a rhombus.
- No kite is concave.
- All rhombi are parallelograms.
- All rhombi are trapezoids.
- Some trapezoids are squares.
- Some trapezoids are kites but not squares.
- Etc.

Properties of quadrilaterals:

Interior angles sum, Area of the selected quadrilaterals, Properties of sides, angles and diagonals of selected quadrilaterals.

- What the sum of all interior angles a quadrilateral? Explain.
- Justify (or derive) the formula for the area of a trapezoid (pg. 125).
- Justify (or derive) the formula for the area of a parallelogram (pg. 120).
- Justify (or derive) the formula for the area of a kite.
- Give examples of 3 quadrilaterals with perpendicular diagonals. Sketch and name them.
- Give examples of 3 quadrilaterals with congruent diagonals. Sketch and name them.
- Give examples of 3 quadrilaterals with mutually bisecting diagonals (both diagonals meet at their midpoints). Sketch and name them.
- Show: If a quadrilateral is equiangular, then it is a rectangle (Hint: if you know what the sum of all interior angles is and what equiangular means, you should be able to calculate the measure of one angle of that quadrilateral).

Midsegment quadrilateral and its properties:

Show that the midsegment quadrilateral of any quadrilateral is always a parallelogram.

Name several quadrilaterals that have a rectangle as their midsegment quadrilateral. What property do these quadrilaterals have in common?

Given the lengths of all sides and diagonals of ABCD, what is the perimeter of the midsegment quadrilateral?

Circles

Vocabulary: center, radius, diameter, chord, tangent, secant, minor and major arc, central angle, inscribed angle (pg. 75, 76)

Chords and Tangents: Explain why the center of a circle always lies on a perpendicular bisector of its chord (pg 77). Use this property to find the (unknown) center of a given circle. (See an Java Applet "Finding Center" on my website)

Briefly explain why a tangent is always perpendicular to the radius drawn to the point of contact.

Central and Inscribed angles.

State and justify the relationship between the central and inscribed angle corresponding to the same arc.

State the relationship among inscribed angles corresponding to the same arc. Justify your statement (use the previous theorem to justify it).

In your own words, state the Thales' Theorem and use it to find the (unknown) center of a circle by using a pencil and a rectangle (sheet of paper).

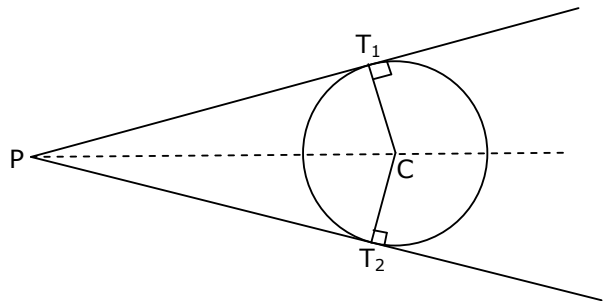
Use the relationship between inscribed and central angles to draw the following inscribed angles: 45° , 30° , 15° (without using a protractor or bisecting the angle). (Hint: You should be able to draw 90° and 60° angle without a protractor. Draw it and make it a central angle in a circle. Any inscribed angle corresponding to the same arc will measure half of it).

Constructing tangents to a circle: Make sure you know how to construct tangents to a circle – at the point of contact or going through a point not on the circle. See Java Applets on my website.

You should also be able to make simple conjectures about tangents and line segments formed by tangents and circles. Examples:

Use triangle congruence to show that line segments PT_1 and PT_2 are congruent.

Hint: Identify two right triangles that have the same hypotenuse and one leg. What can you say about the second leg?



Circles and Centers of a Triangle

You should be able to construct circumcenter, incenter, orthocenter and centroid of a triangle. See Java Applets for Circumcircle and Incircle on my website.

You should be able to formulate important observation about these centers: which ones can fall outside the triangle? Can all four centers be represented by a single point? When it happens?

What is Euler line?

Can all 4 centers of a triangle fall on a straight line? When it happens?