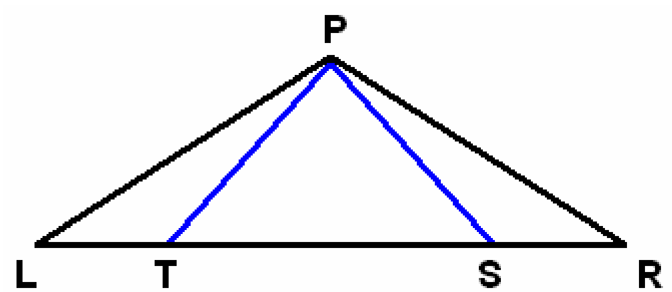
FIGURES FOR SOLUTIONS TO SELECTED EXERCISES

III : Basic Euclidean Concepts and theorems

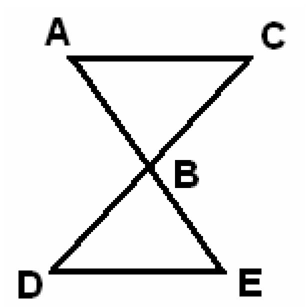
III.2 : Basic theorems on triangles

III.2.3.



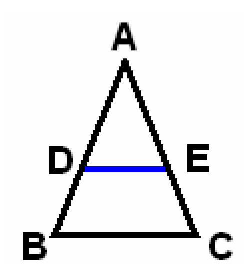
We are given **R∗S∗T,** d**(R, S)** = d**(L, T),** and d**(P, S)** = d**(P, T).** The objective is to prove that we have overlapping congruent triangles △**RTP** ≅ △**LSP** and that we also have |∠ **PSR**| = |∠ **PTL**|.

III.2.4.



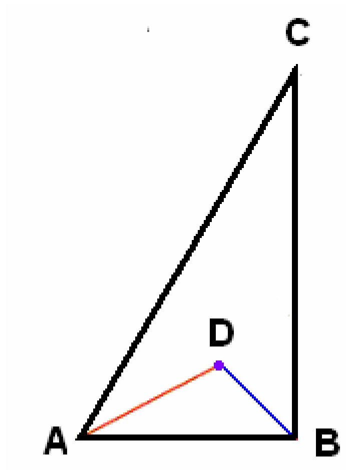
The point **B** which is the midpoint of both **[AE]** and **[CD],** and the objective is to prove that **AC** || **DE.** One method for doing this is to find a pair of alternate interior angles**.**

III.2.6.



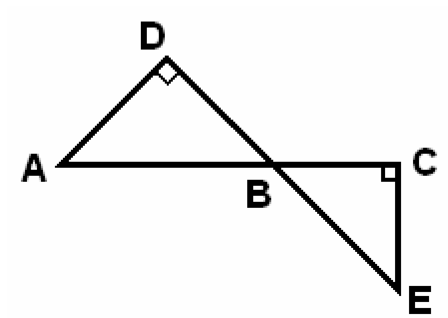
We are given that d(**A, B**) = d(**A, C**), and that **D** and **E** are points of **(AB)** and **(AC)** such that d(**A, D**) = d(**A, E**). To prove that **BC** || **DE,** it suffices to find a pair of corresponding angles**.**

III.2.7.



More generally, if **D** is a point in the interior of △**ABC** such that **[AD** bisects ∠**CAB** and **[BD** bisects ∠**CBA,** then there is a formula relating |∠**ADB**| and |∠**ACB**|**.**

III.2.8.



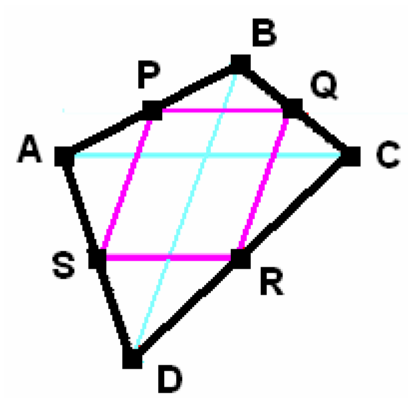
The perpendicular pairs of lines are marked in the drawing**,** and the objective is to show that |∠**DAB**| = |∠**BEC**|**.** In high school geometry books**,** such a result is often stated in the form ***if two angles have their corresponding sides perpendicular, left to left and right to right, then the angles have equal measurements.***

FIGURES FOR SOLUTIONS TO SELECTED EXERCISES

III : Basic Euclidean Concepts and theorems

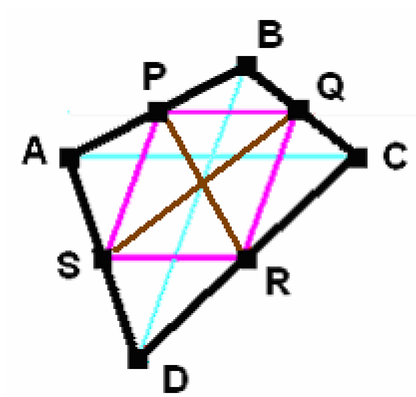
III.3 : Convex polygons

III.3.1.



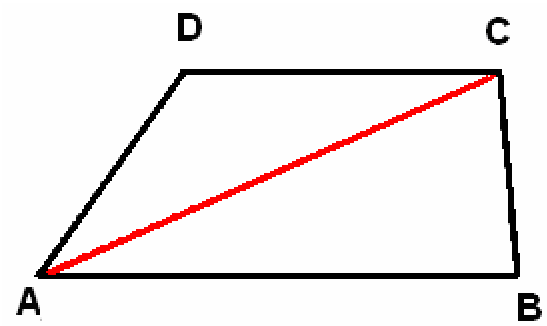
In this figure**,** each of the diagonals of the convex quadrilateral determines a pair of triangles which share a common edge**.** The midpoints of the sides of the original convex quadrilateral are also midpoints of the sides of these triangles**.**

II.3.2.



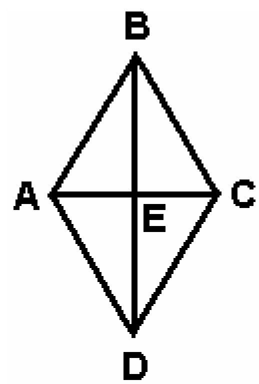
By a previous exercise we know that the midpoints **P, Q, R, S** (in that order) determine a parallelogram**.**

II.3.4.



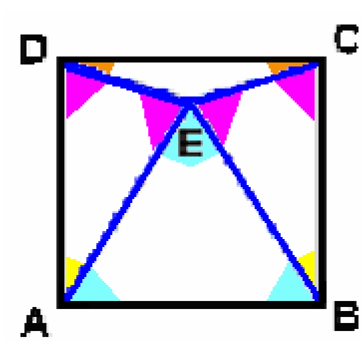
We are given that d(**A, D**) = d(**C, D**) in the trapezoid illustrated above, and the objective is to show that **[AC** bisects $\angle$**DAB.** Note that Δ**DAC** is isosceles.

III.3.6.



The points **A, B, C, D** form the vertices of a parallelogram, and the objective is to show that this parallelogram is a rhombus (all sides have equal length) if and only if **AC** is perpendicular to **BD.**

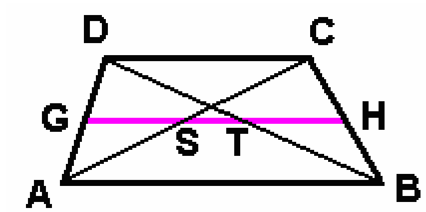
II.3.7.



In the drawing, two angles have equal measurement if they are marked with the same color.

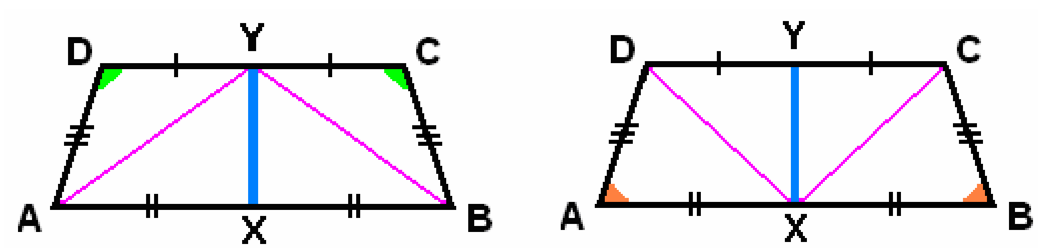
III.3.14.

The points **A, B, C, D** form the vertices of a trapezoid with **AB** || **CD,** and the midpoints of **[AD]** and **[BC]** are **G** and **H** respectively**.** In the first part of this exercise**,** the objective is to show that **GH** is parallel to **AB** and **CD** and to find its length in terms of the lengths of **[AB]** and **[CD].**



In the final part of the exercise the objective is to show that the midpoints **S** and **T** of the diagonals **[AC]** and **[BD]** both lie on the line **GH.**

III.3.15.



We are assuming that the points **A, B, C, D** form the vertices of an ***isosceles*** trapezoid with **AB** || **CD,** and the points **X** and **Y** are the midpoints of **[AB]** and **[CD]** respectively**.** The idea is to use the basic properties of an isosceles trapezoid (various parts have equal measurements) to show that $\triangle$**ADY** $\cong$ $\triangle$**BCY** and $\triangle$**XAD** $\cong$ $\triangle$**XBC,** so that **Y** will be equidistant from **A** and **B,** and **X** will be equidistant from **C** and **D.**