

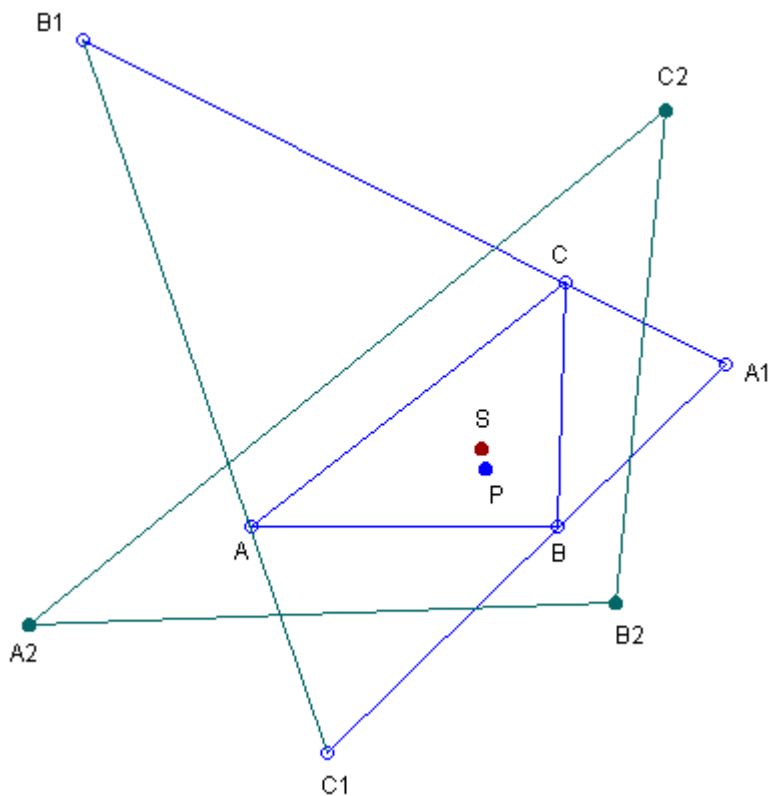
Triangles of Reflections. Part 2.

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Abstract. By using the computer program "Machine for Questions and Answers", we study perspectors of basic triangles and triangles of reflections of a triangle center in the sides of the anticevian triangle of a triangle center. A simple construction of the isogonal conjugate of a triangle center is given.

Given a triangle ABC and a Triangle Center of kind 1, labeled by P . Let $A_1B_1C_1$ be the anticevian triangle of a Triangle Center of kind 2 (possibly different from kind 1). Construct the reflection A_2 of P in the sideline B_1C_1 . Construct the reflection B_2 of P in the sideline C_1A_1 . Construct the reflection C_2 of P in the sideline A_1B_1 . We call triangle $A_2B_2C_2$ the *Triangle of the reflections of the Triangle Center of kind 1 in the sides of the Anticevian Triangle of the Triangle Center of kind 2*.

See the Figure:



P - Triangle Center of kind 1;
 $A_1B_1C_1$ - anticevian triangle of Triangle Center of kind 2;

A_2 - reflection of P in the sideline B_1C_1 ;
 B_2 - reflection of P in the sideline C_1A_1 ;
 C_2 - reflection of P in the sideline A_1B_1 ;
 $A_2B_2C_2$ - Triangle of the reflections of the Triangle Center of kind 1 in the sides of the Anticevian Triangle of the Triangle Center of kind 2.

In this Figure:

P - Nine-Point Center;

S - Incenter;

$A_1B_1C_1$ - anticevian triangle of the Incenter = Excentral Triangle;

A_2 - reflection of P in the sideline B_1C_1 ;

B_2 - reflection of P in the sideline C_1A_1 ;

C_2 - reflection of P in the sideline A_1B_1 ;

$A_2B_2C_2$ - Triangle of the reflections of the Nine-Point Center in the sides of the Excentral Triangle.

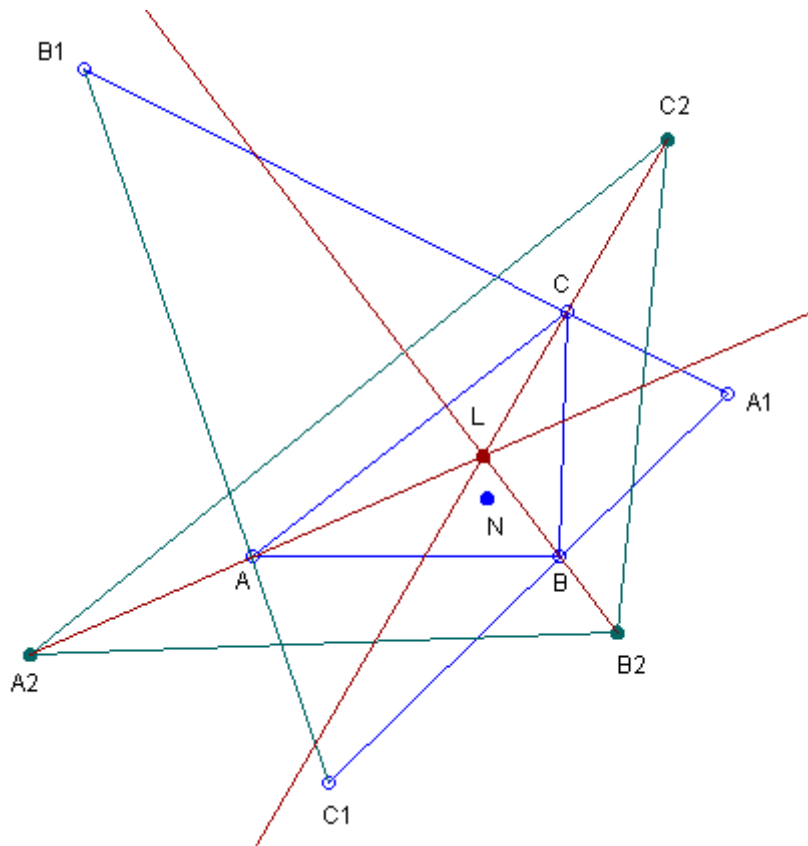
Construction of the Isogonal Conjugate of a Triangle Center

The first theorem from the list below gives us a simple way how to construct the isogonal conjugate of a triangle center:

Triangle ABC and the Triangle of the reflections of the Triangle Center in the sides of the Excentral Triangle are perspective with perspector the Isogonal Conjugate of the Triangle Center.

Hence, we have to construct the Excentral Triangle and the Triangle of the reflections of the Triangle Center in the sides of the Excentral Triangle. Then the Isogonal Conjugate of the Triangle Center is the perspector of Triangle ABC and the Triangle of the reflections of the Triangle Center in the sides of the Excentral Triangle

See the Figure:



In this figure:

N - Triangle Center;

$A_1B_1C_1$ - Excentral Triangle;

A_2 - reflection of N in the sideline B_1C_1 ;

B_2 - reflection of N in the sideline C_1A_1 ;

C_2 - reflection of N in the sideline A_1B_1 ;

$A_2B_2C_2$ - Triangle of the reflections of the Nine-Point Center in the sides of the Excentral Triangle;

L - Isogonal Conjugate of the Triangle Center = Perspector of Triangle ABC and the Triangle of the reflections of the Triangle Center in the sides of the Excentral Triangle.

Examples

The Machine for Questions and Answers produces examples of perspectives between triangles and Triangles of reflections. A few examples are given below.

Triangle ABC and the Triangle of the reflections of the Triangle Center in the sides of the Excentral Triangle are perspective with perspector the Isogonal Conjugate of the Triangle Center.

Triangle ABC and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are homothetic with homothetic center the Incenter.

Triangle ABC and the Triangle of the reflections of the Centroid in the sides of the Excentral Triangle are perspective with perspector the Symmedian Point.

Triangle ABC and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

Triangle ABC and the Triangle of the reflections of the Orthocenter in the sides of the Excentral Triangle are perspective with perspector the Circumcenter.

Triangle ABC and the Triangle of the reflections of the Nine-Point Center in the sides of the Excentral Triangle are perspective with perspector the Kosnita Point.

Triangle ABC and the Triangle of the reflections of the Symmedian Point in the sides of the Excentral Triangle are perspective with perspector the Centroid.

Triangle ABC and the Triangle of the reflections of the Gergonne Point in the sides of the Excentral Triangle are perspective with perspector the Internal Center of Similitude of the Incircle and the Circumcircle.

Triangle ABC and the Triangle of the reflections of the Nagel Point in the sides of the Excentral Triangle are perspective with perspector the External Center of Similitude of the Incircle and the Circumcircle.

Triangle ABC and the Triangle of the reflections of the Mittenpunkt in the sides of the Excentral Triangle are perspective with perspector the Isogonal Conjugate of the Mittenpunkt.

Triangle ABC and the Triangle of the reflections of the Spieker Center in the sides of the Excentral Triangle are perspective with perspector the Isogonal Conjugate of the Spieker Center.

Triangle ABC and the Triangle of the reflections of the Outer Fermat Point in the sides of the Excentral Triangle are perspective with perspector the First Isodynamic Point.

Triangle ABC and the Triangle of the reflections of the Inner Fermat Point in the sides of the Excentral Triangle are perspective with perspector the Second Isodynamic Point.

Triangle ABC and the Triangle of the reflections of the First Isodynamic Point in the sides of the Excentral Triangle are perspective with perspector the Outer Fermat Point.

Triangle ABC and the Triangle of the reflections of the Second Isodynamic Point in the sides of the Excentral Triangle are perspective with perspector the Inner Fermat Point.

Triangle ABC and the Triangle of the reflections of the Schiffler Point in the sides of the Excentral Triangle are perspective with perspector the Orthocenter of the Intouch Triangle.

Triangle ABC and the Triangle of the reflections of the Gibert Point in the sides of the Excentral Triangle are perspective with perspector the Prasolov Point.

Triangle ABC and the Triangle of the reflections of the Second Power Point in the sides of the Excentral Triangle are perspective with perspector the Isotomic Conjugate of the Incenter.

Triangle ABC and the Triangle of the reflections of the Third Power Point in the sides of the Excentral Triangle are perspective with perspector the Isotomic Conjugate of the Symmedian Point.

Triangle ABC and the Triangle of the reflections of the Grinberg Point in the sides of the Excentral Triangle are perspective with perspector the Isogonal Conjugate of the Grinberg Point.

Triangle ABC and the Triangle of the reflections of the Kosnita Point in the sides of the Excentral Triangle are perspective with perspector the Nine-Point Center.

Triangle ABC and the Triangle of the reflections of the Internal Center of Similitude of the Incircle and the Circumcircle in the sides of the Excentral Triangle are perspective with perspector the Gergonne Point.

Triangle ABC and the Triangle of the reflections of the External Center of Similitude of the Incircle and the Circumcircle in the sides of the Excentral Triangle are perspective with perspector the Nagel Point.

Triangle ABC and the Triangle of the reflections of the Prasolov Point in the sides of the Excentral Triangle are perspective with perspector the Gibert Point.

Triangle ABC and the Triangle of the reflections of the Congruent Isoscelizers Point in the sides of the Excentral Triangle are perspective with perspector the Perspector of Triangle ABC and the Extouch Triangle of the Intouch Triangle.

Triangle ABC and the Triangle of the reflections of the Inner Kenmotu Point in the sides of the Excentral Triangle are perspective with perspector the Outer Vecten Point.

Triangle ABC and the Triangle of the reflections of the Outer Kenmotu Point in the sides of the Excentral Triangle are perspective with perspector the Inner Vecten Point.

Triangle ABC and the Triangle of the reflections of the Outer Vecten Point in the sides of the Excentral Triangle are perspective with perspector the Inner Kenmotu Point.

Triangle ABC and the Triangle of the reflections of the Inner Vecten Point in the sides of the Excentral Triangle are perspective with perspector the Outer Kenmotu Point.

Triangle ABC and the Triangle of the reflections of the First Brocard Point in the sides of the Excentral Triangle are perspective with perspector the Second Brocard Point.

Triangle ABC and the Triangle of the reflections of the Second Brocard Point in the sides of the Excentral Triangle are perspective with perspector the First Brocard Point.

Triangle ABC and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Orthocenter.

Triangle ABC and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Orthocenter are homothetic with homothetic center the de

Longchamps Point.

Triangle ABC and the Triangle of the reflections of the Circumcenter in the sides of the Tangential Triangle are homothetic with homothetic center the Circumcenter.

Triangle ABC and the Triangle of the reflections of the Center of the Outer Soddy Circle in the sides of the Anticevian Triangle of the Gergonne Point are perspective with perspector the Center of the Inner Soddy Circle.

Triangle ABC and the Triangle of the reflections of the Center of the Inner Soddy Circle in the sides of the Anticevian Triangle of the Gergonne Point are perspective with perspector the Center of the Outer Soddy Circle.

The Incentral Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Medial Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are homothetic with homothetic center the Internal Center of Similitude of the Bevan Circle and the Nine-Point Circle.

The Medial Triangle and the Triangle of the reflections of the Symmedian Point in the sides of the Excentral Triangle are perspective with perspector the Centroid.

The Medial Triangle and the Triangle of the reflections of the Spieker Center in the sides of the Excentral Triangle are perspective with perspector the Spieker Center.

The Medial Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Medial Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticevian Triangle of the Orthocenter are perspective with perspector the Orthocenter.

The Medial Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Orthocenter are homothetic with homothetic center the Skordev Point.

The Medial Triangle and the Triangle of the reflections of the Nine-Point Center in the sides of the Tangential Triangle are perspective with perspector the Nine-Point Center.

The Orthic Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

The Orthic Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are perspective with perspector the Orthocenter.

The Orthic Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Skordev Point.

The Symmedial Triangle and the Triangle of the reflections of the Centroid in the sides of

the Excentral Triangle are perspective with perspector the Symmedian Point.

The Intouch Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Excentral Triangle are homothetic with homothetic center the Incenter.

The Intouch Triangle and the Triangle of the reflections of the Internal Center of Similitude of the Incircle and the Circumcircle in the sides of the Excentral Triangle are perspective with perspector the Gergonne Point.

The Intouch Triangle and the Triangle of the reflections of the Incenter in the sides of the Anticomplementary Triangle are perspective with perspector the Incenter.

The Extouch Triangle and the Triangle of the reflections of the External Center of Similitude of the Incircle and the Circumcircle in the sides of the Excentral Triangle are perspective with perspector the Nagel Point.

The Extouch Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Anticomplementary Triangle are perspective with perspector the Bevan Point.

The Excentral Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Excentral Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Excentral Triangle are homothetic with homothetic center the Circumcenter.

The Excentral Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Anticomplementary Triangle are perspective with perspector the Bevan Point.

The Excentral Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Spieker Center are perspective with perspector the de Longchamps Point.

The Excentral Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticevian Triangle of the Grinberg Point are perspective with perspector the Circumcenter.

The Anticomplementary Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are homothetic with homothetic center the Spieker Center.

The Anticomplementary Triangle and the Triangle of the reflections of the Symmedian Point in the sides of the Excentral Triangle are perspective with perspector the Centroid.

The Anticomplementary Triangle and the Triangle of the reflections of the Nagel Point in the sides of the Excentral Triangle are perspective with perspector the Nagel Point.

The Anticomplementary Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Circumcenter.

The Anticomplementary Triangle and the Triangle of the reflections of the de Longchamps

Point in the sides of the Anticomplementary Triangle are perspective with perspector the de Longchamps Point.

The Anticomplementary Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Orthocenter are homothetic with homothetic center the Orthocenter.

The Anticomplementary Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Tangential Triangle are homothetic with homothetic center the Nine-Point Center.

The Anticomplementary Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Tangential Triangle are perspective with perspector the Orthocenter.

The Tangential Triangle and the Triangle of the reflections of the Centroid in the sides of the Excentral Triangle are perspective with perspector the Symmedian Point.

The Tangential Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Tangential Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticevian Triangle of the Nine-Point Center are perspective with perspector the Orthocenter.

The Circum-Incentral Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Circum-Incentral Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Circum-Medial Triangle and the Triangle of the reflections of the Symmedian Point in the sides of the Excentral Triangle are perspective with perspector the Centroid.

The Circum-Orthic Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

The Circum-Orthic Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are perspective with perspector the Orthocenter.

The Circum-Orthic Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Centroid.

The Half-Altitude Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

The Half-Altitude Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are perspective with perspector the Orthocenter.

The Half-Altitude Triangle and the Triangle of the reflections of the Center of the Taylor

Circle in the sides of the Tangential Triangle are perspective with perspector the Center of the Taylor Circle.

The Euler Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are homothetic with homothetic center the External Center of Similitude of the Bevan Circle and the Nine-Point Circle.

The Euler Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

The Euler Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Orthocenter.

The Euler Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticevian Triangle of the Orthocenter are perspective with perspector the Circumcenter.

The Euler Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Orthocenter are homothetic with homothetic center the Centroid.

The Euler Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Tangential Triangle are homothetic with homothetic center the Center of the Orthocentroidal Circle.

The Euler Triangle and the Triangle of the reflections of the Nine-Point Center in the sides of the Tangential Triangle are perspective with perspector the Nine-Point Center.

The Euler Triangle and the Triangle of the reflections of the Schoute Center in the sides of the Tangential Triangle are perspective with perspector the Kiepert Center.

The Intangents Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Intangents Triangle and the Triangle of the reflections of the Incenter in the sides of the Anticomplementary Triangle are perspective with perspector the Incenter.

The Extangents Triangle and the Triangle of the reflections of the Schiffler Point in the sides of the Excentral Triangle are perspective with perspector the Orthocenter of the Intouch Triangle.

The Extangents Triangle and the Triangle of the reflections of the Bevan Point in the sides of the Anticomplementary Triangle are perspective with perspector the Bevan Point.

The Mixtilinear Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Fuhrmann Triangle and the Triangle of the reflections of the Nagel Point in the sides of the Excentral Triangle are perspective with perspector the Nagel Point.

The Fuhrmann Triangle and the Triangle of the reflections of the Evans Perspector in the

sides of the Excentral Triangle are perspective with perspector the Incenter.

The Fuhrmann Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Mid-Arc Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Reflection Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Excentral Triangle are perspective with perspector the Orthocenter.

The Reflection Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Nine-Point Center.

The Reflection Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are perspective with perspector the Orthocenter.

The First Brocard Triangle and the Triangle of the reflections of the Third Power Point in the sides of the Excentral Triangle are perspective with perspector the Isotomic Conjugate of the Symmedian Point.

The First Brocard Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Second Brocard Triangle and the Triangle of the reflections of the Centroid in the sides of the Excentral Triangle are perspective with perspector the Symmedian Point.

The Fourth Brocard Triangle and the Triangle of the reflections of the Symmedian Point in the sides of the Excentral Triangle are perspective with perspector the Centroid.

The Malfatti Central Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are perspective with perspector the Incenter.

The Malfatti Squares Triangle and the Triangle of the reflections of the Malfatti-Moses Point in the sides of the Anticomplementary Triangle are perspective with perspector the Malfatti-Moses Point.

The Lucas Central Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Excentral Triangle are perspective with perspector the Circumcenter.

The Lucas Central Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Tangential Triangle are perspective with perspector the Circumcenter.

The Neuberg Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Reflected Neuberg Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the

Circumcenter.

The Hexyl Triangle and the Triangle of the reflections of the Incenter in the sides of the Anticomplementary Triangle are perspective with perspector the Incenter.

The Hexyl Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticevian Triangle of the Spieker Center are perspective with perspector the Orthocenter.

The Hexyl Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticevian Triangle of the Grinberg Point are perspective with perspector the Circumcenter.

The Johnson Triangle and the Triangle of the reflections of the Kosnita Point in the sides of the Excentral Triangle are perspective with perspector the Nine-Point Center.

The Johnson Triangle and the Triangle of the reflections of the Center of the Fuhrmann Circle in the sides of the Excentral Triangle are perspective with perspector the Fuhrmann Center.

The Johnson Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Anticomplementary Triangle are perspective with perspector the Circumcenter.

The Johnson Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Anticomplementary Triangle are homothetic with homothetic center the Centroid.

The Johnson Triangle and the Triangle of the reflections of the de Longchamps Point in the sides of the Anticevian Triangle of the Orthocenter are homothetic with homothetic center the Orthocenter.

The Johnson Triangle and the Triangle of the reflections of the Circumcenter in the sides of the Tangential Triangle are homothetic with homothetic center the Center of the Orthocentroidal Circle.

The Johnson Triangle and the Triangle of the reflections of the Orthocenter in the sides of the Tangential Triangle are perspective with perspector the Orthocenter.

The Inner Johnson-Yff Triangle and the Triangle of the reflections of the Incenter in the sides of the Excentral Triangle are homothetic with homothetic center the Incenter.

The Inner Johnson-Yff Triangle and the Triangle of the reflections of the Center of the Inner Johnson-Yff Circle in the sides of the Anticomplementary Triangle are perspective with perspector the Center of the Inner Johnson-Yff Circle.

The Inner Johnson-Yff Triangle and the Triangle of the reflections of the Internal Center of Similitude of the Incircle and the Circumcircle in the sides of the Tangential Triangle are perspective with perspector the Internal Center of Similitude of the Incircle and the Circumcircle.

The Outer Johnson-Yff Triangle and the Triangle of the reflections of the Incenter in the

sides of the Excentral Triangle are homothetic with homothetic center the Incenter.

The Outer Johnson-Yff Triangle and the Triangle of the reflections of the Center of the Outer Johnson-Yff Circle in the sides of the Anticomplementary Triangle are perspective with perspector the Center of the Outer Johnson-Yff Circle.

The Outer Johnson-Yff Triangle and the Triangle of the reflections of the External Center of Similitude of the Incircle and the Circumcircle in the sides of the Tangential Triangle are perspective with perspector the External Center of Similitude of the Incircle and the Circumcircle.

Note

The above list contains examples in which the perspector is between the most basic points. The Machine for Questions and Answers could identify the other perspector upon request.

Invitation

The reader is invited to submit a note/paper containing

- synthetic proofs of theorems from this paper,
- or, applications of theorems from this paper,
- or, additional references related to this paper.

Definitions

We use the definitions in accordance with [1 - 6] and papers published in this journal.

The Level

The Machine for Questions and Answers is used to produce results in this paper. Currently the Machine has 6 levels of depths - 0,1,2,3,4,5. We use for this paper the level 0, that is, the Machine produces only elementary results. If we need deeper investigation, we have to use a level bigger than 0. Since the Machine for Questions and Answers produces too many results, it is suitable for us to use bigger levels upon request, that is, for specific questions.

Thanks

The figures in this note are produced by using the program C.a.R. (Compass and Ruler), an amazing program created by Rene Grothmann. The Grothmann's program is available for download in the Web: [Rene Grothmann's C.a.R.](#). It is free and open source. The reader may verify easily the statements of this paper by using C.a.R. Many thanks to Rene Grothmann for his wonderful program.

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