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Grinberg Point

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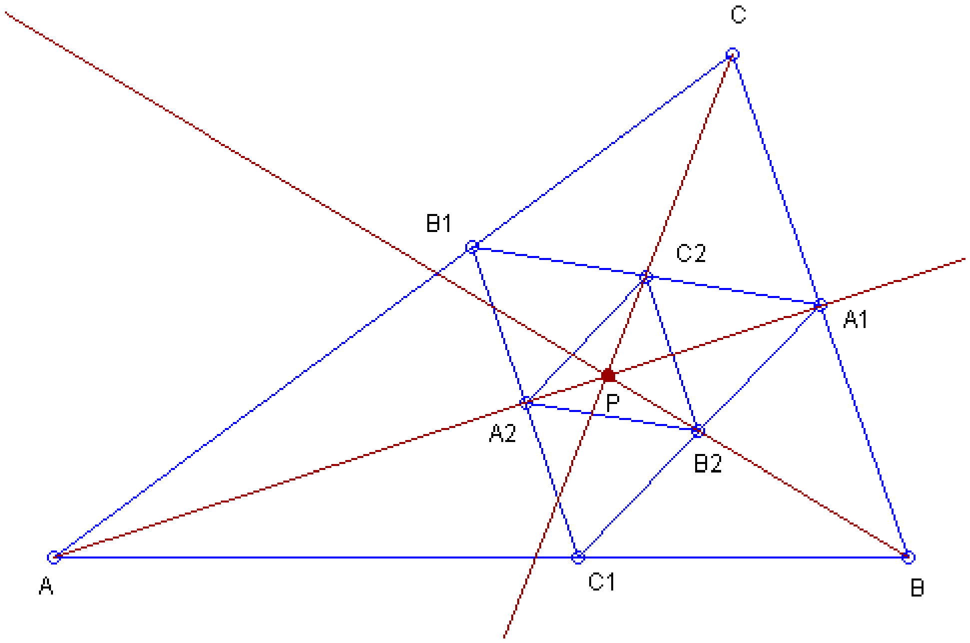
Abstract. By using the computer program "Machine for Questions and Answers", we find properties of the Grinberg Point.

The *Grinberg Point* is the perspector of Triangle ABC and the Medial Triangle of the Incentral Triangle. The Grinberg Point is named in honor of Darij Grinberg, one of the founders of modern Euclidean Geometry.

See the Figure:



$A_1B_1C_1$ - Incentral Triangle;
$A_2B_2C_2$ - Medial Triangle of the Incentral Triangle;
P - Grinberg Point = Prespector of triangles $A_1B_1C_1$ and $A_2B_2C_2$.

Given a point, the Machine for Questions and Answers produces theorems related to properties of the point. The Machine for Questions and Answers produces theorems related to properties of the Grinberg Point:

Grinberg Point = Midpoint between the First Jerabek Point and the Second Jerabek Point.

Grinberg Point = Midpoint between the Isotomic Conjugate of the Incenter and the Equal Parallelians Point.

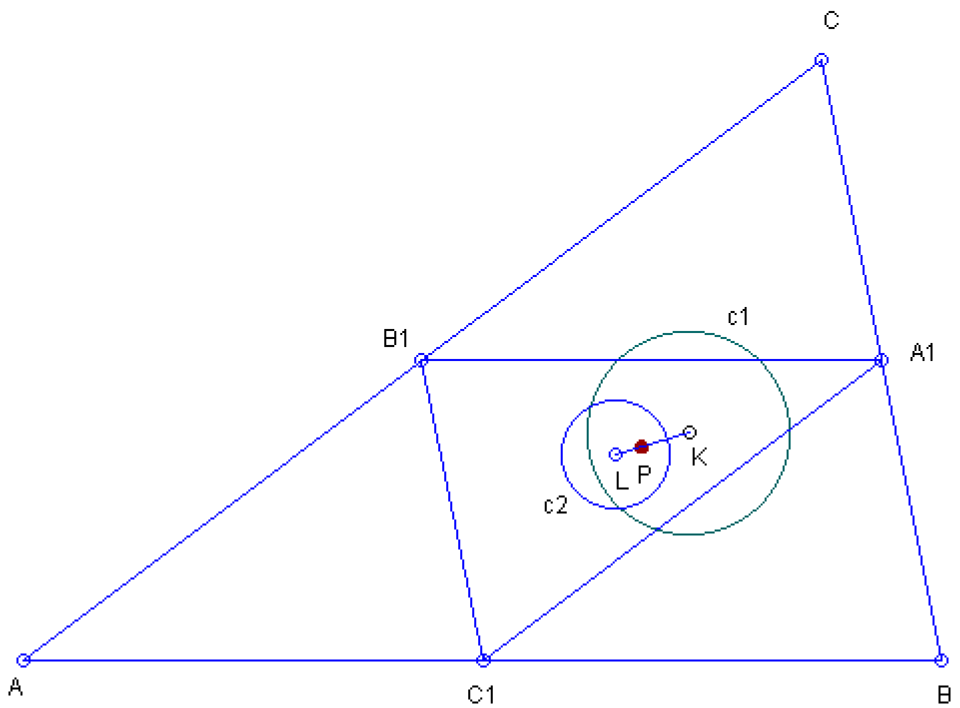
Grinberg Point = Product of the Incenter and the Spieker Center.

Grinberg Point = Product of the Schiffler Point and the Second Feuerbach Point.

Grinberg Point = Product of the Gergonne Point and the Centroid of the Extouch Triangle.

Grinberg Point = Product of the Nagel Point and the Orthocenter of the Intouch Triangle.

Grinberg Point = Internal Center of Similitude of the Half-Moses Circle and the Spieker Circle of the Medial Triangle.

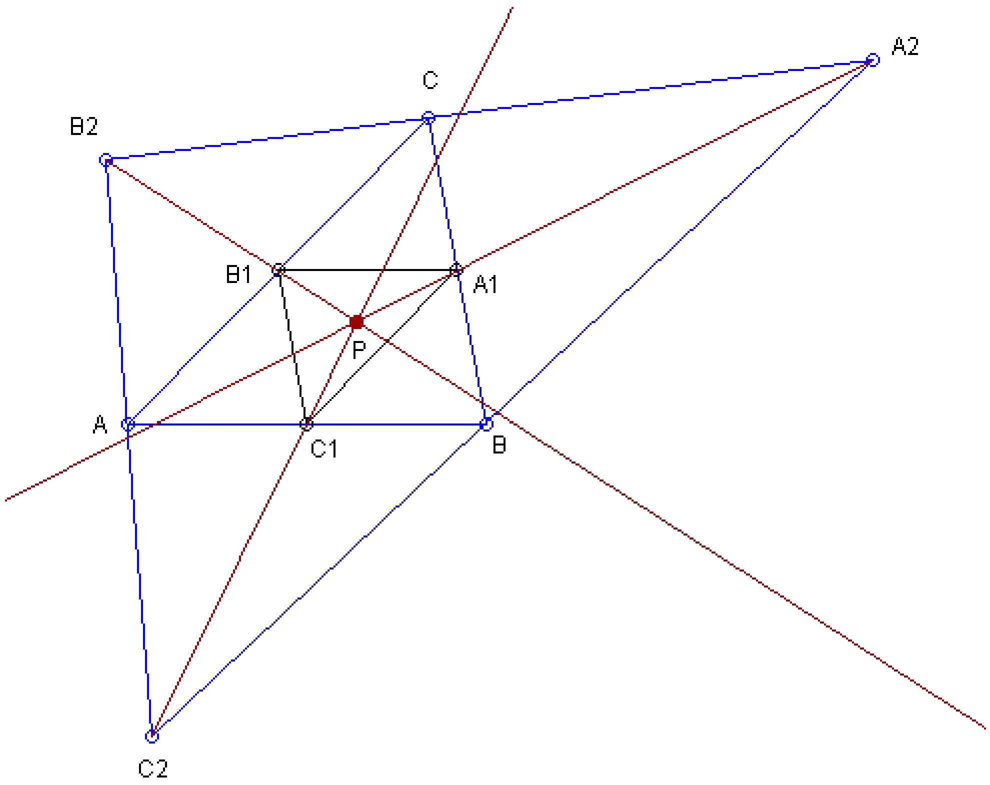


See the Figure:

c1 - Half-Moses Circle;
K - Center of the Half-Moses Circle;
$A_1B_1C_1$ - Medial Triangle;
c2 - Spieker Circle of the Medial Triangle;
L - Center of the Spieker Circle of the Medial Triangle;
P - Grinberg Point = Internal Center of Similitude of the Half-Moses Circle and the Spieker Circle of the Medial Triangle.

Grinberg Point = Perspector of the Medial Triangle and the Anticevian Triangle of the Spieker Center.

See the Figure:

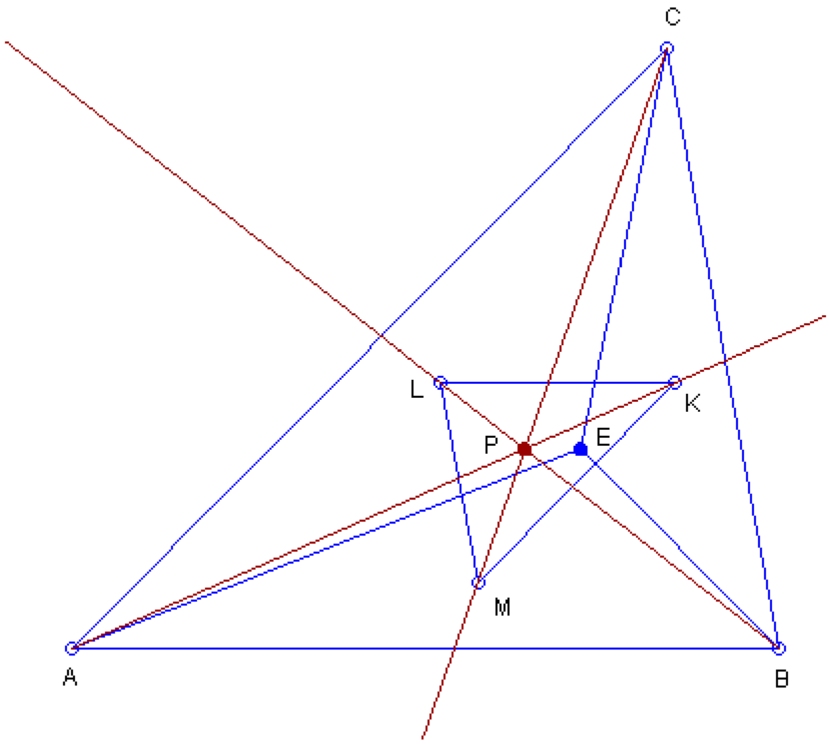


$A_1B_1C_1$ - Medial Triangle;
$A_2B_2C_2$ - Anticevian Triangle of the Spieker Center;
P - Grinberg Point = Prespector of triangles $A_1B_1C_1$ and $A_2B_2C_2$.

Grinberg Point = Perspector of the Anticevian Triangle of the Spieker Center and the Pedal Triangle of the Circumcenter.

Grinberg Point = Homothetic Center of Triangle ABC and the Triangle of the Centroids of the Triangulation Triangles of the Equal Parallelians Point.

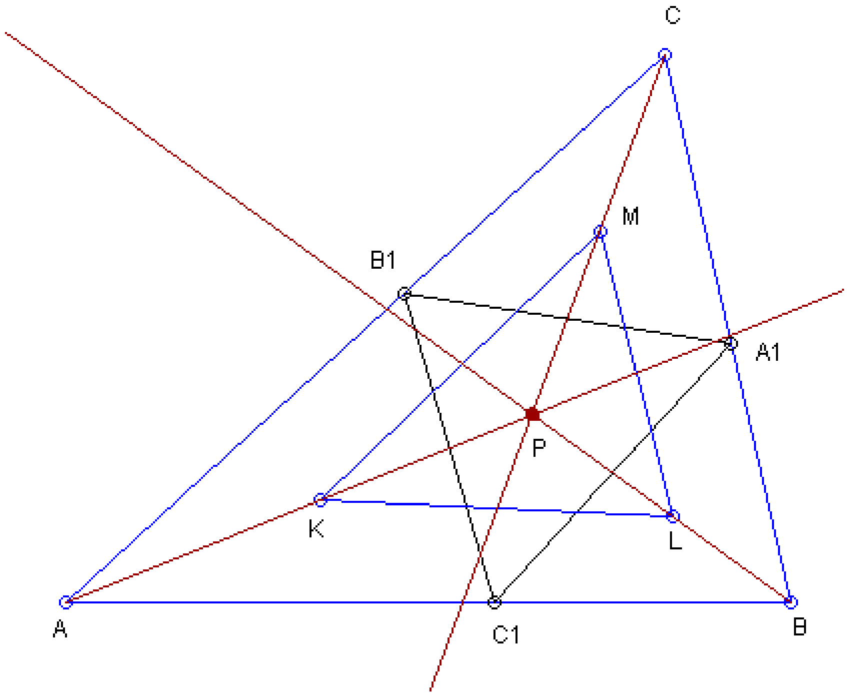
See the Figure:



E - Equal Parallelians Point;
K, L, M - Centroids of triangles BCE, CAE, ABE, respectively;
KLM - Triangle of the Centroids of the Triangulation Triangles of the Equal Parallelians Point;
P - Grinberg Point = Homothetic Center of triangles ABC and KLM.

Grinberg Point = Perspector of Triangle ABC and the Triangle of the Centroids of the Corner Triangles of the Incenter.

See the figure:



$A_1B_1C_1$ - Incentral Triangle;
K, L, M - Centroids of triangles B_1C_1A, C_1A_1B, A_1B_1C, respectively;
KLM - Triangle of the Centroids of the Corner Triangles of the Incenter;
P - Grinberg Point = Perspector of triangles ABC and KLM.

Grinberg Point = Homothetic Center of Triangle ABC and the Triangle of the Grinberg Points of the Corner Triangles of the Centroid.

Grinberg Point = Complement of the Complement of the Equal Parallelians Point.

Grinberg Point = Complement of the Isogonal Conjugate of the Second Power Point.

Grinberg Point = Complement of the Isotomic Conjugate of the Incenter.

Grinberg Point = Complement of the Equal Parallelians Point of the Medial Triangle.

Grinberg Point = Anticomplement of the Grinberg Point of the Medial Triangle.

Grinberg Point = Complement of the Isotomic Conjugate of the Nagel Point of the Medial Triangle.

Grinberg Point = Complement of the Isotomic Conjugate of the Circumcenter of the Intouch Triangle.

The Grinberg Point lies on the Line through the Incenter and the Symmedian Point.

The Grinberg Point lies on the Line through the Incenter and the Mittenpunkt.

The Grinberg Point lies on the Line through the Centroid and the Equal Parallelians Point.

The Grinberg Point lies on the Line through the Mittenpunkt and the Symmedian Point.

The Grinberg Point lies on the Line through the Clawson Point and the Internal Center of Similitude of the Incircle and the Circumcircle.

The Grinberg Point lies on the Line through the Danneels-Apollonius Prespector and the Spieker Center.

The Grinberg Point lies on the Line through the First Jerabek Point and the Second Jerabek Point.

The Grinberg Point lies on the Line through the Centroid and the Isotomic Conjugate of the Incenter.

The Grinberg Point lies on the Line through the Internal Center of Similitude of the Incircle and the Circumcircle and the Perspector of the Intouch Triangle and the Tangential Triangle.

The Grinberg Point lies on the Line through the Internal Center of Similitude of the Incircle and the Circumcircle and the Perspector of the Extouch Triangle and the Tangential Triangle.

The Grinberg Point lies on the Line through the Centroid of the Extouch Triangle and the Centroid of the Incentral Triangle.

The Grinberg Point lies on the Line through the Homothetic Center of the Orthic Triangle and the Tangential Triangle and the Perspector of the Intouch Triangle and the Tangential Triangle.

The Grinberg Point lies on the Line through the Homothetic Center of the Orthic Triangle and the Tangential Triangle and the Perspector of the Extouch Triangle and the Tangential Triangle.

The Grinberg Point lies on the Line through the Perspector of the Extouch Triangle and the Tangential Triangle and the Perspector of the Intouch Triangle and the Tangential Triangle.

The Grinberg Point lies on the Line through the Midpoint of the Incenter and the Symmedian Point and the Midpoint of the Mittenpunkt and the Symmedian Point.

The Grinberg Point lies on the Line through the Midpoint of the Incenter and the Mittenpunkt and the Midpoint of the Incenter and the Symmedian Point.

The Grinberg Point lies on the Line through the Midpoint of the Incenter and the Mittenpunkt and the Midpoint of the Mittenpunkt and the Symmedian Point.

The Grinberg Point lies on the Line through the Internal Center of Similitude of the Circumcircle and the Spieker Circle and the Midpoint of the Incenter and the Symmedian Point.

The Grinberg Point lies on the Line through the Internal Center of Similitude of the Circumcircle and the Spieker Circle and the Midpoint of the Incenter and the Mittenpunkt.

The Grinberg Point lies on the Line through the Internal Center of Similitude of the Circumcircle and the Spieker Circle and the Midpoint of the Mittenpunkt and the Symmedian Point.

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 and Conventions

We use the definitions and conventions 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 we 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.

References

1. Quim Castellsaguer, The Triangles Web, http://www.xtec.es/~qcastell/ttw/ttweng/portada.html
2. D. Dekov, Computer-Generated Encyclopedia of Euclidean Geometry, First Edition, 2006, http://www.dekovsoft.com/
3. D. Dekov, The Ambiguities of the Natural Language, Journal of Computer-Generated Euclidean Geometry, vol. 2 (2007), http://www.dekovsoft.com/j/2007/01/index.htm
4. C. Kimberling, Encyclopedia of Triangle Centers, http://faculty.evansville.edu/ck6/encyclopedia/
5. Eric W. Weisstein, MathWorld - A Wolfram Web Resource. http://mathworld.wolfram.com/

6. Paul Yiu, Introduction to the Geometry of the Triangle, 2001, http://www.math.fau.edu/yiu/geometry.html

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