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99.99% Approximation to Angle Trisection

By Mahesh Bubna

Abstract- Angle trisection, which involves dividing an angle into three equal parts, is a classic problem in geometry. However, it's important to note that it's impossible to exactly trisect an arbitrary angle using only a compass and straightedge, as proven by the ancient Greek mathematicians.

The classical geometric construction methods allow for the creation of angles that are multiples of a fixed angle using only a compass and straightedge. The only angles that can be trisected exactly are those that can be constructed by repeatedly bisecting angles, such as angles of 60 degrees (since $60 = 2^2 * 3 * 5$).

The problem of angle trisection is closely related to the problem of "angle duplication," which involves constructing an angle that is twice a given angle. This problem is similarly unsolvable with only a compass and straightedge for arbitrary angles.

Keywords: angle trisection approximation, geometric constructions, numerical methods for angle trisection, high-precision angle division, trigonometric approximation of angle trisection, computational geometry for angle trisection.

GJSFR-F Classification: LCC: QA445, MSC: 51M04



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The classical geometric construction methods allow for the creation of angles that are multiples of a fixed angle using only a compass and straightedge. The only angles that can be trisected exactly are those that can be constructed by repeatedly bisecting angles, such as angles of 60 degrees (since $60 = 2^2 \cdot 3 \cdot 5$).

The problem of angle trisection is closely related to the problem of "angle duplication," which involves constructing an angle that is twice a given angle. This problem is similarly unsolvable with only a compass and straightedge for arbitrary angles.

If you're interested in an approximation of angle trisection, one approach involves using numerical methods to approximate the trisected angle. However, this wouldn't involve a pure geometric construction and would likely require the use of calculators or computers to perform the calculations.

Keywords: angle trisection approximation, geometric constructions, numerical methods for angle trisection, high-precision angle division, trigonometric approximation of angle trisection, computational geometry for angle trisection.

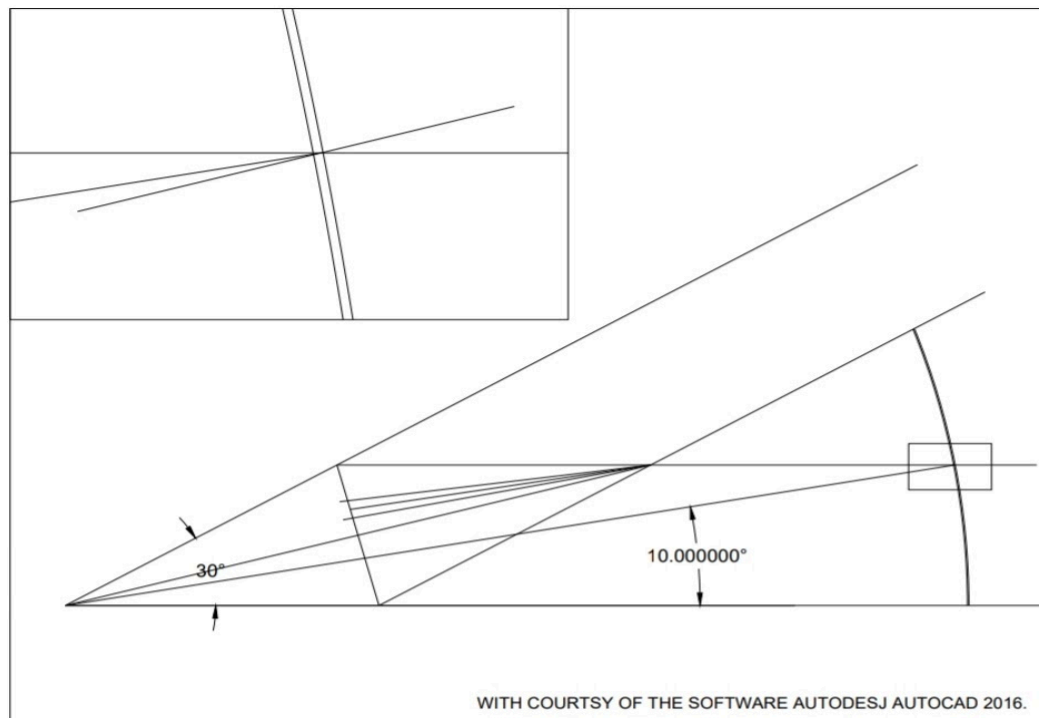
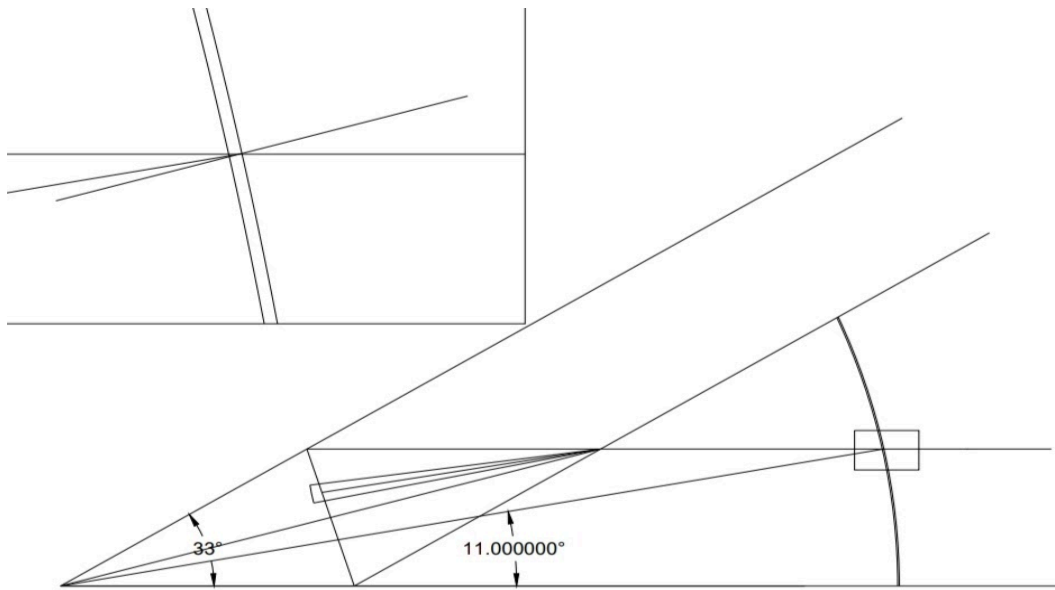


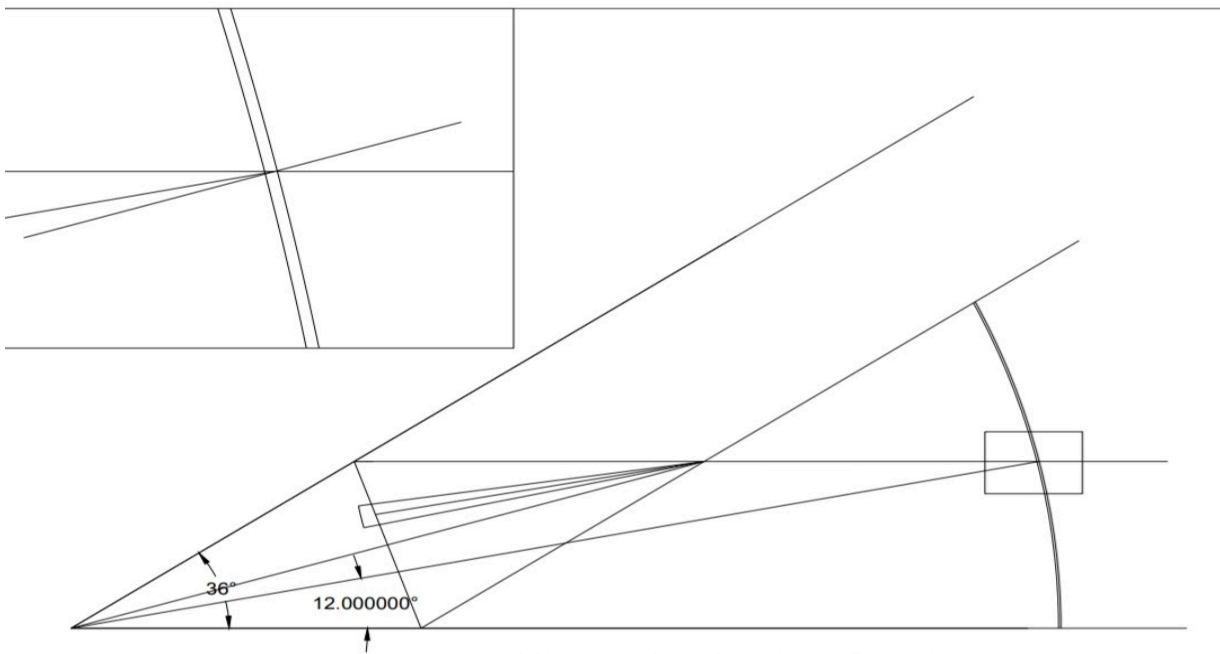
Fig. 1

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Fig. 2



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Fig. 3

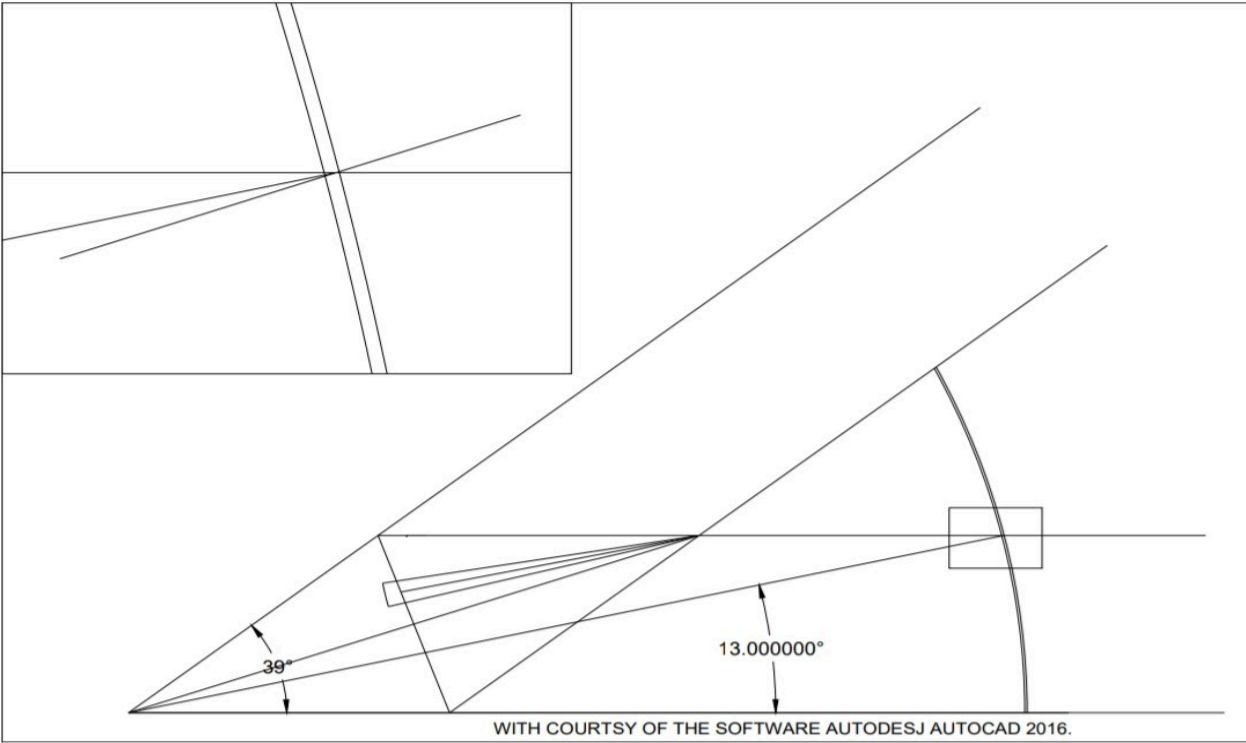


Fig. 4

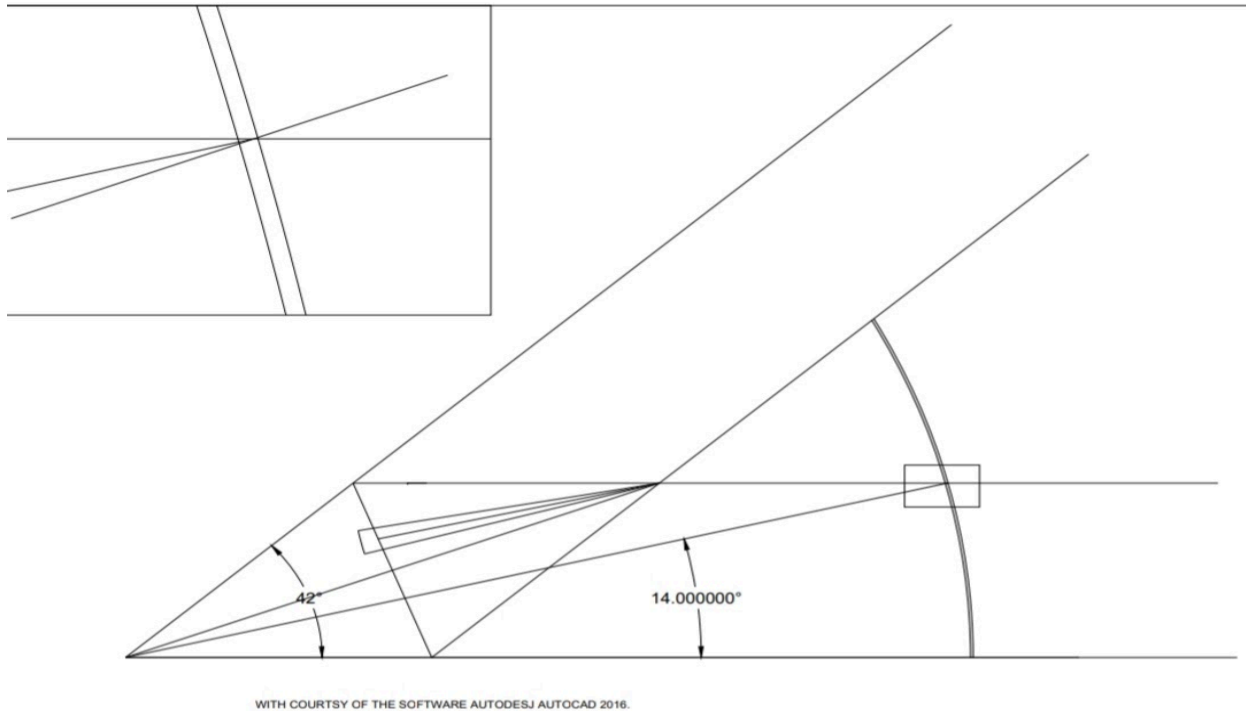
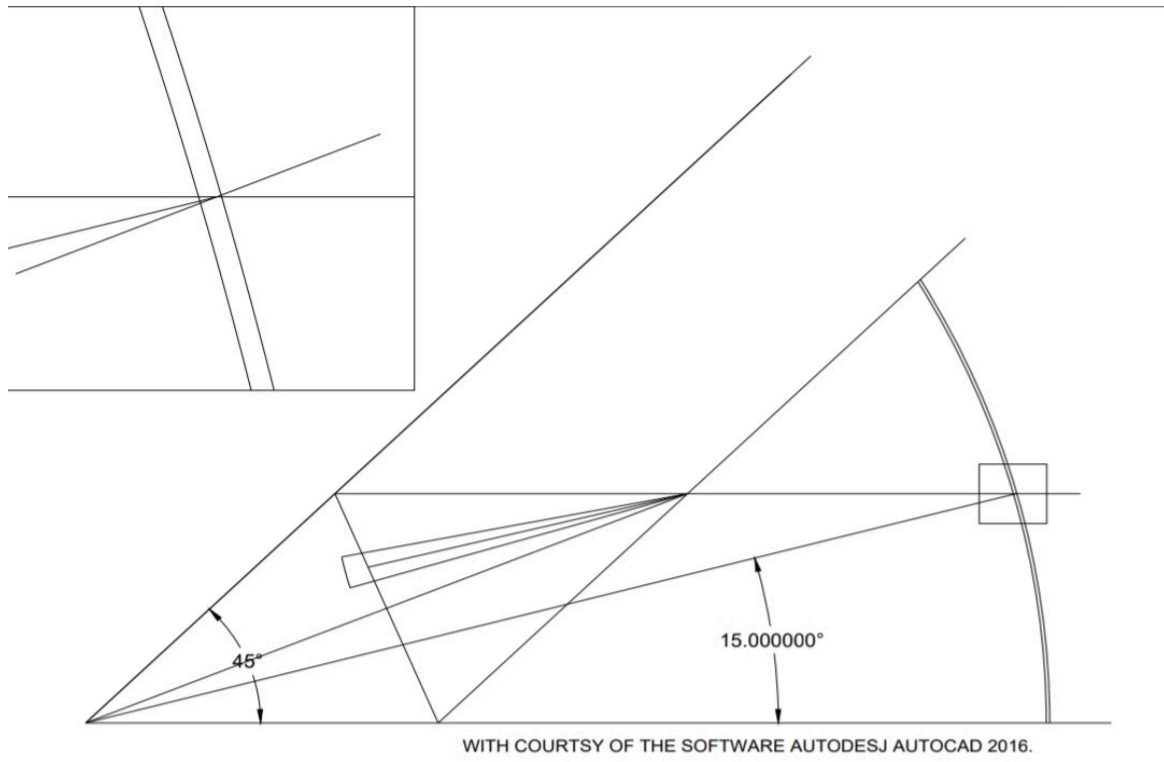
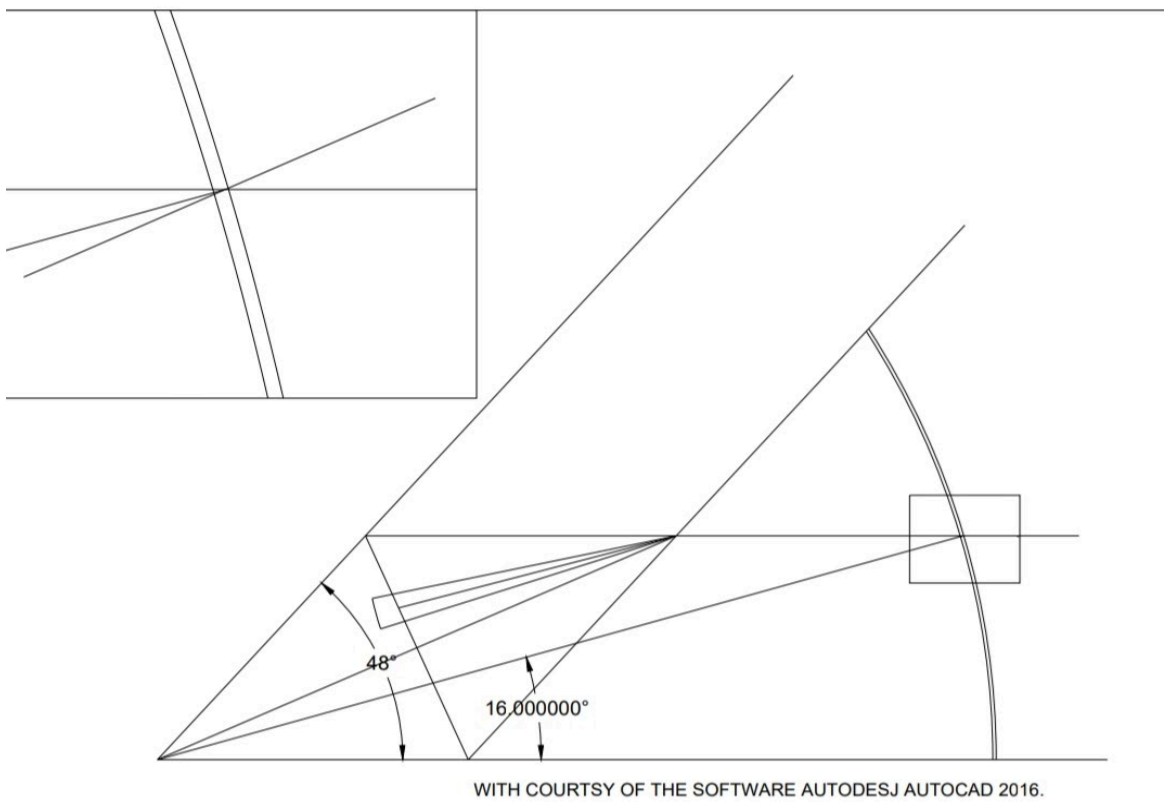
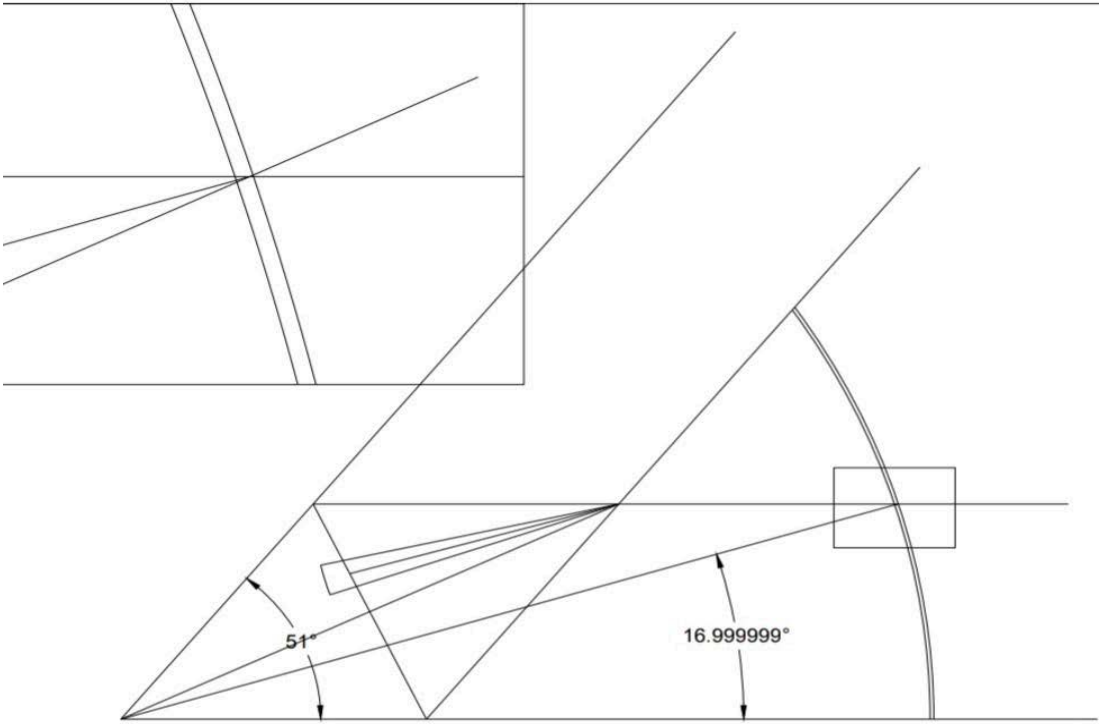


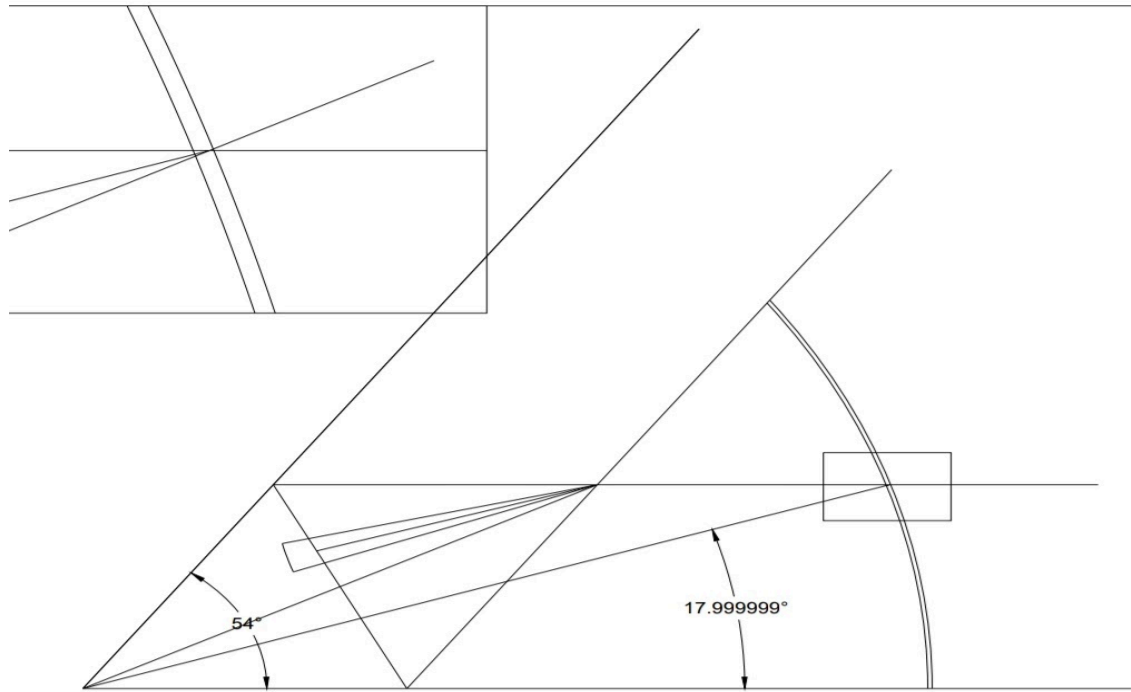
Fig. 5

*Fig. 6**Fig. 7*



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Fig. 8



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Fig. 9

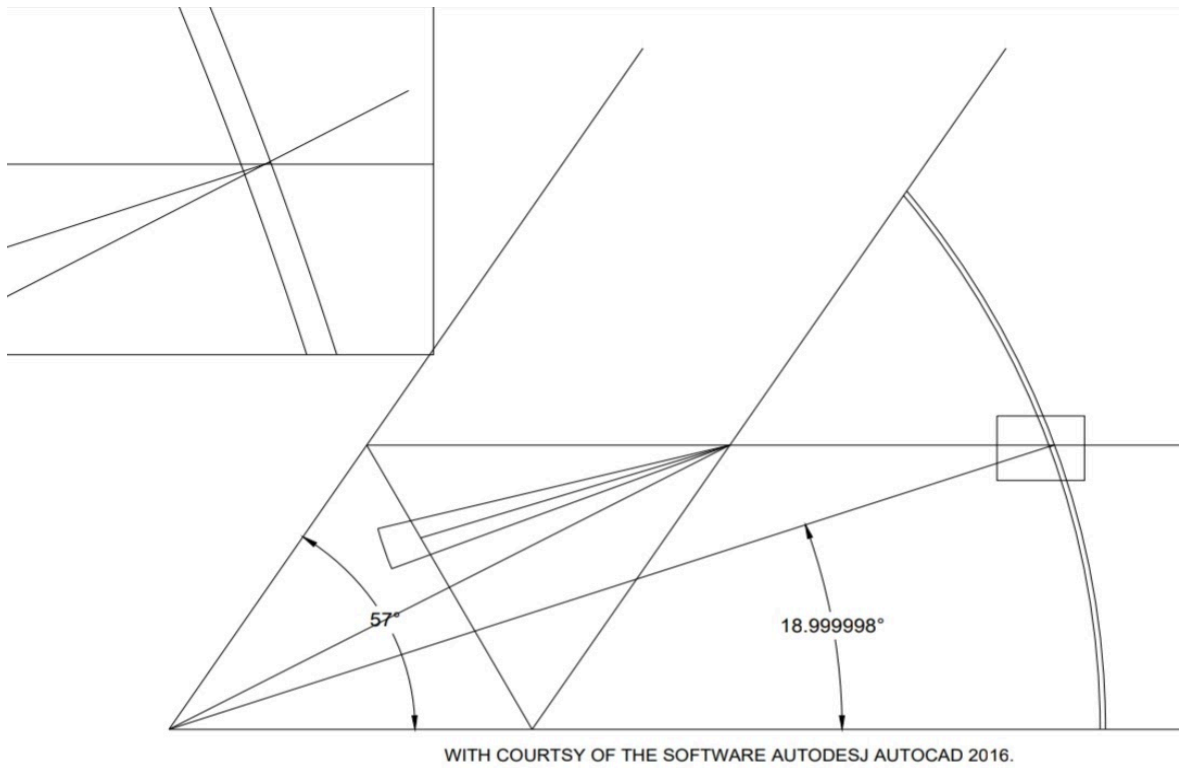


Fig. 10

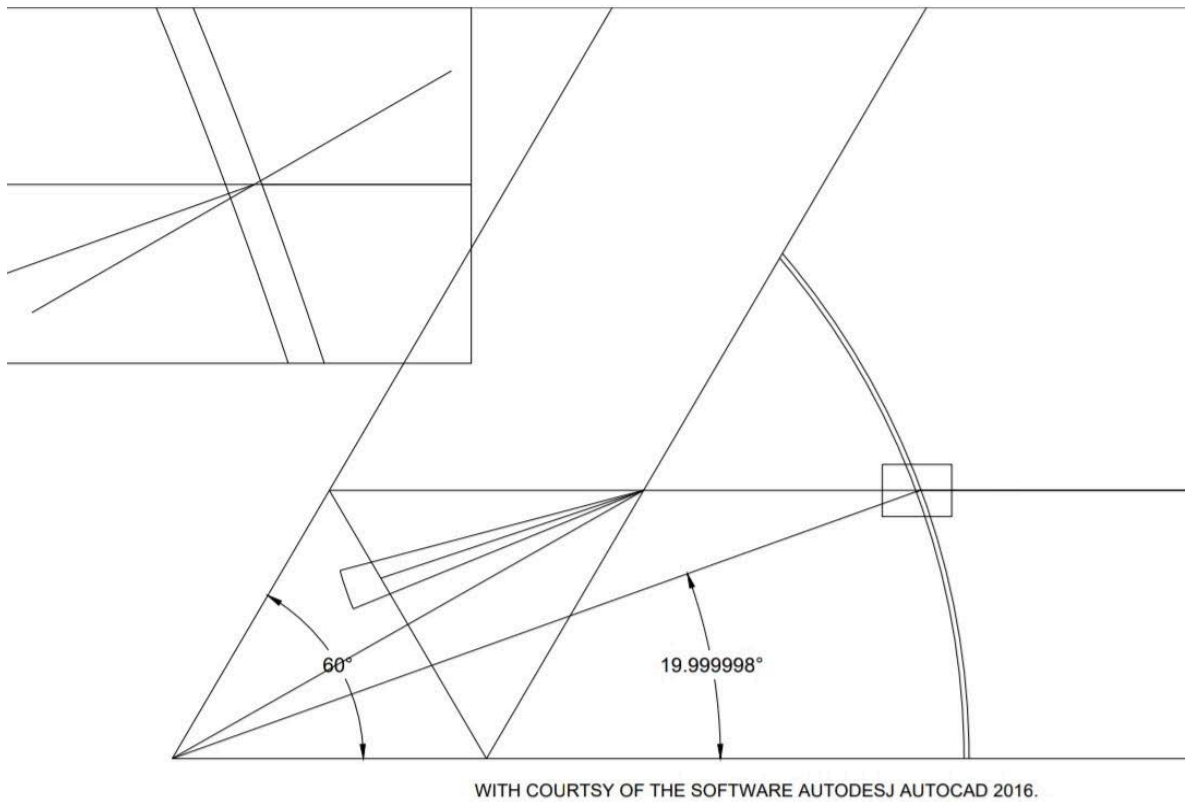
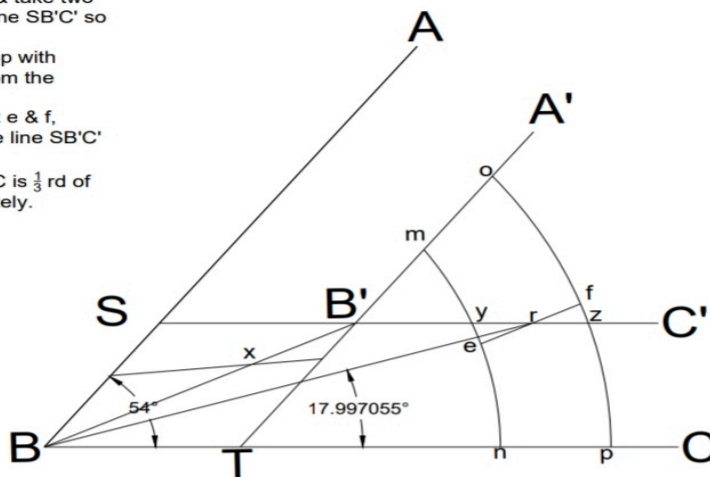


Fig. 11

Construction Steps: ABC is the given angle.

- 1) Construct a rhombus SBTB' & extend the lines SB' to C' & TB' to A',
- 2) Trisect the line BB' at point x & take two points y & z on the extended line SB'C' so as $B'x = B'y = yz$,
- 3) Draw two circular arcs mn & op with radius By & Bz respectively from the center B,
- 4) Bifurcate both the arcs at point e & f,
- 5) Join point e & f intersecting the line SB'C' at point r,
- 6) Now the constructed angle rBC is $\frac{1}{3}$ rd of original angle ABC approximately.



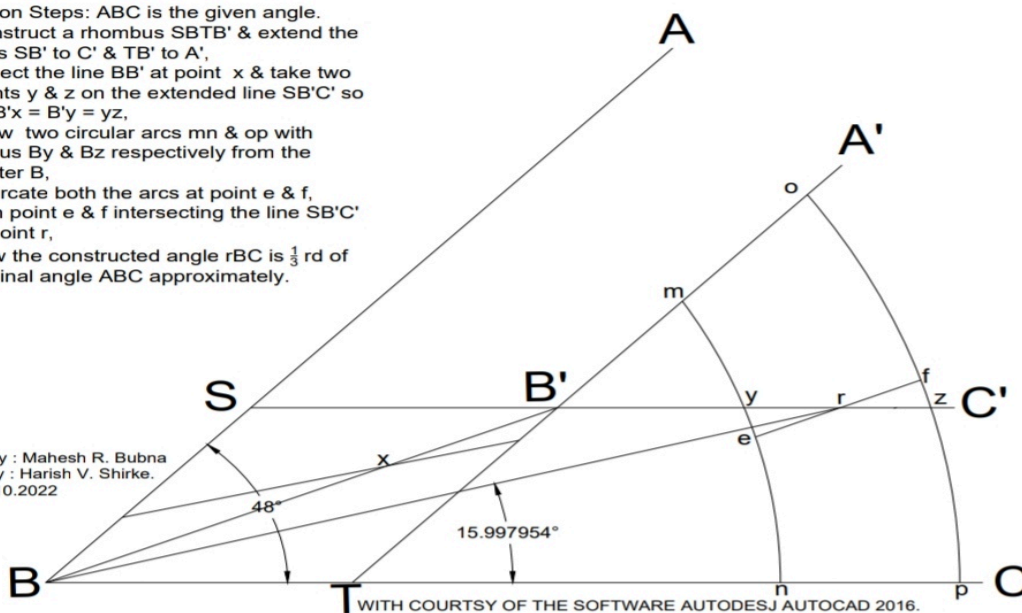
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Fig. 12

Construction Steps: ABC is the given angle.

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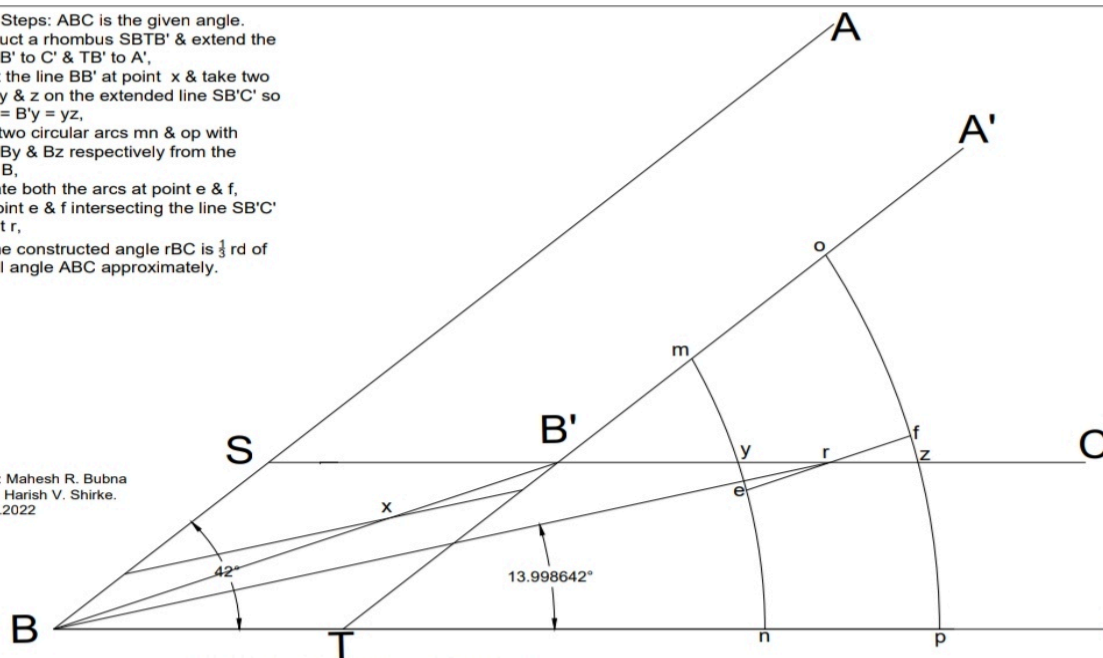
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Fig. 13

Construction Steps: ABC is the given angle.

- 1) Construct a rhombus SBTB' & extend the lines SB' to C' & TB' to A'.
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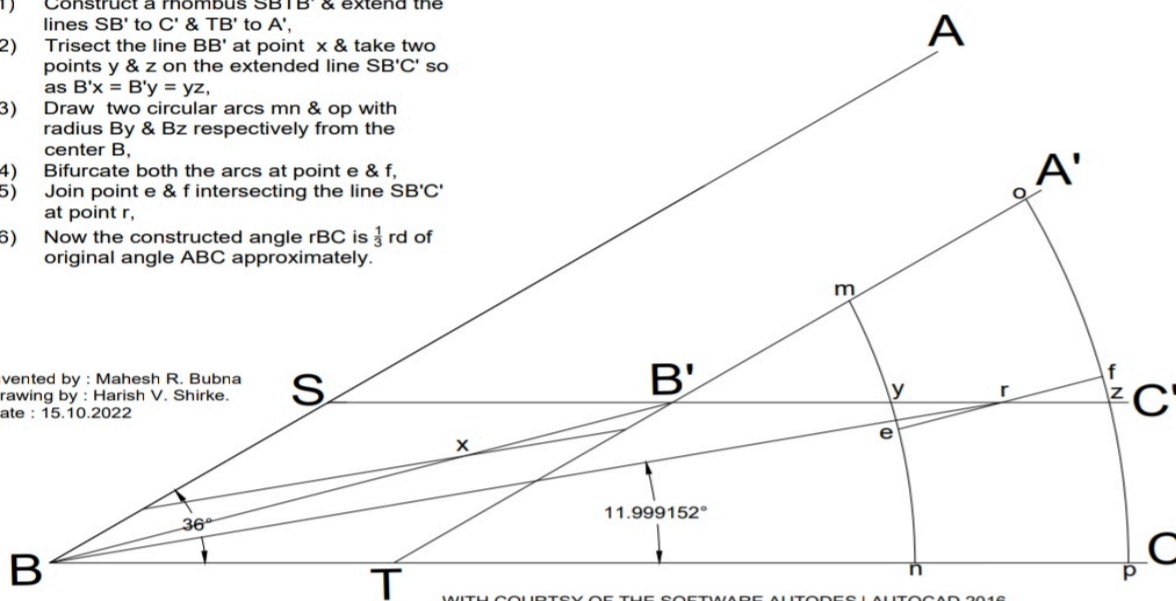
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Fig. 14

Construction Steps: ABC is the given angle.

- 1) Construct a rhombus SBTB' & extend the lines SB' to C' & TB' to A'.
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Fig. 15

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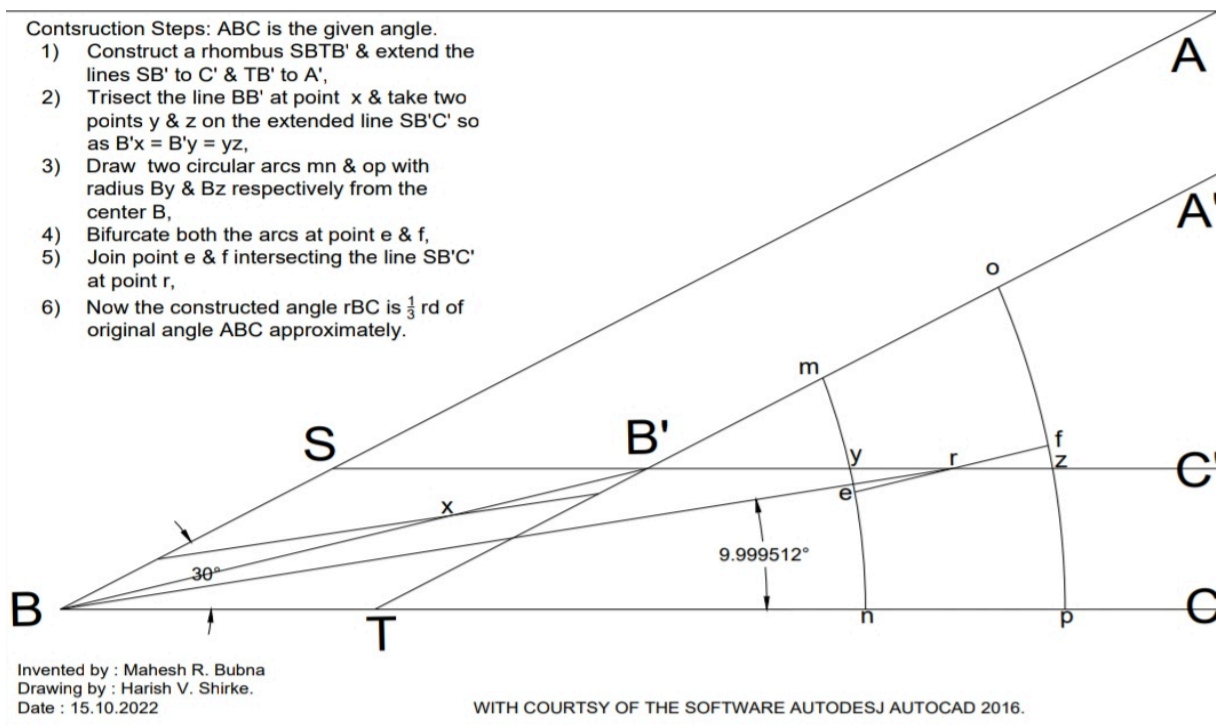


Fig. 16