Mathematics 3820H – Mathematics from medieval to modern times

Assignment #1
Extracting Understanding
Due on Friday, 18 January, 2019.

Here are three verses from the *Ganitapada*, the second part of the *Āryabhaṭīya*, written about 500 A.D. by the Indian mathematician Āryabhaṭa. [1], which focuses on mathematics. Keep in mind that the original Sanskrit is written as a poem.

4. One should always divide the *avarga* by twice the (square) root of the (preceding) *varga*. After subtracting the square (of the quotient) from the *varga* the quotient will be square root to the next place.

7. Half the circumference multiplied by half the diameter is the area of a circle. This area multiplied by its own square root is the exact volume of a sphere.

8. The two sides (separately) multiplied by the perpendicular and divided by their sum will give the perpendicular (from the point where the two diagonals intersect) to the parallel sides. The area is to be known by multiplying half the sum of the two sides by the perpendicular.

For context, which you are likely to need to make sense of verses 4 and 8, please see [1]. Be warned that you may still be confused, especially with respect to verse 4, even after reading the translator's analysis.

1. Are the assertions made in verse 7 correct? Explain why or why not. *[3]*

2. State the assertions made in verse 8 in modern terms and prove the second one. *[3]*

3. Try to explain the objective of and the process described in verse 4 as precisely as you can in modern terms. Does the process necessarily achieve its objective? Explain why it does or does not as best you can. *[4]*

REFERENCE

1. *Āryabhaṭīya*, by Āryabhaṭa, trans. by W.E. Clark, Univ. of Chicago Press, Chicago, 1930. It can be found at: `www.wilbourhall.org/pdfs/aryabhatiyaEnglish.pdf`