

7. [12 points] For Valentine's Day, Jason decides to make a heart-shaped cookie for Sophie to try to win her over. Being mathematically-minded, the only kind of heart that Jason knows how to construct is composed of two half-circles of radius r and an isosceles triangle of height h , as shown below.

Jason happens to know that Sophie's love for him will be determined by the dimensions of the cookie she receives; if given a cookie as described above, her love L will be

$$L = hr^2,$$

where r and h are measured in centimeters and L is measured in pitter-patters, a standard unit of affection. If Jason wants to make a cookie whose area is exactly 300cm^2 , what should the dimensions be to maximize Sophie's love?

