

7. The result should be written as 8.32 cm. The factor of 2 used to convert radius to diameter is exact—it has no uncertainty, and so does not change the number of significant figures.
8. $\sin 30.0^\circ = 0.500$
9. Since the size of large eggs can vary by 10%, the random large egg used in a recipe has a size with an uncertainty of about $\pm 5\%$. Thus the amount of the other ingredients can also vary by about $\pm 5\%$ and not adversely affect the recipe.

10. In estimating the number of car mechanics, the assumptions and estimates needed are:

- the population of the city
- the number of cars per person in the city
- the number of cars that a mechanic can repair in a day
- the number of days that a mechanic works in a year
- the number of times that a car is taken to a mechanic, per year

We estimate that there is 1 car for every 2 people, that a mechanic can repair 3 cars per day, that a mechanic works 250 days a year, and that a car needs to be repaired twice per year.

- (a) For San Francisco, we estimate the population at one million people. The number of mechanics is found by the following calculation.

$$(1 \times 10^6 \text{ people}) \left(\frac{1 \text{ car}}{2 \text{ people}} \right) \left(\frac{2 \frac{\text{repairs}}{\text{year}}}{1 \text{ car}} \right) \left(\frac{1 \text{ yr}}{250 \text{ workdays}} \right) \left(\frac{1 \text{ mechanic}}{3 \frac{\text{repairs}}{\text{workday}}} \right) = \boxed{1300 \text{ mechanics}}$$

- (b) For Upland, Indiana, the population is about 4000. The number of mechanics is found by a similar calculation, and would be $\boxed{5 \text{ mechanics}}$. There are actually two repair shops in Upland, employing a total of 6 mechanics.