Quadratic Equations, Mixtures, and Percent

(1) An American city is divided into two voting districts. One is predominantly Republican (voting population 260,000, 61% vote Republican); the other votes predominantly for the Democratic Party (voting population 170,000, 47% vote Republican). You want to gerrymander the districts so that both of them will predominantly vote Republican. How many voting people in the larger district do you have to move to the smaller district to get 51% Republicans in the smaller district?

(2) Solve the following quadratic equations:

$$0.09x^2 = 289 \tag{1}$$

$$(2+3x)^2 = (3+x)(5x-3)+13 \tag{2}$$

$$\frac{3x-10}{x-2} - \frac{x-4}{x+1} = 1 \tag{3}$$

(3) The product of two consecutive negative integers is 1122. What are the numbers?

(4) A garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. What will be the width of the pathway? See diagram.

(5) A fast train runs 8 mi/h faster than a slow train and takes 3 hours less to travel 288 miles. Find the rates of the trains.

(6) The length of a rectangle court exceeds its width by 2 metres. If the length and the width were each increased by 3 metres, the area of the court would be 80 m^2. Find the dimensions of the court.

(7) Solve the following quadratic equations:

$$x^2 - 4x - 21 = 0 \tag{4}$$

$$x^2 - x + 11 = 0 \tag{5}$$

$$x^2 - \sqrt{5}x + 1 = 0 \tag{6}$$

(8) You have a 15% and a 35% solution. You mix them together for 300 litres of a 20% solution. How much of each original solution did you use?

(9) The surface of a rectangular prism is 1300cm^2. The lengths of the sides have the ratio 4 : 3 : 2. Calculate the volume of the prism.