**Topic "Heart of Alegra"**

**Handout 01/28**

1. You mix 30 lbs of solution A, a 10% carbonate solution, with 20 lbs of solution B, a solution of unknown carbonate percentage. You discover that the resulting solution has a carbonate percentage twice as large as solution B. What is the carbonate percentage of solution B?

2. You have two salt solutions, X and Y. You mix 20 lbs of X with 30 lbs of Y to make a solution that is 10% salt. You discover that the salt% of Y minus the salt% of X equals the salt% of the mixed solution. What are the salt percentages of X and Y?

3. How many solutions are there to the system of equations given below?

$$3x + 4y = 12$$
$$2x = 3 - \frac{8}{3}y$$

4. A business is hosting a dinner for its top donors. 231 people will need to be seated. There are two kinds of tables available: large and small. A large table can sit 12 people. A small table can sit 7 people. If there are 23 tables available, how many large tables will need to be used?

5. If the system of equations below has an infinite number of solutions, what are the values of the constants $k$ and $c$?

$$\frac{12}{7}x = -7 + 2y$$

$$4y + kx = c$$

6. In the system of equations given below, what is the value of x + y?

$$3x + 3y = 80 - 4z$$

$$2x + 2y + z = 60$$

7. Given $p + q = 7$ and $p - q = 4$, compute the following:

- $2p$

- $(p+q)^2(p-q)$

- $p^2 - q^2$

- $\dfrac{20p + 20q}{5p - 5q} + 4p$

8. Sam can solve 15 math questions per hour and 10 history questions per hour. She wants to solve at least 65 questions in no more than five hours. Write a system of inequalities (but do not solve) that represents Sam's goal.

9. Timothy's curved score on a physics exam was a 68. The exam had the following curve applied to it: for each point up to and including 40, the score is curved by 15%. For each point greater than 40, the score is curved by just 10%. What was Timothy's raw score?

10. Elijah is randomly distributing two types of pamphlets throughout his school to no more than 30 people. Using a printing service, he gets a quote that tri-fold pamphlets will cost $3.00 and half-fold pamphlets will cost $2.00. He has a maximum budget of $75 and wants to use at least 10 of the tri-folds. Write a system of inequalities (but do not solve) to represent the conditions described.

11. An outlaw robs a bank at 12 noon and immediately gets on his horse and flees the scene. The sheriff arrives at the bank at 2 p.m. and immediately gives chase. If the sheriff's horse can ride at 30 mph and the outlaw's horse can ride at 20 mph (gold bars are very heavy), at what time will the sheriff catch the outlaw?

# A Life in Traffic*

A subway system is expanded to provide service to a growing suburb. A bike-sharing program is adopted to encourage nonmotorized transportation. [!] To alleviate rush hour traffic jams in a congested downtown area, stoplight timing is coordinated. When any one of these changes occurs, it is likely the result of careful analysis conducted by transportation planners.

[!] The work of transportation planners generally includes evaluating current transportation needs, assessing the effectiveness of existing facilities, and to try to improve those facilities. [!] Most transportation planners work in or near cities but some are employed in rural areas. Say, for example, a large factory is built on the outskirts of a small town. Traffic to and from that location would increase at the beginning and end of work shifts. [!] The transportation planner's job, might involve conducting a traffic count to determine the daily number of vehicles traveling on the road to the new factory. [!] If analysis of the traffic count indicates that there is more traffic than the current design of the road can efficiently accommodate, the transportation planner might: recommend widening the road to add another lane, constructing alternative routes, or introducing public transit options to cut down on the number of vehicles.

Transportation planners work closely with a number of community stakeholders, such as government officials and other interested organizations and individuals. For instance, representatives from the local public health department might provide input in designing a network of trails and sidewalks to encourage people to walk more. [!] Members of the Chamber of Commerce such as the General Counsel might share suggestions about designing transportation and parking facilities to support local businesses.

[!] People, who pursue careers in transportation planning, have a wide variety of educational backgrounds. A two-year degree in transportation technology may be sufficient for some entry-level jobs in the field. [!] Most jobs, however, require at least a bachelor's degree; majors of transportation planners are varied, including fields such as urban studies, civil engineering, geography – or transportation and logistics. For many positions in the field, a master's degree is required.

Transportation planners perform critical work within the broader field of urban and regional planning. As of 2010, there were approximately 40,300 urban and regional planners employed in the United States. [!] The United States Bureau of Labor Statistics forecasts steady job growth in this field; projecting that 16 percent of new jobs in all occupations will be related to urban and regional planning. Population growth and concerns about environmental sustainability are expected to spur the need for transportation planning professionals.

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*adapted from pg. 132 of the official SAT study guide. Accessible online at satsuite.collegeboard.com/media/pdf/official-sat-study-guide-sample-writing-language-test-questions.pdf

# Extra Resources

Dynamic practice problems may be found at khanacademy.org – google "khanacademy official SAT practice" and create a free account – you will see a dashboard where you can do things like create a practice schedule or try some sample problems. The problems in this handout most closely resemble the "Heart of Algebra" group of topics. Dynamic practice is very helpful because it is standardized to your skill level. As you do more problems and become more skilled new problems will get harder to match your progression.