

### Answer on Question #38415 – Math – Linear Algebra

The advertising director for Karisma, a chain of four retail stores is considering 3 media possibilities: 1- Ads in the Ahram newspaper, 2- ads in a local UGO trade magazine that is distributed free to all houses in the city and suburbs, and 3- ads on a local Alex TV station. The stores are expanding their lines of Do -It-Yourself tools and the advertising director is interested in a total new customer exposure level of at least 50% within the city and 60% in the suburbs. Each TV ad has a new-customer exposure level of 5% in the city and 3% in the northwest suburbs. The newspaper ads have corresponding exposure levels per ad of 3.5% and 3%, while the trade magazine has corresponding exposure levels per ad of 0.5% and 1%. The relevant costs are \$1000 per newspaper ad, \$300 per trade magazine ad, and \$2000 per TV ad.all 3 types of media are used, Karizma would like to ensure that no single medium consumes more than 45% of the total amount spent.(newspapers ads = 9, magazine ads = 30, TV = 1, Cost\$20,000)

#### Solution

Let  $x$  be the consumption of TV ads;  $y$  be the consumption of newspaper ads;  $z$  be the consumption of magazine ads.

Compose the next inequalities:

$$5x+3.5y+0.5z \geq 50 \text{ (exposure level of at least 50\% within the city)}$$

$$3x+3y+z \geq 60 \text{ (exposure level of at least 60\% within within the suburbs)}$$

$$x \leq 0.45*(x+y+z) \text{ ( for x: no single medium consumes more than 45\% of the total amount spent)}$$

$$y \leq 0.45*(x+y+z) \text{ ( for y: no single medium consumes more than 45\% of the total amount spent)}$$

$$z \leq 0.45*(x+y+z) \text{ ( for z: no single medium consumes more than 45\% of the total amount spent)}$$
$$x \geq 0, y \geq 0, z \geq 0 \text{ (all 3 types of media are used).}$$

There exist indefinitely many solutions of this system of inequalities, but  $x$  should be greater than  $20/7$ .

Then

1000y - cost of newspaper ads

300z - cost of trade magazines

2000x - cost of TV ads.

But simultaneously  $x=1, y=9, z=30$  is not the solution of this system of inequalities because it does not satisfy inequality  $z \leq 0.45*(x+y+z)$ . We come to  $30 \leq 0.45*(1+9+30)$ , which is false.