

H. M. (1) The 6 per cents are at  $91\frac{1}{2}$  and the 7 per cents at 102. A person has a sum of money to invest which will give him \$3500 more of the former stock than of the latter. Find the difference of income he could obtain by investing in the two stocks.

$$\text{Stock in the 6's} = \$ \frac{\text{sum} \times 100}{91\frac{1}{2}}$$

$$\text{" " 7's} = \$ \frac{\text{sum} \times 100}{102}$$

$$\text{Therefore } \$ \frac{\text{sum} \times 100}{91\frac{1}{2}} - \$ \frac{\text{sum} \times 100}{102} = \$3500$$

$$\text{Therefore sum} \times \left( \frac{1}{91\frac{1}{2}} - \frac{1}{102} \right) = \$35$$

$$\text{Sum} = \frac{35}{\frac{1}{91\frac{1}{2}} - \frac{1}{102}} = \frac{35}{\frac{204 - 183}{183 \times 102}} = \frac{35 \times 183 \times 102}{21} = \$31110$$

$$\text{Income from } \$31110 \text{ in the 6's} = \$ \frac{31110 \times 6}{91\frac{1}{2}} = \$2040$$

$$\text{Income from } \$31110 \text{ in the 7's} = \$ \frac{31110 \times 7}{102} = \$2135$$

$$\$2135 - \$2040 = \$95$$

(2) Required the number of milligrams in 15 cb. cm. of water measured at  $4^{\circ}\text{C}$ ?

$$1 \text{ cb. cm.} = 1 \text{ gram.}$$

$$15 \text{ cb. cm.} = 15 \text{ grams} = 15000 \text{ milligrams.}$$

(3) A man has \$3430 stock in the  $3\frac{1}{2}$  per cents at  $83\frac{1}{2}$ ; when the stock rises 2 per cent he transfers his capital to the 4 per cents at 98; find the alteration in his income.

$$\text{Stock sold for } \$ \frac{3430 \times 85\frac{1}{2}}{100} = \$2932.65$$

$$\text{First income} = \$ \frac{3430 \times 3\frac{1}{2}}{100} = \$120.05$$

$$\text{Second income} = \$ \frac{2932.65 \times 4}{98} = 119.70$$

$$\$120.05 - \$119.70 = \$0.35$$

(4) Two trains, 92 ft. long and 84 ft. long, respectively, are moving with uniform velocities on parallel rails: when they move in opposite directions they are observed to pass each other in one second and a-half; but when they move in the same direction the faster train is observed to pass the other in six seconds. Find the rate at which each train moves.

Faster train moves  $x$  ft. per second.

Other " "  $y$  " " "

Coming together  $(x+y)$  ft. per second.

Moving in same direction  $(x-y)$  ft. per second

$$\frac{176}{x+y} = 1\frac{1}{2} \quad \frac{176}{x-y} = 6$$

$$176 = \frac{3x}{2} + \frac{3y}{2}$$

$$176 = 6x - 6y \quad \text{Therefore } x = 50 \quad y = 30$$

(5) A certain company of soldiers can be formed into a solid square; a battalion consisting of seven such equal companies, can be formed into a hollow square, the men being four deep. The hollow square formed by the battalion is sixteen times as large as the solid square formed by one company. Find the number of men in the company.

Let  $x$  = No. of men in side of solid square.

Then  $x^2$  = solid square.

$7x^2$  = all the men.

Hollow square has  $4x$  men on one side.

All the first rank =  $4(4x-1)$

second " =  $4(4x-3)$

third " =  $4(4x-5)$

fourth " =  $4(4x-7)$

$$\text{All} = 4(16x-16) = 7x^2$$

$$x = 8$$

$$x^2 = 64 = \text{men in the company.}$$

(6) Solve  $xy = 128$

$$x^2 - y^2 = 192$$

Let  $x = vy$

$$\text{Then } vy^2 = 128 \text{ and } v^2y - y^2 = 192$$

Solving this quadratic  $v = 2$

$$\text{Then } 2y^2 = 128$$

$$y = 8 \text{ and therefore } x = 16$$

(7) Solve  $x + \sqrt{x+9} = \sqrt{x+18} + 6$

$$\sqrt{x+18} - \sqrt{x+9} = x-6$$

$$\text{Square each side: } x+18-2\sqrt{(x+18)(x+9)}+x+9 = x^2-12x+36-2\sqrt{(x+18)(x+9)} = x^2-14x+9$$

$$\text{Square both sides and transpose: } x^4-28x^3+210x^2-360x-567=0$$

Transform this biquadratic equation into another without the second term. For this purpose assume

$$x = y + 7$$

$$\text{Then } (y+7)^4 - 28(y+7)^3 + 210(y+7)^2 - 360$$

$$(y+7) - 567 = 0$$

$$y^4 - 84y^2 - 164y = 0$$

$$\text{Therefore } y = 0 \text{ and } y^3 - 84y - 164 = 0$$

Solve the latter equation by Cardan's method. The three values of  $y$  will be imaginary.

When  $y = 0$   $x = 7$  By taking the other values for  $y$ , three other values of  $x$  can be got. (To see the reason for the above process the student should consult Hall and Knight's Higher Algebra or Todhunter's Theory of Equation.)

### SCHOOL AND COLLEGE.

Miss Lottie M. Coates, teacher at Musquash, St. John County, has added sixteen volumes to her school library.

Through the exertions of Miss Bessie McLeod, lately teacher at Pennfield Ridge, Charlotte County, the school house has been neatly painted.

Miss Emma D. Gunter, teacher at Bocabec, Charlotte County, assisted by pupils and friends, has provided her school with slate black-board and other useful apparatus.

Miss Gertrude Hatfield, during the last term, by means of a school entertainment, raised enough money to greatly improve the house in the Upper Old Ridge, Charlotte County.