91. A note of $2,450, dated Halifax, June 1, 1886, for 4 months, bearing interest at 6%, is discounted at a bank on Aug. 15th at 8%. Find the proceeds.

SOLUTION.—

Time from June 1st to Oct. 4th = 125 days
" " Aug. 15th to Oct. 4th = 50 days
Int. on $2,450 for 125 days at 6% = $50.34 +
$2,450 + 50.34 = $2,500.34
Int. on $2,500.34 for 50 days at 8% = $27.40 nearly
∴ proceeds are $2,500.34 − 27.40 = $2,472.94.

PROBLEMS FOR SOLUTION.

92. A GOVERNMENT which derives a revenue of twenty million dollars from the duty on imported goods, finds it necessary to obtain an additional two millions from this source. Assuming that if the rate of duty be increased by any fraction, say one-fifth of itself, the value of the goods imported will be diminished by one-tenth, and so on; find approximately by what per cent. of itself the rate of duty must be increased in order to produce the revenue required.

93. A dealer buys a quantity of liquor at $\frac{4}{5}$ of its value, which he keeps for two years and then sells. The value increased 10 per cent per annum by age, 1 per cent. is lost each year by evaporation, and there is a waste of 2 per cent. in handling while it is being sold. What rate per cent. per annum interest does he make on his money if he sells at the enhanced value?

94. "In dividing by 73,000 it is advantageous to do so by the following method:—Having written down the number to be divided, we write under it one-third of itself, then one-tenth of this second number, neglecting remainders, and lastly one-enth of this third number. The sum of these four numbers, with the last five figures reckoned as decimals, will be the quotient required."

Establish the correctness of this method.

To what extent can its accuracy be depended upon?

Indicate a slight extension of the method which will enable any required degree of accuracy to be obtained.

These three are proposed by J. T. S. The next is sent by E. R. E., Claremont.

95. Hamblin Smith's Arithmetic, page 217, paper 3, question 5:

"A person buys 6% City of Toronto bonds, the interest on which is paid yearly, and which are to be paid off at par three years after the time of purchase. If money be worth 5%, what price should he give for the bonds?"

MISCELLANEOUS EXAMPLES.

WE insert the following general examples in the hope that they may prove suggestive and useful to many readers who propose to go up for some of the ensuing examinations, or who have pupils in course of preparation.

96. Construct an isosceles triangle of which each basal angle shall be double the vertical angle.—*Euclid IV. 10.*

Let ABC be the triangle required, AC being the base.

Let AD bisect the angle A, meeting BC in D.

Then in the triangles ABC, CAD we have the angle B = angle DAC and the angle C common to both triangles, hence these triangles are equiangular and therefore similar. But ABC is isosceles, hence CAD is also isosceles, *i.e.*, AD = AC.

Also, since the angle DAB = angle B in the triangle, AD = BD and DB is therefore = AC.

In the similar triangles the sides about the equal angles are proportional,

∴ BA : AC = AC : DC

or BC : BD = BD : DC

i.e., BC, DC = BD^2. Hence we can find the point D by dividing BC as in Euclid II. 11. Then from centres D and C describe circles with radii = BD, their point of intersection will determine the point A. Then by joining BA and AC we have the triangle required, which is one-tenth of a regular decagon, and the basis of the regular pentagon.

N.B.—For examination purposes, the application of the principle of proportion wherever possible is really equivalent to an extension of time, since a minute saved by means of a short proof is in fact a minute gained for the solution of riders and deductions. Compare Euc. III. 35 with the solution given in this column, February, 1890.

97. Solve the equation

$$\frac{x+a}{(a-b)(c-a)} - \frac{x-b}{(a-b)(b-c)} - \frac{x-c}{(b-c)(c-a)} = \frac{b+c}{(a-b)(b-c)(c-a)}$$

SOLUTION.—It is easy to shew that

$$\frac{x-a}{(a-b)(c-a)} + \frac{x-b}{(a-b)(b-c)} + \frac{x-c}{(b-c)(c-a)} = 0$$

Add this identity, term by term, to the given equation.

$$\therefore \frac{2x}{(a-b)(c-a)} = \frac{b+c}{(a-b)(b-c)(c-a)}$$

$$\therefore x = \tfrac{1}{2} \cdot \frac{b+c}{b-c}$$

98. $a^3+a^2x+ay+z=0$
$b^3+b^2x+by+z=0$
$c^3+c^2x+cy+z=0$

Find x, y and z.

SOLUTION.—Each equation is of the form

$p^3+p^2x+py+z$, and the first equation shows that this expression vanishes when $p = a$, the second that it vanishes when $p = b$, and the third when $p = c$. Hence we must have

$p^3+p^2x-py+z = (p-a)(p-b)(p-c)$ for *all* values of p.

$= p^3 - p^2(a+b+c) + p(ab+bc+ca) - abc$

Equating coefficients in this identity we have

$x = -(a+b+c)$; $y = ab+bc+ca$; $z = -abc$.

99. Solve the equation

$$\frac{2a-b-c}{x+a-b-c} - \frac{2b-c-a}{x+b-c-a} + \frac{2c-a-b}{x+c-a-b} = 4$$

SOLUTION.—There is probably some special method of solving this equation in the usual form, but it may be solved by inspection if the denominators be thrown into the forms $(x-a)+2a-b-c$; $(x-a)+(b-c)$; $(x-a)-(b-c)$. For we see that when $x-a=0$, the first fraction = 1, and the other two become $(2b-c-a)\div(b-c)$ and $2c-a-b\div(c-b)$ or together $=(3b-3c)\div(b-c)=3$, and the whole = 4. Hence $x=a$ is one root and by symmetry $x=b$ and $x=c$ are the other two roots.

100. Let DC be the base of the parallelogram ABCD, and DB its diagonal. Take P any point within the figure, and draw through P the line GH parallel to BC and EF parallel to AB. Prove that the three diagonals EG, HF and DB of the parallelograms AP, PC and AC being produced will pass through the same point.

PROOF.—EG and HF are evidently not parallel; let them meet in some point O beyond B; join OB and complete the parallelogram OD by producing DA to K, DC to L, EF to M, and HG to N. Then the following equations among the parallelograms result, KG = GM, and FL = FN

∴ KG = GF + BM, and FL = GF + NB

hence KB = BL; the complements about the diagonal they must be and therefore D, B, O are in a straight line.]

[NOTE.—In problem 81 the printers have substituted the Greek *delta* for the *theta* of the copy, not having enough of the latter type in the case. ED. JOURNAL.]

Book Notices, etc.

The Alhambra. By Washington Irving. Edited for the use of schools, by Alice H. White. Boston, U.S.A.: Ginn & Company.

Marmion: A Tale of Flodden Field. By Sir Walter Scott. With notes by D. H. M. Ginn & Company.

These are the latest volumes which have come to hand of the admirable "Classics for Children," which are in course of publication by the above well-known and enterprising firm. It is necessary only to refer to the titles of the books and the names of their authors to establish their claims to a place in this series. They are of course uniform with the other books of the series, and have the same mechanical excellencies. The *Alhambra* is somewhat abridged, and in such of the stories and legends as have been retained, the necessary alterations have been made to suit them to the class of readers for whom they are intended. Most of the Spanish words and phrases have been left out, and in cases where the author himself has not furnished a translation, an English equivalent has been substituted. In *Marmion* the publishers have used, by permission, Dr. William J. Rolfe's carefully restored text. The notes are at the foot of the page, and, without overburdening the text, are sufficiently copious to meet all the wants of the ordinary reader.

School-Room Methods.

EQUATIONS IN ARITHMETIC.

THE use of the equation in arithmetic enables the pupil to put his work in a compact and orderly form, and the arrangement is convenient for the inspection and criticism of the teacher. After the pupil has a knowledge of fractions, the equation may be used in a wide variety of work.

In forming the first equation the first member of the equation should be of the denomination given or determined; the second member should be of the denomination of the required result. The following will illustrate some of the uses of the equation:

1. In 14 yards how many feet?
   1 yard = 3 feet.
   14 yards = 14 × 3 feet or 42 feet.
2. In 54 feet how many yards?
   3 feet = 1 yard.
   1 foot = ⅓ yard.
   54 feet = 54 × ⅓ yard or 54-3 yards or 18 yards.
3. 60 rods are what part of an acre?
   160 rods = 1 acre.
   1 rod = 1-160 acres.
   60 rods = 60 × 1-160 acres or 60-160 acres, or 3-8 acres.
4. If 5 yards of cloth cost $12 what will $27 buy?
   $12 bought 5 yards.
   $1 bought 1-12 of 5 yards, or 5-12 yards.
   $27 will buy 27 × 5-12 yards or 135-12 yards, or 11¼ yards.
5. In 63 pecks how many bushels?
   4 pecks = 1 bushel.
   1 peck = ¼ bushel.
   63 pecks = 63 × ¼ bushel or 63-4 bushel, or 15¾ bushels.
6. In 30 rods, 6 yards, 2 feet, how many feet?
   1 rod = 5½ yards.
   30 rods = 30 × 5½ yards or 165 yards.
   165 yards + 6 yards = 171 yards.
   1 yard = 3 feet.
   171 yards = 171 × 3 feet or 513 feet.
   513 feet + 2 feet = 515 feet.
7. If 6 men in 8 days cut 50 cords of wood, in how many days should 12 men cut 200 cords?
   If 6 men cut 50 cords in 8 days?
   1 man would cut 50 cords in 6 × 8 day or 48 days.
   1 man would cut 1 cord in 1-50 of 48 days or 48-50 days.
   12 men would cut 1 cord in 1-12 of 48-50 days, or 4-50 days.
   12 men would cut 200 cords in 200 × 4-50 days, or 16 days.
8. In ⅜ or a mile how many rods?
   1 mile = 320 rods.
   ⅛ mile = ⅛ of 320 rods or 40 rods.
   ⅜ mile = 3 × 40 rods, or 120 rods.
9. $15 is what per cent. of $200?
   $2 is 1 per cent. of $200.
   $1 is ½ per cent. of $200.
   $15 is 15 × ½ per cent. or 7½ per cent. of $200.
10. 180 is 12 per cent. of what number?
    12 per cent. of a number = 180.
    1 per cent. of the number = 1-12 for 180 or 15.
    100 per cent. of the number = 100 × 150, 1,500.

—*Central School Journal.*