A

ple until it can make it readily and accurately. At the very least it must write it on every line of a page of its copy-book. In drawing, however, it is the custom to be satisfied with one attempt to produce a certain form after the method of drawing it has been explained. A pupil is shown how to draw an ellipse, for example, and when he has drawn one, however imperfectly, another copy is given. No one can make a complete drawing well, except he can draw its elemental parts with ease. The power to do this can only be secured by extensive practice.

GENERAL DIRECTIONS FOR CONDUCTING A DRAWING LESSON .-Position of the book .- The drawing-book should lie square in front of the pupil. It may be turned around occasionally to enable him to criticise his work, or when drawing in certain directions the curved shading lines of a sphere.

2. Position of the body. The body should be kept in an easy position, with the head a little farther from the book than when writing. The right arm should be perfectly free to move readily in any direction.

8. Holding the pencil. The pencil should be held about an inch and a half from the point. Small children may allow the fingers to come nearer to the point. The hand may be turned into different positions for drawing lines in different directions.

4. Construction lines. These are guiding lines intended to help the pupils to fix more easily and more definitely the relative proportions and positions of the various parts of a drawing. They should be very faint, dotted or discontinuous lines, so that they may be readily erased.

5. Trial lines. All lines in a drawing should be drawn so lightly at first that they can barely be seen. If the first trial line is in the wrong position, draw another and another until one is in the proper position. This line should be made dark and definite, and then, but not till then, the other trial lines should be erased.

6. Erasing. Some teachers allow altogether too much erasing to be done. When any part of a drawing is definitely "lined in ' it should not be erased. Pupils should not be allowed to make too many erasures even of "trial lines." The rubber should have a clean edge and should never be moistened. Even perspiration from the hand will unfit it for use.

Eye and pencil. When drawing "trial lines" the pupil should not watch the point of the pencil, but the point to which the line is to be drawn. When "lining it" the eye should accompany the point of the pencil.

8. Correction of Errors Correct only one error at a time. If too many errors be pointed out to the pupil at once, he is certain to be confused and likely to be discouraged. In some drawings devote special attention to form, in others to lining, etc.

In the next number of the JOURNAL the subject of drawing will be continued and practical hints given in connection with Blackboard Drawing Lessons, Memory Drawing, Dictation Drawing, and Model and Object Drawing.

## Mathematical Aepartment.

Communications intended for this part of the JOURNAL should be on separ-ate sheets, written on only one side, and properly paged to prevent mistakes.

ARITHMETICAL AND ALGEBRAIC SOLUTIONS.

By J. A. MCLELLAN, M.A., LL.D.

ARITHMETIC.

marked it at an advance of 25 % on cost, and in selling it used a | very easy. For the sum of the integral parts of the quotients in

yard measure which was \$ of an inch too short, his entire gain being \$124.80. Find the cost price of the cloth, and the amount gained by using the false measure.

Take cost price as unit. Then he has  $25 \% = \frac{1}{2}$  fair gain. He gains  $\frac{3}{4}$  inch on  $35\frac{1}{4} = \frac{1}{47}$ , on which he also gains 25 %.  $\frac{1}{1} + \frac{1}{2}$  of  $\frac{1}{2} = -\frac{\delta}{2}$  fraudulent gain

and total gain = 
$$\frac{1}{1} + \frac{1}{188} = \frac{1}{17}$$
 of cost = \$124.80; and  $\therefore$ 

cost = \$451.20. And fraudulent gain = \$12.

2. A merchant in Montreal owes another in Lisbon 1623# milrees, and he resolves to remit through London, Amsterdam, and Paris ; exchange between Montreal and London is at 94 %, between London and Amsterdam £1 stg. for £135 Flemish, between Amstordam and Paris £1 Flemish per 13 francs, and between Paris and Lisbon 3 francs per 450 rees; if the expenses of this circuitous course be  $2\frac{1}{2}$  %, what will it cost the Montreal merchant to settle his Lisbon account l (1000 rees = 1 milree.)

We have one milree =  $\frac{20}{3}$  francs, 1 franc =  $\frac{1}{13}$  Flem. £, 1 Flem.  $\pounds = \frac{39}{74}$  Eng.  $\pounds$ , 1 Eng.  $\pounds = 40 \times \$1.095$ , and  $\$1 \ debt =$  $100 \div 97\frac{1}{2}$  actually paid (since expense =  $2\frac{1}{2}$  %, or  $97\frac{1}{2}$  is paid with 100):  $\therefore 1623$  inilrees  $= \frac{20}{3} \times \frac{1}{13} \times \frac{39}{74} \times \frac{40 \times 1.095}{9} \times \frac{12987}{8} \times \frac{100}{100} \times \frac{100$ 

 $\frac{40}{39} = \$2190.$ 

3. I bought a hind and a fore-quarter of beef weighing together 252 lbs., paying 71 cents per lb. for the hind quarter, and 54 cents per lb. for the fore-quarter; I found that I had paid 173 cents more than if I had bought both quarters at 6g cents per lb. Find the weight of each quarter.

6g is the average of the two prices ; if both quarters had been bought at this rate, every pound of hind quarter would have cost ¿ cent more, and every pound of fore-quarter ¿ less than was actually paid. And .: if the qrs. had been of equal weight, the cost would have been the same; but the cost was 174 cents more, ... the hind (dearer) qr. was heavier by  $17\frac{1}{2} \div \frac{2}{3} = 20$  lbs., and (252)  $-20) \div 2 = 116$  the lighter qr.; 136 the other.

4. A person invests a certain sum in U. S. 5's 10-40 and 7010 % more than that sum in U.S. 6'2 5-20, the former being at a discount of 5 %, and the latter at a premium of 8%, and the interest on both payable in gold. His income from the two investments is \$1400 in gold. Find the amount invested in each kind of bonds.  $70\frac{1}{19}$  % =  $\frac{67}{98}$ ,  $\therefore$  for every unit of the first investment there is  $1\frac{67}{95} = \frac{162}{95}$  of the second.

The 1st is at disct. of 5, ... 95 brings 5 income, and 1 brings 35. The 2nd is at prem. of 8, ... 108 brings 6 income, and 1 brings 8

And 
$$\frac{162}{95}$$
 brings  $\frac{162}{95} \times \frac{6}{108} = \frac{9}{95}$ 

 $\therefore \frac{5}{95}$  to  $\frac{9}{95} = 5:9$  is ratio of income from the investments;

or \$500 and \$900 respectively : (1) \$5 income comes from \$95, ... \$500 from \$9500; and (2) \$6 income comes from \$108 ... \$900 from \$16200.

1. Solve 
$$\frac{16x-13}{4x-3} + \frac{40x-43}{8x-9} = \frac{32x-30}{8x-7} + \frac{20x-24}{4x-5}$$
.

The solution of this equation by the ordinary rule for "clearing of fractions, &c.," will involve a good deal of work; but if we 1. A retail merchant bought a quantity of Canadian tweed and | complete the divisions represented by the fractions, the work will be