

ARITHMETIC.

1. What is the standard (1) of the gold coinage (2) of the silver coinage in England and also in the United States; reduce 5 lbs. 10 ozs. 3 dwts. 15 grs. troy to the decimal of 1 cwt. avoirdupois.

2. What is Practice? Apply the rule to the solution of the following: If sugar be bought at £1.19.6 a cwt., and retailed at 6½d a lb., what is the profit on a cask containing 7 cwt. 1 qr. 14 lbs.?

3. A man embarks his capital in four successive ventures. In the first, he clears 100 per cent., and in each of the others he loses 20 per cent., what percentage of profit has he upon his original outlay?

4. What is meant by Exchange? Course of Exchange? Par of Exchange? A banker at New York remits \$6000 to Liverpool, thus: first to Paris, at 5 frs. 40c. for \$1; thence to Hamburg at 185 francs for 100 marks; thence to Amsterdam at 35 stivers for 2 marks; thence to Liverpool at 220 stivers for £1. What sterling money will he receive at Liverpool, and what will be his gain over direct exchange at 8½ per cent premium?

5. 270 sheep and 14 horses eat 101 acres of grass in 30 days; and 155 sheep and 21 horses eat 185 acres of grass in 75 days; compare the amount eaten by a sheep and a horse in the same time.

6. What is the fundamental unit in the metric system, and why was it chosen? Write down the metric table of length and capacity, and give the respective values of a hectare and of a kilogramme in English measure and weight.

PRACTICAL MATHEMATICS.

1. If several numbers form a geometrical series, prove that their logarithms constitute an arithmetical series.

2. Demonstrate the theorem for the solution of oblique triangles when the three sides are given.

3. Two posts stand one on each side of a street which is 70 feet wide. Their tops, which are 50√2 feet apart, are just reached by a ladder 50 feet long, whose bottom end is fastened at a point in the street. Find the height of the posts.

4. Define course, departure, leeway; distinguish between deviation and variation of the compass, and explain what is meant by meridional difference of latitude.

5. Demonstrate a formula for finding the area of a quadrilateral derived from its sides and inclination of diagonals.

6. A frustrum of a cone of marble has its slant side 8 feet, and the diameters of its bases 4 feet and 1.5 feet. What is its value at 12s. per solid foot?

7. What are the parallelogram of forces, and polygon of forces respectively? A uniform rod weighing 4 lbs. has 12 lbs. at one end and 18 at the other. The centre of gravity of the whole is 9 inches from the middle; what is the length of the rod?

ALGEBRA.

1. Simplify the expression:

$$3a - [b + \{2a - (b - c)\}] + \frac{1}{2} + \frac{2c^2 - \frac{1}{2}}{2c + 1}.$$

2. A number is represented by 6 digits, of which the left hand digit is 1. If the one be removed to units place, the others remaining in the same order as before, the new number is three times the original number. Find the number.

3. Show that—

$$\sqrt{10} + \sqrt{20} + \sqrt{40} - \sqrt{5} - \sqrt{80} = \sqrt{5} (1 + \sqrt{2})$$

4. Deduce the general formula for the roots of the quadratic equation $x^2 + px + q = 0$ —Also solve

$$\frac{2 + x^2}{3} - \frac{x - x^2}{2} = 1 - x + x^2$$

5. Prove the formulas for the sum of an arithmetical series, and find the first term and the common difference of an arithmetical series, when the sum of n terms is always equal to n^2 .

6. State the laws for the expansion of binomials and apply them to the expansion of $(x + y)^3$.

7. A person has \$1300, which he divides into two portions, and loans at different rates of interest, so that the two portions produce equal returns. If the first portion had been loaned at the second rate of interest, it would have produced \$36, and if the second portion had been loaned at the first rate of interest it would have produced \$49. Required, the rates of interest.

GEOMETRY.

1. On the sides of any triangle ABC , equilateral triangles BCD , CAE , ABF , are described, all external: show that the straight lines AD , BE , CF , are all equal.

2. If a straight line be divided into two equal and also into two unequal parts, the squares on the two unequal parts are together double of the square on half the line and of the square on the lines between the points of section.

3. The least square which can be inscribed in a given square is that which is half of the given square.

4. To draw a straight line from a given point, either without or on the circumference, which shall touch a given circle.

5. If from any point in the circumference of a circle a chord and tangent be drawn, the perpendiculars dropped on them from the middle point of the subtended arc are equal to one another.

6. To inscribe a regular quindecagon in a given circle.

7. Find the locus of the middle points of chords in a circle that pass through a given point.

SCHOOL SYSTEM AND SCHOOL MANAGEMENT.

1. Mention the chief powers of the Council of Public Instruction.

2. "Among the essential instincts of a child are a taste for observation and an impulse to activity."

Show how you propose to take advantage of these facts in directing your school-room work.

3. Give an outline of those provisions of the "Act relating to Public Instruction," which are specially designed to secure a better attendance at schools.

4. Write a note on "Physical Culture in its relation to the school-room."

5. "The practice of keeping in at recess or of prescribing 'impositions' is being rapidly relegated to the limbo of absurdities."

Discuss the educational doctrine taught or implied in this quotation.

TEACHING.

1. "Knowledge should precede definitions." Expand fully the meaning of this proposition, and show how you would apply the principle involved to the teaching of any subject you choose.

2. (a) Mention any writers on education with whose works you are familiar, and state the leading principles enunciated by any of them.

(b) Explain the "Kindergarten system."

(Answer either (a) or (b) but not both.)

3. *Object-lessons.* Explain (1) their nature; (2) the advantages resulting from their use; (3) any common errors in modes of conducting them.

4. Explain your mode of imparting to a class the elementary conceptions of Geometry.

5. Classify the mental faculties and discuss the relation of particular studies to the growth and development of any two of them.

6. Furnish notes of an oral lesson in British History adapted to pupils of the 7th grade, selecting as a basis any reign or period you prefer.

PHYSIOLOGY.

1. Give an outline of the bodily structure, with a short description of the Skeleton.

2. Explain fully the circumstances under which Asphyxia takes place.

3. Describe the structure and connections of the liver.

4. Classify the aliments and state their composition.

5. Discuss fully the various sources of the impurities of the air we breathe.

6. State the effects upon the constitution of (1) over-exertion and (2) insufficient exercise.