

4. Find in acres, rods, etc., the area of a rectangular field, of which the longest side is to the shortest in the ratio of 15 to 8, and which a person walking at the rate of 3 3-11 miles an hour, takes 5 minutes 45 seconds to walk round.

5. What must be the perpendicular depth of a cistern in the form of an inverted cone having the angle at the apex  $60^\circ$ , to contain 400 gallons of water?

6. Using a diagram show what is meant by "Meridional Difference of Latitude." Prove that the arc of a parallel of Latitude is equal to the corresponding arc of the equator multiplied by the cosine of the Latitude.

7. What is meant by the "moment of a force" and how is its magnitude determined? At the corners of a square, taken in order, are placed weights 1, 3, 5 and 7; find their centre of gravity.

#### ALGEBRA.

1. Solve the equation:

$$(b - c)x^2 + (c - a)x + (a - b) = 0.$$

2. Three students, A, B, and C, agree to work out a series of difficult problems in preparation for an examination; and each student determines to solve a fixed number every day. A solves 9 problems per day, and finishes the series 4 days before B; B solves 2 more problems per day than C, and finishes the series 6 days before C. Find the number of problems, and the number of days given to them by each student.

3. Four numbers are in arithmetical progression. The product of the 1st and 3rd is 27, and of the 2nd and 4th, 72. What are the numbers?

4. A and B each attempt the same quadratic equations. A, after reducing has only a mistake in the numerical term and finds for roots  $+8$  and  $+2$ ; B, after reducing, has only a mistake in the coefficient of  $x$ , and finds for roots  $-9$  and  $-1$ . Find the correct roots of the equation.

5. Solve the equation:

$$\frac{x + \sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}} - \frac{x - \sqrt{x^2 - 1}}{x + \sqrt{x^2 - 1}} = 8\sqrt{x^2 - 1}$$

6. State the fundamental laws of the Binomial Theorem, and write down the 3rd, 5th, and 7th terms of  $(x + y)^{10}$ .

7. Find how many permutations can be formed of the letters in the word *Education*, taken altogether.

#### GEOMETRY.

1. The straight lines drawn from the angular points of a triangle to the middle points of the opposite sides meet in a point.

2. Prove geometrically that the difference of the squares on two straight lines is equal to the rectangle of their sum and difference.

3. If a straight line touch a circle and from the point of contact a chord be drawn, the angles which this chord makes with the tangent shall be equal to the angles in the alternate segments of the circle.

4. Find the locus of a point without a square such, that straight lines being drawn from it to the angular points of the square, the angle contained by the two extreme lines is divided into three equal parts by the other two.

5. Prove that the angle at the centre of a circle is double of the angle at the circumference subtended by the same arc.

6. Show how to inscribe a regular hexagon in a given circle.

7. If from any point in the circumference of the circle circumscribed about a triangle perpendiculars are drawn to the three sides, the feet of these perpendiculars are in the same straight line.

#### SCHOOL SYSTEM AND SCHOOL MANAGEMENT.

1. "Any sum required by any section over and above the sums provided by the Province and Municipality for the support and maintenance of a public school or schools during the ensuing year shall be a charge on the section, and shall be levied as follows." Complete this statement.

2. Specify the most important points of business transacted by the annual school meeting.

3. Define the term *class* as used in connection with school work, and state as fully as you can the principles underlying successful class management.

4. Make a programme for one day's work in an advanced department consisting of Grades VI and VII.

5. Give your views as to the wisdom of making promotions depend entirely on stated written examinations.

#### TEACHING.

1. What do you understand by a topical recitation? Lay down rules for conducting one.
2. Explain the method you would pursue (with a class) in the critical study of a piece of literature.
3. Describe the preparatory work that should be done by a teacher and class before assigning to the latter the writing of a composition on a scientific subject.
4. What general directions would you give teachers of primary grades for the conduct of object lessons.
5. Describe and illustrate the proper method of dictating a paragraph for the purpose of teaching spelling. How would you have such an exercise corrected.

#### PHYSIOLOGY.

[Candidates who prefer may substitute for this paper that on Latin given below. If papers on both subjects are handed in by same candidate, no credit will be given for either.]

1. Describe the course of the circulation of the blood, and give an explanation of "blushing."
2. Distinguish between *arterial* and *venous* blood, and explain the mechanism of respiration.
3. Describe the cavity of the mouth and pharynx.
4. Describe the general structure of the eye. What is the "blind spot?" What is color blindness?
5. What is *anæmia*? State its causes and its effects on the human system.
6. Write a note on "Vegetable Foods;" compare the different varieties as articles of food.

#### LATIN.

##### I.

1. Translate into English:

*Adjuvabat etiam eorum consilium, qui rem deferrebant, quod Nervii antiquitus, cum equitatu nihil possent (neque enim ac hoc tempus ei rei student, sed, quicquid possent, pedestris valent copias), quo facilius finitimorum equitatum, si praedandi causa ad eos venissent, impedirent, teneris arboribus incisus atque inflexis, crebris in latitudinem ramis onatis et rubus sentibusque interiectis effecerant, ut instar muri hae sepes munimentum praeherent, quo non modo non intrari, sed ne perspicere quidem posset. His rebus cum iter agminis nostri impediretur, non omittendum consilium Nervii existimaverunt.*

2. Parse *adjuvabat, incisus, inflexis, onatis, antiquitus, instar, rei*.

3. What is the grammatical construction of the clause *quod Nervii antiquitus.....effecerant*.

##### II.

1. Decline together *foedem scelus, acer senex, idem sermo*.

2. Write down the perfect indicative first person singular and the supine of *tango, teno, texo, adolesco, figo, caveo, vinco, vincio, vivo, caedo, caedo*.

3. Name the chief classes of verbs which (the corresponding verbs in English being transitive) govern (a) the Genitive, (b) the Dative, (c) the Ablative.

4. State and illustrate the various ways in which *purpose* may be expressed in Latin.

#### CHEMISTRY.

1. Write the symbols and scientific names, and give the chief properties of the following: *corrosive sublimate, ammonia, saleratus and phosphuretted hydrogen*.

2. Give a general outline of the photographic process.

3. Briefly explain the method by which sulphuric acid is made. Describe the Bessemer process of manufacturing steel. Describe Marsh's test for As.

5. How would you distinguish the following gases from one another: *chlorine, nitrogen, marsh gas, carbonic oxide and olefant gas*?

6. State the advantages arising from the application of quicklime to soils.

#### PHYSICS.

1. Define Tenuity, Resultant, Flexibility, Elasticity, and Viscosity. Explain the statement, "weight is proportional to mass."

2. State the laws and give illustrations of capillary action.

3. Describe the operation of the Air-pump (use a diagram).