ARITHMETIC.

1. Show that "the method of representing Decimal Fractions is merely an extension of the method by which Integers are represented," and also state the advantages and disadvantages of working with decimals instead of vulgar fractions.

2. What number multiplied by $\frac{2}{3} + \frac{5}{8} + \frac{1}{16} - 1\frac{1}{6}$ will produce .37575? Calculate $\frac{1}{\sqrt{.4}}$ correctly to four places of decimals.

3. If the true discount of a certain sum for 3 yrs. 4 mos. be $83\frac{1}{3}$ per cent. of the simple interest for the same time, and their difference be $24, find the rate per cent. and the sum of money.

4. C does half as much in a day as A and B can do together, and B does half as much again as A. If all three working together can mow 20 acres of barley in 16 days, how long would each, working by himself, take to mow 5 acres?

5. In a book on Arithmetic an example was printed thus:

"Add together $\frac{1}{14\frac{2}{3}}$, $\frac{1}{19\frac{1}{3}}$, $\frac{1}{\quad}$, $\frac{1}{13\frac{3}{4}}$," the denominator of one fraction being accidentally omitted. The answer given was $\frac{1}{23}$; required the missing denominator.

6. A man bought a farm for $4500, and agreed to pay principal and interest in four equal annual payments; how much was the annual payment, money being worth 6 per cent.?

PRACTICAL MATHEMATICS.

1. Find all the functional values of 45° and 60°.

2. State and demonstrate the theorem for the solution of oblique triangles when two sides and the contained angle are given.

3. The distance between two towns is 54 miles, and the distance between their places on a map is $6\frac{3}{4}$ inches; what area of country is represented by a circle on the map of one inch radius?

4. Demonstrate a formula for the surface of a sphere.

5. A right-angled triangle, the length of whose sides are 15 and 20 inches, is made to turn round its hypotenuse: find the volume and surface of the solid so formed.

6. Prove that a plane right-triangle may represent the mutual relations of course, departure, difference of latitude, and distance.

7. State Newton's Laws of Motion, and show what is the direction and magnitude of the equilibrant of four equal forces which act at successive angles of 30°, 60°, and 90°.

ALGEBRA.

I. Simplify $\frac{a}{(a-b)(a-c)} + \frac{b}{(b-a)(b-c)} + \frac{c}{c-a)(c-b)}$

2. Find the values of x and y in the following equations:

$$\frac{6}{x+y} + \frac{5}{x-y} = 7, \text{ and } \frac{15}{x+y} - \frac{2}{x-y} = 3.$$

3. Two towns on a uniformly flowing river are 27 miles apart. A steamboat takes an hour and a half on its downward trip from one town to the other, and a row-boat three hours. The steamboat returns against stream in one-tenth of the time that the row-boat takes. Required the velocity of the river and the speed of the boats in still water.

4. Solve $\sqrt{x-3} + \sqrt{3x+4} + \sqrt{x+2} = 0$.

Prove that both answers satisfy the equation.

5. A man walks a certain distance in a certain time. He calculates that if he had walked a mile per hour slower than he did, he would have taken six hours more than three-fourths of the time he actually took; but if he had walked a mile faster per hour, he would have taken two hours longer than half the time he actually took. Find the distance walked and the rate of walking.

6. Construct the equations whose roots are:

(1) $0, -3$.

(2) $-1+\sqrt{-5}, \quad -1-\sqrt{-5}$.

and find the numerical value of a in the equation

$$ax^2 + 2x + 3a = 0,$$

if the sum of its roots is equal to their product.

7. If the first term of a geometric series be a, and the last term be l, the number of terms being odd, what is the middle term in terms of a and l?

GEOMETRY.

1. Define parallel straight lines. Give also the VIth postulate, and state your opinion whether it might be advantageously superseded by any other, with your reasons for the same.

2. The straight line drawn at right angles to a diameter of a circle at one of its extremities is a tangent to the circle, and no other straight line can be drawn through this point so as not to cut the circle.

3. Squares are described on the three sides of a right-angled triangle; divide the square on the hypotenuse into two rectangles which shall be respectively equal to the squares on the other sides.

4. If a straight line touch a circle, and from the point of contact a straight line be drawn cutting the circle, the angles made by this line with the line touching the circle must be equal to the angles which are in the alternate segments of the circle.

5. In a given triangle ABC, the perpendiculars AD, BE, drawn from two vertices to the opposite sides, meet in a point O, and AD meets the circle circumscribed to the triangle in a point K; prove that DK is equal to DO.

6. In a given circle to inscribe a triangle equiangular to a given triangle.

7. Given two intersecting straight lines AB, AC, and a point P between them, show that of all straight lines which pass through P and are terminated by AB, AC, that which is bisected at P cuts off the triangle of minimum area.

SCHOOL SYSTEM AND SCHOOL MANAGEMENT.

1. State how the County Fund is (1) determined and levied, and (2) distributed.

2. Give the substance of the law and regulations regarding the formation of new school sections.

3. Discuss suggested methods of dealing with pupils who are delinquent in their lessons.

4. State generally the principles which should determine the allotment of time for the several subjects of instruction, and outline a weekly allotment for the subjects embraced in *Common School Course*, Grade VIII.

5. Distinguish between *organization* and *classification*, specifying various methods of the latter.

TEACHING.

1. Describe the methods by which you would train your pupils to the habit of correct expression.

2. Give notes of a lesson in simple subtraction, using examples in which the units and tens figures in the subtrahend are larger than the corresponding ones in the minuend. Show reasons for each step, and discuss the old formula of "borrowing *ten* and paying back *one*."

3. State your views as to the importance of exercise in mental arithmetic.

4. Should examples supplied for the consideration of classes in grammar consist of complete sentences or isolated words? Give reasons for your answer.

5. State what you consider the essential characteristics of good questioning.

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. Write brief notes on *(a)* the skin, *(b)* mucous membrane, *(c)* connective tissue, *(d)* the muscles.

2. Describe the working of the heart.

3. What are the sweat-glands? How are they distributed, and how controlled?

4. Describe the spinal cord.

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

6. State as fully as you can the injurious effects of bad diet.

LATIN.

I.

1. Translate into English:—

Erat magni periculi res, cum tantis copiis iniquo loco dimicare. Tum, quoniam liberatum obsidione Ciceronem sciebat, eoque omnino remittendum de celeritate existimabat, consedit, et, quàm æquissimo potest loco, castra communit. Atque hæc, etsi erant exigua per se, vix hominum millium septem, præsertim nullis cum impedimentis, tamen angustiis viarum, quàm maximè potest, contrahit, eo consilio, ut in summam contemptionem hostibus veniat. Interim, speculatoribus in omnes partes dimissis, explorat, quo commodissimo itinere vallem transire possit.

2. Syntax of *periculi, dimicare, obsidione, remittendum, hominum, viarum, hostibus.*

3. Account for the mood of *possit.*

II.

1. Decline together *iracundior deus, idem iecur, pejus poema.*

2. What nouns in *us* of the second declension are
(1) Feminine,
(2) Neuter?

3. Write the first person singular of the perfect indicative and supine of:—*tollo, occido, occido, percello, lino, haereo, lavo, farcio, meto.*

4. Distinguish between the gerund and gerundive, with examples.