

I certainly would not refuse you. If you had asked for it yesterday, you could have had it then; or if you could wait till to-morrow, it would be at your disposal.

5. Give the compound of the present indicative of the reflective verb *ingannarsi* ("to be mistaken").

6. Cite a few of the Italian verbs having two forms of infinitive, and state which are the tenses derived from each form, giving also the past participle of the verbs.

### TRIGONOMETRY.

1. Define what is meant by plane trigonometry, ratio, chord, sine, tangent, secant, cosine, cotangent, and cosecant.

2. Express the sine and cosine of the sum and difference of two angles in terms of the sines and cosines of the angles themselves, thus:—

$$\sin(A+B)=$$

$$\cos(A+B)=$$

$$\sin(A-B)=$$

$$\cos(A-B)=$$

3. Show that—

$$\sin 2A = 2 \sin A \cos A.$$

$$\cos 2A = 2 \cos^2 A - 1 = 1 - 2 \sin^2 A = \cos^2 A - \sin^2 A.$$

$$\sin 3A = 3 \sin A - 4 \sin^3 A.$$

$$\cos 3A = 4 \cos^3 A - 3 \cos A.$$

4. Show that—

$$\sin 18^\circ = \frac{\sqrt{5}-1}{4}.$$

$$\sin 36^\circ = \frac{\sqrt{(10-2\sqrt{5})}}{4}.$$

5. Find the side of a pentagon inscribed in a circle whose radius is 1.

6. Demonstrate that the angle subtended at the centre of a circle by an arc which is equal in length to the radius is an invariable angle, and determine the value of that angle in degrees.

7. A circular park 100 yards in diameter is surrounded by a belt of plantation 20 yards wide. What is the area of the plantation?

8. The height of a house subtends a right angle at an opposite window, the top being  $60^\circ$  above a horizontal straight line. Find the height of the house, taking the breadth of the street to be 30 feet.

9. Find the distance between two objects A and B, separated from each other by a marsh, from the following data, viz.: AC=500 yards; BC=450 yards; and the angle ACB= $66^\circ 30'$ .

10. In a triangle, given  $A=68^\circ 23'$ ,  $B=62^\circ 40'$ ,  $a=5,000$ , find  $b$  and  $c$ .

### ALGEBRA.

1. Express with brackets—(1) taking the terms three together, and (2) using an inner bracket, including in it the latter two of the three terms within the outer brackets—

$$(6x^3+5y^3-4x^2-3y^2+2x-y).$$

2. Add  $\frac{x^2+2x-3}{x^2-1}$ ,  $\frac{1}{x-1}$ ,  $\frac{x+2}{x^2+x+1}$ .

3. Resolve into fractions  $x^4-4x^2y+4y^2$ ; also  $x^3x^2-10ax+25$ .

4. Divide  $a^2(b+c)-b^2(a+c)+c^2(a+b)+abc$  by  $a-b+c$ .

5. Extract the square root of  $\frac{1}{25}x-\frac{2}{5}x(\frac{1}{6}y-\frac{1}{12}z)+\frac{1}{36}y-\frac{1}{3}y\frac{1}{12}z+\frac{1}{144}z$ .

6. Simplify  $\left(\frac{1-x^2}{1+y}\right)\left(\frac{1-y^2}{x+x^2}\right) \times \left(1+\frac{x}{1-x}\right)$

7. Multiply  $5x\sqrt[3]{(a-x)^2}$  by  $3a\sqrt[3]{a-x}$ .

8. Solve the following equations:—

$$\left. \begin{aligned} x+\frac{1}{3}z &= 32-\frac{1}{2}y \\ \frac{1}{4}y-15+\frac{1}{5}z &= -\frac{1}{3}x \\ \frac{1}{6}z &= 12-\frac{1}{4}x-\frac{1}{5}y \end{aligned} \right\}$$

and

$$x=8-\sqrt{(5x+10)}.$$

9. Expand  $(a-b)^4$ , and explain the process you adopt.

10. When I had been three months in business I took a partner, our joint capital being £416. Six months after, we divided stock and gain, when I received £228 and my partner £252. What capital did we each invest?

11. What numbers are to one another as 2:3, and the sum of whose squares is 117?

### GEOMETRY.

1. Define a superficies, a polygon, similar segments of circles, equal circles.

2. The angles made by one straight line with another on the same side of it are either two right angles, or together equal to two right angles.

3. The diagonals of every parallelogram bisect each other.

4. If a straight line be divided into any two parts, four times the rectangle contained by the whole line and one of the parts, together with the square on the other part, is equal to the square on the straight line which is made up of the whole line and that part.