

dividend, what difference will he find in his income?

5. Simplify.

$$(i) \frac{2^n + 2 - 2 \times \frac{2^n}{4}}{2^n + 2} \times \frac{2^n}{4},$$

$$(ii) \frac{x^2 + \left(\frac{a}{b} + \frac{b}{a}\right)xy + y^2}{x^2 + \left(\frac{a}{b} - \frac{b}{a}\right)xy - y^2},$$

$$(iii) \frac{\frac{a^2 + b^2}{b} - a}{\frac{1}{b} - \frac{1}{a}} \times \frac{a^2 - b^2}{a^2 + b^2}$$

$$\times \left(\frac{2 + b}{a - b} + \frac{a - b}{a + b}\right) \times \left(\frac{a}{a + b} + \frac{b}{a - b}\right).$$

6. Divide $6x^5 - 4x^4 - 19x^3 + 23x^2 - 13x + 3$ by $3x^2 - 2x + 1$, (i) in full; (ii) by Horner's method.

7. Prove the rule for finding the G. C. M. of two quantities.

Find the G. C. M. of $(x^3 + x^2y + 3xy^2 + y^3)$ and $(x^3 + 3x^2y + xy^2 - y^3)$.

8. Solve.

$$(i) \frac{3-x}{3+x} - \frac{2-x}{2+x} + \frac{1-x}{1+x} = 1.$$

$$(ii) x^2 + 4.8x + 2.87 = 0.$$

$$(iii) \sqrt{2 + 1 - (2x - 1)^{-1}} = 0.$$

9. Extract the square root of $32 + 10\sqrt{7}$.

10. Solve.

$$(i) \begin{cases} x + y = a \\ x^4 + y^4 = 14x^2y^2 \end{cases}$$

$$(ii) \begin{cases} \frac{(x+y)^2}{a^2} + \frac{(x-y)^2}{b^2} = 8 \\ x^2 + y^2 = 2(a^2 + b^2) \end{cases}$$

$$(iii) \begin{cases} (x+y)(x^2+y^2) = 1216 \\ x^2 + xy + y^2 = 49. \end{cases}$$

$$(iv) \begin{cases} x^2y^2 = a \\ y^2xz = b \\ z^2xy = c \end{cases}$$

11. If a side of any triangle be produced, the exterior angle is equal to the two interior and opposite angles; and the three interior angles of every triangle are together equal to two right angles.

The difference of the angles at the base of any triangle is double the angle contained by a line drawn from the vertex perpendicular to the base, and another bisecting the angle at the vertex.

12. To describe a parallelogram that shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.

13. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.

If two opposite sides of a quadrilateral figure inscribed in a circle be equal, prove that the other two are parallel.

TRIGONOMETRY—HONORS.

1. Explain the terms *characteristic* and *mantissa*, and state the rule for writing down the characteristic of the logarithm of any number.

Write down the characteristics of '5, '0007 and 60050'3.

What would be the characteristics of these numbers to base 100, and also to base $\frac{1}{10}$.

2. Find the logarithms of $\sqrt[3]{.007}$ and $(.5)^{-3}$.

Find the index of the power to which 7 mu. be raised to produce 300.

3. Having given

$$\text{Log cot } 57^\circ 30' = 9.804187$$

$$\text{Difference} = 279.$$

Find $\text{Log cot } 57^\circ 30' 15''$, and find the angle, the Log of whose tangent is 9.804251.

4. Find the values $\sin 30^\circ$, $\cos 30^\circ$, and $\sec 45^\circ$.

Write down the tabular logarithms of these ratios.

5. Prove the formulas:

$$(1.) \sin A = \sin (180^\circ - A) = \cos (90^\circ - A).$$

$$(2.) \cos (A - B) = \cos A \cos B + \sin A \sin B.$$

$$(3.) \sin 2A = 2 \sin A \cos A.$$

The angle BAC is bisected by AD . BC and BD are perpendicular to AC and AD . Prove that

$$BA \cdot BC = 2 BD \cdot AD$$

$$\text{and } BA \cdot AC = AD^2 - BD^2$$

6. Shew that

$$(1.) \sin 18^\circ \sin 54^\circ = \frac{1}{4}.$$

$$(2.) 16 \cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = 1.$$

7. In any triangle, prove the formulas

$$(1.) c = a \cos B + b \cos A.$$

$$(2.) \tan \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}.$$