Calculate the value of $\frac{\cdot 0156}{\cdot 278}$

to five places of decimals, and explain how you determine the position of the decimal point in the result.

3. Calculate to five places of decimals the value of

$$\cfrac{1}{\sqrt{7}+\cfrac{1}{\sqrt{7}+\cfrac{1}{\sqrt{7}+\cfrac{1}{\sqrt{7}}}}}$$

4. Three watches are set together. The first gains 5 minutes a week, the second gains 8 minutes a week, whilst the third loses 4 minutes a week. When will they all indicate the same time?

5. Simplify—

(i.) $(x^6 - 2x^3y^3 + y^6) \div (x^2 + xy + y^2)$

(ii.) $(x^4 + 1) \div (x^2 - x\sqrt{2} + 1)$.

6. Find the expression of lowest degree in x of which the three expressions $24x^3 - 14x^2 - 11x + 6$, $30x^3 + 29x^2 - 6x - 8$, and $60x^3 + 43x^2 - 34x - 24$ are factors; and express it in factors each of which is of the first degree in x.

7. A certain number of men, all working together, could do a piece of work in x days. It is however completed in y days, one of the men working only half the time, and another working only one-third of the time, but the rest of the men working the whole time. How many men were there? (The answer is to be expressed in terms of x and y.)

8. (i.) Solve, without using any formula, the quadratic equation $6x^2 - 7x + 2 = 0$.

(ii.) Find the two values of x which will make the expression $8x^2 + 22x - 21$ vanish.

9. The first term of an arithmetical progression is 169, and the common difference is -13; find the number of terms whose sum is 988.

10. A man finds that he has in his purse half-crowns, shillings and sixpences. He calculates that the number of the half-crowns and the number of the sixpences added together will exceed the number of the shillings by two; but that the value of the half-crowns and sixpences together is a shilling less than twice the value of the shillings; whilst the number of shillings in the value of the sixpences and shillings together is one less than double the number of half-crowns. How many coins of each kind has he?

GEOMETRY.

1. Prove that, if two triangles have the sides of the one respectively equal to the sides of the other, they are equal in all respects.

2. Two triangles on the same base are such that one lies wholly inside the other; prove that the inner one has the smaller perimeter.

Extend this proposition to two polygons on the same base, of which the inner one has no re-entrant angle.

3. Prove that the sum of the angles of any triangle is equal to two right angles.

4. Show that the middle points of the sides of any quadrilateral are the vertices of a parallelogram.

Prove that the area of this parallelogram is half the area of the quadrilateral.

5. Prove by a geometrical construction that, if a straight line is divided into two segments, the square described on the whole line is equal to the squares described on the segments together with twice the rectangle contained by the segments.

6. Show that, if two circles touch each other, the line joining their centres passes through the point of contact.

7. A segment of a circle is described on a straight line AB, at any point P on it the tangent PT is drawn meeting AB produced in T; prove that the angle which PT makes with AB is equal to the difference of the angles PAB and PBA.

8. Chords of a circle are drawn through a given point inside it; prove that the rectangles contained by their segments are all equal.

Investigate also for what other points these rectangles have the same area as for the given point.

9. A number of triangles with equal vertical angles are inscribed in the same circle; show that their bases are all tangents to a circle.