

31. Through C , a point of intersection of two given circles, a st. line ACB is drawn terminated in the circumferences at A and B . Find the locus of the middle point of AB .

32. From a fixed point P , two st. lines PA , PB , at rt. $\angle$ s to each other, are drawn to cut the circumference of a fixed circle at A and B . Find the locus of the middle point of AB .

33. A $\square$ gm is inscribed in a given 4-gon $ABCD$ with sides $\parallel AC$ and BD . The locus of the point of intersection of the diagonals of the $\square$ gm is the st. line joining the middle points of the diagonals of the 4-gon.

MAXIMA AND MINIMA.

2. **Definition:**—If a magnitude, such as the length of a line-segment, an angle, or an area, varies, subject to given conditions, it is said to be a **maximum** when it has its greatest possible value; and a **minimum** when it has its least possible value.

Cases of maxima and minima values have been given in Part II: see § 43; § 47, Ex. 10 and Ex. 11; § 92, Ex. 15; § 128, Ex. 18; § 140, Ex. 6 and Ex. 9; § 150, Ex. 10; § 174, Ex. 4 and Ex. 16; § 190, Ex. 5.

3.—Exercises

1. Give examples showing that if a magnitude vary continuously, a maximum value is in a position where the magnitude is greater than in the positions close to it on either side; and a minimum value is in a position where the magnitude is less than in the positions close to it on either side.

2. Give examples showing that if a magnitude vary continuously, there must be between any two equal values of the magnitude at least one maximum or minimum value.

3. A and B are two fixed points and P is any point. Find the position of P for which $PA^2 + PB^2$ is a min.