

centre; prove that $PN:PY = PQ^2:OR^2$, OR being the semi-diameter parallel to the tangent at P .

14. Let ABC be a plane triangle; DEF the triangle formed by joining the points where perpendiculars from the angles A, B, C , meet the opposite sides; O the centre of the circumscribed circle, and R its radius; P the intersection of the perpendiculars; and ρ the radius of the circle inscribed in DEF ; prove the following relation

$$AP^2 + BP^2 + CP^2 + OP^2 = 5R^2 \pm 8\rho^2,$$

the upper or lower sign being taken according as the triangle ABC is obtuse or acute.

15. The diagonals of a four-sided figure are h and k , and the area is A ; show that the area of the circumscribing square is

$$\frac{h^2 k^2 - 4A^2}{h^2 + k^2 - 4A}$$

16. A conic is described having a common focus with the conic $\frac{c}{r} = 1 + e \cos \theta$, similar to it, and touching at the point $\theta = a$; prove that its latus rectum is $\frac{2c(1 - e^2)}{1 + 2e \cos a + e^2}$, and prove that the angle between the axes of the two conics is $2 \tan^{-1} \frac{e + \cos a}{\sin a}$.

MODERN LANGUAGES.

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EXERCISES IN ENGLISH GRAMMAR AND COMPOSITION.

1. Substitute words for the italicized phrases:

- He came *with the intention* to remain.
- It is *beyond all doubt* the best of the lot.
- I hope that the stoppage will be only *for a time*.

(d) She showed it *in a manner not to be mistaken*.

(e) It is said to be a custom among the *people of Norway*.

(f) *In consequence of this* some change will be necessary.

(g) Can you explain *in what way* it is done?

(h) They accused me of *being ungrateful*.

(i) He was well liked by *those in the same class with him*.

(j) They were accompanied by the band *belonging to the regiment*.

2. Expand the following simple sentences to complex ones:—

(a) I supposed him to be the proprietor.

(b) He is not the man to refuse such an offer.

(c) It is impossible for such a result to happen.

(d) His successor will have a difficult task.

(e) You would be very foolish to try it.

(f) His telling you that makes no difference.

(g) She is almost certain to forget about it.

(h) For fear of frightening him I did not tell him.

(i) Explain the construction of the air-pump.

(j) To deceive her he wrote the following letter.

3. Change the following complex sentences to compound ones.

(a) Though he has left us we shall not forget his kindness.

(b) If he did not write it he got some one else to write it.

(c) I could not buy it as I had no money with me.

(d) After he had read it through he handed it to me.

(e) If you will call for me I will go with you.

(f) His father, who was working in the next field, came to his aid.

4. Combine the following groups into single sentences:—

(a) He wrapped a handkerchief round the wound. He hastened from one rank to another. He encouraged his soldiers. He exhorted them to be steady. He exhorted them to reserve their fire.

(b) They scrambled up. They held on by roots and branches. They were guided by the stars. These stars shone over the top of the cliff.