

Mathematics

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(Chapter – 1) (Number Systems)(Exemplar Problems)

(Class – IX)

Exercise 1.4

Question 4:

If $a = \frac{3+\sqrt{5}}{2}$, then find the value of $a^2 + \frac{1}{a^2}$.

Answer 4:

Given that: $a = \frac{3+\sqrt{5}}{2}$

$$\Rightarrow a^2 = \left(\frac{3+\sqrt{5}}{2}\right)^2$$

$$= \frac{9+5+6\sqrt{5}}{4}$$

$$= \frac{14+6\sqrt{5}}{4}$$

$$= \frac{7+3\sqrt{5}}{2}$$

and $\frac{1}{a^2} = \frac{2}{7+3\sqrt{5}}$

$$= \frac{2}{7+3\sqrt{5}} \times \frac{7-3\sqrt{5}}{7-3\sqrt{5}}$$

$$= \frac{14-6\sqrt{5}}{49-45}$$

$$= \frac{14-6\sqrt{5}}{4}$$

$$= \frac{7-3\sqrt{5}}{2}$$

Now

$$a^2 + \frac{1}{a^2} = \frac{7+3\sqrt{5}}{2} + \frac{7-3\sqrt{5}}{2} = \frac{14}{2} = 7$$

