~~thing~~ Using bayes' rule, we see that the posterior can be obtained:

$$\underbrace{p(\theta|x)}_{\text{posterior}} = \frac{\overbrace{p(x|\theta)}^{\text{likelihood}}\ \overbrace{p(\theta)}^{\text{prior}}}{p(x)}$$

Now since $p(x)$ is not available (calculating it as a marginal is intractable), we work with

$$p(\theta|x) \propto p(x|\theta)\, p(\theta)$$
$$= \theta (1-\theta)^{\sum x_i} \cdot \theta^{a-1} (1-\theta)^{b-1}$$
$$= \theta^{a} (1-\theta)^{b + \sum x_i - 1}$$

without the normalizing constant, we can still see that this is a Beta distribution.

If we normalize this, we ~~obtain~~ can see the parameters. are $a+1, b+\sum x_i$

$$p(\theta|x) \sim \text{Beta}(a+1, b+\sum x_i)$$

Ans.

$$p(\theta|x) = \frac{\Gamma(a+b+\sum x_i+1)}{\Gamma(a+1)\Gamma(b+\sum x_i)}\, \theta^{a} (1-\theta)^{b+\sum x_i - 1}$$