A heat engine extracts 500 J from the hot reservoir and exhausts 300 J into the cold reservoir. Calculate the (a) the work done and (b) the efficiency?

Given:

Heat extracted from the engine: $Q_H = 500$ J

Heat exhausted into cold reservoir: $Q_C = 300$ J

To determine:
(a) Work done: W
(b) Efficiency: e

(a) To determine the work done, use formula:
$$W = Q_H - Q_C \text{ ----------------(1)}$$

Substituting for Q_H & Q_C in (1):
W = 500 – 300 =200 J

(b) To determine the efficiency, use formula:
$$e = W / Q_H \text{ ----------------(2)}$$

Substituting for W and Q_H in (2):
e = 200 / 500 = 0.4 = 40 %