

- 3 A spring is fixed at one end and attached to the frame of a pulley at the other end. A cable is passed around the wheel of the pulley. The spring is stretched to a fixed length using the cable and pulley.

Fig. 3.1 shows the view from above of the spring, cable and pulley.

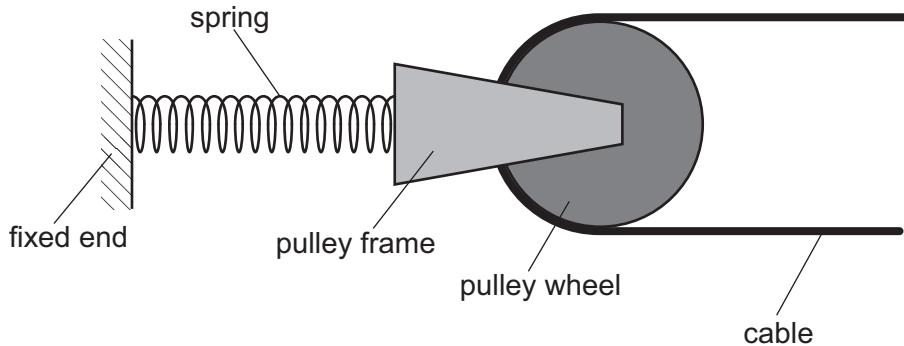


Fig. 3.1

The spring obeys Hooke's law and has a spring constant k of 250 N m^{-1} . A force F acts on the spring. The tension in the cable is T . The pulley is in equilibrium.

- (a) On Fig. 3.2, draw labelled arrows to show the directions of the forces acting on the pulley.

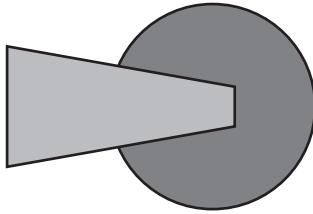


Fig. 3.2

[2]

- (b) The force F is 110 N .

- (i) Determine T .

$$T = \dots \text{ N} [1]$$



- (ii) Calculate the extension of the spring.

extension = m [2]

- (c) A second identical spring with the same spring constant of 250 N m^{-1} is now also connected to the pulley, as shown in Fig. 3.3.

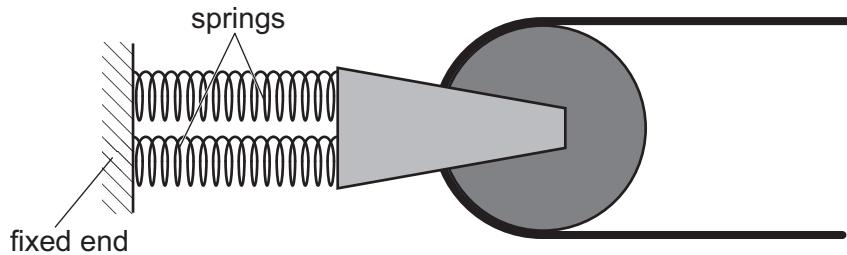


Fig. 3.3

The tension in the cable is kept the same. The pulley is again in equilibrium.

- (i) Determine the extension of the springs.

extension = m [2]

- (ii) The elastic potential energy stored in the spring in Fig. 3.1 is E_1 . The **total** elastic potential energy stored in the two springs in Fig. 3.3 is E_2 .

Calculate the ratio $\frac{E_1}{E_2}$.

ratio = [2]

[Total: 9]