1) Given $\vec{a}$ = [2, 4, –5], $\vec{b}$ = [–1, 3, 7], and $\vec{c}$ = [–2, 7, 3], evaluate each expression.

a) $\vec{a} \times \vec{b} \cdot \vec{c}$

b) $\vec{a} \times \vec{c} \cdot \vec{b}$

2) Determine the projection, and its magnitude of $\vec{u}$ on $\vec{v}$.

a) $\vec{u}$ = [2, 1, 7], $\vec{v}$ = [–7, 2, 6]

b) $\vec{u} = 7\hat{\imath} - 6\hat{\jmath} + 5\hat{k}, \ \vec{v} = 3\hat{\imath} - 2\hat{\jmath} + \hat{k}$

3) Determine the work done in the direction of travel.

a) $\vec{F}$ = [200, 150, 75], $\vec{s}$ = [2, –1, 8]

b) $\vec{F} = -3\hat{\imath} + 9\hat{\jmath} + 5\hat{k}, \ \vec{s} = 2\hat{\imath} + 5\hat{\jmath} + 3\hat{k}$

4) Find the area of the parallelogram with sides consisting of the vectors.

a) $\vec{a}$ = [−4, 5, −8], $\vec{b}$ = [1, −2, 3]   **b)** $\vec{a}$ = [9, −5, 7], $\vec{b}$ = [3, −2, 5]

5) Find the area of the triangle with the given vertices.

a) A(0, 2, 4), B(3, −2, 1), C(4, −2, 5)   **b)** A(−2, 4, 5), B(1, 4, 2), C(7, 4, 9)

6) Determine the volume of the parallelepiped determined by the vectors.

a) $\vec{a}$ = [2, 5, −8], $\vec{b}$ = [7, −2, 3], and $\vec{c}$ = [8, 2, −1]   **b)** $\vec{a}$ = [1, −5, 9], $\vec{b}$ = [3, 4, −7], and $\vec{c}$ = [1, 0, 2]

7) Find the torque produced by a cyclist exerting a force of 85 N on the pedal in the position shown in the diagram, if the shaft of the petal is 11 cm long.
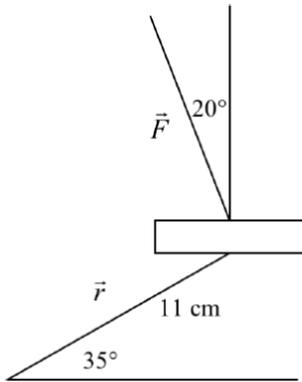
8) A woman pushes her baby stroller a distance of 1500 m by a force of 89 N applied at an angle of 35° to the roadway. Calculate the work done.

9) Determine the work done by gravity in causing a 45 kg child to slide down a 55 m slope, which has an angle of 47° to the horizontal.

10) A force of 75 N is applied to a wrench in a clockwise direction at 52° to the handle, 17 cm from the centre of the bolt.

a) Calculate the magnitude of the torque.

b) In what direction does the bolt move?