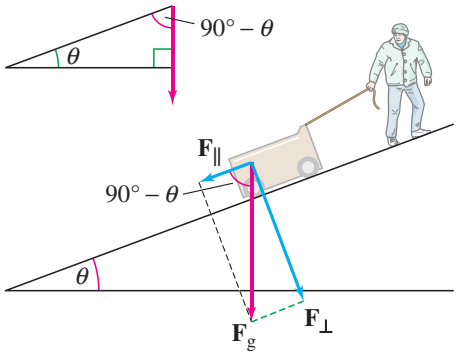
(1) What is the minimum force you must apply to pull a 20-kg wagon up a frictionless ramp inclined at an angle $\theta = 15°$.



(2) Consider the two vectors $\mathbf{v} = \langle 1, 2, 3\rangle$ and $\mathbf{w} = \langle 3, -2, 1\rangle$. Are $\mathbf{v}$ and $\mathbf{w}$ perpendicular? Justify your answer.

(3) Consider the two vectors $\mathbf{v} = \langle 1, 2, 3\rangle$ and $\mathbf{w} = \langle 5, 0, 1\rangle$. Are $\mathbf{v}$ and $\mathbf{w}$ parallel? Justify your answer. If they are not, produce a unit vector normal to both $\mathbf{v}$ and $\mathbf{w}$.

(4) Calculate the area of the parallelogram spanned by $\mathbf{v}$ and $\mathbf{w}$.
$\mathbf{v} = \langle 1, 0, 1\rangle$ and $\mathbf{w} = \langle 0, -2, 3\rangle$.

(5) Find the vector and scalar projections of $\mathbf{v} = \langle 1, 2, 3\rangle$ onto $\mathbf{w} = \langle 1, -1, 0\rangle$.

(6) The diagonals of a parallelogram are given by the vectors $\mathbf{a} = \langle 3, -4, -1 \rangle$ and $\mathbf{b} = \langle 2, 3, -6 \rangle$. Show that the parallelogram is a rhombus.

(7) For what values of a are $\mathbf{v} = \langle a, -2, 1 \rangle$ and $\mathbf{w} = \langle 2a, a, -4 \rangle$ perpendicular?

(8) Compute the volume of the parallelepiped spanned by the vectors $\mathbf{a} = \langle 2, -3, 0 \rangle$, $\mathbf{b} = \langle 1, 1, -1 \rangle$ and $\mathbf{c} = \langle 3, 0, -1 \rangle$.

(9) Show that the distance from a point $P_1(x_1, y_1)$ to the line $ax + by + c = 0$ is

$$\frac{| \, ax_1 + by_1 + c \, |}{\sqrt{a^2 + b^2}}$$

Use this formula to find the distance from the point $(-2, 3)$ to the line $3x - 4y + 5 = 0$.