5.3 Applications of the Dot Product Worksheet

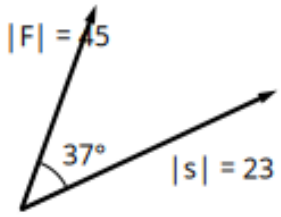
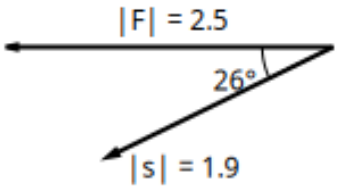
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1) Determine the work done by each force $\vec{F}$, in Joules, for each object moving along $\vec{s}$.

a) $\vec{F} = [3, -2]$, $\vec{s} = [1, 8]$	b) $\vec{F} = [8, -9]$, $\vec{s} = [-3, 7]$

2) Determine the work done by the force $\vec{F}$, in Joules, for each object moving along $\vec{s}$.

a) 	b) 

3) Determine the angle between the vectors in each pair.

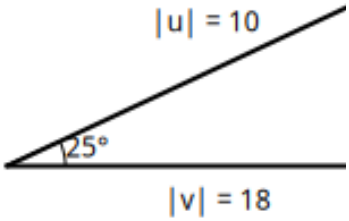
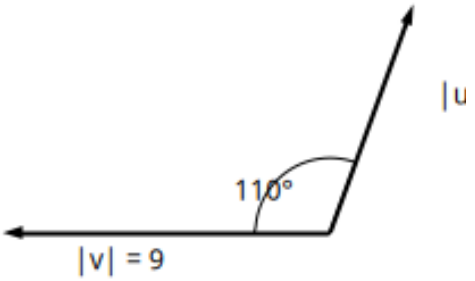
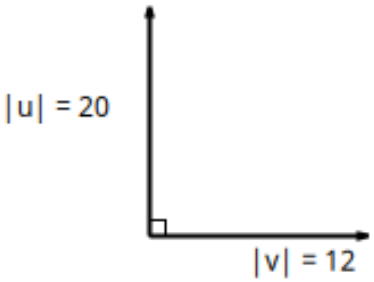
a) $\vec{p} = [6, 7]$ and $\vec{q} = [3, 2]$	b) $\vec{r} = [-1, -7]$ and $\vec{s} = [5, 4]$

4) Determine the projection of the first vector on the second.

a) $\vec{a} = [6, -1]$, $\vec{b} = [3, -4]$	b) $\vec{c} = [6, 7]$, $\vec{d} = [3, 2]$

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5) Determine the projection of $\vec{u}$ on $\vec{v}$

a)	b)	c)
		

6) For each of the following, find the magnitude of the projection of $\vec{x}$ on $\vec{y}$ and also the vector projection of $\vec{x}$ on $\vec{y}$.

a) $\vec{x} = [1, 1], \vec{y} = [1, -1]$	b) $\vec{x} = [2, 5], \vec{y} = [-5, 12]$

7) $\triangle DEF$ has vertices $D(-3, 5)$, $E(2, 3)$, and $F(6, 7)$. Calculate $\angle DEF$.

8) How much work is done against gravity by the orderly pushing an 85 kg person up a 5 m ramp inclined at an angle of 15° to the horizontal?

9) A stage lamp is dragged 15 m along level ground by a 120 N force applied at an angle of 35° to the ground. It is then dragged up a 12 m ramp onto a stage by the same force. If the ramp is inclined at 15° to the ground. Find the total work done.

10) A box on a wagon pulled a distance of 35 m by a 27 N force applied at an angle of 40° to the ground. The box is then lifted a distance of 1.5 m and placed on a table by exerting a force of 37 N. Find the total work done.

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Answer Key

1) a) -13 b) -87

2) a) 826.59 b) 4.27

3) a) $\theta = 15.71°$ b) $\theta = 136.79°$

4) a) $\left[\frac{66}{25}, \frac{-88}{25}\right]$ b) $\left[\frac{96}{13}, \frac{64}{13}\right]$

5) a) $9.06\hat{v}$ b) $-2.39\hat{v}$ c) $\vec{0}$

6) magnitude = 0, vector projection: $\vec{0}$ b) magnitude $= \frac{50}{13}$, vector projection: $\left[\frac{-250}{169}, \frac{600}{169}\right]$

7) 113.2°

8) 1077.98 J

9) 2827.63 J

10) 779.4 J

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