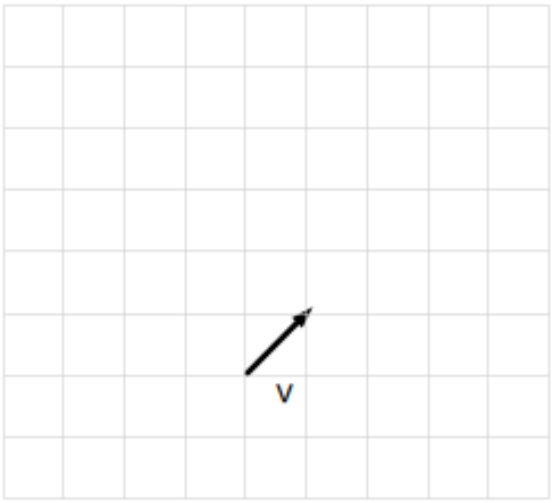
4.3 Multiplication of a Vector by a Scalar Worksheet

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

1) Draw representatives of the following vectors on the grid provided.

a) $3\vec{v}$ b) $0.5\vec{v}$ c) $-2\vec{v}$ d) $-\vec{v}$



2) Simplify each of the following algebraically.

a) $\vec{a} + 2\vec{a} + 4\vec{a}$

b) $7\vec{u} + 5\vec{v} - 2\vec{u} + 8\vec{v}$

c) $2(\vec{u} + \vec{v}) - 3(\vec{u} - 2\vec{v})$

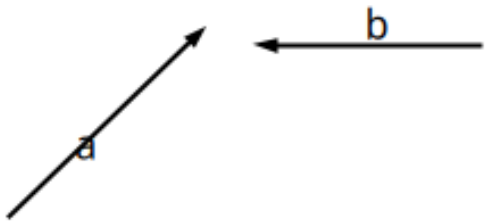
d) $7\vec{u} + 5\vec{v} - 2(\vec{u} - \vec{v}) + 2\vec{u}$

e) $-3(\vec{u} + \vec{v}) + 2(\vec{u} - \vec{v})$

f) $6(\vec{u} + 2\vec{v}) - 5(\vec{u} - 3\vec{v})$

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3) For the vectors $\vec{a}$ and $\vec{b}$ shown, draw and label…



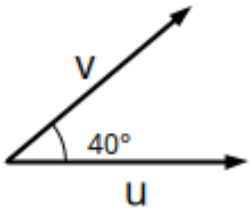
a) $2\vec{a}$

b) $-3\vec{b}$

c) $\vec{a} + 2\vec{b}$

d) $-\vec{a} - 3\vec{b}$

4) Two vectors $\vec{u}$ and $\vec{v}$ make an angle of 40° with each other. Construct each vector sum or difference.



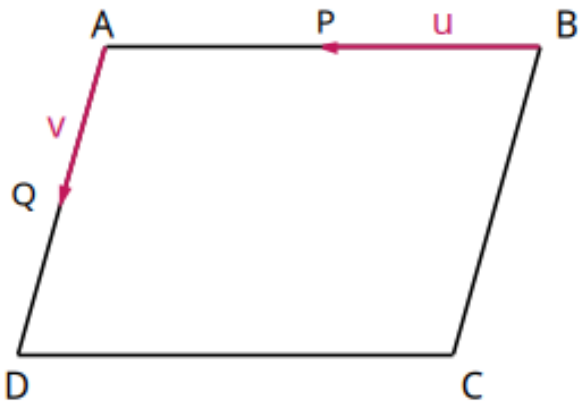
a) $\vec{u} + 2\vec{v}$

b) $2\vec{u} - 2\vec{v}$

c) $-2\vec{u} + \vec{v}$

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5) In parallelogram ABCD, opposite sides are parallel and equal, $\overrightarrow{BP} = \overrightarrow{PA}$, and $\overrightarrow{AQ} = \overrightarrow{QD}$. Let $\overrightarrow{BP} = \vec{u}$ and $\overrightarrow{AQ} = \vec{v}$. Express the following vectors in terms of $\vec{u}$ and $\vec{v}$.



a) $\overrightarrow{AD}$ = _____

b) $\overrightarrow{PA}$ = _____

c) $\overrightarrow{CD}$ = _____

d) $\overrightarrow{PQ}$ = _____

e) $\overrightarrow{BD}$ = _____

f) $\overrightarrow{PD}$ = _____

g) $\overrightarrow{AC}$ = _____

6) Given that $|\vec{u}| = 8$ and $|\vec{v}| = 10$ and the angle between $\vec{u}$ and $\vec{v}$ is 60°, determine:

a) $|\vec{u} - \vec{v}|$

b) the direction of $\vec{u} - \vec{v}$ relative to $\vec{u}$

c) the unit vector in the direction of $\vec{u} + \vec{v}$

d) $|5\vec{u} + 2\vec{v}|$

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7) $|\vec{v}| = 2$. Draw the following vectors and express each of them as a scalar multiple of $\vec{v}$.



a) A vector in the same direction as $\vec{v}$ with twice its magnitude

b) a vector in the same direction as $\vec{v}$ with one half its magnitude

c) a vector in the opposite direction as $\vec{v}$ with two-thirds its magnitude

d) a vector in the opposite direction as $\vec{v}$ with twice its magnitude

e) a unit vector in the same direction as $\vec{v}$

Answer Key

1) See grid.

2) a) $7\vec{a}$ b) $5\vec{u} + 13\vec{v}$ c) $-\vec{u} + 8\vec{v}$ d) $7\vec{u} + 7\vec{v}$ e) $-\vec{u} - 5\vec{v}$ f) $\vec{u} + 27\vec{v}$

3) Diagrams may vary.

4) Diagrams may vary.

5) a) $2\vec{v}$ b) $\vec{u}$ c) $2\vec{u}$ d) $\vec{u} + \vec{v}$ e) $2\vec{v} + 2\vec{u}$ f) $\vec{u} + 2\vec{v}$ g) $2\vec{v} - 2\vec{u}$

6) a) $2\sqrt{21}$ b) 70.9° c) $\frac{1}{2\sqrt{61}}(\vec{u} + \vec{v})$ d) $20\sqrt{7}$

7) a) $2\vec{v}$ b) $\frac{1}{2}\vec{v}$ c) $-\frac{2}{3}\vec{v}$ d) $-2\vec{v}$ e) $\frac{1}{|\vec{v}|}\vec{v}$

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