9a. $u\cdot(7v+w) = (3,4)\cdot\left[(35,-7)+(7,1)\right] = (3,4)\cdot(42,-6) = 126-24 = 102$

b. $\|(u\cdot w)w\| = \|(3\cdot7+4\cdot1)(7,1)\| = \|(25)(7,1)\| =$
$(25)\|(7,1)\| = 25\sqrt{(49)+(1)} = 25\sqrt{50} = 125\sqrt{2}.$

c. $\|u\|(v\cdot w) = (\sqrt{3^2+4^2})(5\cdot7+(-1)(1)) = (5)(34) = 170$

d. $(\|u\|v)\cdot w = (25,-5)\cdot(7,1) = 25\cdot7-5\cdot1 = 175-5 = 170.$

12. These points are not colinear, so they form a triangle.

$\vec{AB} = (4-3, 3-0, 0-2) = (1,3,-2)$
$\vec{BC} = (8-4, 1-3, -1-0) = (4,-2,-1)$

$\vec{AB}\cdot\vec{BC} = 1\cdot4-3\cdot2+2\cdot1 = 4-6+2 = 0$, so $\vec{AB}$ and $\vec{BC}$ are orthogonal, so there is a right angle at the vertex B.

13. Find a unit vector w orthogonal to $u=(1,0,1)$ and $v=(0,1,1)$.
$w=(x,y,z)$
$u\cdot w=0 \Rightarrow x+z=0 \Rightarrow x=-z$
$v\cdot w=0 \Rightarrow y+z=0 \Rightarrow y=-z$

So, $w=(x,x,-x)$. $\|w\| = \sqrt{(x^2)+x^2+(-x)^2} = \pm x\sqrt{3}$

So the unit vector is $\left(\frac{1}{\sqrt3}, \frac{1}{\sqrt3}, \frac{-1}{\sqrt3}\right)$ or $\left(\frac{-1}{\sqrt3}, \frac{-1}{\sqrt3}, \frac{1}{\sqrt3}\right)$

14) a. If p + q are $\parallel$, if 3 is $\frac{3}{2}$ of 2, 5 is $\frac{3}{2}$ of K. So, $K=\frac{10}{3}$

b. $p\cdot q=0 \Rightarrow 2\cdot6+K\cdot5=0 \Rightarrow K=-6/5.$

c. $\cos\frac{\pi}{3} = \frac{1}{2} = \frac{p\cdot q}{\|p\|\|q\|} = \frac{6+5K}{(\sqrt{4+K^2})(\sqrt{34})}$ Simplified, $K = \frac{-60+34\sqrt3}{33}$

d. $\cos\frac{\pi}{4} = \frac{\sqrt2}{2} = \frac{6+5K}{(\sqrt{4+K^2})(\sqrt{34})}$ Simplified, $K=\frac{1}{2}$