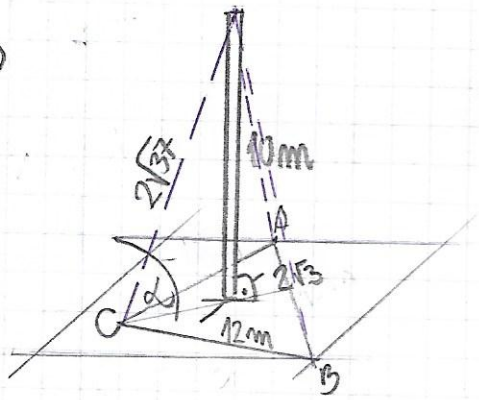
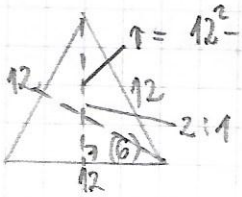
TOČKA, PREMICA & RAVNINA V PROSTORU

47)





$r = \sqrt{12^2 - 6^2} = \sqrt{108} \Rightarrow \boxed{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = 6\sqrt{3}$

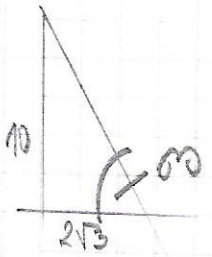
$\frac{6\sqrt{3}}{3} = 2\sqrt{3}\ (+4\sqrt{3})$

a) $(4\sqrt{3})^2 + 10^2 = |V|^2$

$16 \cdot 3 + 100 = 148 \Rightarrow \sqrt{\ } \Rightarrow \boxed{2 \cdot 2 \cdot \sqrt{37}} = \underline{2\sqrt{37}}$

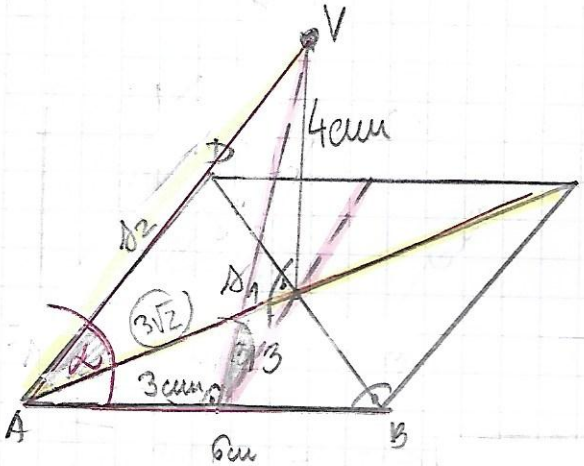
b) $\tan\alpha = \frac{10}{2\sqrt{37}} \Rightarrow \alpha = \underline{55°17'}$

c)



$\operatorname{tg}\varphi = \frac{10}{2\sqrt{3}} \Rightarrow \underline{70°53'}$

48)



$\Delta_1^2 = 3^2 + 4^2 = 9 + 16$

$\Delta_1 = 5$ cm

$\cos\beta = \frac{3}{5}$

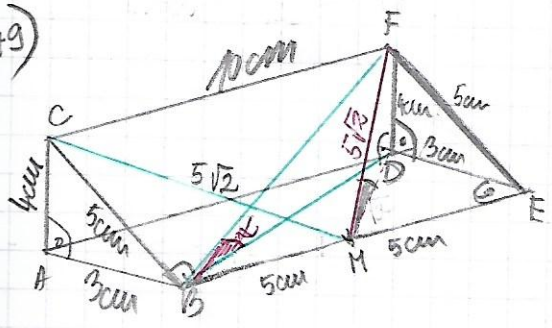
$\underline{\beta = 53,1°}$

$\operatorname{tg}\alpha = \frac{4}{3\sqrt{2}}$

$\alpha = 43,3°$

$\operatorname{tg}\alpha = \frac{3}{5}$

49)

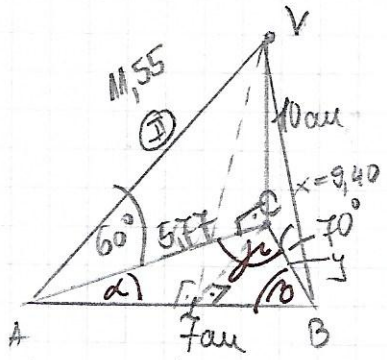


a) $CM = 5\sqrt{2}$ $BF = 5\sqrt{5}$ $BD = \sqrt{109}$

b) $\cos\alpha = \frac{\sqrt{109}}{\sqrt{6} \cdot 5} = 20,96° \approx 21°$

c) $\sin\beta = \frac{4}{5\sqrt{2}} = 34,45° \approx 34°$

50)

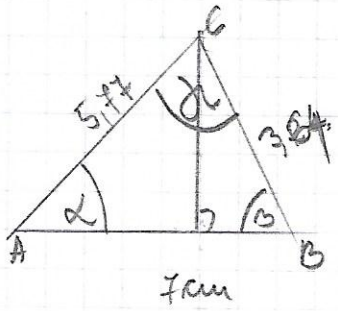


$\operatorname{tg} 60 = \frac{I}{10}$; $I = 5{,}77$

$\sin 60° = \frac{10}{II}$; $II = 11{,}55$

$\sin 70° = \frac{10}{x}$; $x = 9{,}40$

$\cos 70° = \frac{y}{9{,}40}$; $y = 3{,}214$



$c^2 = a^2 + b^2 - 2ab \cdot \cos\gamma$

$2{,}46 = -42 \cdot \cos\gamma$

$\gamma = 93{,}4°$

$\beta = 55{,}4°$

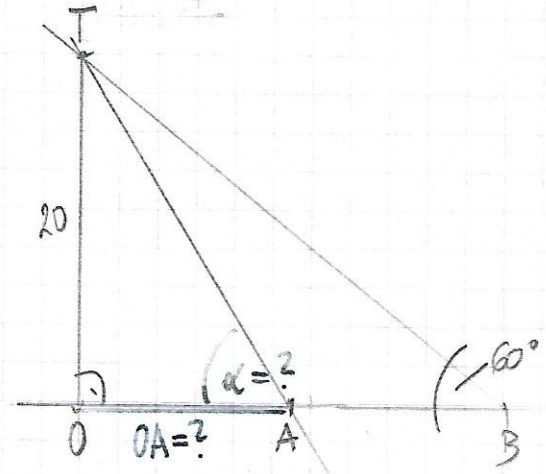
$a^2 = b^2 + c^2 - 2bc \cdot \cos\alpha$

$13{,}25 = 33{,}29 + 49 - 80{,}78 \cdot \cos\alpha$

$-69{,}04 = -80{,}78 \cdot \cos\alpha$

$\alpha = 31{,}2°$

51)



$\operatorname{tg} 60 = \frac{20}{OB}$

$OB = \frac{20}{\operatorname{tg} 60}$

$OB = 11{,}55$

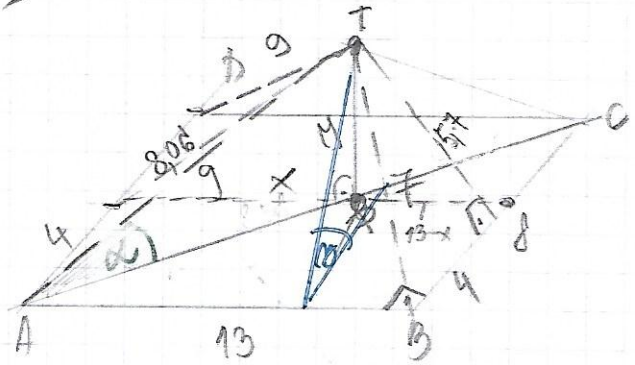
$OA = 5{,}77$

$\operatorname{tg}\alpha = \frac{20}{OA} = 5{,}77$

$\operatorname{tg}\alpha = 3{,}47$

$\alpha = 73{,}91°$

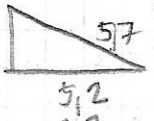
52)



a) $AC^2 = 13^2 + 8^2 = \sqrt{233} \doteq 15{,}26$

b) $8{,}06^2 = x^2 + v^2$ $\quad 5{,}7^2 = (13 - x)^2 + v^2$

$201{,}47 = 26x$; $x = 7{,}8$ $\quad 13 - 7{,}8 = 5{,}2$



$v^2 + 5{,}2^2 = 5{,}7^2$; $v = 2{,}3$

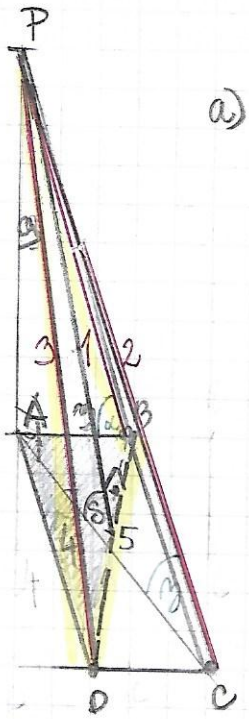
c) $\sin\alpha = \frac{2{,}3}{9}$ $\quad \alpha = 14{,}81°$

d) $y^2 = 16 + 5{,}29$; $y = 4{,}6$

$\operatorname{tg}\gamma = \frac{2{,}3}{4}$

$\gamma = 29{,}90° \doteq 30°$

53)



a) $(1)^2 = 9^2 + 5^2 = 81 + 25 = \sqrt{106} = 10,30$

$(2)^2 = 9^2 + 3^2 = 81 + 9 = \sqrt{90} = 9,50$

$(3)^2 = 9^2 + 4^2 = 81 + 16 = \sqrt{97} = 9,85$

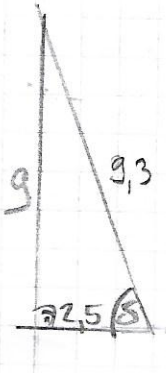
$\Sigma_{1,2,3} = 29,65$

b) $\operatorname{tg}\alpha = \frac{9}{3} \Rightarrow \alpha = 71,6°$

$\operatorname{tg}\beta = \frac{9}{5} \Rightarrow \beta = 60,9°$

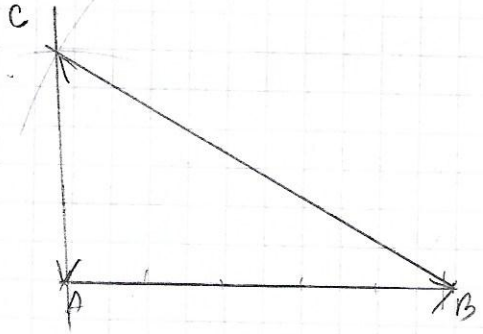
$\operatorname{tg}\gamma = \frac{9}{4} \Rightarrow \gamma = 66,0°$

c) $\operatorname{tg}\delta = \frac{9}{25} \Rightarrow 74,5°$



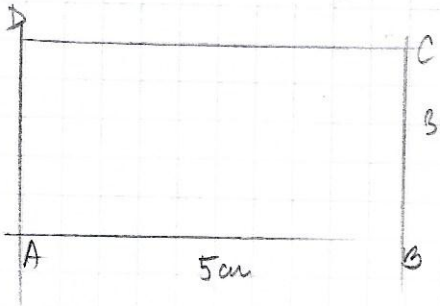
DEFINICIJA VEKTORJA

54)



$\vec{AB}, \vec{AC}, \vec{BC}, \vec{BA}, \vec{CA}, \vec{CB}, \vec{AA} = 0$

55)



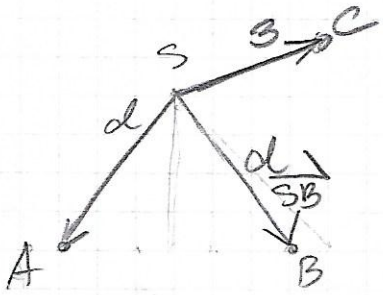
a) $\vec{AB}, \vec{AC}, \vec{AD}, \vec{BA}, \vec{BD}, \vec{BC}, \vec{CB}, \vec{CA}, \vec{CD}, \vec{DA}, \vec{DB}, \vec{DC}$

$\vec{AA} = \vec{0} = \vec{BB} = \vec{CC} = \vec{DD}$

b) $\vec{AB} = \vec{DC}, \vec{BA} = \vec{CD}, \vec{DA} = \vec{CB}, \vec{AD} = \vec{BC}$

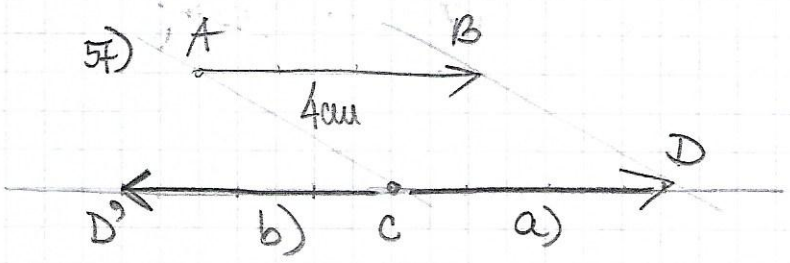
$\vec{AA} = \vec{BB} = \vec{CC} = \vec{DD} = \vec{0}$

56)

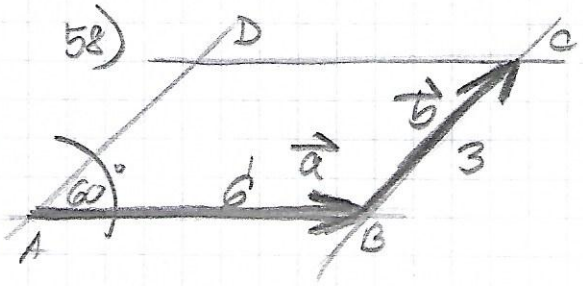


Vektorji imajo različno smer zato niso enaki

57)



58)



a) $\vec{a} = \vec{DC}$ $\vec{b} = \vec{AD}$

b) $\vec{a} = -\vec{CD}$ $\vec{b} = -\vec{DA}$

59)

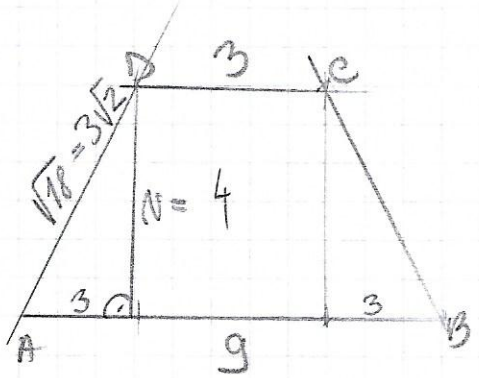
a) $\vec{AB}, \vec{BA}, \vec{BC}, \vec{CB}, \vec{CD}, \vec{DC}$

b) $\vec{AC} = 2\text{enoti} = \vec{BD}$; $\vec{DA} = 3\text{en}$

c) $\vec{AB} = \vec{BC} = \vec{CD}$ $\vec{AC} = \vec{BD}$ $\vec{AD} = \vec{}$

$\vec{BA} = \vec{CB} = \vec{DC}$ $\vec{CA} = \vec{DB}$

60)



a) $\vec{AB}, \vec{BA}, \vec{BC}, \vec{CB}, \vec{CD}, \vec{DC}, \vec{DA}, \vec{AD}, \vec{AC}, \vec{CA}$

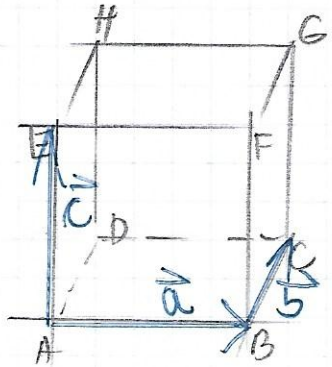
$\vec{AA} = \vec{BB} = \vec{CC} = \vec{DD}$

b) ni jk

c) $|\vec{AD}| = |\vec{BC}| = \sqrt{3^2+4^2} = \sqrt{25} = 5$

$|\vec{AC}| = |\vec{BD}| = \sqrt{6^2+4^2} = \sqrt{52} = 2\sqrt{13}$

61)

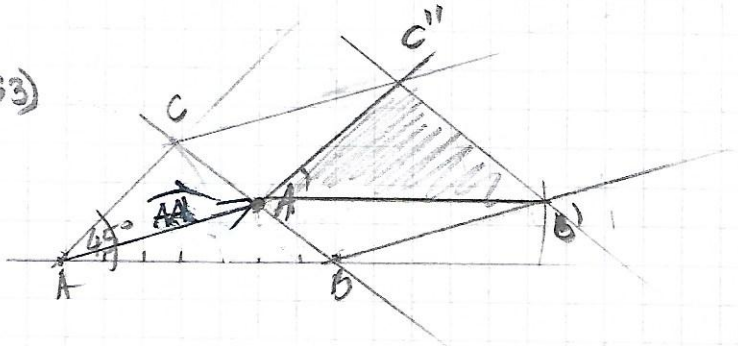


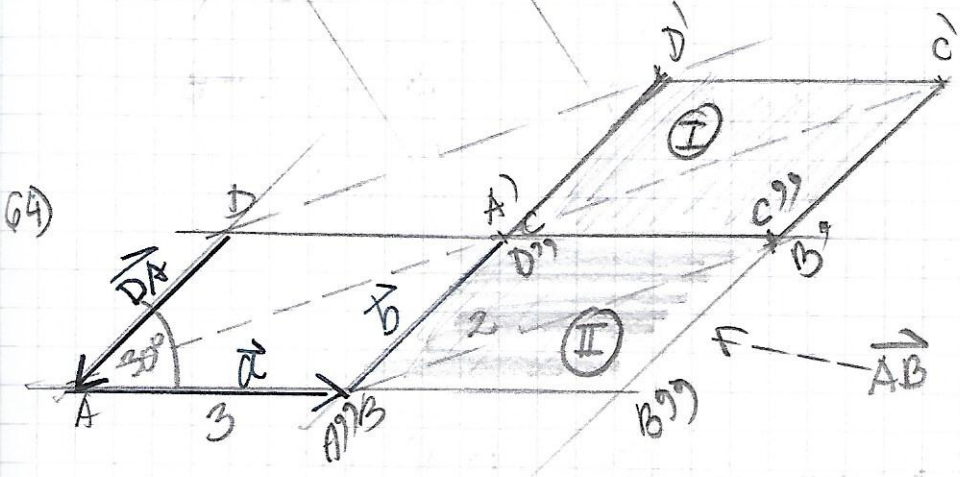
a) $\vec{a} = \vec{DC} = \vec{EF} = \vec{HG}$

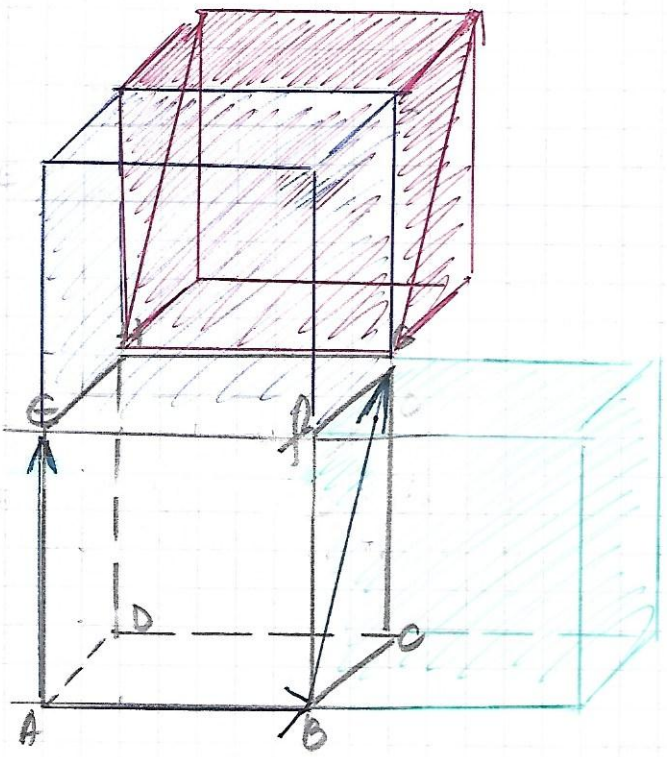
b) $\vec{c} = \vec{BF} = \vec{DH} = \vec{CG}$

c) $\vec{b} = \vec{DA} = \vec{GF} = \vec{HE}$

VZPOREDNI PREMIK





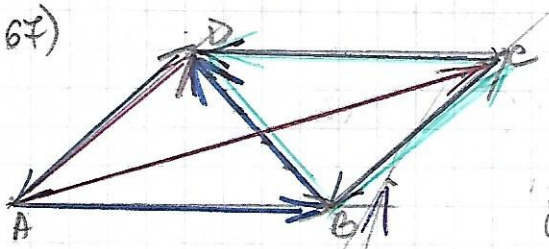


SEŠTEVANJE IN ODŠTEVANJE VEKTORJEV

66) $\vec{b}-(\vec{a}+\vec{b})=\vec{b}-\vec{a}-\vec{b}=-\vec{a}$ b) $\vec{a}+\vec{b}-\vec{c}-(\vec{b}-\vec{a}-\vec{c})-\vec{a}=\vec{a}$

c) $\vec{b}-\vec{c}+\vec{a}-(\vec{a}-\vec{c}+\vec{b})=\vec{b}-\vec{c}+\vec{a}-\vec{a}+\vec{c}-\vec{b}=0$

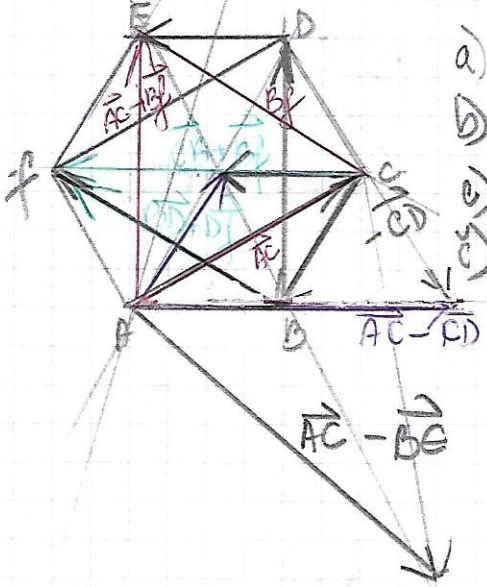
67)



a) $\vec{AB}+\vec{AD}=\vec{AC}$
b) $\vec{BC}+\vec{CA}=\vec{BA}$
c) $\vec{AB}+\vec{AC}$
č) $\vec{AD}+\vec{BC}=0$
d) $\vec{AC}-\vec{AD}=\vec{CD}$
e) $\vec{BC}-\vec{BD}=\vec{CB}$
f) $\vec{AB}+\vec{BD}-\vec{AD}=0$
g) $\vec{CB}-\vec{DC}-\vec{AD}-\vec{BA}$

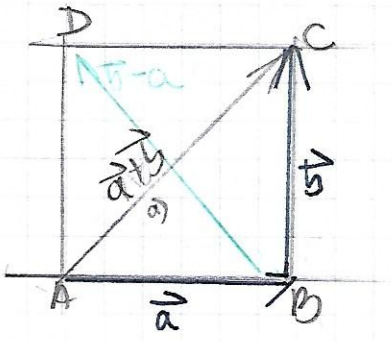
$\vec{BE}+\vec{AD}$

68)



a) $\vec{CB}+\vec{Bf}=\vec{Cf}$
b) $\vec{BD}+\vec{Df}=\vec{Bf}$
c) $\vec{AC}+\vec{DE}=\vec{AE}$
č) $\vec{AC}-\vec{CD}$
d) $\vec{AC}+\vec{Bf}$
e) $\vec{BE}+\vec{AD}$
f) $\vec{AC}-\vec{BE}$

69)



a) $\vec{a}+\vec{b}=$
b) $\vec{BC}-\vec{AC}=$
c) $\vec{CA}+\vec{DC}$

** $\vec{CA}=-\vec{b}-\vec{a}+\vec{a}=-\vec{b}$

* $-\vec{AC}=-\vec{b}-\vec{a}$
$-\vec{b}+\vec{b}-\vec{a}=-\vec{a}$

g) $\vec{AD}-\vec{BD}=\vec{a}$ ($\vec{AD}=\vec{b}$, $\vec{BD}=+\vec{a}+\vec{b}$)
d) $\vec{AC}-\vec{AD}=\vec{a}$ ($\vec{AC}=\vec{a}+\vec{b}$, $\vec{AD}=-\vec{b}$)
e) $\vec{BC}-\vec{BD}+\vec{CD}=$
$\vec{b}+\vec{a}-\vec{b}-\vec{a}=\vec{0}$

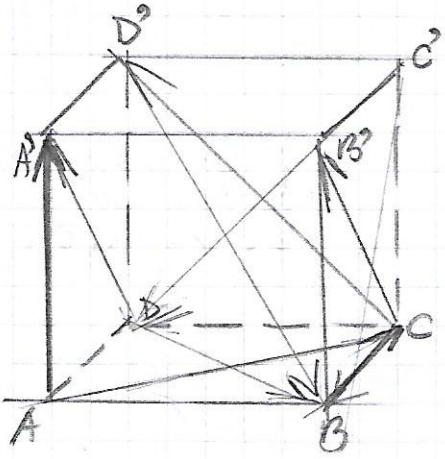
10) a) $\vec{c}-\vec{b}=\vec{a}$; $\vec{a}+\vec{b}=\vec{c}$; $\vec{b}-\vec{c}=-\vec{a}$

b) $\vec{b}=\vec{d}-\vec{c}-\vec{a}$; $\vec{a}+\vec{c}=\vec{b}+\vec{d}$

c) $\vec{a}+\vec{d}=\vec{e}+\vec{b}+\vec{c}$; $\vec{a}=\vec{e}+\vec{b}+\vec{c}-\vec{d}$

ç) $\vec{a}=\vec{b}+\vec{d}-\vec{e}+\vec{c}$

11)

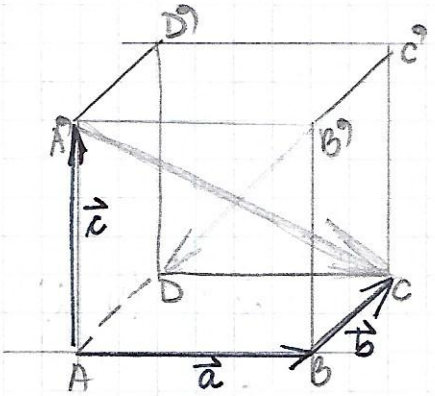


a) $\vec{AA'}+\vec{BC}=\vec{AD}$

b) $\vec{AB}+\vec{CC'}=\vec{AB}+\vec{BB'}=\vec{AB}$

c) $\vec{CD}+\vec{CB'}=\vec{CA'}$

ç) $\vec{C'D}-\vec{BD}=\vec{C'B}$



12) a) $\vec{AC}=\vec{a}+\vec{b}$

b) $\vec{AC'}=\vec{a}+\vec{b}+\vec{c}$

c) $\vec{BC'}=\vec{b}+\vec{c}$

ç) $\vec{C'D}=-\vec{c}-\vec{a}$

d) $\vec{A'C}=-\vec{c}+\vec{a}+\vec{b}$

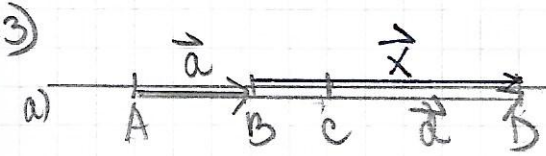
e) $\vec{D'A}=-\vec{c}-\vec{b}$

f) $\vec{CA'}=-\vec{b}-\vec{a}+\vec{c}$

g) $\vec{B'D}=-\vec{c}-\vec{a}+\vec{b}$

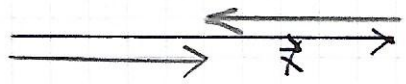
13)

a)



$\vec{AB}+\vec{X}=\vec{AD}$; $\vec{X}=\vec{AD}-\vec{AB}=\vec{BD}$

b)

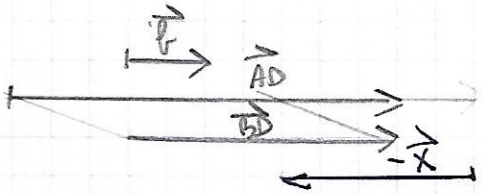


$\vec{DC}+\vec{X}=\vec{AC}\Rightarrow X=\vec{AC}-\vec{DC}=\vec{AD}$

c)

$\vec{AC}-\vec{X}=\vec{AD}\Rightarrow \vec{X}=\vec{AC}-\vec{AD}=\vec{DC}$

ç)

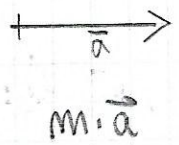


$\vec{BC}-\vec{X}+\vec{AD}=\vec{BD}$

$\vec{BC}+\vec{AD}-\vec{BD}=\vec{X}=\vec{AC}$

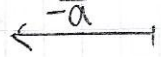
MNOŽENJE VEKTORJA S ŠTEVILOM

74) $|\vec{a}| = 2$

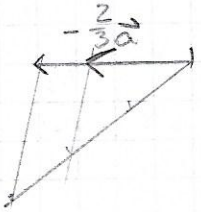


$m \cdot \vec{a}$

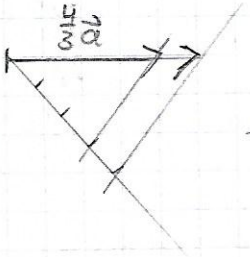
a) $m = -1$



b) $m = -\frac{2}{3}$



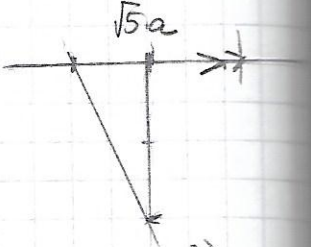
c) $m = \frac{4}{3}$



č) $m = \sqrt{5}$

$x^2 + y^2 = 5$

$1^2 + 2^2 = 5$



75) a) $\vec{b} + \vec{a} - (\vec{b} - \vec{a}) =$
$= \vec{b} + \vec{a} - \vec{b} + \vec{a} =$
$= 2\vec{a}$

b) $\vec{a} + 2\vec{b} - \vec{c} - (\vec{b} - 3\vec{a} - \vec{c})$
$= \vec{a} + 2\vec{b} - \vec{c} - \vec{b} + 3\vec{a} + \vec{c}$
$= 4\vec{a} + \vec{b}$

c) $3\vec{b} - \vec{c} + \vec{a} - 3(\vec{a} - \vec{c} + \vec{b})$
$= 3\vec{b} - \vec{c} + \vec{a} - 3\vec{a} + 3\vec{c} - 3\vec{b} =$
$= 2\vec{c} - 2\vec{a} = 2(\vec{c} - \vec{a})$

č) $\vec{b} - \frac{1}{3}\vec{a} + (2 - \frac{1}{2})\vec{c} + \frac{1}{6}(2\vec{a} - \vec{c} + 2\vec{b})$
$= \vec{b} - \frac{1}{3}\vec{a} + 2\vec{c} - \frac{1}{2}\vec{c} + \frac{1}{3}\vec{a} - \frac{1}{6}\vec{c} + \frac{1}{3}\vec{b} =$
$= \frac{4}{3}\vec{b} + \frac{3}{2}\vec{c} + \frac{1}{3}\vec{a} - \frac{1}{6}\vec{c} + \frac{4}{3}\vec{b} = \frac{4}{3}(\vec{b} + \vec{c})$

d) $2\vec{a} + \frac{1}{2}\vec{b} - \frac{1}{3}(\vec{b} + \frac{1}{2}\vec{a} + \frac{3}{4}\vec{c}) - \frac{1}{12}\vec{c}$
$= 2\vec{a} + \frac{1}{2}\vec{b} - \frac{1}{3}\vec{b} + \frac{1}{6}\vec{a} - \frac{3}{12}\vec{c} - \frac{1}{12}\vec{c}$
$= \frac{12}{6}\vec{a} + \frac{1}{6}\vec{a} + \frac{3}{6}\vec{b} - \frac{2}{6}\vec{b} - \frac{4}{12}\vec{c} =$
$= \frac{13}{6}\vec{a} + \frac{1}{6}\vec{b} - \frac{2}{6}\vec{c} = \frac{1}{6}(13\vec{a} + \vec{b} - 2\vec{c})$

76) a) $\vec{a} - \frac{1}{2}\vec{b} + \vec{x} - \frac{1}{3}\cdot(\vec{b} - \vec{a})$
$\vec{x} = \frac{1}{3}\vec{b} - \frac{1}{3}\vec{a} - \vec{a} + \frac{1}{2}\vec{b}$
$\vec{x} = \frac{2}{6}\vec{b} + \frac{3}{6}\vec{b} - \frac{1}{3}\vec{a} - \frac{3}{3}\vec{a}$
$\vec{x} = \frac{5}{6}\vec{b} - \frac{4}{3}\vec{a}$

b) $\vec{b} - 3\vec{x} - \frac{1}{2}(\vec{a} - \frac{1}{4}\vec{b}) = \vec{a}$
$\vec{b} - \frac{1}{2}\cdot\vec{a} + \frac{1}{8}\vec{b} - \vec{a} = 3\vec{x}$
$\frac{8}{8}\vec{b} + \frac{1}{8}\vec{b} - \frac{1}{2}\vec{a} - \frac{2}{2}\vec{a} = 3\vec{x}$
$\frac{9}{8}\vec{b} - \frac{3}{2}\vec{a} = 3\vec{x}$
$\vec{x} = \frac{9}{24}\vec{b} - \frac{3}{6}\vec{a} = \frac{3}{8}\vec{b} - \frac{1}{3}\vec{a}$

c) $3(\vec{x} + 2\vec{a} - \vec{b}) = \vec{b} + 5\vec{a} + \frac{1}{2}(\vec{x} - 2\vec{c})$
$3\vec{x} + 6\vec{a} - 3\vec{b} = \vec{b} + 5\vec{a} + \frac{1}{2}\cdot\vec{x} - \vec{c}$
$3\vec{x} - \frac{1}{2}\vec{x} = -6\vec{a} + 5\vec{a} + \vec{b} + 3\vec{b} - \vec{c}$
$\frac{6}{2}\vec{x} - \frac{1}{2}\vec{x} = -\vec{a} + 4\vec{b} - \vec{c}$
$\frac{5}{2}\vec{x} = -\vec{a} + 4\vec{b} - \vec{c}$
$5\vec{x} = -2\vec{a} + 8\vec{b} - 2\vec{c}$
$\vec{x} = -\frac{2\vec{a}}{5} + \frac{8\vec{b}}{5} - \frac{2\vec{c}}{5}$
$\vec{x} = \frac{2}{5}\cdot(-\vec{a} + 4\vec{b} - \vec{c})$

77) $\vec{u} = -\vec{a} - \frac{1}{2}\vec{b}$

$\vec{v} = \frac{1}{2}\vec{a} + \vec{b}$

$3\vec{u} + \frac{2}{3}\vec{v} - \frac{4}{5}\left(\vec{u} - \frac{1}{2}\vec{v}\right) =$

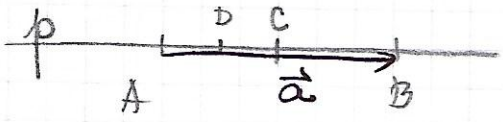
$= 3\cdot\left(-\vec{a} - \frac{1}{2}\vec{b}\right) + \frac{2}{3}\cdot\left(\frac{1}{2}\vec{a} + \vec{b}\right) - \frac{4}{5}\cdot\left(-\vec{a} - \frac{1}{2}\vec{b} - \frac{1}{2}\cdot\left(\frac{1}{2}\cdot\vec{a} + \vec{b}\right)\right) =$

$= -3\vec{a} - \frac{3}{2}\vec{b} + \frac{2}{6}\vec{a} + \frac{2}{3}\cdot\vec{b} - \frac{4}{5}\cdot\left(-\vec{a} - \frac{1}{2}\vec{b} - \frac{1}{4}\vec{a} - \frac{1}{2}\cdot\vec{b}\right) =$

$= \frac{-9}{3}\vec{a} + \frac{1}{3}\vec{a} - \frac{9}{6}\vec{b} + \frac{4}{6}\vec{b} + \frac{4}{5}\vec{a} + \frac{4}{10}\vec{b} + \frac{4}{20}\vec{a} + \frac{4}{10}\cdot\vec{b} =$

$= \frac{-18}{3}\vec{a} + \vec{a} - \frac{5}{6}\vec{b} + \frac{2}{10}\cdot\vec{b} = \frac{-5}{3}\vec{a} - \frac{25}{30}\cdot\vec{b} + \frac{24}{30}\vec{b} = \underline{-\frac{5}{3}\vec{a} - \frac{1}{30}\vec{b}}$

78)

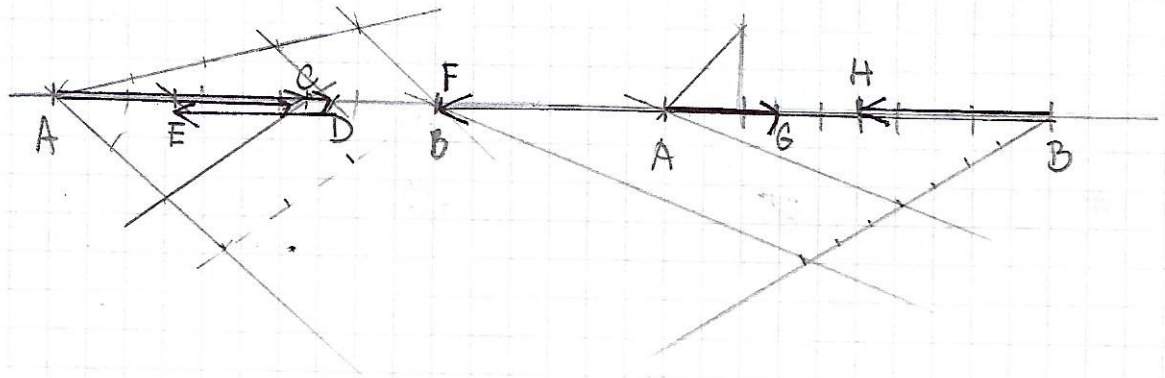


$\vec{AC} = \frac{1}{2}\cdot\vec{AB} = \frac{1}{2}\vec{a}$

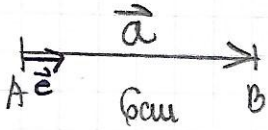
$\vec{DC} = \frac{1}{4}\cdot\vec{a}$

$\vec{BD} = -\frac{3}{4}\cdot\vec{a}$

79)

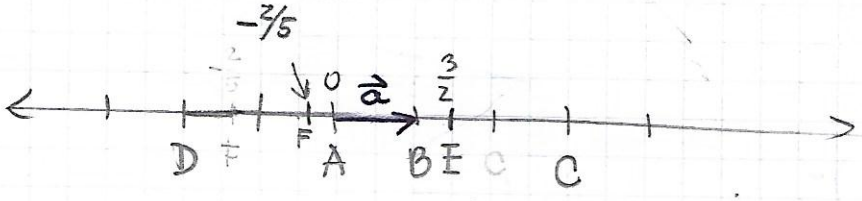


80)



$\vec{e} = \frac{1}{6}\cdot\vec{a}$

81)



$\vec{AC} = 3\vec{a}$

$\vec{AD} = -2\vec{a}$

$\vec{BD} = -3\vec{a}$

$\vec{AE} = \frac{3}{2}\vec{a}$

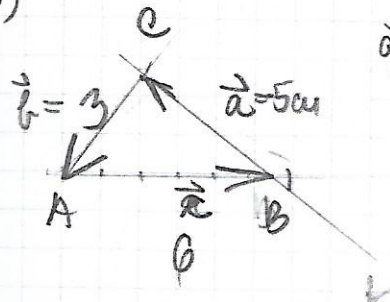
$\vec{AF} = -\frac{2}{5}\vec{a}$

$\vec{BE} = \frac{1}{2}\vec{a}$

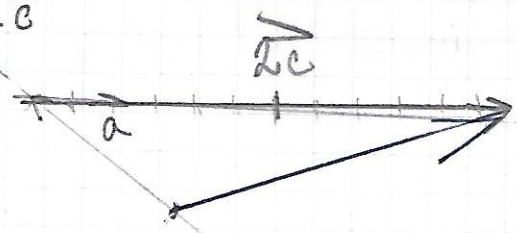
$\vec{ED} = \frac{3}{2}\cdot(-\vec{a}) = -\frac{3}{2}\vec{a}$

$\vec{FE} = \left(\frac{3}{2} + \frac{2}{5}\right)\cdot\vec{a} = \left(\frac{15}{10} + \frac{4}{10}\right)\cdot\vec{a} = \frac{19}{10}\cdot\vec{a}$

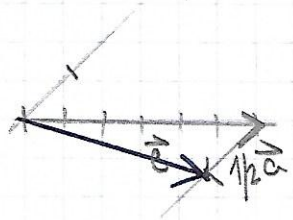
82)



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

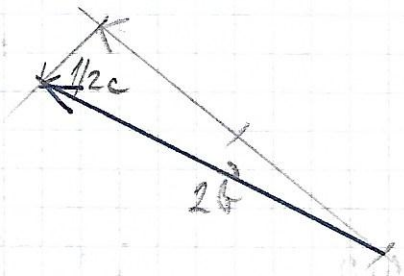


b) $\vec{c} + \frac{1}{2}\vec{a}$

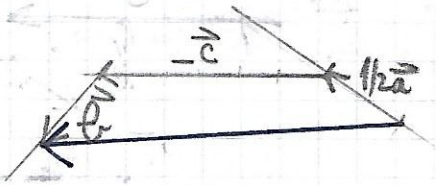


c) $-\vec{a} - \frac{1}{2}\vec{c}$

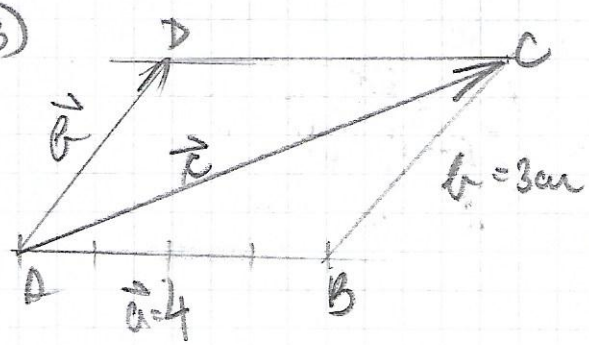
c) $2\vec{b} + \frac{1}{2}\vec{c}$



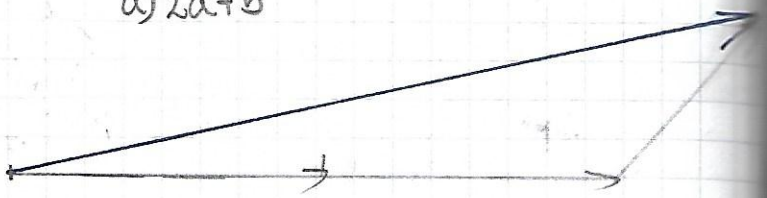
d) $\vec{b} - \vec{c} + \frac{1}{2}\vec{a}$



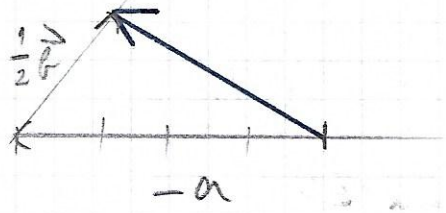
83)



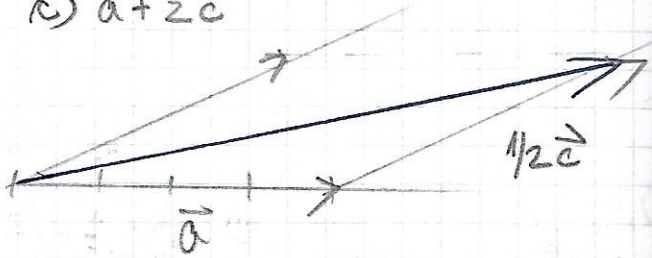
a) $2\vec{a} + \vec{b}$



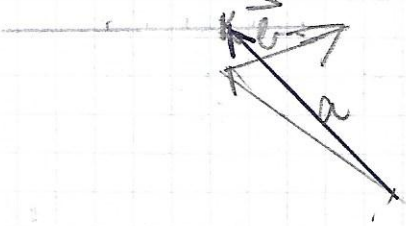
b) $-\vec{a} + \frac{1}{2}\vec{b}$



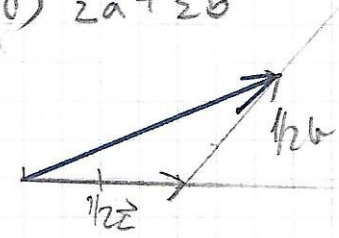
c) $\vec{a} + \frac{1}{2}\vec{c}$



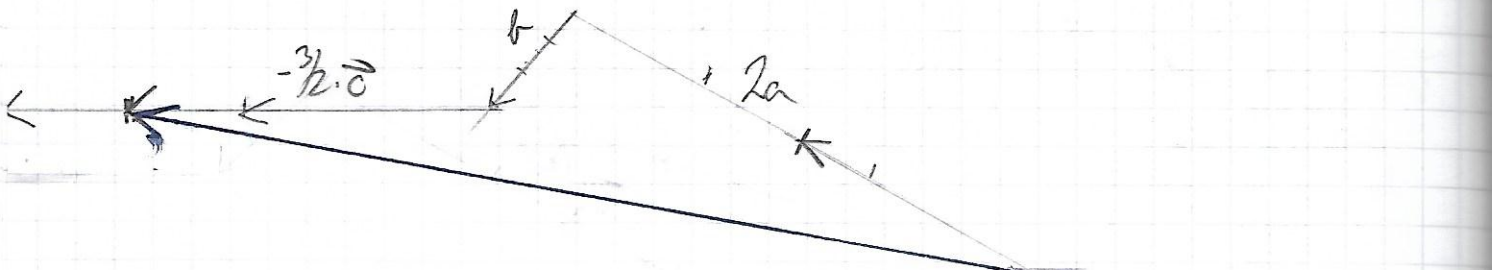
d) $\vec{a} + \vec{b} - \frac{1}{2}\vec{c}$



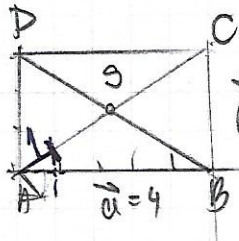
e) $\frac{1}{2}\vec{a} + \frac{1}{2}\vec{b}$



e) $2\vec{a} + \vec{b} - \frac{3}{2}\vec{c}$

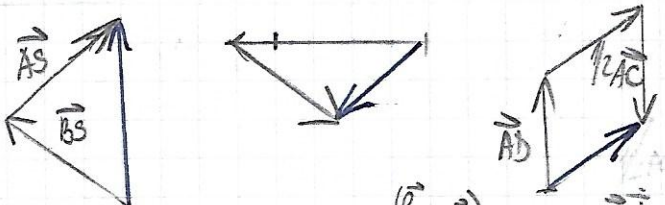


84)



$\vec{b} = 3$ $\quad \vec{a} = 4$

a) $\vec{BS} + \vec{AS}$ $\qquad \vec{CD} - \vec{SD}$ $\quad (+\vec{DS})$ $\qquad \vec{AD} + \frac{1}{2}\vec{AC} - \vec{BC}$ $\quad (+\vec{BC})$



b) $\vec{CA} = m\vec{AS}$: $-\vec{b} - \vec{a} = m \cdot \left(\frac{1}{2}\vec{a} + \frac{1}{2}\vec{b}\right) \Rightarrow m = \frac{-(\vec{b}+\vec{a})}{\frac{1}{2}(\vec{a}+\vec{b})} = -2 \cdot \frac{\vec{a}+\vec{b}}{\vec{a}+\vec{b}} = -2$

$\vec{BS} = \frac{1}{2}\vec{b} + n\vec{a}$: $-\frac{1}{2}\vec{a} + \frac{1}{2}\vec{b} = \frac{1}{2}\vec{b} + n \cdot \vec{a} \Rightarrow -\frac{1}{2} \cdot \frac{\vec{a}}{\vec{a}} = n = -\frac{1}{2}$

c) $\vec{e}$: $\quad (\text{suer } \vec{AC})$

$\vec{e} = \frac{1}{5}(\vec{a} + \vec{b})$

$(x \cdot \vec{a})^2 + (y \cdot \vec{b})^2 = 1$

$16x^2 + 9y^2 = 1$

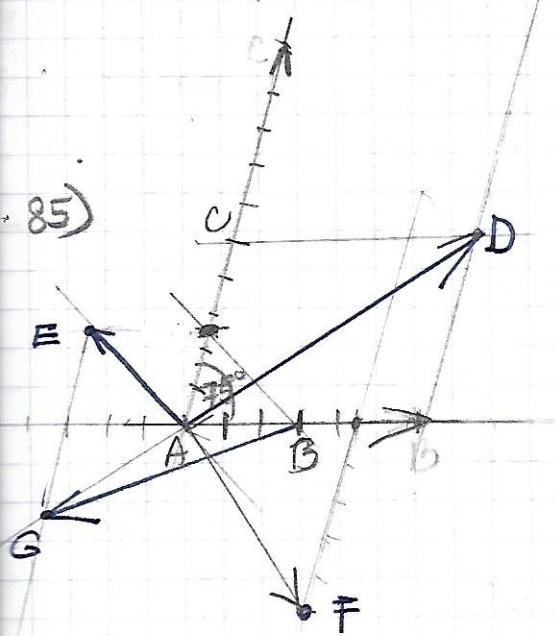
krožnica

$|\vec{AC}| = 16 + 9 = 25 \Rightarrow \sqrt{25} = 5 : 5$

$\vec{a} + \vec{b} = 5 = \vec{AC}$

$\frac{1}{5}\vec{AC} = \frac{1}{5}(\vec{a} + \vec{b}) = \vec{e}$

85)



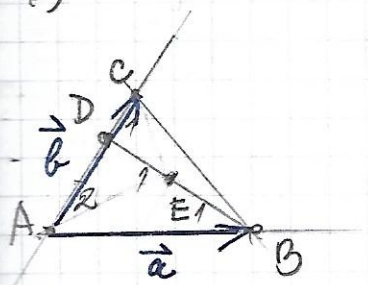
a) $\vec{AD} = 2\vec{AB} + \vec{AC}$

b) $\vec{AE} = -\vec{AB} + \frac{1}{2}\vec{AC}$

c) $\vec{AF} = \frac{3}{2}\vec{AB} - \frac{1}{3}\vec{AC}$

č) $\vec{BG} = -2\vec{AB} - \vec{AC}$

86)



$\vec{DE} = \frac{1}{2}\vec{DB} = \left(-\frac{2}{3}\vec{b} + \vec{a}\right) \cdot \frac{1}{2} = -\frac{2}{6}\vec{b} + \frac{1}{2}\vec{a} = \frac{1}{2}\vec{a} - \frac{1}{3}\vec{b}$

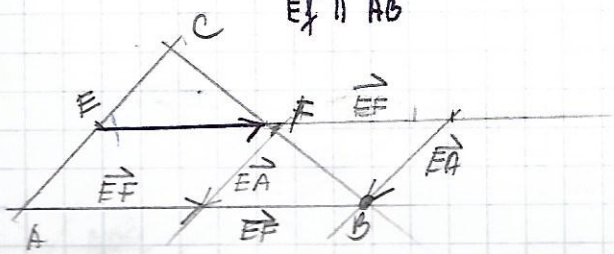
$\vec{AE} = \vec{AD} + \vec{DE} = \frac{2}{3}\vec{b} + \frac{1}{2}\vec{a} - \frac{1}{3}\vec{b} = \frac{1}{2}\vec{a} + \frac{1}{3}\vec{b}$

$\vec{CE} = \vec{CD} + \vec{DE} = -\frac{1}{3}\vec{b} + \frac{1}{2}\vec{a} - \frac{1}{3}\vec{b} = \frac{1}{2}\vec{a} - \frac{2}{3}\vec{b}$

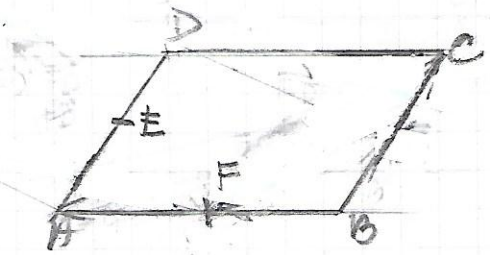
87)

$\vec{EF} = \frac{1}{2}\vec{AB}$

$\vec{EF} \parallel \vec{AB}$



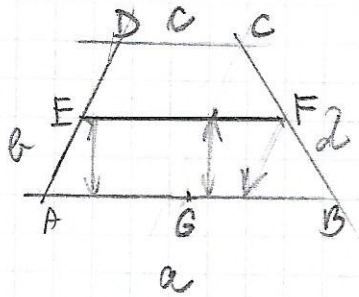
88)



$\vec{EA} - \vec{DF} = -\frac{1}{2}\vec{AD} - \vec{AB}$

$\vec{CE} - \vec{EG} = -\vec{AB} - \frac{1}{2}\vec{AD}$

89)



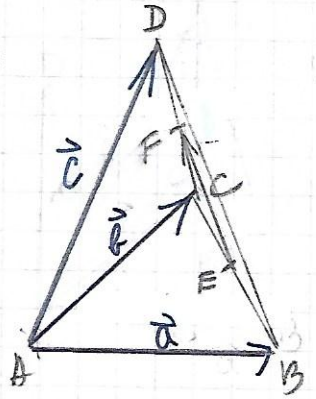
$\vec{AD} + \vec{DC} + \vec{CF} + \vec{EA}$

$b + c + \frac{1}{2}\vec{d} - \frac{1}{2}b =$

$= \frac{1}{2}\vec{b} + \vec{c} + \frac{1}{2}\vec{d}$

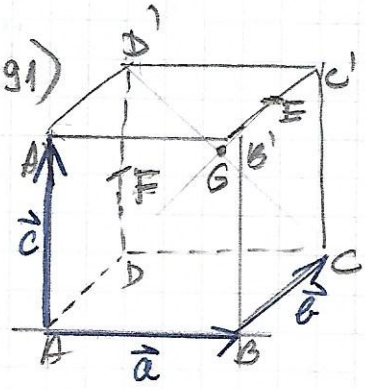
$b + c + d = \vec{AB} = \vec{a}$

90)



$\vec{EF} = -\frac{1}{2}\vec{a} + \frac{1}{2}\vec{c}$

91)



a) $\vec{AE} = \vec{a} + \vec{c} + \frac{1}{2}\vec{b}$

b) $\vec{AG} = \vec{b} + \frac{1}{2}(\vec{a} + \vec{c}$

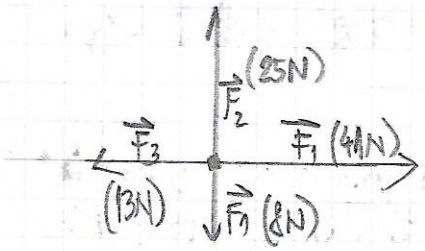
c) $\vec{BF} = -\vec{a} + \vec{b} + \frac{1}{2}\vec{c}$

č) $\vec{FC} = -\frac{1}{2}\vec{c} + \vec{a}$

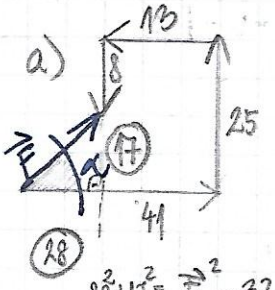
d) $\vec{B'G} = \vec{b} - \frac{1}{2}\vec{a} - \frac{1}{2}$

e) $\vec{EG} = \frac{1}{2}\vec{b} - \frac{1}{2}a - \frac{1}{2}$

92)



a)



$28^2 + 17^2 = \vec{F}^2 = 32{,}76\ N$

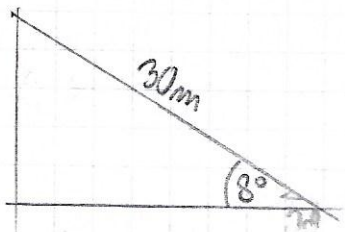
$tg\ \alpha = \frac{17}{28} \Rightarrow \alpha = 31{,}26°$

b) $\vec{F} = m \cdot \vec{a} = ?$

$\vec{a} = \frac{\vec{F}}{m} = \frac{32{,}76}{10}$

$= 3{,}276\ N/kg$

93)



$\vec{F} = m \cdot \vec{a}$

$a = F/m$

$s = \frac{a \cdot t^2}{2}$

konst.

$v = a t$

g

$F_d = mg \sin\varphi$

$\frac{F_d}{m} = g \cdot \sin\varphi$

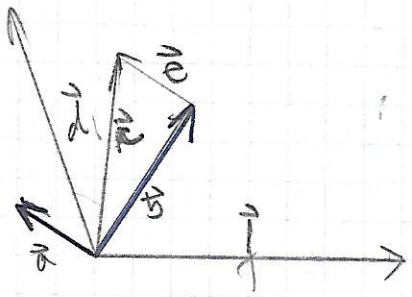
$a = g \cdot \sin\varphi = \sin 8° \cdot 9{,}8 = 1{,}4\ m/s^2$

$t = \sqrt{\frac{s^2}{a}} = \sqrt{\frac{30 \cdot 2}{1{,}4}} = 6{,}5\ s$

$v = 1{,}4\ m/s^2 \cdot 6{,}5\ s = 9{,}1\ m/s$

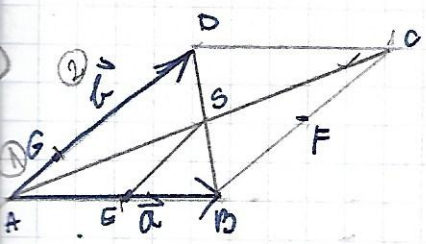
OLINEARNI in KOMPLANARNI VEKTORJI

bazna vektorja $\vec{a}$ in $\vec{b}$



$\vec{a} = \vec{a}\cdot 1 + 0\cdot\vec{b}$
$\vec{b} = \vec{b}\cdot 1 + 0\cdot\vec{a}$
$\vec{c} = \vec{a} + \vec{b}$
$\vec{d} = 2\cdot\vec{a} + 1\cdot\vec{b}$

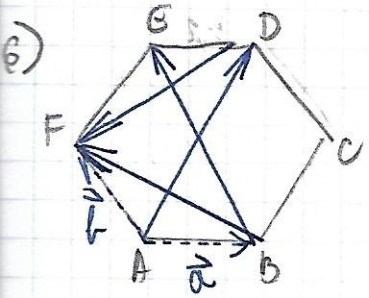
$\vec{e} = 1\cdot\vec{a} + 0\cdot\vec{b}$
$\vec{f} = (-2)\cdot\vec{a} + 1\cdot\vec{b}$



$\vec{AS} = \frac{1}{2}\vec{a} + \frac{1}{2}\vec{b}$
$\vec{AF} = \vec{a} + \frac{1}{2}\vec{b}$
$\vec{EF} = \frac{1}{2}(\vec{a} + \vec{b})$
$\vec{CE} = -\vec{b} - \frac{1}{2}\vec{a}$

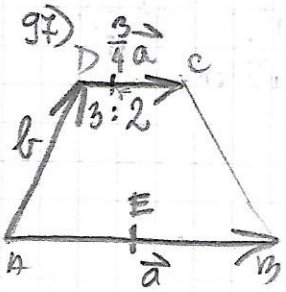
$\vec{FD} = \frac{1}{2}\vec{b} - \vec{a}$
$\vec{SF} = \frac{1}{2}\vec{a}$
$\vec{GB} = -\frac{1}{3}\vec{b} + \vec{a}$
$\vec{GF} = \vec{a} + \left(\frac{1}{2} - \frac{1}{3}\right)\cdot\vec{b} = \vec{a}\left(\frac{3}{6} - \frac{2}{6}\right)\vec{b} = \vec{a} + \frac{1}{6}\vec{b}$
$\vec{SG} = -\frac{1}{2}\vec{a} - \left(\frac{1}{2} - \frac{1}{3}\right)\vec{b} = -\frac{1}{2}\vec{a} - \frac{1}{6}\vec{b}$

6)

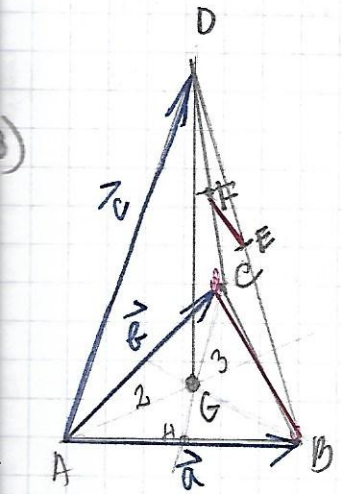


$\vec{BF} = -\vec{a} + \vec{b}$
$\vec{BE} = 2\vec{b}$
$\vec{AD} = 2\vec{b} + 2\vec{a}$
$\vec{DF} = -2\vec{a} - \vec{b}$

9)



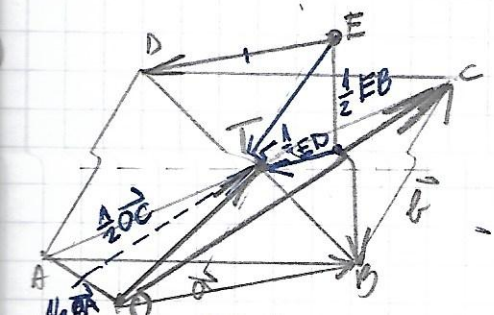
$\vec{DB} = -\vec{b} + \vec{a}$
$\vec{EC} = \left(\frac{1}{2}\vec{a} + \frac{3}{4}\vec{a}\right) + \vec{b} = \frac{1}{4}\vec{a} + \vec{b}$
$\vec{BF} = -\vec{a} + \vec{b} + \vec{a}\left(\frac{3}{4}\cdot\frac{3}{5}\right) =$
$= -\vec{a} + \vec{b} + \vec{a}\left(\frac{9}{20}\right) =$
$= -\frac{11}{20}\vec{a} + \vec{b}$
$\vec{FE} = -\vec{a}\left(\frac{3}{5}\cdot\frac{3}{4}\right) - \vec{b} + \frac{1}{2}\vec{a}$
$= -\vec{a}\frac{9}{20} + \frac{10}{20}\vec{a} - \vec{b}$
$= +\vec{a}\frac{1}{20} - \vec{b}$



$\vec{AE} = \frac{1}{2}\vec{a} + \frac{1}{2}\vec{c}$
$\vec{AF} = \frac{1}{2}\vec{b} + \frac{1}{2}\vec{c}$
$\vec{AG} = \frac{1}{3}\vec{a} + \frac{1}{3}\vec{b}$
$\vec{GF} = \frac{2}{3}\vec{AC} + \frac{1}{2}\vec{CD}$
$= \left(\frac{1}{2}\vec{a} + \vec{b}\right)\cdot\frac{2}{3} + \frac{1}{2}\left(-\vec{b} + \vec{c}\right) = -\frac{2}{6}\vec{a} + \frac{2}{3}\vec{b} + \frac{1}{2}\vec{b} + \frac{1}{2}\vec{c} = -\frac{1}{3}\vec{a} + \frac{1}{6}\vec{b} + \frac{1}{2}\vec{c}$

kolin: $\vec{EF} \overset{R}{=} \vec{BC}$ $\quad \vec{b} = m\cdot\vec{a}$

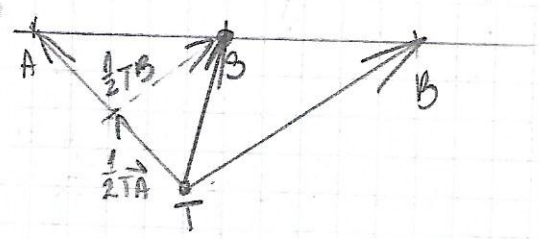
$\vec{BC} = m\cdot\vec{EF} \Rightarrow \vec{AF} - \vec{AE} = \frac{1}{2}(\vec{b} - \vec{a})$
$= \frac{1}{2}\vec{EC}$
$\Vert$
m



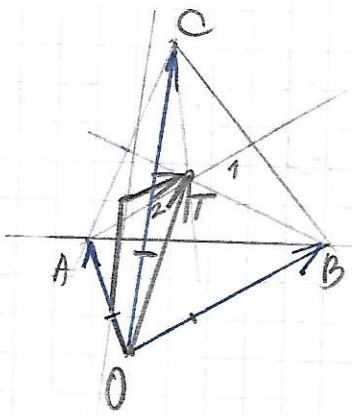
$\vec{AC} = \vec{a} + \vec{b}$
$\frac{1}{2}\vec{AC} = \frac{1}{2}\cdot(\vec{a} + \vec{b})$

$\vec{BD} = \vec{BA} + \vec{AD} = -\vec{a} + \vec{b}$
$\frac{1}{2}\vec{BD} = \frac{1}{2}(\vec{b} - \vec{a})$

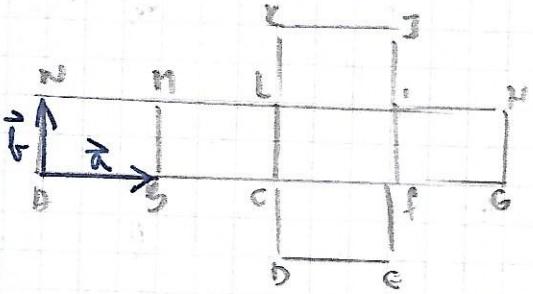
100)



101)



102)



$\vec{AL} = 2\vec{a} + \vec{b}$ $\quad \vec{LE} = -2\vec{b} + \vec{a}$

$\vec{AE} = 3\vec{a} - \vec{b}$ $\quad \vec{JD} = -3\vec{b} - \vec{a}$

$\vec{MJ} = 2\vec{a} + \vec{b}$

103) a) $m\vec{a} + (n+1)\vec{b} = \vec{a} - \vec{b}$

$m\vec{a} + \vec{b}n + \vec{b} = \vec{a} - \vec{b}$

$m\vec{a} + \vec{b}n + \vec{b} - \vec{a} + \vec{b} = 0$

$\vec{a}(m-1) + \vec{b}(n+1+1) = 0$

$\vec{a}(m-1) + \vec{b}(n+2) = 0$

$m_1 = 1 \quad n = -2$

b) $(1-m)\vec{a} - (n-2)\vec{b} = 2\vec{a} + \vec{b}$

$\vec{a} - \vec{a}m - \vec{b}n + 2\vec{b} - 2\vec{a} - \vec{b} = 0$

$\vec{a}(1-m-2) + \vec{b}(-n-2+1) = 0$

$1 - m - 2 = 0 \quad n = +1$

$-1 = m$

c) $\vec{b} - m\vec{a} + 2(1-n)\vec{b} = 3a$

$\vec{b} - m\vec{a} + 2\vec{b} - 2n\vec{b} - 3a = 0$

$\vec{b}(1+2-2n) - \vec{a}(m+3) = 0$

$3 = 2n$

$n = 3/2 \quad m = -3$

ć) $(m+1)\vec{a} + \vec{b} = (n-1)\vec{b} - \vec{a}$

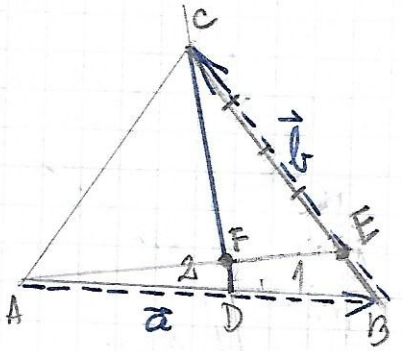
$m\vec{a} + \vec{a} + \vec{b} = \vec{b}n - \vec{b} - \vec{a}$

$m\vec{a} + \vec{a} + \vec{b} - \vec{b}n + \vec{b} + \vec{a} = 0$

$a(m+1+1) + \vec{b}(1-n+1) = 0$

$m = -2 \quad n = 2$

104)



$|DF| : |FC|$

$\vec{DF} = -\frac{2}{3}\vec{a} + n \cdot \vec{AE}$

$= -\frac{2}{3}\vec{a} + n \cdot (\vec{a} + \frac{1}{5}\vec{b})$

$= -\frac{2}{3}\vec{a} + \vec{a} \cdot n + \frac{1}{5}n \cdot \vec{b}$

$\vec{DF} = n \cdot \vec{DC} = n(\frac{1}{3}\vec{a} + \vec{b})$

$= \frac{1}{3}n \cdot \vec{a} + \vec{b} \cdot n$

$-\frac{2}{3}\vec{a} + \vec{a} \cdot n + \frac{1}{5}n \cdot \vec{b} - \frac{1}{3}n\vec{a} - \vec{b} \cdot n = 0$

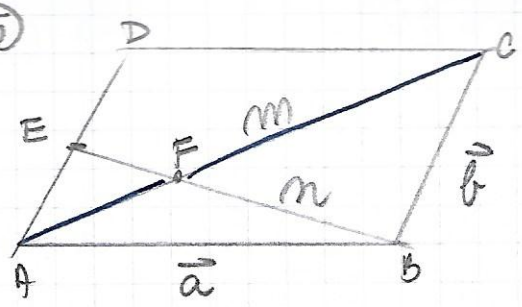
$\vec{a}(-\frac{2}{3} + n - \frac{1}{3}n) + \vec{b}(\frac{1}{5}n - n) = 0$

$n = \frac{1}{3}n + \frac{2}{3}$

$5n = (1/3) \cdot n + \frac{2}{3} \quad /\cdot 3 \; ; n = \frac{1}{7}$

$DF : FC = 1 : 6$

105)



$\vec{AF} = m \cdot \vec{AC} = m \cdot (\vec{a} + \vec{b})$ $\quad \vec{AF} = \vec{a} + \vec{BE} \cdot m$

$= m \cdot \vec{a} + m \cdot \vec{b}$ $\quad = \vec{a} - \vec{a} \cdot m + \frac{1}{2}\vec{b} \cdot m$

$m \cdot \vec{a} + m \cdot \vec{b} - \vec{a} + \vec{a} \cdot m - \frac{1}{2} \cdot \vec{b} \cdot m = 0$

$\vec{a}(m - 1 + m) + \vec{b} \cdot (m - \frac{1}{2} m) = 0$

$m = 1 - m$ $\quad m = \frac{1}{2} m$

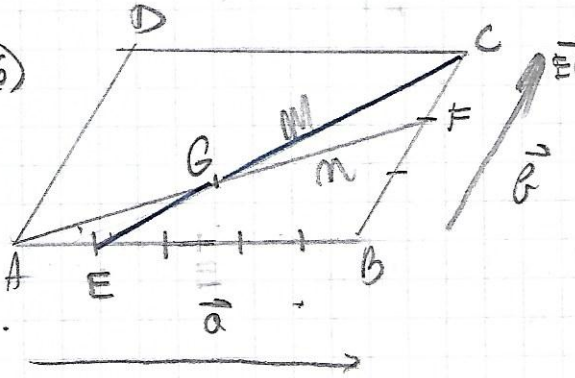
$m = 1 - 2m$ $\quad 2m = m$

$3m = 1$

$m = 1/3$

$AF : FC = 1 : 2$

106)



$\vec{EG} = m \cdot \vec{EC} = \left(\frac{4}{5}\vec{a} + \vec{b}\right) \cdot m$

$= \frac{4}{5}\vec{a} \cdot m + \vec{b} \cdot m$

$\vec{EG} = -\frac{1}{5}\vec{a} + m \cdot \vec{AF}$

$= -\frac{1}{5}\vec{a} + m\left(\vec{a} + \frac{2}{3}\vec{b}\right)$

$= -\frac{1}{5}\vec{a} + m \cdot \vec{a} + \frac{2}{3}\vec{b} \cdot m$

$\frac{4}{5}\vec{a} \cdot m + \vec{b} \cdot m + \frac{1}{5}\vec{a} - m \cdot \vec{a} - \frac{2}{3}\vec{b} \cdot m = 0$

$\vec{a}\left(\frac{4}{5} \cdot m + \frac{1}{5} - m\right) + \vec{b}\left(m - \frac{2}{3}m\right) = 0$

$m = \frac{4}{5}m + \frac{1}{5}$ $\quad m = \frac{2}{3}m$

$m = \frac{4}{5} \cdot \left(\frac{2}{3}m\right) + \frac{1}{5} = \frac{8}{15}m + \frac{1}{5}$

$\frac{15}{15}m - \frac{8}{15}m = \frac{1}{5}$

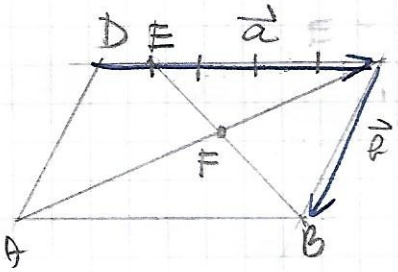
$\frac{7}{15}m = \frac{3}{5} \mid \cdot 15 \Rightarrow 7m = 3$

$m = 3/7$

$m = \frac{2}{3} \cdot m = \frac{2}{3} \cdot \frac{3}{7} = \frac{6}{21} = \frac{2}{7}$

$2 : 5$

107)



$\vec{EF} = m \cdot \vec{EB} = m \cdot \left(\frac{4}{5}\vec{a} + \vec{b}\right) = \frac{4}{5}\vec{a} \cdot m + \vec{b} \cdot m$

$\vec{EF} = \frac{4}{5}\vec{a} + m \cdot \vec{CA} = \frac{4}{5}\vec{a} + m\left(-\vec{a} + \vec{b}\right) = \frac{4}{5}\vec{a} - m\vec{a} + m \cdot \vec{b}$

$\frac{4}{5}\vec{a} \cdot m + \vec{b} \cdot m - \frac{4}{5}\vec{a} + m\vec{a} - m \cdot b = 0$

$\vec{a}\left(\frac{4}{5}m - \frac{4}{5} + m\right) + \vec{b} \cdot (m - m) = 0$

$m = m$

$\frac{4}{5}m - \frac{4}{5} + m = 0$

$\frac{9}{5}m = \frac{4}{5} \Rightarrow m = \frac{4}{9}$

$\vec{AF} = \frac{2}{5} \cdot \vec{b} + m \cdot \vec{CE} = \frac{2}{5} \cdot \vec{b} - m \cdot \vec{a} - \frac{3}{5} \cdot \vec{b} \cdot m$ $\quad (\vec{CE} = -\vec{a} - \frac{3}{5}\vec{b})$

$\frac{2}{5}\vec{b} - m \cdot \vec{a} - \frac{3}{5}\vec{b} \cdot m + m\vec{a} = 0$

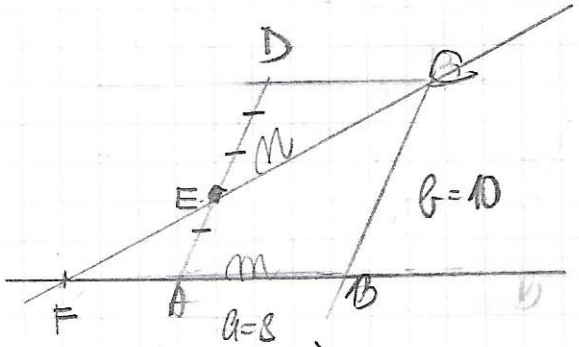
108)

$\vec{a}(m - m) + \vec{b}\left(\frac{2}{5} - \frac{3}{5} \cdot m\right) = 0$

$m = m$ $\quad \frac{2}{5} = \frac{3}{5} \cdot m \mid 5$

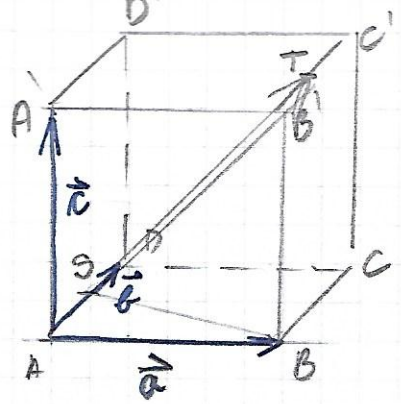
$\frac{2}{3} = m$

$AF = -\frac{2}{3} \cdot \vec{a} = \left|-\frac{2}{3} \cdot 8\right| = \left|-\frac{16}{3}\right| = 5\frac{1}{3}$



$\vec{AF} = -m \cdot \vec{a}$

109)

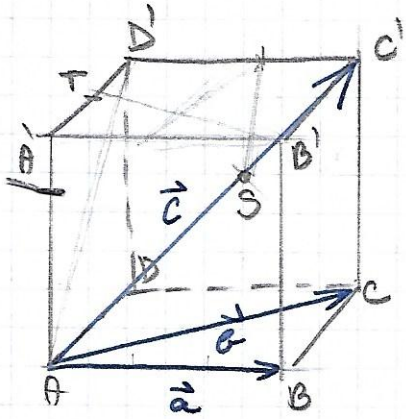


$\overrightarrow{BS} = \overrightarrow{BA} + \overrightarrow{AS} = -\vec{a} + \frac{1}{2}\vec{b}$ ✓

$\overrightarrow{DT} = \overrightarrow{DC} + \overrightarrow{CC'} + \overrightarrow{C'T} = \vec{a} + \vec{c} - \frac{1}{2}\vec{b}$ ✓

$\overrightarrow{ST} = \frac{1}{2}\vec{b} + \vec{a} + \vec{c} - \frac{1}{2}\vec{b} = \vec{a} + \vec{c}$ ✓

110)



$\overrightarrow{AA'} = \vec{c} - \vec{b}$

$\overrightarrow{A'D'} = \vec{c} - \vec{a}$

$\overrightarrow{B'T} = -\vec{a} + \overrightarrow{A'T} = -\vec{a} + \frac{1}{2}(-\vec{a} + \vec{b}) =$

$= -\vec{a} - \frac{1}{2}\vec{a} + \frac{1}{2}\vec{b} = -\frac{3}{2}\vec{a} + \frac{1}{2}\vec{b}$

$\overrightarrow{B'S} = -\vec{a} + \frac{1}{2}\vec{b} - \frac{1}{2}\vec{a} + \frac{1}{2}\vec{b} - \frac{1}{2}\vec{c} + \frac{1}{2}\vec{b} =$

$= -\frac{3}{2}\vec{a} + \frac{3}{2}\vec{b} - \frac{1}{2}\vec{c}$

111) a) $(m + 2m - p - 4)\cdot\vec{a} + (2m - m + 3p + 2)\vec{b} - (-m + 3m + 2p)\vec{c} = 0$

$m + 2m - 4 = p$

$1 + 2 - 4 = p$

$p = -1$

$2m - m + 3\cdot(m + 2m - 4) + 2 = 0$

$2m - m + 3m + 6m - 12 + 2 = 0$

$5m + 5m - 10 = 0$

$m + m - 2 = 0$

$m = 2 - m$

$-m + 3m + 2\cdot(m + 2m - 4) = 0$

$-m + 3m + 2m + 4m - 8 = 0$

$m + 7m - 8 = 0$

$m = 8 - 7m$

$2 - m = 8 + 7m$

$6m = 6 \Rightarrow m = 1$

$m = 8 - 7\cdot 1 = 1$

b) $(5m - 3p - 7)\vec{a} + (m + 2m - p - 4)\cdot\vec{b} - (3m - m + 4p - 5)\cdot\vec{c} = 0$

$p = m + 2m - 4$

$5m - 3(m + 2m - 4) - 7 = 0$

$5m - 3m - 6m + 12 - 7 = 0$

$-m - 3m + 5 = 0$

$m = 5 - 3m$

$m = 5 - 3 = 2$

$p = 1 + 4 - 4 = 1$

$3m - m + 4(m + 2m - 4) - 5 = 0$

$7m + 7m - 21 = 0$

$m + m - 3 = 0$

$m + 5 - 3m - 3 = 0$

$m = 1$

c) $(2m + 3m + p - 3)\cdot\vec{a} + (m + m + p - 1)\vec{b} - (2 - m + 2m + 4p)\cdot\vec{c} = 0$

$p = 1 - m - m$

$2m + 3m + 1 - m - m - 3 = 0$

$m = 2 - 2m$

$m = 2 - 2\cdot\frac{1}{2} = 1$

$p = 1 - 1 - 1 = -\frac{1}{2}$

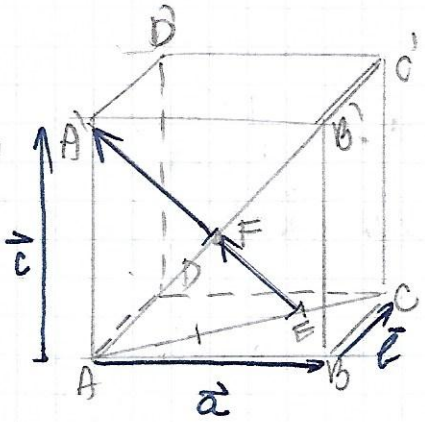
$2 - m + 2m + 4\cdot(1 - m + m) = 0$

$6 - 5m - 2m = 0$

$6 - 5\cdot(2 - 2m) - 2m = 0$

$4 = 6m \Rightarrow m = 1/2$

112)



$$\overrightarrow{EF} = m\cdot\overrightarrow{EA'} - m\cdot\left(\frac{2}{3}\overrightarrow{CA}+\overrightarrow{AA'}\right) = m\cdot\left(\frac{2}{3}\cdot(-\vec{b}-\vec{a})+\vec{c}\right)$$
$$= \frac{2}{3}\cdot m\cdot(-\vec{b}) - \frac{2}{3}m\cdot\vec{a}+\vec{c}\cdot m$$

$$\overrightarrow{Ef} = \frac{2}{3}\overrightarrow{CA}+\overrightarrow{AE} = \frac{2}{3}(-\vec{b}-\vec{a})+m\overrightarrow{AC'} = \frac{2}{3}\cdot(-\vec{b}-\vec{a})+m\cdot(a+b+\vec{c})$$
$$= -\frac{2}{3}\vec{b}-\vec{a}\cdot\frac{2}{3}+\vec{a}m-\vec{b}m+\vec{c}m$$

$$\underbrace{-\frac{2}{3}m\cdot\vec{b}}_{v} \underbrace{-\frac{2}{3}m\vec{a}}_{w}+\vec{c}\cdot m \underbrace{+\frac{2}{3}\vec{b}}_{u}+\underbrace{\vec{a}\frac{2}{3}}_{w}-\vec{a}m+\underbrace{\vec{b}m}_{w}-\vec{c}m=0$$
$$a\left(-\frac{2}{3}m+\frac{2}{3}-m\right)-\vec{b}\left(-\frac{2}{3}m+\frac{2}{3}+m\right)+\vec{c}(m-m)=0$$

$m=m$

$-\frac{2}{3}m+\frac{2}{3}-m=0$

$\frac{5}{3}m=\frac{2}{3}\ |\cdot 3$

$5m=2$

$m=2{,}5$

$|Ef| : |FA'| = 2:3$