

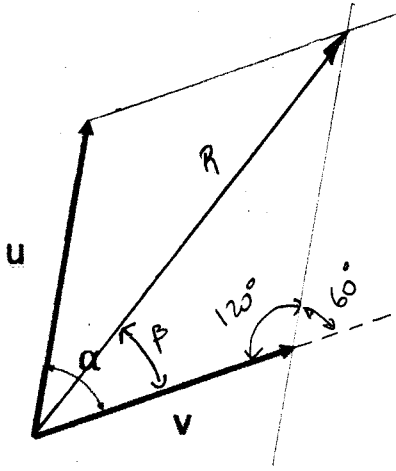
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 Física Mecânica, Prof. Simões.  
 Soma de vetores usando a lei dos cossenos

Dados os vetores abaixo, calcule a resultante e seu ângulo em relação ao vetor  $v$ . Represente graficamente a resultante usando a regra do paralelogramo.

1. Dados:  $u = 2,95$ ;  $v = 3,99$ ,  $\alpha = 60^\circ$ . Resposta: 6,03

$$R^2 = 2,95^2 + 3,99^2 + 2 \times 2,95 \times 3,99 \times \cos 60^\circ$$

$$R = 6,03$$



$$\frac{R}{\sin 120^\circ} = \frac{u}{\sin \beta} \Rightarrow \frac{6,03}{\sin 120^\circ} = \frac{2,95}{\sin \beta}$$

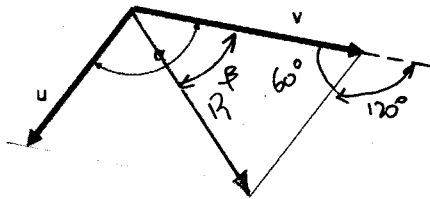
$$\sin \beta = \frac{2,95 \times \sin 120^\circ}{6,03} \Rightarrow \sin \beta = 0,424$$

$$\beta = 25,1^\circ$$

2. Dados:  $u = 1,69$ ;  $v = 2,33$ ,  $\alpha = 120^\circ$ . Resposta: 2,09

$$R^2 = 1,69^2 + 2,33^2 + 2 \times 1,69 \times 2,33 \times \cos 120^\circ$$

$$R = 2,09$$



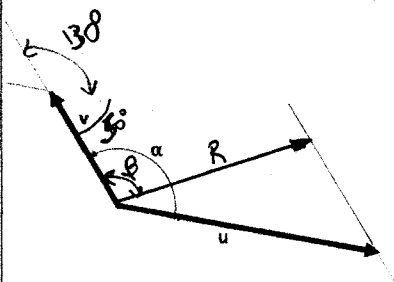
$$\frac{2,09}{\sin 60^\circ} = \frac{1,69}{\sin \beta} \Rightarrow \sin \beta = \frac{1,69 \times \sin 60^\circ}{2,09}$$

$$\sin \beta = 0,70 \Rightarrow \beta = 44,4^\circ$$

3. Dados:  $u = 2,24$ ;  $v = 1,14$ ,  $\alpha = 130^\circ$ . Resposta: 1,74

$$R^2 = 2,24^2 + 1,14^2 + 2 \times 2,24 \times 1,14 \times \cos 130^\circ$$

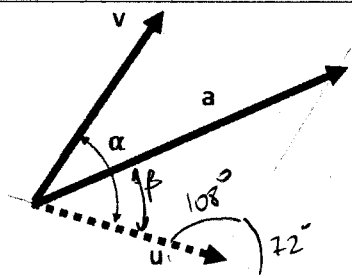
$$R = 1,74$$



$$\frac{1,74}{\sin 50^\circ} = \frac{2,24}{\sin \beta} \Rightarrow \sin \beta = \frac{2,24 \times \sin 50^\circ}{1,74}$$

$$\sin \beta = 0,986 \Rightarrow \beta = 80,5^\circ \text{ ou } 99,5^\circ$$

Como  $\beta > 90^\circ$ ,  $\beta = 99,5$



4. Dados:  $a = 9,58$ ;  $v = 6,45$  e  $\alpha = 72^\circ$ , calcule  $u$  e seu ângulo em relação à resultante  $a$ . Resposta:  $u = 5,36$

$$9,58^2 = u^2 + 6,45^2 + 2 \times u \times 6,45 \times \cos 72^\circ$$

$$91,8 = u^2 + 41,6 + 3,99u$$

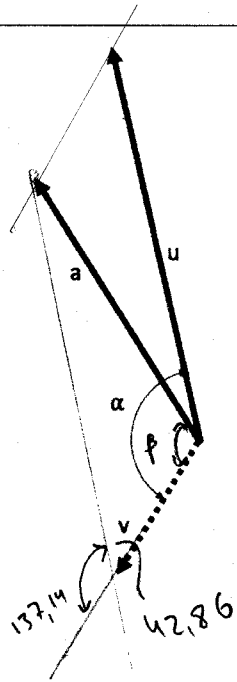
$$u^2 + 3,99u - 50,2$$

Bhaskara  $\Rightarrow u = 5,36$

$$\frac{9,58}{\sin 108^\circ} = \frac{6,45}{\sin \beta}$$

$$\sin \beta = \frac{6,45 \times \sin 108^\circ}{9,58} = 0,64$$

$$\beta = 39,8^\circ$$



5. Dados:  $a = 4,75$ ;  $u = 6,2$ ,  $\alpha = 137,14^\circ$ , calcule  $v$  e seu ângulo em relação à resultante  $a$ . Resposta:  $v = 2,35$

$$4,75^2 = 6,2^2 + v^2 + 2 \times 6,2 \times v \times \cos 137,14^\circ$$

$$22,6 = 38,4 + v^2 - 9,09v$$

$$v^2 - 9,09v + 15,8 = 0$$

Bhaskara  $\Rightarrow v = 2,34$

Obs:  $v = 6,75$  foi

rejeitado pois

seno maior que

a resultante

$$\frac{4,75}{\sin 42,86^\circ} = \frac{6,2}{\sin \beta}$$

$$\sin \beta = \frac{6,2 \times \sin 42,86^\circ}{4,75} = 0,888$$

$$\beta = 62,6^\circ$$