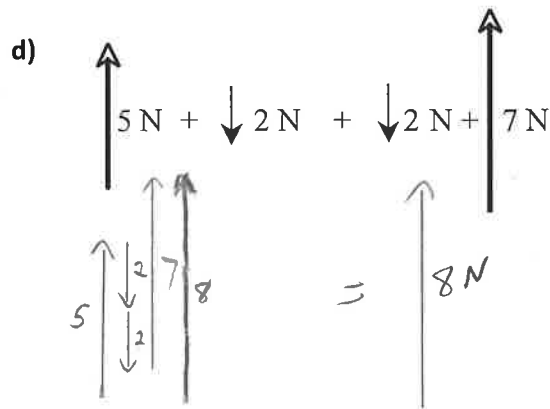
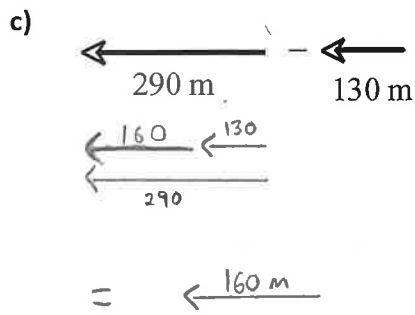
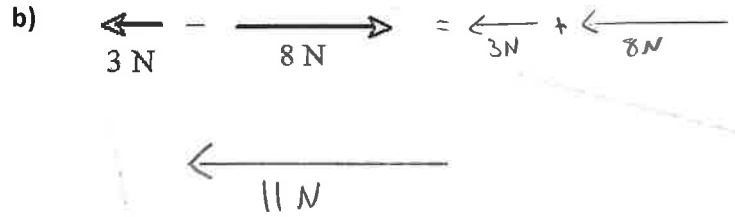
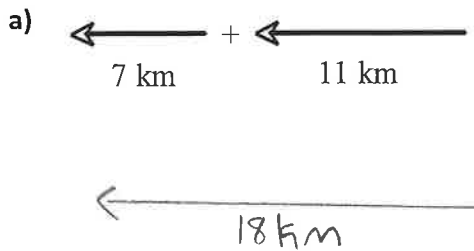
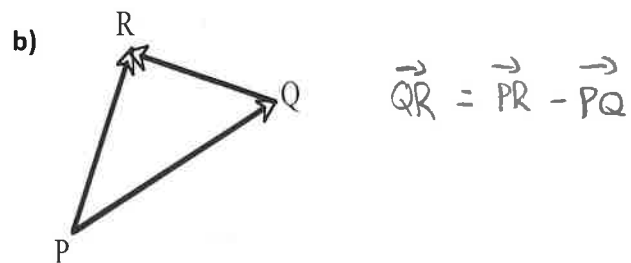
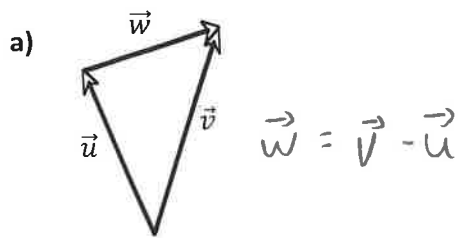


1) Draw a diagram to illustrate each vector sum or difference.

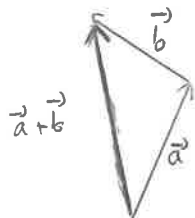


2) Express the shortest vector in each diagram as the sum or difference of the other two vectors.

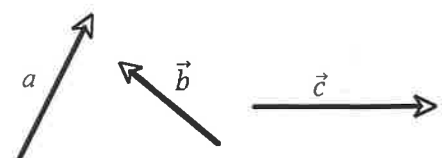
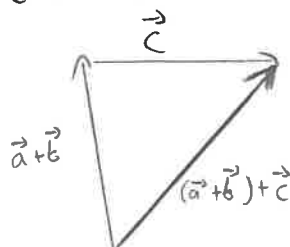


3) Given the vectors \vec{a} , \vec{b} and \vec{c} , construct $\vec{a} + \vec{b}$ and $(\vec{a} + \vec{b}) + \vec{c}$.

$\vec{a} + \vec{b}$:

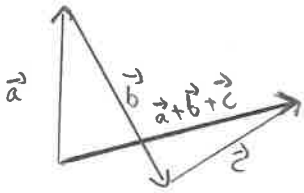


$(\vec{a} + \vec{b}) + \vec{c}$:

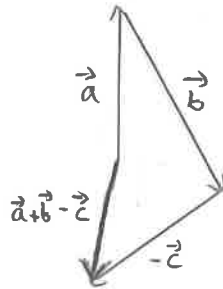


4) Given the vectors \vec{a} , \vec{b} and \vec{c} , draw a diagram of each expression.

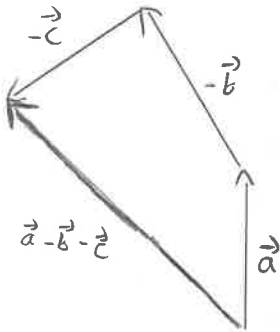
a) $\vec{a} + \vec{b} + \vec{c}$



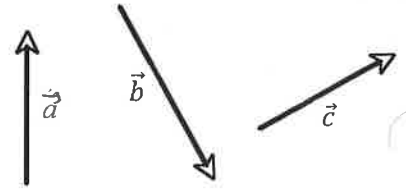
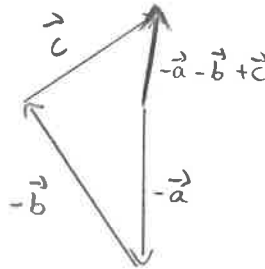
b) $\vec{a} + \vec{b} - \vec{c}$
 $= \vec{a} + \vec{b} + (-\vec{c})$



c) $\vec{a} - \vec{b} - \vec{c}$



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



5) The diagram shows three congruent equilateral triangles.

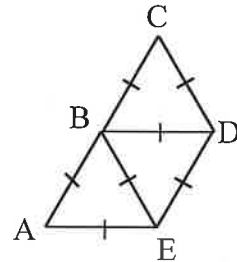
Express each difference as a single vector. Show your simplification steps.

a) $\vec{AB} - \vec{AE}$
 $= \vec{EB}$

b) $-\vec{AB} + \vec{AE} + \vec{ED}$
 $= \vec{BE} + \vec{ED}$
 $= \vec{BD}$

c) $\vec{BD} - \vec{BE}$
 $= \vec{ED}$

d) $\vec{CD} - \vec{BD}$
 $= \vec{CD} + (-\vec{BD})$
 $= \vec{CD} + \vec{DB}$
 $= \vec{CB}$



6) An airplane leaves the airport travelling N30°W at 720 km/h. After 1 h, the airplane then turns north and travels another 1.5 h at 850 km/h. What is the displacement of the airplane after 2.5 h?



$$|\vec{a}|^2 = 720^2 + 1275^2 - 2(720)(1275)\cos(150^\circ)$$

$$|\vec{a}| \approx 1932.4 \text{ km}$$

$$\frac{\sin \theta}{1275} = \frac{\sin 150}{1932.4}$$

$$\theta \approx 19.26^\circ$$

$$\beta = 30 - 19.26$$

$$\beta = 10.74^\circ$$

Answer: 1932.4 km N10.74°W

7) ABCD is a parallelogram, and E is the intersection point of the diagonal AC and BD. Name a single vector equivalent to each expression.

$$\vec{AE} + \vec{EB} = \vec{AB}$$

$$\vec{BC} + \vec{BA} = \vec{BD}$$

$$\vec{AE} + \vec{EC} = \vec{AC}$$

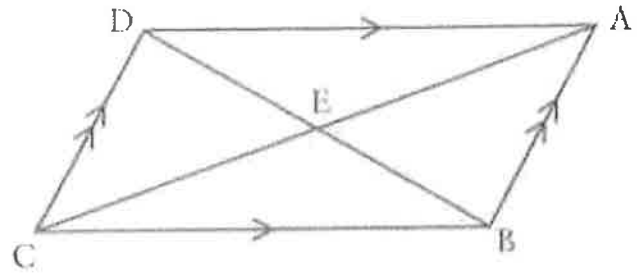
$$\vec{AD} + \vec{DB} = \vec{AB}$$

$$\vec{BA} + \vec{AE} + \vec{ED} + \vec{DC} = \vec{BC}$$

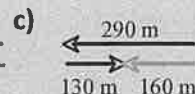
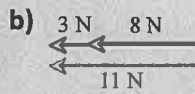
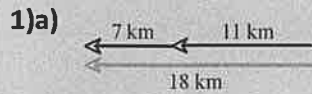
$$\vec{AB} - \vec{DB} = \vec{AB} + \vec{BD} = \vec{AD}$$

$$\begin{aligned} \vec{AB} - \vec{CB} - \vec{DC} &= \vec{AB} + \vec{BC} + \vec{CD} \\ &= \vec{AD} \end{aligned}$$

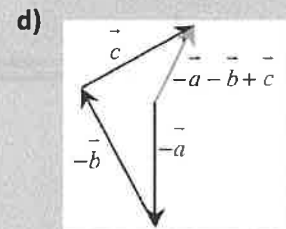
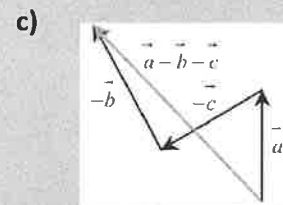
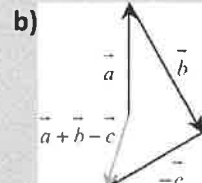
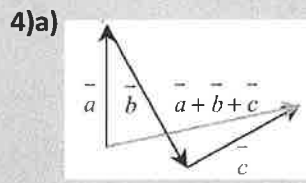
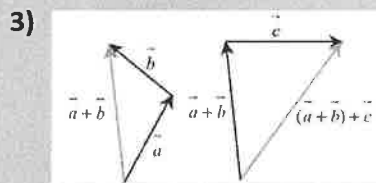
$$\begin{aligned} \vec{AE} - \vec{EB} - \vec{BC} &= \vec{AE} + \vec{BE} + \vec{CB} \\ &= \vec{AB} + \vec{CB} \\ &= \vec{0} \end{aligned}$$



Answer Key:



2) a) $\vec{w} = \vec{v} - \vec{u}$ b) $\vec{QR} = \vec{PR} - \vec{PQ}$



5) a) \vec{EB} b) \vec{BD} c) \vec{ED} d) \vec{CB}

6) 1932.4 km N10.7°W

7) a) \vec{AB} b) \vec{BD} c) \vec{AC} d) \vec{AC} e) \vec{BC} f) \vec{AD} g) \vec{AD} h) $\vec{0}$