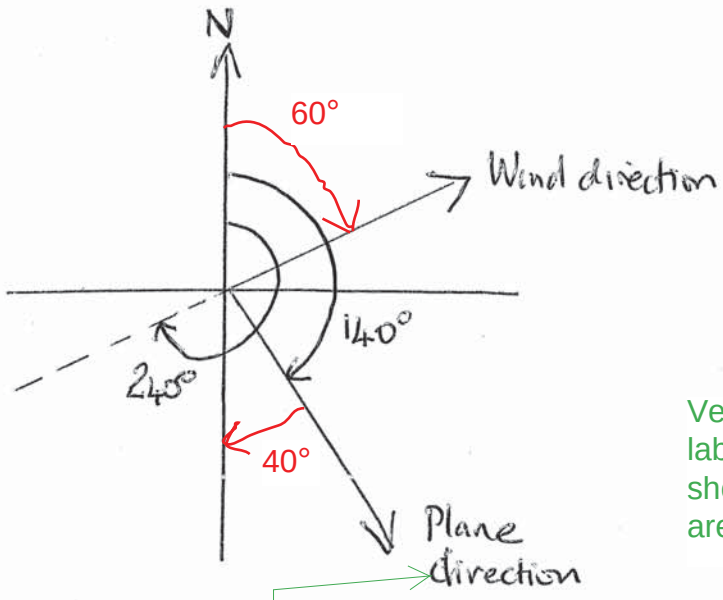
Q1(a)

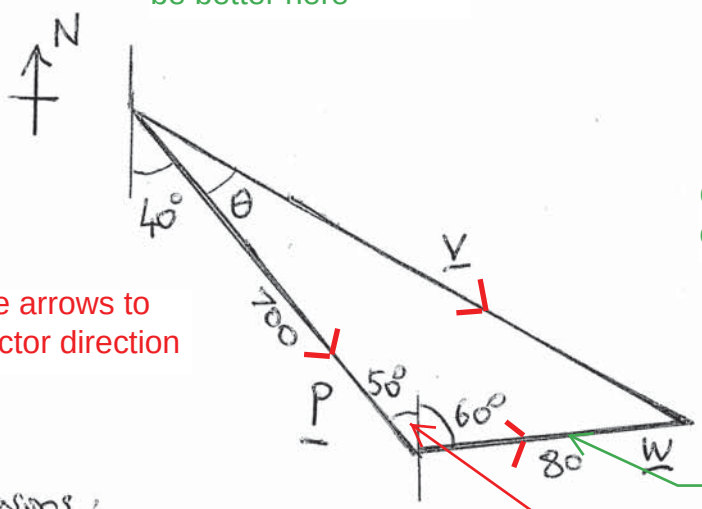


"Plane heading" would be better here

Very good - you missed labelling the two angles shown in red - these are useful for part(b)

(a) 2/3

(b)



Good diagram with clear labelling

Must use arrows to show vector direction

Need not be to scale but this side is much too long and the 60° angle is rather large too

Reasons:

40° is from part (a) ✓

50° is because = 90° − 40°

60° is from part (a) ✓

So the angle between P and W is 50+60 = 125°

This is actually 40° because it is an alternate angle - see Unit 5 page 53

oops, should be 40°+60° = 100°

(b) 3/5

(c) To find the resultant velocity $\underline{V}$ we need the bearing of $\underline{V}$ and the length of the vector

For the bearing we want the angle θ shown above

(c) continued

OK but usual notation for vector magnitudes would be |**p**|, |**w**|, |**v**|. See Unit 5 page 40.

The sides of the triangle are p, w and v

To find θ we must first find v using the cosine rule: ✔

$$v^2 = p^2 + w^2 - 2pw\cos 120^\circ$$

should be 100° but will follow through with your figure of 120°

$$= 700^2 + 80^2 - 2\times 700\times 80\times \cos 120^\circ$$

$$= 496400 - 112000\times \tfrac{1}{2}$$

oops, cos 120° = -1/2 so should have 496400 + 11200 x 1/2 = 552400 and hence |**v**| = 743.236...

$$= 440400$$

$$\therefore v = \sqrt{440400} = 663.63 \text{ to 2 d.p.}$$

Keep full accuracy until end of calculations

Good work - right method, just lost a mark for one more slip here. You might have noticed that your |**v**| was less than |**p**| which cannot be correct for this triangle

We find θ using the sine rule: ✔

$$\frac{v}{\sin 120^\circ} = \frac{w}{\sin\theta}$$

Good - still following through with your figure of 120°

$$\sin\theta = \frac{w\sin 120^\circ}{v} = \frac{80\times \frac{\sqrt{3}}{2}}{663.63} = 0.104399$$

This is where you need to use the full calculator accuracy not the rounded value

$$\theta = \sin^{-1}(0.104399) = 5.99^\circ \text{ to 2 d.p.}$$

Vector notation: **v** in print or $\underline{v}$ in handwriting

Correct if using your value of 120° but true value should be sin θ = 0.109693... so θ = 6.297639... °

Hence the resultant velocity vector v has magnitude 663.63 and bearing $180^\circ - 40^\circ - 5.99^\circ = 134.01^\circ$

Well done Pascale. You were asked for magnitude to 1 d.p. with units and bearing to nearest degree so expected conclusion (with correct answers) is that **v** has magnitude 718.2 km/h and bearing 134°.

(c) 7/10

Total for Q1: 2 + 3 + 7 = 12/18