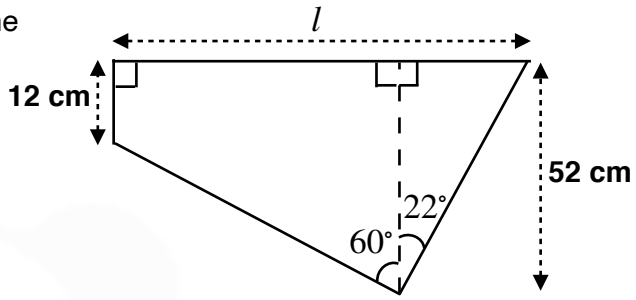
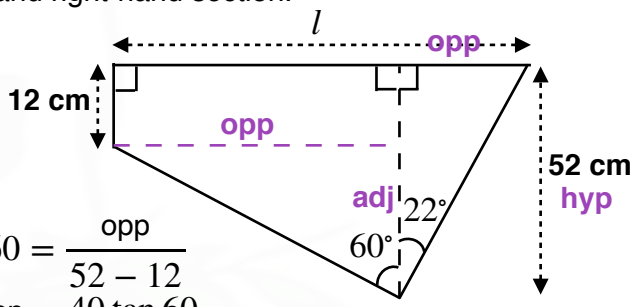
Bearings with trigonometry

Starter

1. **(Review of last lesson)** The diagram shows the frame of a bicycle. Find the length, l, of the top tube. Give your answer to 3 s.f..



Working: Split the length l into a left and right-hand section.



opp and adj $\Rightarrow$ tan

$\tan\theta = \frac{\text{opp}}{\text{adj}}$: $\quad \tan 60 = \frac{\text{opp}}{52-12}$

$\text{opp} = 40\tan 60$

N.B. *Do not round half-way through the calculation.*

opp and hyp $\Rightarrow$ sin

$\sin\theta = \frac{\text{opp}}{\text{hyp}}$: $\quad \sin 22 = \frac{\text{opp}}{52}$

$\text{opp} = 52\sin 22$

N.B. *Do not round half-way through the calculation.*

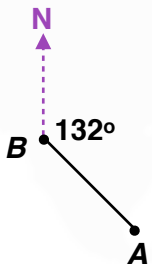
$l = 40\tan 60 + 52\sin 22 = 88.8$ cm

Geogebra: **Bearings**

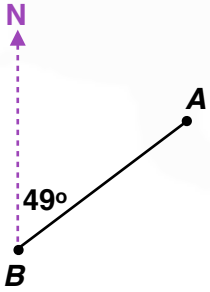
E.g. 1 Write down the bearing of A from B.

N.B. "Start from B" so there must be a north arrow at B.

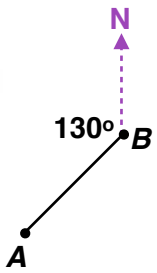
(a)



(b)



(c)

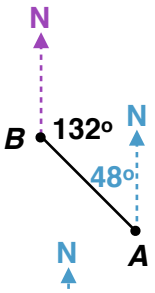


Working: (a) 132° (b) 049° (c) $360^\circ - 130^\circ = 230^\circ$

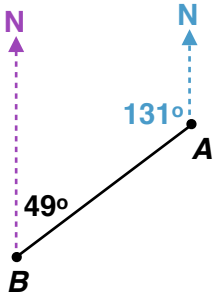
E.g. 2 For the diagrams of ***E.g. 2(a)*** and ***E.g. 2(b)*** above, calculate the bearing of B from A.

Working: "the bearing of B from A" — the "***from*** A" means start from A.
Therefore, a North arrow must be drawn ***from*** A.

E.g. 2(a)
By allied angles, the angle between the line AB and A's North arrow is $180 - 132 = 48°$.
So bearing of B from A is $360 - 48 = 312°$

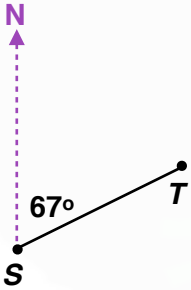


E.g. 2(b)
By allied angles, the angle between the line AB and A's North arrow is $180 - 49 = 131°$.
So bearing of B from A is $360 - 131 = 229°$

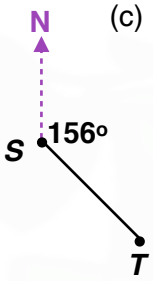


E.g. 3 What is the bearing of S from T?

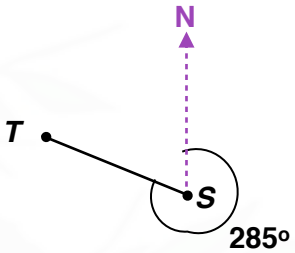
(a)



(b)

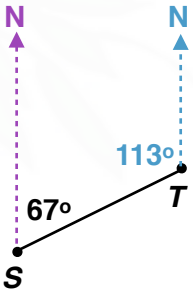


(c)

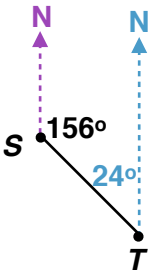


Working: "the bearing of S from T" — the "***from*** T" means start from T.
Therefore, a North arrow must be drawn ***from*** T.

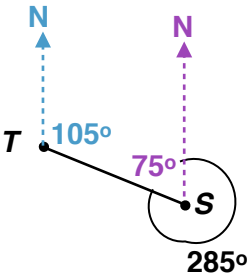
(a) By allied angles, the angle between the line ST and T's North arrow is $180 - 67 = 113°$.
So the bearing of S from T is $360 - 113 = 247°$



(b) By allied angles, the angle between the line ST and T's North arrow is $180 - 156 = 24°$.
So the bearing of S from T is $360 - 24 = 336°$



(c) The angle between the line ST and S's North arrow is $360 - 285 = 75°$.
By allied angles, the bearing of S from T is $180 - 75 = 105°$



Trigonometry questions often incorporate bearings in them.

E.g. 4 Sarah starts at point A and walks 9 km due east and then 5 km due south to reach point B. Calculate the bearing of B from A.

Working: bearing of B from A $\Rightarrow$ start from A $\Rightarrow$ draw north arrow at A

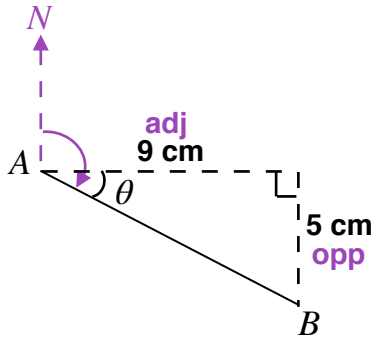
opp and adj $\Rightarrow$ tan

$\tan\theta = \frac{\text{opp}}{\text{adj}}$: $\tan\theta = \frac{5}{9}$

$\theta = \tan^{-1}\frac{5}{9}$

Bearing $= 90° + \tan^{-1}\frac{5}{9} = 119°$

The bearing of B from A is $119°$.



E.g. 5 A ship is due south of a lighthouse. It sails on a bearing of $058°$ for a distance of 76 km until it is due east of the lighthouse. How far is it now from the lighthouse?

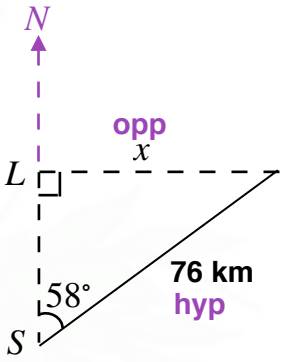
Working: opp and hyp $\Rightarrow$ sin

$\sin\theta = \frac{\text{opp}}{\text{hyp}}$: $\sin 58 = \frac{x}{76}$

$76\sin 58 = x$

$x \approx 64.45$ km

The ship is now 64.5 km (3 s.f..) from the lighthouse.



Video: Bearings

Video: Back bearings

Video: Position given bearings from two points

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p568 M18.2 Qu 1-14 Protractor needed
A*-G class textbook:	p529 M18.2 Qu 1-11 Protractor needed
9-1 homework book:	p191 M18.2 Qu 1-7 Protractor needed
A*-G homework book:	p146 M18.2 Qu 1-6 Protractor needed