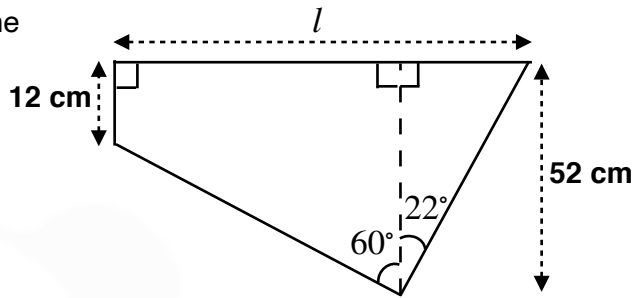


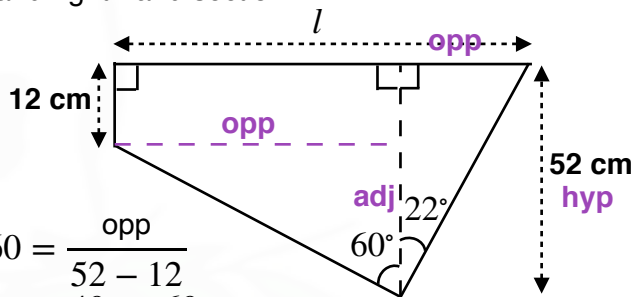
Bearings with trigonometry

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.



$$\begin{aligned} \text{opp and adj} &\Rightarrow \tan \\ \tan \theta = \frac{\text{opp}}{\text{adj}}: &\quad \tan 60 = \frac{\text{opp}}{52 - 12} \\ &\quad \text{opp} = 40 \tan 60 \end{aligned}$$

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

$$\begin{aligned} \text{opp and hyp} &\Rightarrow \tan \\ \tan \theta = \frac{\text{opp}}{\text{hyp}}: &\quad \tan 22 = \frac{\text{opp}}{52} \\ &\quad \text{opp} = 52 \tan 22 \end{aligned}$$

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

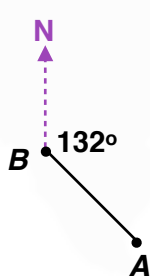
$$l = 40 \tan 60 + 52 \tan 22 = 90.3 \text{ cm}$$

Geogebra: [Bearings](#)

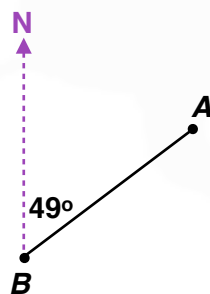
E.g. 1 Write down the bearing of A from B .

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

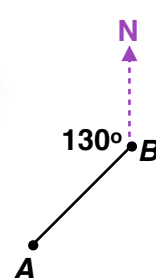
(a)



(b)



(c)



Working:

(a) 132°

(b) 049°

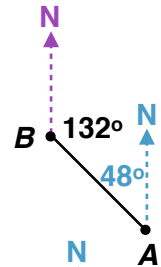
(c) $360^\circ - 130^\circ = 230^\circ$

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*.

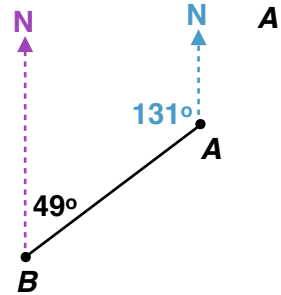
E.g. 2(a)

By allied angles, the angle between the line *AB* and *A*’s North arrow is $180 - 132 = 48^\circ$.
So bearing of *B* from *A* is $360 - 48 = 312^\circ$

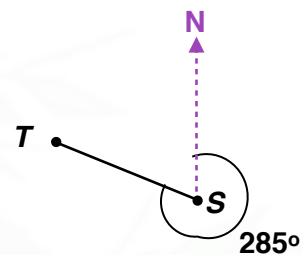
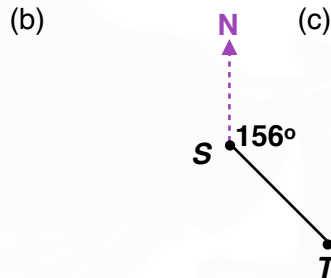
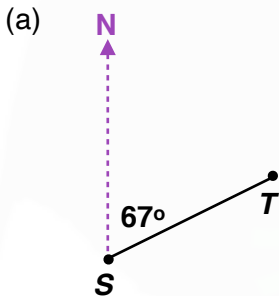


E.g. 2(b)

By allied angles, the angle between the line *AB* and *A*’s North arrow is $180 - 49 = 131^\circ$.
So bearing of *B* from *A* is $360 - 131 = 229^\circ$

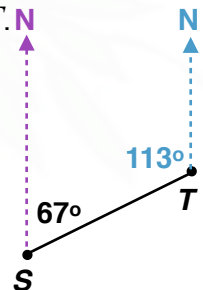


E.g. 3 What is the bearing of *S* from *T*?

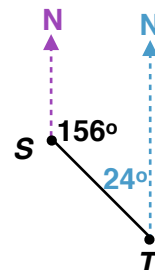


Working: “the bearing of *S* from *T*” – the “*from T*” means start from *T*. Therefore, a North arrow must be drawn *from T*.

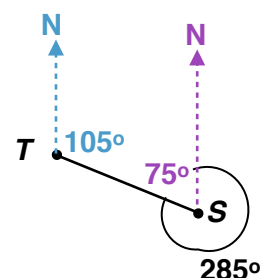
(a) By allied angles, the angle between the line *ST* and *T*’s North arrow is $180 - 67 = 113^\circ$.
So the bearing of *S* from *T* is $360 - 113 = 247^\circ$



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



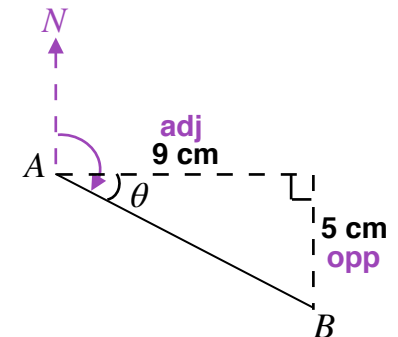
(c) The angle between the line *ST* and *S*’s North arrow is $360 - 285 = 75^\circ$.
By allied angles, the bearing of *S* from *T* is $180 - 75 = 105^\circ$



Trigonometry questions often incorporate bearings in them.

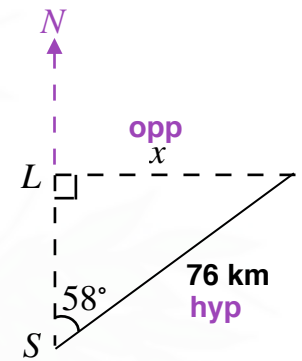
E.g. 4 Sarah starts at point A and walks 9 km due east and then 5 km due south to reach point B . Calculate the bearing of B from A .

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