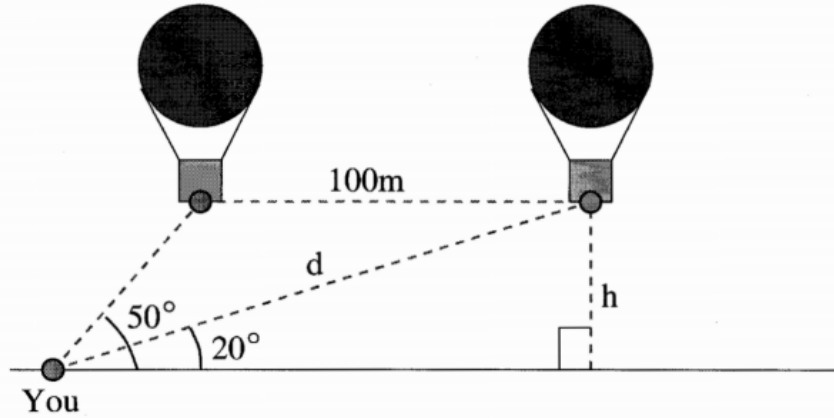


1

10. A balloon is sailing along. You measure the angle of inclination to the balloon twice as shown over a distance of 100m.



(a) Find d .

[12 pts]

(b) Find h . For this you need d . If you couldn't get part (a) then just use the letter d in your answer.

[8 pts]

2

Figure 2 shows a geometric model $ABCD$ in the form of tetrahedron. It is given that $\angle BAD = 86^\circ$, $\angle CBD = 43^\circ$, $AB = 10$ cm, $AC = 6$ cm, $BC = 8$ cm and $BD = 15$ cm.

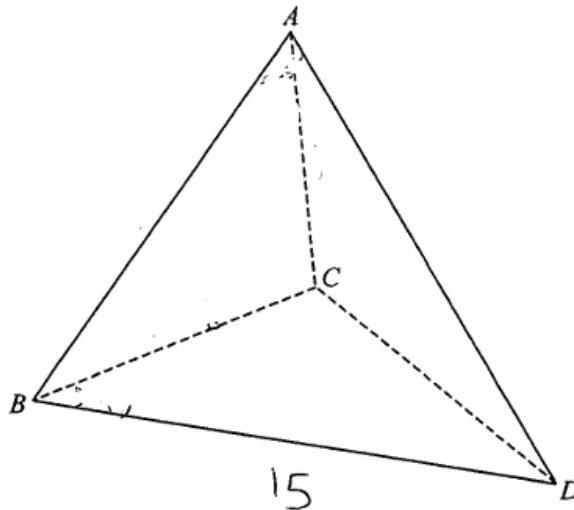


Figure 2

(a) Find $\angle ABD$ and CD .

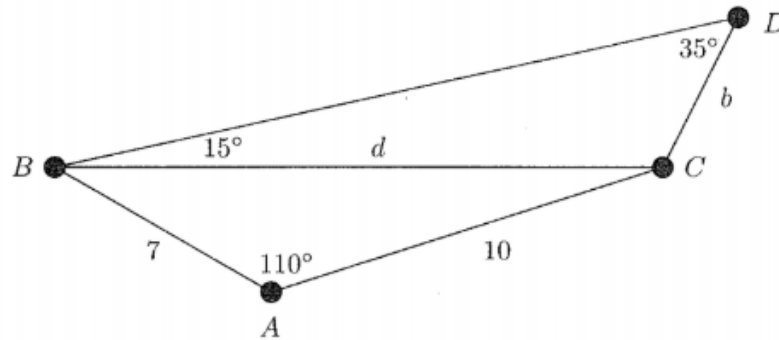
(4 marks)

(b) A craftsman claims that the angle between AB and the face BCD is $\angle ABC$. Do you agree? Explain your answer.

(2 marks)

3

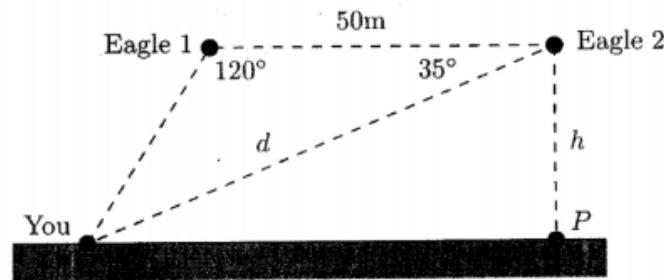
Suppose you measure the angles and distances shown on the picture. This picture is not drawn to scale.



- Find the distance d from point B to point C .
You may leave trigonometric functions in your answer.
- Find the distance b from C to D . This requires d . If you couldn't answer part i, just use the letter d in your answer to this question.
You may leave trigonometric functions in your answer.

4

Suppose two eagles are flying along and both look down and see you. Since they don't have much else to do they measure the information as shown.



- Find the distance d from you to Eagle 2.
You may leave trigonometric functions in your answer.
- Find the height h from you to the point P on the ground directly below Eagle 2. This requires d . If you couldn't answer part i, just use the letter d in your answer to this question.
You may leave trigonometric functions in your answer.

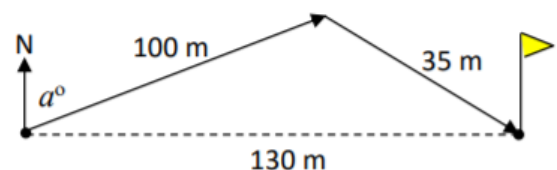
5

A par 3 hole on a golf course the tee is a distance of 130 metres due west from the pin.

On his first shot, Bruce hits the ball 100 metres but not at the correct angle.

On his second shot he hits the ball 35 metres and gets it in the hole.

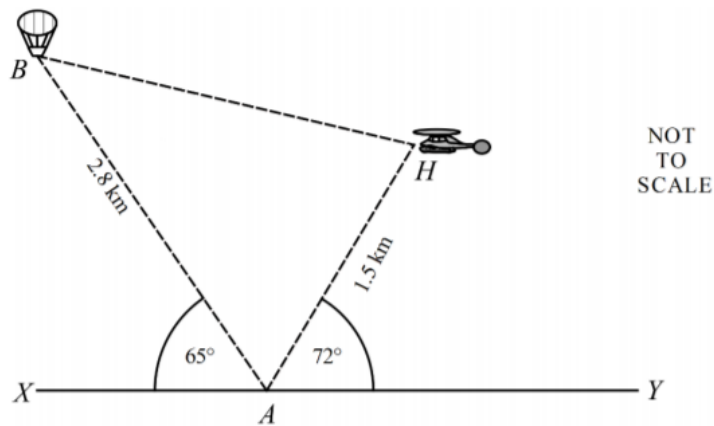
On what bearing, a° , did he hit his first stroke?



6

From a point on a level ground an observer sees a balloon B and a helicopter H which are both stationary at the time.

The balloon is positioned due west of point A , at a distance of 2.8 km on an angle of elevation of 65° and the helicopter is positioned due east of point A , at a distance of 1.5 km on an angle of elevation of 72° , as shown in the diagram.



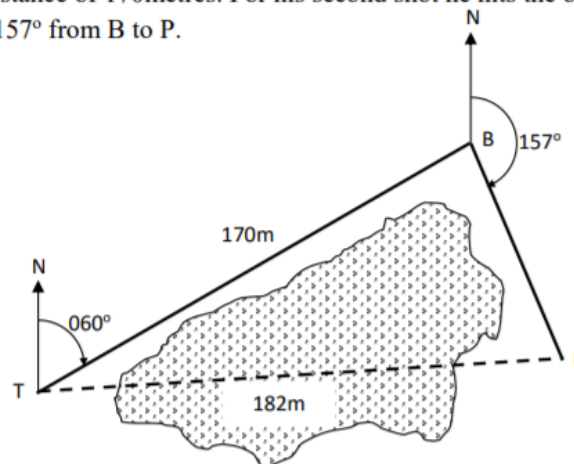
- (i) Show that the distance between the helicopter and the balloon is approximately 2.0 km.

7

5. The diagram shows part of a golf course where players have to get the ball from the tee (T) to the pin (P).

They can either play one stroke across the lake or play 1 stroke from T to B then another from B to P which avoids the lake.

Harry decides to take the 2 stroke option and hits his first shot on a bearing of 060° or a distance of 170 metres. For his second shot he hits the ball on a bearing of 157° from B to P.



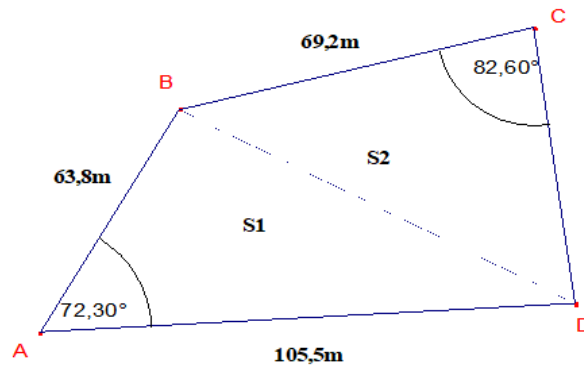
- (a) Calculate the size of angle TBP.

The distance TP is 182 metres. David decided to attempt to hit his ball across the lake.

- (b) Calculate the bearing on which he would have to hit the ball to achieve this.

8

12) → De broers Philip en Laurent erven samen een stuk grond dat de volgende vorm heeft: ¶



¶

a) → Ze mogen de lap grond enkel verdelen volgens het lijnstuk $[BD]$. Zo ontstaan de stukken S_1 en S_2 . Bereken de lengte van de gemeenschappelijke zijde $[BD]$. ¶

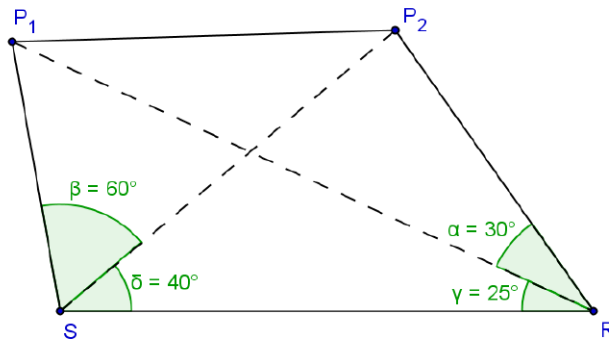
b) → Bereken de lengte van de zijde $[CD]$. ¶

c) → Het oorspronkelijke stuk grond heeft een oppervlakte van $6 \cdot 256 \cdot \text{m}^2$. Omdat de 2 delen niet dezelfde grootte hebben, wordt er een financiële compensatie afgesproken op basis van $50 \cdot \text{euro} \cdot \text{per} \cdot \text{m}^2$. Welke eigenaar moet een compensatievergoeding betalen en hoe hoog is het bedrag? ¶



9

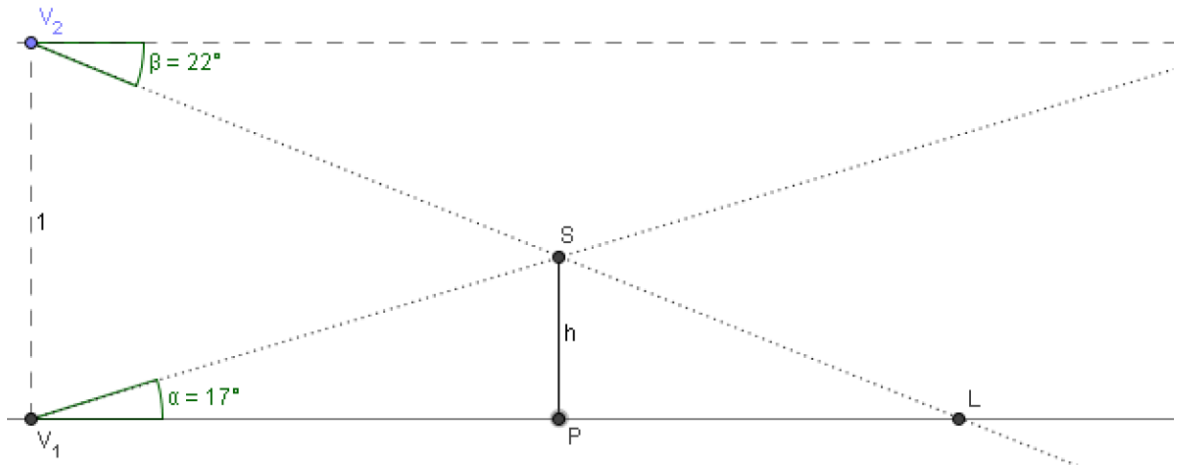
Koffi N'dri Romanic staat te scherp voor goal (onder een hoek $\alpha = 30^\circ$), en besluit daarom een pass te geven naar Moussa Sanogo die minder scherp voor goal staat (onder een hoek $\beta = 60^\circ$). De lengte van de pass bedraagt $|RS| = 10 \text{ m}$. Verder zijn ook de hoeken $\gamma = 25^\circ$ en $\delta = 40^\circ$ gegeven (zie figuur). Bereken de breedte van de doelmond $|P_1P_2|$, op de millimeter nauwkeurig.



10

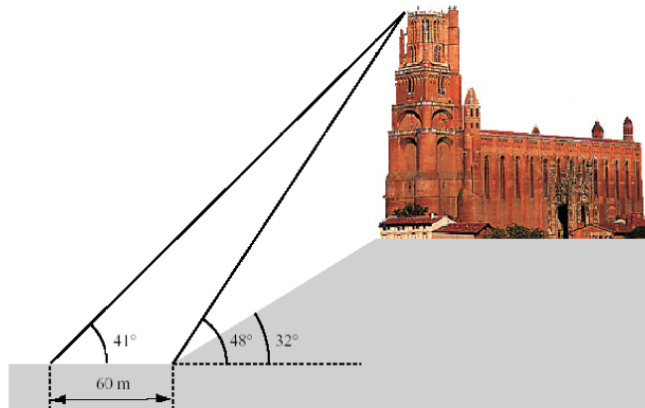
Vliegtuig V_1 stijgt op onder een hoek van $\alpha = 17^\circ$ en vliegtuig V_2 (dat exact 1 kilometer boven V_1 vliegt) is aan het landen onder een hoek van $\beta = 22^\circ$ (zie figuur).

- Op welke hoogte h kan er een eventuele botsing gebeuren?
- Welke afstand $|V_2L|$ moet vliegtuig V_2 nog afleggen alvorens het de grond raakt? (beide op de centimeter nauwkeurig).



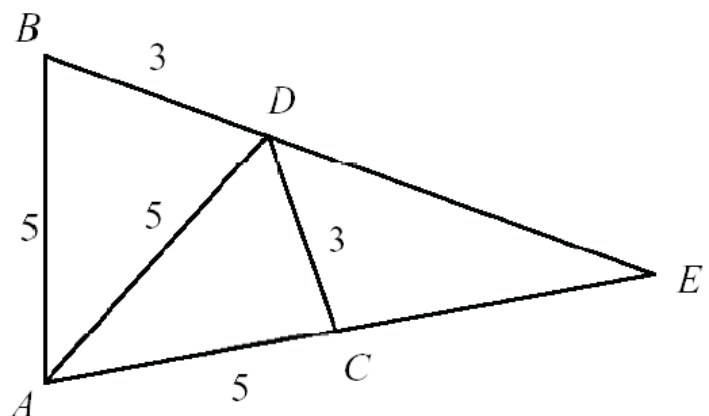
11

Une basilique est située au sommet d'une colline (voir schéma ci-dessous). Quelle est la hauteur de cette basilique ?



12

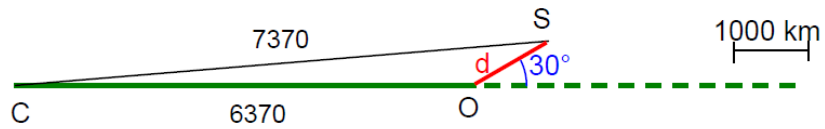
Quelle est la longueur du segment $[DE]$?



13

Un observateur, couché sur le sol, voit un satellite sous un angle de 30° avec la verticale. Sachant que le satellite gravite à 1000 km au-dessus de la surface de la Terre et que le rayon de la terre mesure environ 6370 km, quelle est la distance d séparant l'observateur du satellite ?

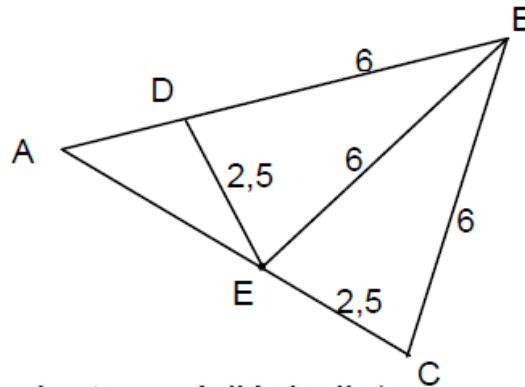
Commençons par un dessin (à l'échelle)



C désigne le centre de la terre, O l'observateur et S le satellite.

14

TAC 2



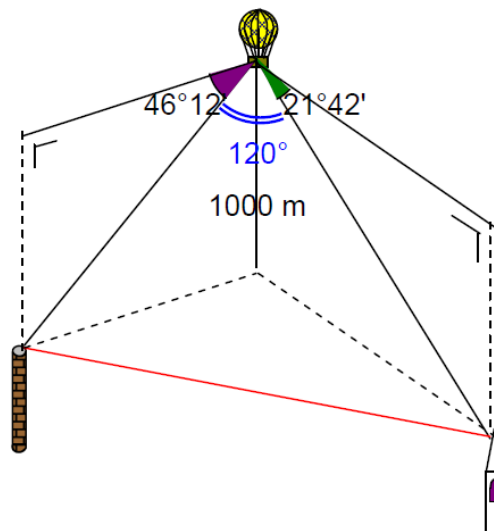
(Le dessin n'est pas à l'échelle)

Quelle est la longueur du segment [AE] ?

15

TAC 4

Un ballon à air chaud navigue à 1000 mètres d'altitude. A bord, un observateur note les angles de dépression (angle entre l'horizontale et le point visé vers le bas) d'une cathédrale ($21^\circ 42'$) et de la cheminée d'une usine ($46^\circ 12'$). L'angle entre les deux visées est de 120° . Quelle distance sépare la cathédrale et la cheminée ?

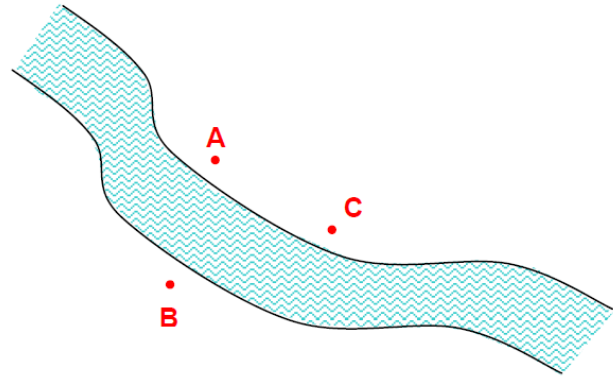


16

1. Pour calculer la distance séparant deux points A et B situés sur les rives opposées d'un fleuve, à 5 mètres chacun de l'eau, un géomètre a déterminé un point C sur la même rive que A, à 5 mètres de l'eau et à 300 mètres de A. Il a mesuré les angles \widehat{BAC} et \widehat{ACB} : $\widehat{BAC} = 56^\circ 12'$ et $\widehat{ACB} = 23^\circ 15'$.

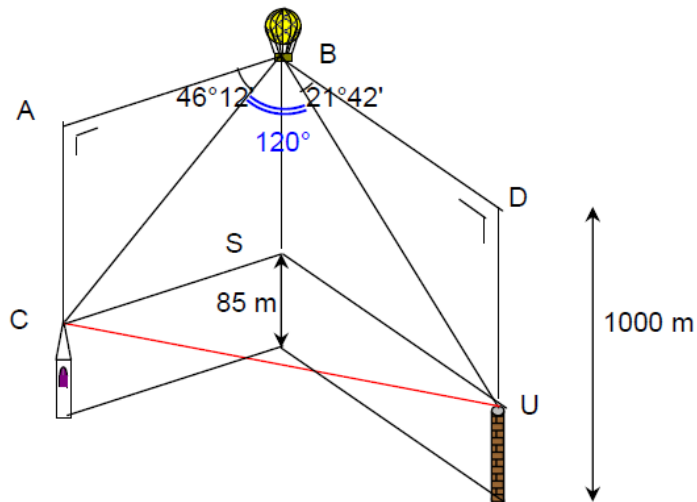
Déterminez :

- 1) la distance entre A et B ;
- 2) la largeur du fleuve.



17

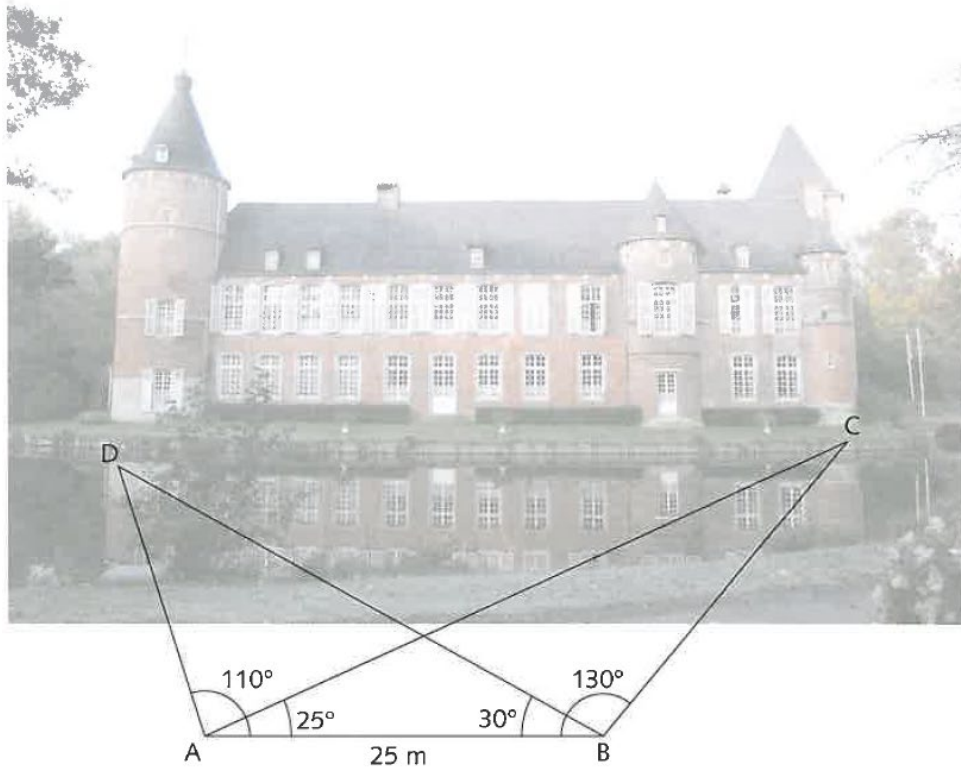
2. Un ballon à air chaud navigue à 1000 mètres d'altitude. A bord, en visant le sommet des édifices, un observateur note les angles de dépression du clocher d'une cathédrale ($46^\circ 12'$) et de la cheminée d'une usine ($21^\circ 42'$). L'angle entre les deux visées est de 120° . Quelle distance (en km, avec arrondi au centième) sépare la cathédrale et la cheminée, sachant que la cathédrale et la cheminée ont une hauteur de 85 m ?



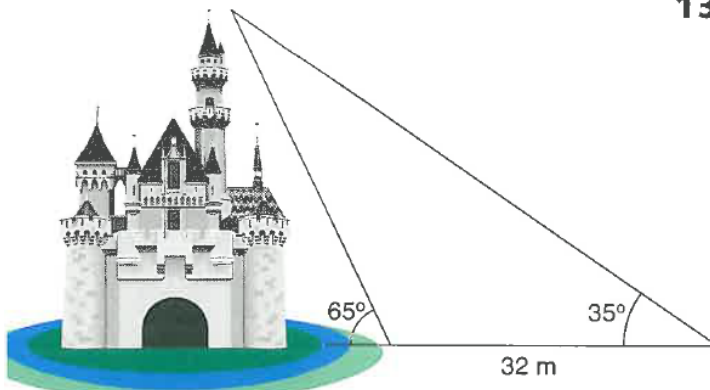
Remarque : le schéma n'est pas à l'échelle.

18

Ilke, Koen en Wouter zijn benieuwd naar de breedte van het kasteel Kruikenburg. Aangezien het kasteel volledig omringd is door water doen zij met behulp van een theodoliet volgende metingen. Wat is de breedte van het kasteel?



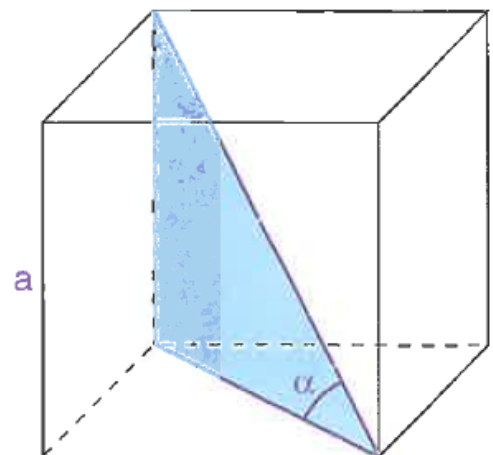
19



13 De leerlingen van het vierde jaar willen de hoogte van het kasteel Kruikenburg bepalen. Zij kunnen echter niet over het water. Zij steken de hoofden bij elkaar en doen met behulp van een theodoliet de volgende metingen. Welke hoogte zullen zij bekomen?

20

Bereken α in de gegeven kubus.



21

Question 8

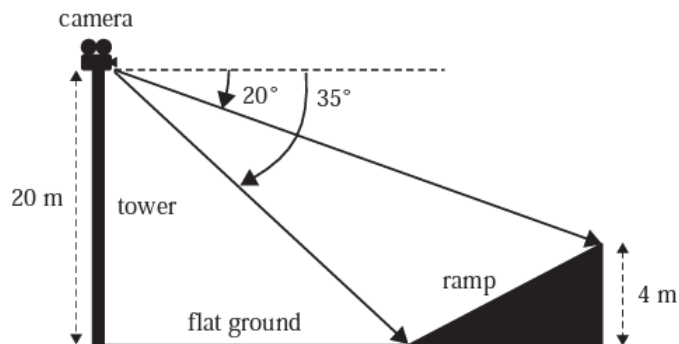
A movie camera is placed 20 m above ground level on a vertical tower.

Actors are filmed running away from the tower along a stretch of flat ground and up a ramp.

The end of the ramp is 4 m above ground level.

The angle of depression from the camera to the bottom of the ramp is 35° and the angle of depression from the camera to the top of the ramp is 20° .

This information is shown in the diagram below.



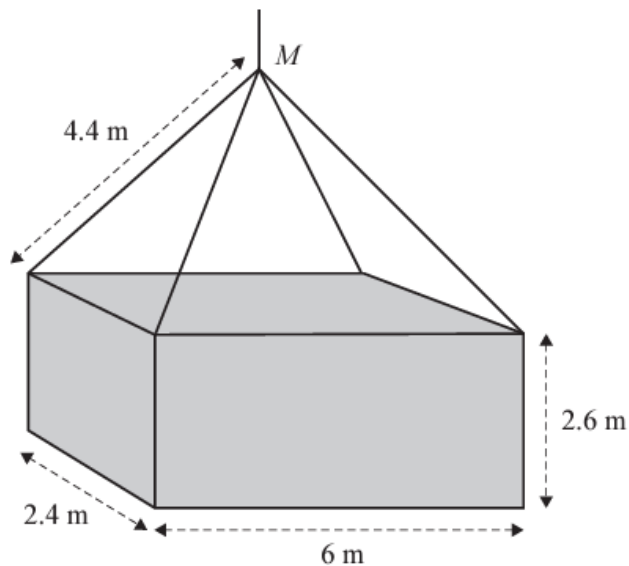
The length of the ramp, in metres, is closest to

- A. 12
- B. 14
- C. 16
- D. 35
- E. 47

22

A shipping container is a rectangular prism.

Four chains connect the shipping container to a hoist at point M , as shown in the diagram below.



The shipping container has a height of 2.6 m, a width of 2.4 m and a length of 6 m.

Each chain on the hoist is 4.4 m in length.

What is the vertical distance, in metres, between point M and the top of the shipping container?
Round your answer to the nearest metre.

23

- (b) Olga wants to measure the vertical height of a hill. The point H is at the top of the hill. The points R and P are 20 m apart on horizontal ground, at the bottom of the hill.

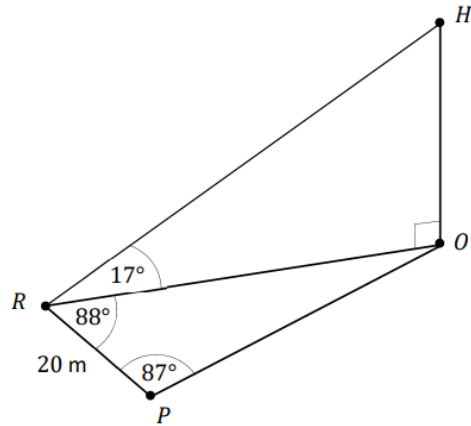
Olga measures the angle of elevation from R to H .

Taking O to be the point directly below H that is horizontal with R and P , Olga also measures the angles $\angle OPR$ and $\angle ORP$.

All of these are shown in the diagram below (not to scale).



Source: www.bikeforums.net/road-cycling

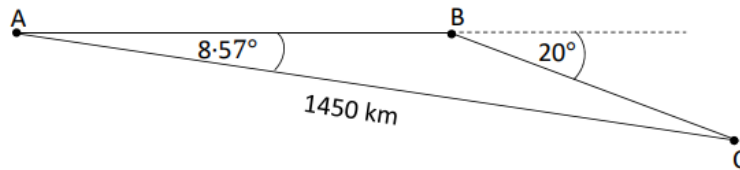


24

An aeroplane flies east from point A for 2 hours at a constant speed of 420 km per hour until it reaches point B . It then changes direction by heading 20° towards the south at the same speed until it reaches point C , as shown in the diagram below.

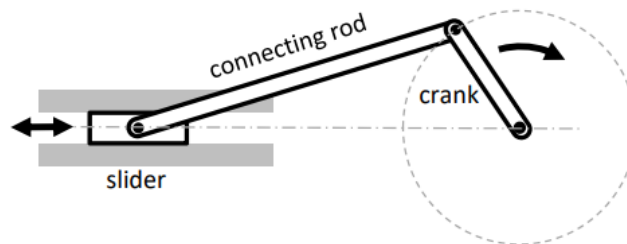
The direct distance from A to C is 1450 km and $|\angle BAC| = 8.57^\circ$.

- (i) Find how long it took to fly from B to C .
Give your answer correct to the nearest minute.



25

In engineering, a crank-and-slider mechanism can be used to change circular motion into motion back and forth in a straight line.



The diagram below shows a particular position of the mechanism with $|\angle DCO| = 15^\circ$. Find $|\angle COD|$, correct to the nearest degree.

