Solution Book of Mathematic

Ssnior 2 Part I

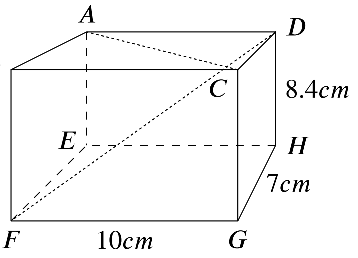
MELVIN CHIA

Written on 9 October 2022

Contents

16.1 Revision Exercise 17

1. In the cuboid shown below, $FG = 10cm$, $GH = 7cm$, $DH = 8.4cm$, find:

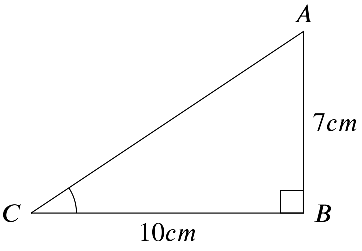


2.

(a) The angle formed by line AC and plane $BFGC$.

Sol.

The angle formed by AC and plane $BFGC$ is $\angle ACB$.



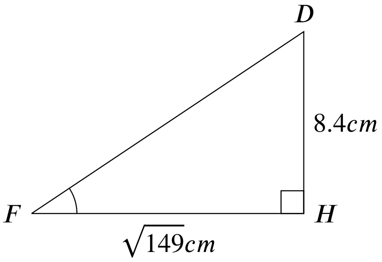
$$\begin{aligned}\tan\angle ACB &= \frac{AB}{CB}\\ &= \frac{7}{10}\\ \angle ACB &\approx 34.99^\circ\end{aligned}$$

(b) The angle formed by line FD and plane $EFGH$.

Sol.

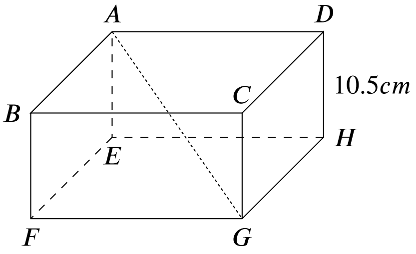
The angle formed by FD and plane $EFGH$ is $\angle DFH$.

$$\begin{aligned}\text{In } EFGH,\ FH &= \sqrt{FG^2 + GH^2}\\ &= \sqrt{10^2 + 7^2}\\ &= \sqrt{149}cm\end{aligned}$$



$$\begin{aligned}\tan\angle DFH &= \frac{DF}{FH}\\ &= \frac{8.4}{\sqrt{149}}\\ \angle DFH &\approx 34.53^\circ\end{aligned}$$

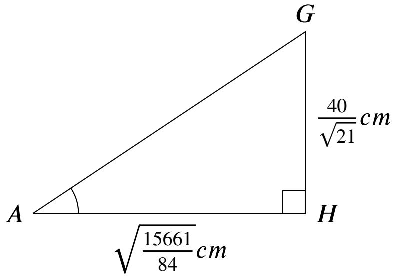
3. The diagram below shows a cuboid with volume of $400cm^3$, height of $10.5cm$, $AD = 2DC$. Find the angle formed by line AG and plane $ADHE$.



Sol.

The angle formed by line AG and plane $ADHE$ is $\angle GAH$.

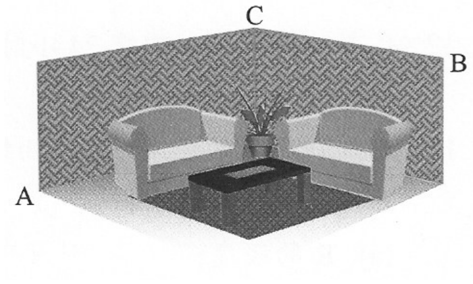
$$\begin{aligned}AD &= 2DC\\ AD \times DC \times 10.5 &= 400\\ 2DC \times DC &= \frac{400}{10.5}\\ DC^2 &= \frac{400}{21}\\ DC &= \frac{20}{\sqrt{21}}cm\\ AD &= 2 \times \frac{20}{\sqrt{21}}cm\\ &= \frac{40}{\sqrt{21}}cm\\ \text{In } ADHE,\ AH &= \sqrt{AD^2 + DH^2}\\ &= \sqrt{\left(\frac{40}{\sqrt{21}}\right)^2 + 10.5^2}\\ &= \sqrt{\frac{15661}{84}}cm\end{aligned}$$



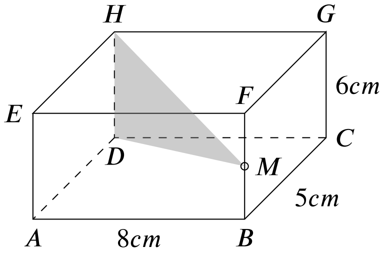
$$\begin{aligned}\tan\angle GAH &= \frac{GH}{AH}\\ &= \frac{\frac{40}{\sqrt{21}}}{\sqrt{\frac{15661}{84}}}\\ \angle GAH &\approx 17.73^\circ\end{aligned}$$

4. The diagram below shows a reception room with a square floor with side length of $6m$. Given that the elevation angle of corner C measured from corner A is

$30°$, find the angle formed by the line connecting corner A and B with the floor.



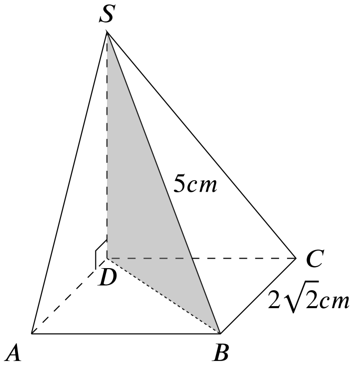
5. The diagram below shows a cuboid with length of $8cm$, width of $5cm$ and height of $6cm$, M is the midpoint of BF. Find the angle formed by plane HDM and plane $ADHE$.



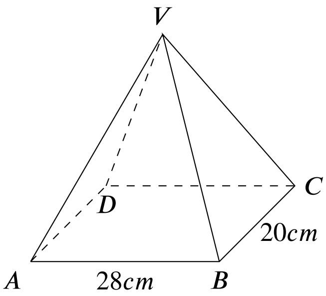
6. The diagram below shows a pyramid with a square base, its lateral edge SD is perpendicular to its base. Given that $BC = 2\sqrt{2}cm$, $SB = 5cm$. Find:

   (a) The angle formed by plane SAD and plane SBD.

   (b) The angle formed by lateral edge SA and base $ABCD$.



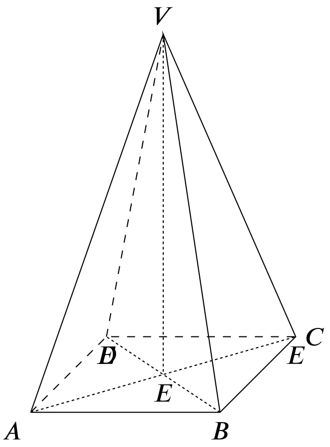
7. The diagram below shows a right prism with a rectangular base $ABCD$ with length of $28cm$ and width of $20cm$. Assume that plane VBC and the base of the pyramid forms a $60°$ angle. Find the angle formed by plane VAB and the base.



8. The diagram below shows a regular cuboid with a square base. Given that $VE = \frac{5}{2}AD$. Find:

   (a) The angle formed by the angle VA and the base $ABCD$.

   (b) The angle formed by plane VAD and the base.



9. Find the distance from the Panama City($9°N, 79°30'W$) to Toronto ($43°45'N, 79°30'W$). (Express your answer in nautical miles)

10. Tokyo and Adelaide are located at the same longitude, their latitude are $35°45'N$ and $35°S$ respectively. Find the distance between two cities along the parallel of latitude.

11. A plane flies $2000NM$ along the equator, Find the difference of longitude between the point of departure and the destination.

12. Location M and N are both located at the parallel of latitude 45° north to the equator with a difference in longitude of 20°. Find the distance between M and N along the parallel of latitude. (Express your answer in nautical miles)

13. Location X and Y are on the parallel of latitude 20° north to the equator, their longitude are $45°E$ and $80°E$ respectively. Find the distance between location X and Y along the parallel of latitude. (Express your answer in nautical miles)

14. A plane flies from $A(42°E)$ to $B(20°E)$ along the equator, then it flies from B due north to $C(30°N)$. Find the distance the plane flies in total.

15. Assume that A is located $1000NM$ due north of the equator, $600NM$ due east of the Greenwich Meridian, find the longitude and latitude of A.

16. A plane flies from $P(15^\circ N, 30^\circ E)$ $2000NM$ due south to B, find the longitude and latitude of B. Another plane flies from P $3000NM$ due east to C, find the longitude and latitude of C.

17. A plane flies from $A(130^\circ E)$ along the equator to $B(120^\circ 30' E)$ along the equator, then flies from B due north to $C(20^\circ 45')$. Assume that the average speed of the plane is $300NM/hr$ throughout the journey, find the flight duration for the whole journey.

18. A plane flies from $A(50^\circ N, 10^\circ E)$ due east to $B(45^\circ E)$.
    (a) Find the flight distance of the plane. (Express your answer in nautical miles)
    (b) Assume that the speed of the plane is $420NM/hr$ in average, find the flight duration of the plane.

19. Given that three locations P, Q and R are located on the same parallel of latitude 40° north to the equator, The longitude of P and R are $10^\circ 30' W$ and $4^\circ 30' E$, Q is located at the middle of P and R.
    (a) Find the difference of longitude between P and R.
    (b) Find the longitude of Q.
    (c) Find the distance between P and R along the parallel of latitude.
    (d) A ship sails from P to Q along the parallel of latitude with a speed of $18NM/hr$, find the sailing duration of the ship.