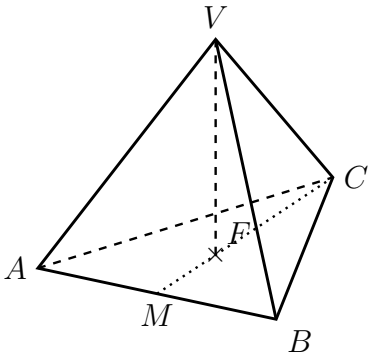
3D Trigonometry & Pyramids

Practice Worksheet (Edexcel GCSE 1MA1 Nov 2024 2H Style)

I Do

$VABC$ is a solid pyramid. ABC is an equilateral triangle.



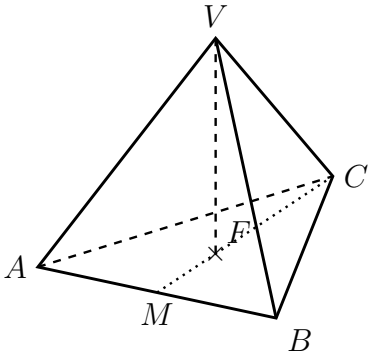
M is the midpoint of AB. F is the point on MC such that $MF : FC = 1 : 2$.
The vertex V is vertically above F. $VA = VB = VC$.

$VF = 8$ cm Angle $VCM = 52°$

Work out the side length of the equilateral triangle ABC. Give your answer correct to 1 decimal place.

We Do

$VABC$ is a solid pyramid. ABC is an equilateral triangle.



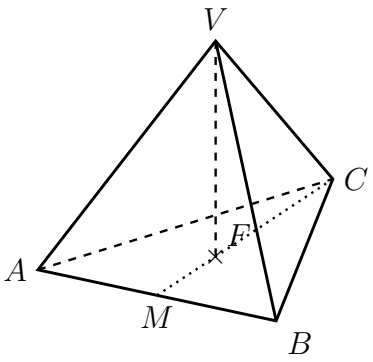
M is the midpoint of AB. F is the point on MC such that $MF : FC = 1 : 2$.
The vertex V is vertically above F. $VA = VB = VC$.

$VF = 10$ cm Angle $VCM = 48°$

Work out the side length of the equilateral triangle ABC. Give your answer correct to 1 decimal place.

You Do

$VABC$ is a solid pyramid. ABC is an equilateral triangle.

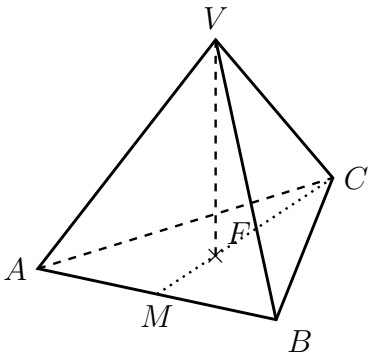


M is the midpoint of AB. F is the point on MC such that $MF : FC = 1 : 2$.
The vertex V is vertically above F. $VA = VB = VC$.
$VF = 12$ cm Angle $VCM = 55°$

Work out the side length of the equilateral triangle ABC. Give your answer correct to 1 decimal place.

Challenge

$VABC$ is a solid pyramid. ABC is an equilateral triangle.



M is the midpoint of AB. F is the point on MC such that $MF : FC = 1 : 2$.
The vertex V is vertically above F. $VF = 9$ cm and Angle $VCM = 50°$.

(a) Work out the side length of the equilateral triangle ABC. Give your answer correct to 1 decimal place.

(b) Work out the volume of the pyramid $VABC$. Give your answer correct to 1 decimal place.

Answers & Worked Solutions

- **I Do:**
  1. In right-angled $\triangle VFC$ ($\angle VFC = 90°$ and $\angle VCF = 52°$):
  $$\tan(52°) = \frac{VF}{FC} = \frac{8}{FC} \implies FC = \frac{8}{\tan(52°)} \approx 6.2503 \text{ cm}$$
  2. Since $MF : FC = 1 : 2$, $FC = \frac{2}{3}MC \implies MC = \frac{3}{2}FC = \frac{3}{2}(6.2503) = 9.3754$ cm.
  3. In equilateral $\triangle ABC$ with side length s, $MC = s\sin(60°) = s\frac{\sqrt{3}}{2}$.
  4. Solve for s: $s = \frac{9.3754}{\sin(60°)} = \frac{2(9.3754)}{\sqrt{3}} \approx 10.8258 \implies$ **10.8** cm (1 dp).

- **We Do:**
  1. $FC = \frac{10}{\tan(48°)} \approx 9.0040$ cm.
  2. $MC = 1.5 \times 9.0040 = 13.5061$ cm.
  3. Side length $s = \frac{13.5061}{\sin(60°)} \approx 15.5955 \implies$ **15.6** cm (1 dp).

- **You Do:**
  1. $FC = \frac{12}{\tan(55°)} \approx 8.4025$ cm.
  2. $MC = 1.5 \times 8.4025 = 12.6037$ cm.
  3. Side length $s = \frac{12.6037}{\sin(60°)} \approx 14.5535 \implies$ **14.6** cm (1 dp).

- **Challenge:**
  1. $FC = \frac{9}{\tan(50°)} \approx 7.5519$ cm $\implies MC = 1.5 \times 7.5519 = 11.3279$ cm.
  2. (a) Side length $s = \frac{11.3279}{\sin(60°)} \approx 13.0803 \implies$ **13.1** cm (1 dp).
  3. (b) Base Area $= \frac{\sqrt{3}}{4}s^2 = \frac{\sqrt{3}}{4}(13.0803)^2 \approx 74.0856$ cm^2.
  Volume $= \frac{1}{3} \times$ Base Area $\times$ Height $= \frac{1}{3}(74.0856)(9) \approx 222.2569 \implies$ **222.3** cm^3 (1 dp).