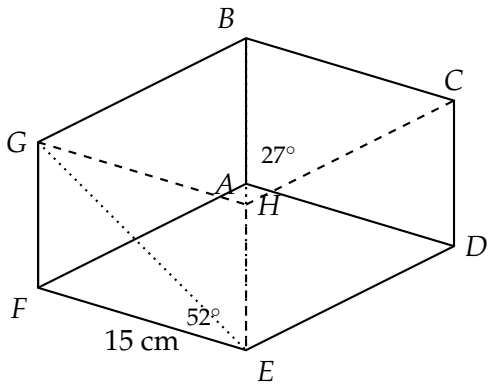
3D Trigonometry Cuboids Worksheet

Calculating Angles and Lengths in 3D Shapes

Reference: Edexcel GCSE 1MA1 / Higher Tier / Paper 2H / Q19

I Do

$ABCDEFGH$ is a cuboid.



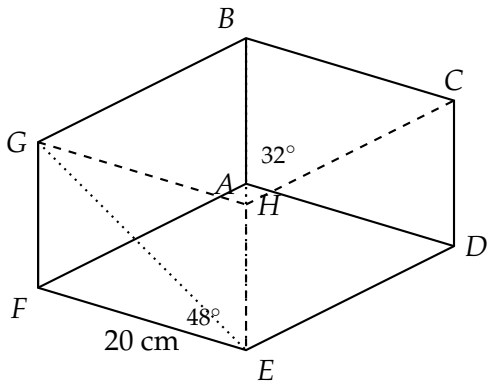
Angle $GEF = 52°$, Angle $BHG = 27°$, and $EF = 15$ cm.

Work out the size of angle GEB. Give your answer to the nearest degree.

(Total for Question 1 is 4 marks)

We Do

$ABCDEFGH$ is a cuboid.



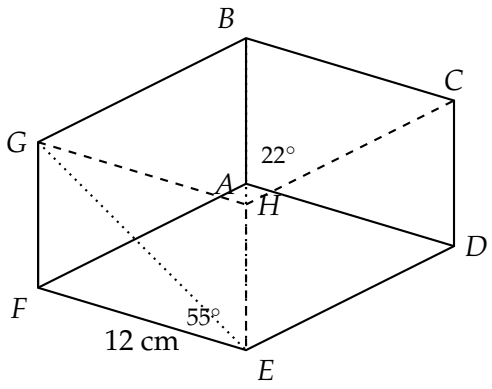
Angle $GEF = 48°$, Angle $BHG = 32°$, and $EF = 20$ cm.

Work out the size of angle GEB. Give your answer to the nearest degree.

(Total for Question 2 is 4 marks)

You Do

$ABCDEFGH$ is a cuboid.



Angle $GEF = 55°$, Angle $BHG = 22°$, and $EF = 12$ cm.

Work out the size of angle GEB. Give your answer to 1 decimal place.

(Total for Question 3 is 4 marks)

Challenge

$ABCDEFGH$ is a cuboid where $EF = 18$ cm, Angle $GEF = 50°$, and Angle $GEB = 25°$.

Work out the length of BH. Give your answer to 3 significant figures.

(Total for Question 4 is 5 marks)

Answers & Worked Solutions

• **I Do:**

1. In right-angled $\triangle GFE$ ***(bottom face):***

$\cos(52°) = \frac{EF}{EG} \implies EG = \frac{15}{\cos(52°)} \approx 24.365$ ***cm***

2. In right-angled $\triangle BGH$ ***(top face,*** $GH = EF = 15$ ***cm):***

$\tan(27°) = \frac{BG}{GH} \implies BG = 15\tan(27°) \approx 7.643$ ***cm***

3. In right-angled $\triangle BGE$ ***(vertical triangle,*** $BG \perp EG$***):***

$\tan(\angle GEB) = \frac{BG}{EG} = \frac{7.643}{24.365} \approx 0.31369 \implies \angle GEB = \tan^{-1}(0.31369) \approx 17.41°$

Answer: $17°$ ***(to nearest degree)***

• **We Do:**

1. Find EG ***in*** $\triangle GFE$***:*** $EG = \frac{20}{\cos(48°)} \approx 29.889$ ***cm***

2. Find BG ***in*** $\triangle BGH$***:*** $BG = 20\tan(32°) \approx 12.497$ ***cm***

3. Find $\angle GEB$ ***in*** $\triangle BGE$***:***

$\tan(\angle GEB) = \frac{12.497}{29.889} \approx 0.41812 \implies \angle GEB = \tan^{-1}(0.41812) \approx 22.69°$

Answer: $23°$ ***(to nearest degree)***

• **You Do:**

1. Find EG ***in*** $\triangle GFE$***:*** $EG = \frac{12}{\cos(55°)} \approx 20.921$ ***cm***

2. Find BG ***in*** $\triangle BGH$***:*** $BG = 12\tan(22°) \approx 4.848$ ***cm***

3. Find $\angle GEB$ ***in*** $\triangle BGE$***:***

$\tan(\angle GEB) = \frac{4.848}{20.921} \approx 0.23173 \implies \angle GEB = \tan^{-1}(0.23173) \approx 13.04°$

Answer: $13.0°$ ***(to 1 d.p.)***

• **Challenge:**

1. In $\triangle GFE$***:*** $EG = \frac{18}{\cos(50°)} \approx 28.003$ ***cm***

2. In $\triangle BGE$***:*** $BG = EG\tan(25°) = 28.003 \times \tan(25°) \approx 13.058$ ***cm***

3. In right-angled $\triangle BGH$***:*** $BH = \sqrt{BG^2 + GH^2} = \sqrt{13.058^2 + 18^2} \approx \sqrt{494.51} \approx 22.238$ ***cm***

Answer: 22.2 ***cm (to 3 s.f.)***