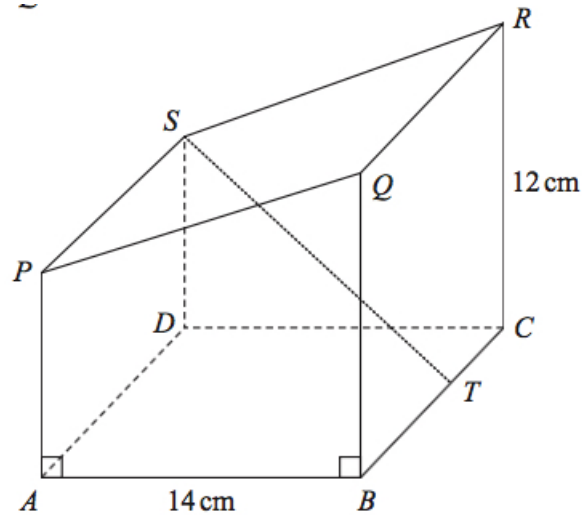


**Dr Oliver Mathematics**  
**Worked Examples**  
**Angle 1**

**From:** Edexcel GCSE Mathematics June 2022 Paper 3H (Calculator)

1. Here is a prism  $ABCDSPQR$ .

(5)



The base  $ABCD$  of the prism is a square of side  $14\text{ cm}$ .  
 $T$  is the point on  $BC$  such that  $BT : TC = 4 : 3$ .

The cross-section of the prism is in the shape of a trapezium of area  $147\text{ cm}^2$ .  
 $CR = 12\text{ cm}$ .

Find the size of the angle between the line  $ST$  and the base  $ABCD$ .  
Give your answer correct to 1 decimal place.

**Solution**

We want to find the  $\angle DTS$ . Now,

$$BT : TC = 4 : 3 \Rightarrow BT : TC = 8 : 6$$

so that makes  $TC = 6\text{ cm}$ .

Next,

$$\begin{aligned}DT^2 &= CD^2 + TC^2 \Rightarrow DT^2 = 14^2 + 6^2 \\ &\Rightarrow DT^2 = 196 + 36 \\ &\Rightarrow DT^2 = 232 \\ &\Rightarrow DT = 2\sqrt{58} \text{ cm.}\end{aligned}$$

Now, the cross-section of the prism is in the shape of a trapezium of area  $147 \text{ cm}^2$ . If we use the rear face,  $CDSR$ , we get

$$\begin{aligned}\frac{1}{2} \times 14 \times (SD + 12) &= 147 \Rightarrow SD + 12 = 21 \\ &\Rightarrow SD = 9.\end{aligned}$$

Finally,

$$\begin{aligned}\tan = \frac{\text{opp}}{\text{adj}} &\Rightarrow \tan DTS = \frac{9}{2\sqrt{58}} \\ &\Rightarrow \angle DTS = 30.577\,946\,78 \text{ (FCD)} \\ &\Rightarrow \underline{\underline{\angle DTS = 30.6^\circ \text{ (1 dp)}}}.\end{aligned}$$