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## 9.2 The Sine rule

1) a) $\frac{x}{\sin 45} = \frac{10}{\sin 80}$

$x = \frac{10 \sin 45}{\sin 80}$

$x = 7.18015$

$\hookrightarrow 7.18\text{cm}$

b) $\frac{x}{\sin 12} = \frac{25}{\sin 100}$

$x = \frac{25 \sin 12}{\sin 100}$

$x = 5.2779$

$\hookrightarrow 5.28\text{cm}$

c) $\frac{x}{\sin 90} = \frac{14}{\sin 70}$

$x = \frac{14 \sin 90}{\sin 70}$

$x = 14.8984$

$\hookrightarrow 14.9\text{cm}$

2) a) $\frac{\sin\theta}{7} = \frac{\sin 95}{10}$

$\sin^{-1}\left(\frac{7 \sin 95}{10}\right)$

$\theta = 44.2136$

$\hookrightarrow 44.2°$

b) $\frac{\sin\theta}{9} = \frac{\sin 65}{12}$

$\sin^{-1}\left(\frac{9 \sin 65}{12}\right)$

$\theta = 42.822$

$\hookrightarrow 42.8°$

c) $\frac{\sin \angle ACB}{6.8} = \frac{\sin 100}{12.5}$

$\sin^{-1}\left(\frac{6.8 \sin 100}{12.5}\right)$

$\angle ACB = 32.39°$

$180 - (100 + 32.39)$

$= 47.6°$

$\theta = 47.6°$

3) a) $(8)^2 + (10)^2 - 2(8)(10)\cos(80)$

$= 136.21$

$\sqrt{136.21} = 11.67\text{ cm}$ ← length of AC

$\frac{\sin\angle ADC}{11.67} = \frac{\sin 35}{7}$

$\sin^{-1}\left(\frac{11.67\sin 35}{7}\right)$

$\angle ADC = 72.98°$

↳ $73.0°$

b) $\frac{CD}{\sin 72} = \frac{7}{\sin 35}$

$CD = \frac{7\sin 72}{\sin 35}$

$CD = 11.6068$

↳ $11.6\text{ cm}$

4) a) $\frac{\sin x}{6} = \frac{\sin 40}{4}$

$\sin x = \frac{6\sin 40}{4}$

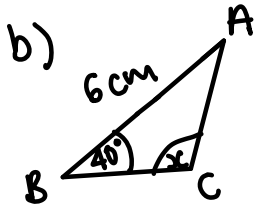
$\sin^{-1}\left(\frac{6\sin 40}{4}\right)$

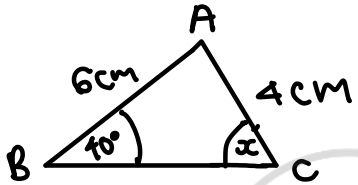
$= 74.6°$

$180 - 74.6 = 105.4°$

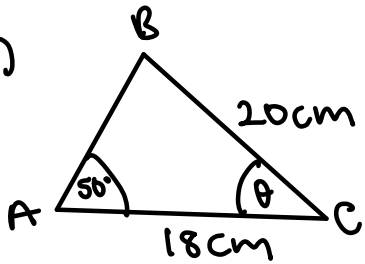
$\angle ACB = 74.6°, 105.4°$

b)




5)




$$\frac{\sin\theta}{18} = \frac{\sin 50}{20}$$

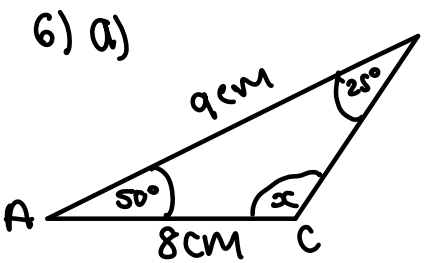
$$\sin\theta = \frac{18\sin 50}{20}$$

$$\sin^{-1}\left(\frac{18\sin 50}{20}\right) = 43.5857$$

$$180 - (43.5857 + 60) = 86.4°$$

$$\theta = 86.4°$$

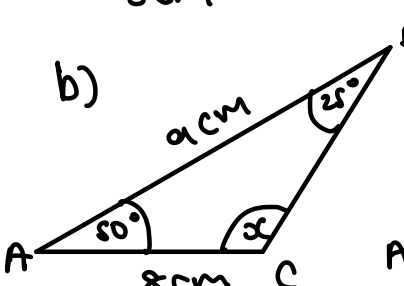
6) a)

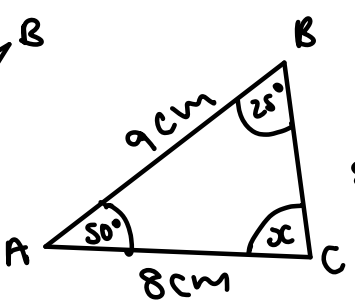



$$\sin x = \frac{9\sin 25}{8}$$

$$\sin x = 0.475$$

b)




$$\frac{\sin x}{9} = \frac{\sin 25}{8}$$

$$\sin^{-1}\left(\frac{9\sin 25}{8}\right)$$

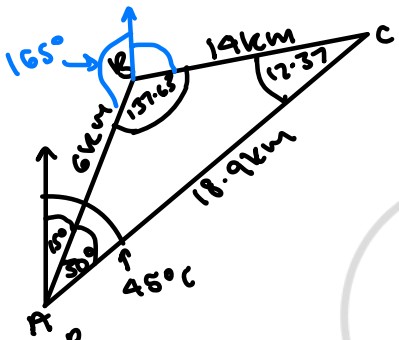
$$= 28.388$$

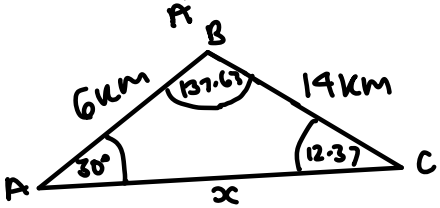
$$\hookrightarrow 28.39°$$

$$180 - 28.39 = 151.61°$$

$$x = 28.39°, 151.61°$$

7) a)




$$\frac{\sin\theta}{6} = \frac{\sin 30}{14}$$

$$\sin^{-1}\left(\frac{6\sin 30}{14}\right) = 12.37$$

$$180 - (30 + 12.37) = 137.63$$

$$\frac{x}{\sin 132.62} = \frac{14}{\sin 30}$$

$$x = \frac{14\sin 137.63}{\sin 30}$$

$$x = 18.86$$

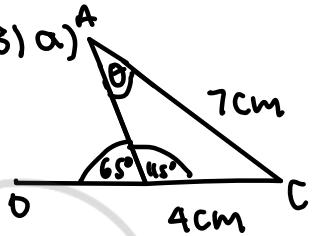
↳ 18.9km

b) $180 - 15 = 165°$

$$360 - (165 + 137.63) = 57.37$$

↳ 057°

8) a)




$180 - 65 = 115°$

$$\frac{\sin\theta}{4} = \frac{\sin 115}{7}$$

$$\sin^{-1}\left(\frac{4\sin 115}{7}\right)$$

$\theta = 31.19$

↳ 31.2°

b)


$180 - (31.19 + 115)$

$\angle ACB = 33.81$

$180 - 33.81 = 146.19°$

↳ $\angle ACD$

$180 - (15 + 146.19) = 18.81°$

↳ $\angle ADC$

$$\frac{x}{\sin 146.19} = \frac{7}{\sin 18.8}$$

$$x = \frac{7\sin 146.19}{\sin 18.8}$$

$x = 12.08$

↳ 12.1cm

c) $$\frac{CD}{\sin 15} = \frac{12.08}{\sin 146.19}$$

$$CD = \frac{12.08\sin 15}{\sin 146.19}$$

$CD = 5.618$

↳ 5.62cm

9) $\frac{4x-3}{\sin\frac{\sqrt{3}}{2}} \overset{\times 2}{=} \frac{2x+1}{\sin 3/4} \overset{\times 4}{}$

$\frac{2(4x-3)}{\sqrt{3}} = \frac{4(2x+1)}{3}$

$\frac{8x-6}{\sqrt{3}} = \frac{8x+4}{3}$

$3(8x-6) = \sqrt{3}(8x+4)$

$24x - 18 = 8\sqrt{3}x + 4\sqrt{3}$

$24x - 8\sqrt{3}x = 4\sqrt{3} + 18$

$x(24 - 8\sqrt{3}) = 4\sqrt{3} + 18$

$x = \frac{4\sqrt{3}+18}{24-8\sqrt{3}} \times \frac{24+8\sqrt{3}}{24+8\sqrt{3}}$

$x = \frac{96\sqrt{3} + 96 + 432 + 144\sqrt{3}}{576 + 192\sqrt{3} - 192\sqrt{3} - 192}$

$= \frac{240\sqrt{3} + 528}{384}$ 11 5 8

$x = \frac{11+5\sqrt{3}}{8}$