

Author: Brunelle Ndongala

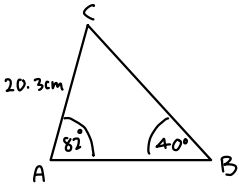
This step-by-step solution guide has been created by **Brunelle Ndongala** for educational purposes. While we have made every effort to ensure the accuracy of the information presented, it is possible that there may be errors or omissions. We encourage users to critically evaluate and verify the content. BF Maths and the author cannot be held responsible for any errors or inaccuracies in this guide.

If you find any mistakes or have any suggestions for improvements, please contact us at bfmathshello@gmail.com. Your feedback is invaluable in helping us maintain the quality and accuracy of our resources. Please specify which exercise and which question in the email.

Thank you for using BF Maths for your maths revision!

Problem Solving: Set A

Bronze



$$a) \frac{20.3}{\sin 40} = \frac{BC}{\sin 82}$$

$$BC = \frac{20.3}{\sin 40} \times \sin 82$$

$$BC = 31.3 \text{ cm (3 sf)}$$

$$b) \angle ACB = 180^\circ - (82^\circ + 40^\circ) = 58^\circ$$
$$\frac{1}{2} \times 20.3 \times 31.3 \times \sin 58$$
$$= 269 \text{ cm}^2 \text{ (3 sf)}$$

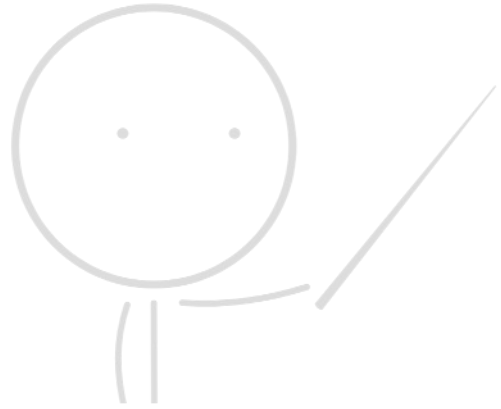
$$c) \frac{20.3}{\sin 40} = \frac{AB}{\sin C}$$

$$\frac{20.3}{\sin 40} = \frac{AB}{\sin 58}$$

$$AB = \frac{20.3}{\sin 40} \times \sin 58$$

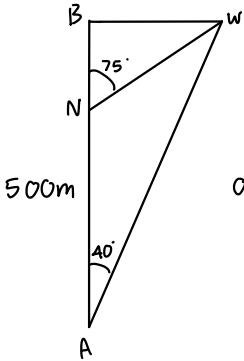
$$AB = 26.8 \text{ cm (3 sf)}$$

$$\text{Perimeter} = 20.3 + 26.8 + 31.3$$
$$= 78.4 \text{ cm (3 sf)}$$



BF MATHS

Silver



$$\begin{aligned} \text{a) } \angle ANW &= 180^\circ - 75^\circ = 105^\circ \\ \angle NWA &= 180^\circ - (105^\circ + 40^\circ) = 35^\circ \end{aligned}$$

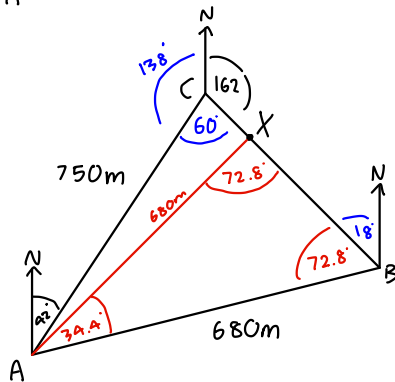
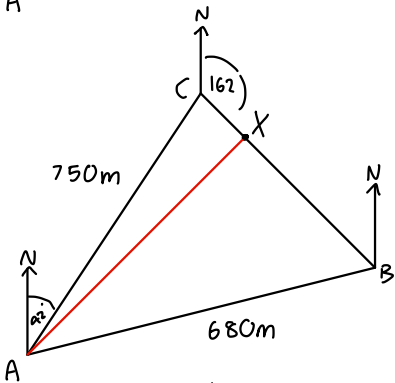
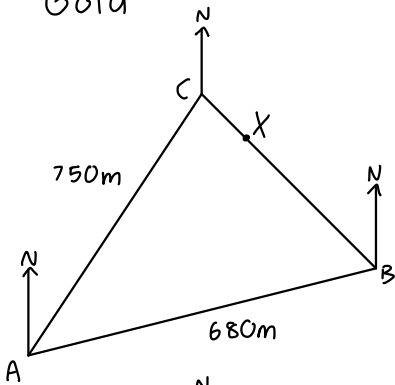
$$\frac{500}{\sin 35} = \frac{NW}{\sin 40}$$

$$NW = \frac{500}{\sin 35} \times \sin 40$$

$$NW = 560\text{m (3 sf)}$$

$$\begin{aligned} \text{b) } BW &= \sin \theta \times NW \\ &= \sin 75 \times 560 \\ &= 541\text{m (3 sf)} \end{aligned}$$

Gold



$$\begin{aligned} \text{a) } \angle CBA &= \frac{\sin 60}{680} = \frac{\sin B}{750} \\ \sin B &= \sin^{-1} \frac{\sin 60}{680} \times 750 \\ &= 72.7799991^\circ \end{aligned}$$

$$AX = 680\text{m}$$

$$\therefore \angle AXB = 72.7799991^\circ$$

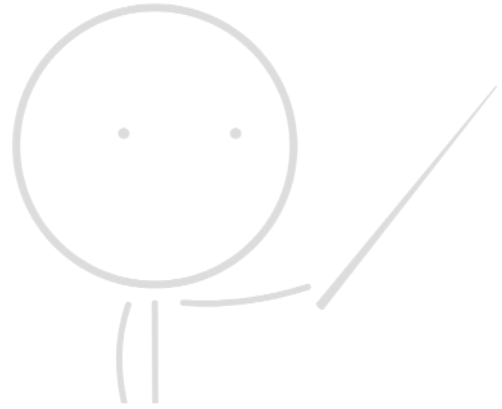
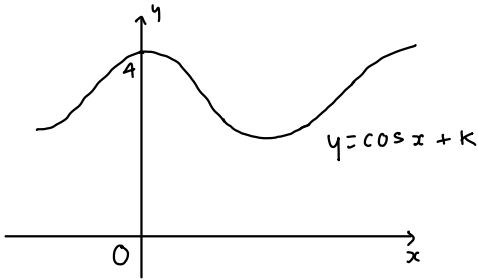
$$\begin{aligned} \angle XAB &= 180^\circ - (72.8^\circ \times 2) \\ &= 34.400018^\circ \end{aligned}$$

$$\begin{aligned} XB^2 &= 680^2 + 680^2 - 2(680)(680) \times \cos 34.4 \dots \\ XB &= \sqrt{680^2 + 680^2 - 2(680)(680) \times \cos 34.4 \dots} \\ &= 403\text{m (3sf)} \end{aligned}$$

$$\begin{aligned} \text{b) } &360 - (18 + 72.8) \\ &= 269^\circ \text{ (nearest degree)} \end{aligned}$$

Problem Solving: Set B

Bronze



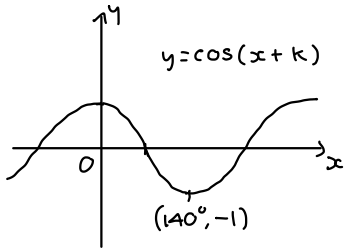
BF MATHS

a) max. value of $y = \cos x = 1$
max. value of $y = \cos x + k = 4$
 $\therefore k = 3$

b) $k = 3 \rightarrow y = \cos x + 3$
min. value of $y = \cos x = -1$
 \therefore min. value of $y = \cos x + k = 2$
 \therefore min. coordinates = $(-180^\circ, 2)$ and $(180^\circ, 2)$

c) $y = \cos x + A$ crosses the y-axis at $(0, A+1)$
as $A+1$ refers to the graph moving towards
the left

Silver



a) $y = \cos x$ has min. point of $(180^\circ, -1)$
 $\therefore k = 180^\circ - 140^\circ$
 $\therefore k = 40$

b) $y = \cos(x+40^\circ) \therefore$ translate by vector $\begin{pmatrix} -40^\circ \\ 0 \end{pmatrix}$
 \therefore roots = $-130^\circ, 50^\circ, 230^\circ$

c) Period of graph = 360°
 $\therefore k$ can be any value from $40 \pm 360n$
 $\therefore k = 400$

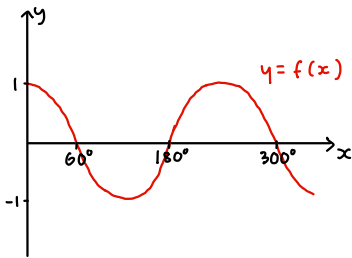
Gold

a) $f(x) = 0.5$
 $f(x) = \cos kx$

$$k = 0.5$$
$$2k = 1$$

∴ there are $2k$ solutions

b) $y = \cos 1.5x \rightarrow$ stretch by scale factor $\frac{2}{3}$ parallel to the x -axis



c) $\cos kx = 0.5 \quad kx = \theta$
 $\cos \theta = 0.5$
 $\cos^{-1} 0.5 = 60^\circ$

$$\theta = 60^\circ \quad (360^\circ - 60^\circ)$$
$$\therefore \theta = 60^\circ, 300^\circ$$
$$\theta = 420^\circ \quad (360^\circ + 60^\circ)$$

∴ first three solutions = $60^\circ, 300^\circ, 420^\circ$

↳ graph must end on at least 420° for a regular cosine curve to have three solutions ($0 \leq \theta \leq 420^\circ$)

$$\frac{420}{360} = \frac{7}{6}$$

Gold c) continued

fourth solution = 660° ($300^\circ + 360^\circ$)

\therefore graph must end before 660° or there will be too many solutions

$$\therefore \frac{660}{360} = \frac{11}{6}$$

Use values to write an inequality for k

$$\frac{7}{6} \leq k \leq \frac{11}{6}$$

BF MATHS
