## Section 7.7 - Applications of Trigonometry

This booklet belongs to: Block:

- The LAW of SINES and LAW of COSINES are very useful when solving 'real' world problems
- Remember that using the LAW of COSINES for SSS triangles, solve for the largest angle first
- Remember that using the LAW of COSINES for SAS triangles, solve for the smallest angle first

Example 1: To measure the length of a lake, a baseline $A B$ is set and measured at 130 m . Angles $A$ and $B$ are measured to be $42^{\circ}$ and $125^{\circ}$ respectively. How long is the lake?

## Solution 1:



Example 2: A ship is heading due east and passes a rock $A$. At the time, the bearing to the lighthouse L is $N 60^{\circ} E$. After travelling 5 km , the bearing is $N 40^{\circ} E$. How far is the ship from the lighthouse?

## Solution 2:



$$
\begin{array}{lr}
\angle A=90-60 & \frac{a}{\sin 30}=\frac{5}{\sin 2} \\
\angle A=30^{\circ} & a=7.3 \\
\angle B=90+40 & a \\
\angle L=180-130-30 & 7.3 \mathrm{~km}
\end{array}
$$

Example 3: The length of the sides of a triangular parcel of land are approximately $300 \mathrm{~m}, 400 \mathrm{~m}$, and 600 m . Approximate the area of the parcel of land

## Solution 3:


$\angle A$ nose


$$
\begin{aligned}
& \angle B=117.3 \quad \angle A= \\
& A=\frac{600(177.6)}{2}=53327 \mathrm{~m}^{2}
\end{aligned}
$$

$$
\angle A=36.3^{\circ}
$$

Example 4: To approximate the length of a lake, a surveyor triangulates the distance to one side to be 950 m and to the other 800 m . If the angle between the two measures $100^{\circ}$, how long is the lake?

## Solution 4:



$$
\begin{aligned}
& d^{2}=950^{2}+800^{2}-2(950)(800) \cos 100^{\circ} \\
& d^{2}=1806445.23 \\
& d=1344 \\
& 1344 m
\end{aligned}
$$

## Section 7.7 - Practice Questions

1. A hot air balloon is flying directly between two cities that are 4 km apart. The balloonist finds that the angle of depression to one city is $38^{\circ}$ and $33^{\circ}$ to the other city. How high above the ground is the balloon?
2. Two planes leave airport A at the same time in different directions. One plane lands at airport $B$, 630 km from airport $A$. The other plane lands at airport $C$ some time later. If the $\angle A B C=110^{\circ}$ and $\angle A C B=40^{\circ}$, how far did the second plane fly.
3. Two planes leave Victoria at 9 am . One plane travels due east at $500 \mathrm{~km} / \mathrm{h}$, while the other plane travels $640 \mathrm{~km} / \mathrm{h} N 30^{\circ} \mathrm{W}$. How far apart are the two planes at noon?
4. In our solar system, the distance from the Sun $(S)$ to planets $A$ and $B$ are 85 and 61 million miles respectively. When $\angle A=20^{\circ}$, how far is it from planet $A$ to planet $B$ and $B^{\prime}$ ?


## Answer Key - 7.7

| 1. | 1.42 km |
| :--- | :--- |
| 2. | 921 km |
| 3. | 2969.2 km |
| 4. | $A B^{\prime}=133.6$ million miles $; A B=26.4$ million miles |

Extra Work Space

