Unit/Chapter: Measurement
Topic: Pythagorean Theorem

II homework check: NPM 9 p. 440 \# 1-5, 7, 10
\# note: Pythagorean Theorem
The Pythagorean Theorem describes both a geometric and algebraic relationship between the three sides of a right angled triangle.


The most common mistakes when working with the Pythagorean Theorem are either substituting numbers incorrectly or forgetting to square root to find the unknown. The variables in the algebraic representation are really irrelevant as it is the position of the variables that hold significance. This is why words can be used to state the theorem: "the square of the hypotenuse is equal to the sum of the squares of the other two sides". Note that the hypotenuse is the only singular side and it holds the most relevance in this theorem.

In geometry, the Pythagorean Theorem is necessary to find the slant height of cones or pyramids. This slant height is needed to find the surface area of pyramids and cones.

For example, find the unknown measurements.


$$
\begin{aligned}
& 38^{2}=16^{2}+x^{2} \\
& 1444=256+x^{2} \\
& \sqrt{1444-256}=x \\
& x=34.5 m \\
& 16^{2}=12^{2}+y^{2} \\
& 256=144+y^{2} \\
& \sqrt{256-144}=y \\
& y=10.6 m \\
& z=38-10.6 \\
& z=27.4 m
\end{aligned}
$$

Find the surface area of the following pyramid.


Base of Triangle:
$b=\frac{7.4}{2}$
$b=3.7 \mathrm{~mm}$

Slant Height (triangle height):
$c^{2}=3.7^{2}+8.3^{2}$
$c=\sqrt{13.69+68.89}$
$c=9.1 \mathrm{~mm}$
There are four sides to this pyramid, each the same triangle shape.
height of triangle $=9.1 \mathrm{~mm}$ and base of triangle $=7.4 \mathrm{~mm}$
$A=4\left(\frac{1}{2}\right)(7.4)(9.1)$
$A=134.7 \mathrm{~mm}^{2}$
The base of the pyramid is a square with sides $=7.4 \mathrm{~mm}$
$A=7.4^{2}$
$A=54.8 \mathrm{~mm}^{2}$
Therefore, the total surface area of the pyramid is

$$
\begin{aligned}
& A_{\text {total }}=134.7+54.8 \\
& A_{\text {total }}=189.5 \mathrm{~mm}^{2}
\end{aligned}
$$

\# homework assignment: NPM 9 p. 446 \#3-7, 9

