

# MAT 106 – Technical Math

## Learning Outcomes with Example Problems

- (Application Level) Perform basic operations with whole numbers, fractions, decimals and percent.

**EXAMPLES:**

Add.	Divide	Multiply	Percent
$\begin{array}{r} 137 \\ \underline{208} \end{array}$	$1\frac{1}{2} \div \frac{1}{6}$	$0.002 \times 36.78$	What percent of 660 is 13.20?

- (Application Level) Convert fractions to decimals to percent in any order.

**EXAMPLES:**

Convert the following fraction into a percent. <div style="text-align: center; margin-top: 20px;"> <math display="block">3\frac{7}{8}</math> </div>	Represent the percent as a fraction in lowest terms <div style="text-align: center; margin-top: 20px;"> <math display="block">2\frac{3}{5}\%</math> </div>
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- (Synthesis Level) Use data represented in graphs to draw conclusions.
- (Application Level) Solve applied percent problems involving mechanical efficiency, production waste, relative manufacturing error and tolerance.

**EXAMPLES:**

The volumetric efficiency of a certain engine is 88.9%. This means the actual airflow is 88.9% of the theoretic airflow. If the actual airflow is 227 cfm, what is the theoretic airflow for this engine?	Specifications call for a hole in a machined part to be 2.313 in. in diameter. If the hole is measured to be 2.319 in., what is the machinist's error?
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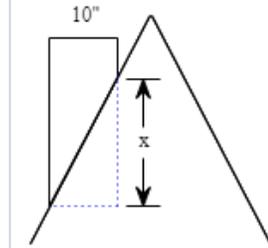
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5. (Analysis Level) Set-up and solve proportion problems including direct proportion, similar figures, roof pitch, scale drawings, etc.

**EXAMPLE:**

A cylindrical vent 10 in. in diameter must be cut at an angle to fit on a gable roof with a  $\frac{2}{5}$  pitch. This means that for the vent itself the ratio of rise to run will be 2 : 5. Find the height  $x$  of the cut that must be made on the cylinder to make it fit the slope of the roof. (See the figure.)



6. (Application Level) Solve applied inverse proportion problems involving gear ratios, lever arms, etc.

**EXAMPLE:**

A 30-tooth gear on a motor shaft drives a larger gear having 54 teeth. If the motor shaft rotates at 900 rpm, what is the speed of the larger gear?

7. (Application Level) Convert measurements from U. S. Customary units to metric and vice versa for length, weight, volume and temperature. Express converted quantities to a specified level of precision (e.g. to the nearest sixteenth inch).

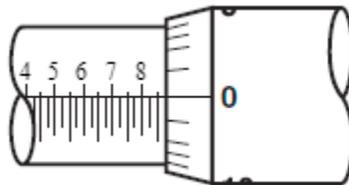
**EXAMPLE:**

<p>Which is performing more efficiently, a car getting 11 km per liter of gas or one getting 29 miles per gallon of gas?</p>	<p>Add or subtract as shown. Round your answer to the correct precision.</p> <p>39.4 psi + 36 psi + 7.9 psi</p>
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8. (Application Level) Make measurements using rulers, calipers and micrometers as well as using scales of the trade.

**EXAMPLE:**

Read the micrometer.

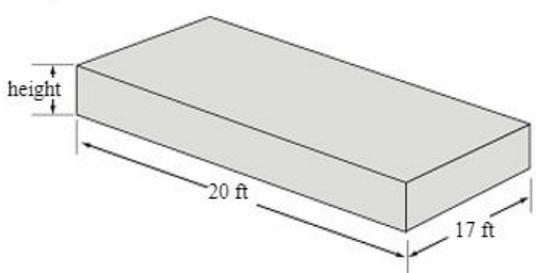
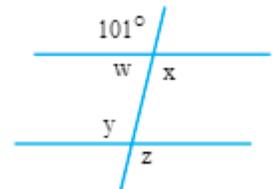


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9. (Analysis Level) Recognize basic shapes used in the trade, identify angles and find missing angle measures.

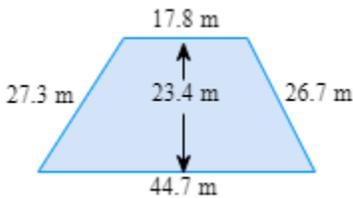
**EXAMPLE:**

<p>Find the height of the sole plate for the following object. The plate has a density of 482 lbs per cubic feet and a mass of 508,028 lbs. (note: dimensions are not to scale.)</p> <div style="text-align: center;">  </div>	<p>In the following figure, two parallel lines are cut by a third line. Find the measure of the other angles.</p> <div style="text-align: center;">  </div>
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10. (Application Level) Apply basic geometric concepts to solve problems involving area, perimeter and volume.

**EXAMPLE:**

Find the perimeter and area of the figure.



11. (Application Level) Apply differing strategies to solve application problems both with and without a calculator.

**EXAMPLE:**

At \$11.18 per foot for the curved portion and \$1.33 per foot for the straight portion, how much will it cost to put molding around the window pictured? Use  $\pi = 3.14$ .

