

MTH 202 - Quiz 8

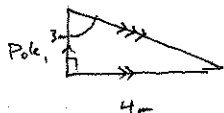
13 November 2015

Name: Solutions

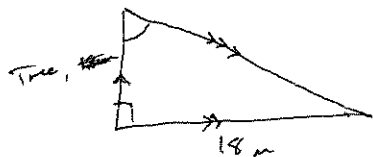
Show all your work to receive full credit on the following problems; carefully organize your solutions so that the work is clear. No calculators or other electronic devices are allowed on this quiz.

1. (5 points) Give a Teacher's Solution (starting with a diagram, and justifying every step) to the following problem:

A tree casts a shadow 18 m long while a 3 m long pole casts a shadow 4 m long. How tall is the tree?



$$\text{Ratio of shadows} = \frac{18 \text{ m}}{4 \text{ m}} = \frac{9}{2}$$



$$\therefore \text{Ratio of heights} = \frac{9}{2}$$

$$\therefore \text{Height of tree} = \frac{9}{2} \cdot 3 \text{ m} = \underline{\underline{\frac{27}{2} \text{ m}}}$$

Marked angles are equal (see // lines)

⇒ Similar triangles
by AA test.

(or 13.5 m).

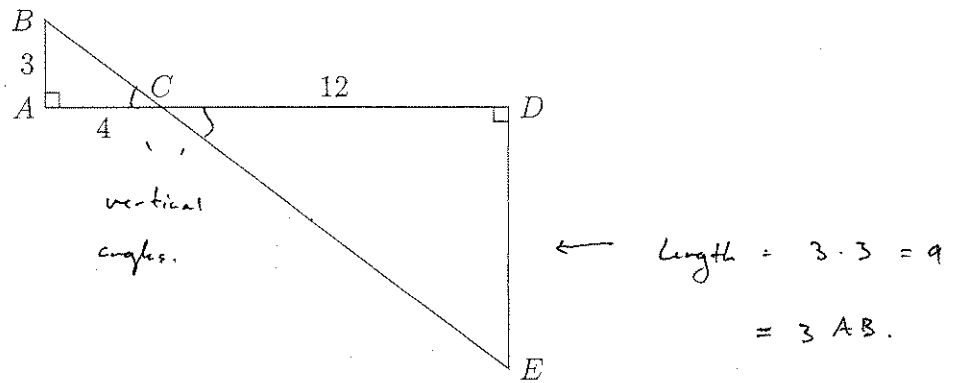
2. (8 points) Triangle $\triangle ABC$ contains a 60° angle, and triangle $\triangle DEF$ contains a 120° angle. Furthermore, we have

$$AB = 3DE \quad \text{and} \quad AC = 3DF$$

Is it possible that $BC = 3EF$? Explain why or why not.

No. This would mean that all three sides are proportional, so $\triangle ABC$ is similar to $\triangle DEF$. But the $\triangle ABC$ contains a 60° angle, a 120° angle, and another angle. The sum of angles is then more than 180° .

3. (4+4+4=12 points) Consider the figure. \overline{AD} and \overline{BE} are straight line segments.



(a) Why are the triangles similar?

AA test: $\angle BAC = 90^\circ = \angle EDC$
 $\angle ACB = \angle DCE$ vertical angles.

(b) What is the scale factor between the triangles?

CD corresponds to AC
 12 ————— 4

\therefore Ratio = $\frac{12}{4} = \underline{\underline{3}}$.

(c) What is the ratio of the areas of the triangles?

Area (ABC) = $\frac{1}{2} \cdot 3 \cdot 4 = 6$

Area (CDE) = $\frac{1}{2} \cdot 9 \cdot 12 = 54$

\therefore Ratio = $\frac{54}{6} = \underline{\underline{9}}$.

Note: Soon we'll see how area always changes like (scale factor)².

Here, $9 = 3^2$.