# Unit 5 - Trigonometry
## Congruent & Similar Triangles

*May 9/2016*

Definitions:

1. Ratio - a relationship between two quantities, usually expressed as a fraction.

$$\frac{3}{5} \text{ or } 3:5$$

2. Proportional - all ratios between   corresponding   sides are equal between two objects, and the ratio is called the   scale factor .

3. Congruent - two objects are   congruent   if they have the same dimensions and shape (the scale factor is 1)

4. Similar - objects are proportional, but not congruent (the scale factor is   not 1)

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Which shapes are congruent? proportional?
*similar?*
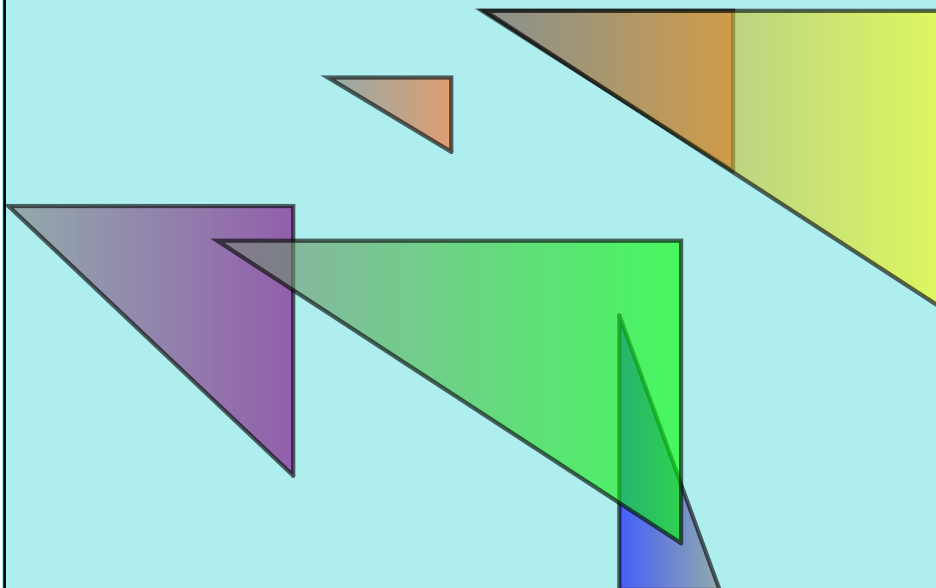


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Ex.1 Are the triangles congruent?  Similar?  Neither?

(a)

A
3      5
B ⌐     C
   4

X
10        6
Z ¬        Y
   8

1. Corresponding sides?
2. Calculate ratios

△ABC

△XYZ

$\dfrac{AB}{XY} = \dfrac{3}{6}$      $\dfrac{BC}{YZ} = \dfrac{4}{8}$      $\dfrac{AC}{XZ} = \dfrac{5}{10}$

$= \dfrac{1}{2}$          $= \dfrac{1}{2}$          $= \dfrac{1}{2}$

∴ all ratios are equal
∴ ratios are NOT 1

∴ △ABC ~ △XYZ

"is similar to"

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(b)

L

10        5

M      N

8        4

P        Q

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Recommend breaking overlapping triangles into
individual triangles.

$$10 + 8 = 18$$

$$5 + 4 = 9$$

$$\triangle LMN$$

$$\triangle LPQ$$

$$\frac{LM}{LP} = \frac{10}{18} \, \frac{5}{9} ; \quad \boxed{\frac{MN}{PQ} = \frac{?}{?}} \quad \frac{LN}{LQ} = \frac{5}{9}$$

$$= \frac{5}{9}$$

this ratio is also $\frac{5}{9}$ because of
the common angle between sides.

$$\therefore \triangle LMN \sim \triangle LPQ$$

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Summary:

If △ABC is similar to △XYZ,
we write:

   △ABC ~ △XYZ

\* the order that we
   write the vertices
   is important

We can show similarity (or congruence) by:
(a) side-side-side similarity (SSS~)
(b) side-angle-side similarity (SAS~)
(c) angle-angle similarity (AA~)

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In similar triangles
- <u>corresponding</u> sides are <u>proportional</u>
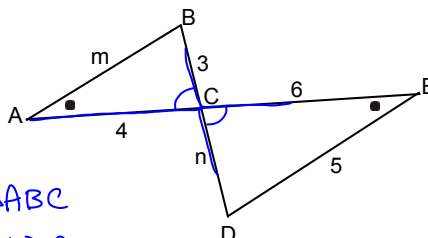  (i.e., the ratios are equal)
- <u>corresponding</u> angles are equal.

Given   △ABC ~ △XYZ

Ratios:     $\dfrac{AB}{XY} = \dfrac{BC}{YZ} = \dfrac{AC}{XZ}$

Angles:     <A = <X
                <B = <Y
                <C = <Z

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Ex.2 Determine the value of m & n.



△ABC
△EDC

∡A = ∡E (given)
∠ACB = ∠ECD (OAT)

∴ △ABC ~ △EDC (AA~)

① corresponding triangles
② similarity?
③ solve for m, n

$\dfrac{AB}{ED} = \dfrac{BC}{DC} = \dfrac{AC}{EC}$

$\dfrac{m^?}{5} = \dfrac{3}{n^?} = \dfrac{4}{6}$

$\dfrac{m}{5} = \dfrac{4}{6}$      $\dfrac{3}{n} = \dfrac{\cancel{4}^2}{\cancel{6}_3}$

$6m = 20$      $2n = 9$

$m = \dfrac{\cancel{20}^{10}}{\cancel{6}_3}$      $n = \dfrac{9}{2}$

$m = \dfrac{10}{3}$

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Assigned Work:

     Read p.374 - 378
     Answer p.378 # 1, 2, 4ac, 5, 6, 7ab, 8cd, 13

7(b)

$\angle K = \angle N$ (given)
$\angle L = \angle P$ (given)

$\triangle KLM \sim \triangle NPO$

(AA$\sim$)

$$\dfrac{KL}{NP} = \dfrac{LM}{PO} = \dfrac{KM}{NO}$$

$$\dfrac{11}{b} = \dfrac{c}{?} = \dfrac{12}{6}$$

$$\dfrac{11}{b} = \dfrac{2}{1}$$

$$2b = 11$$

$$b = \dfrac{11}{2}$$

$$c^2 + 11^2 = 12^2$$

$$c^2 + 121 = 144$$

$$c^2 = 23$$

$$c = \pm\sqrt{23} \quad \text{length} > 0$$

$$c = \sqrt{23}$$

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8cd

(c)

$\because CE = \overline{AE}$

$\therefore$ isosceles

$\rightarrow f = h$

$f + h + 70° = 180$

$2f + 70° = 180$

$2f = 110°$

$f = 55°$

$h = 55°$

$\therefore \triangle BCD$ is also isosceles

$\rightarrow g = CD$

$g = 4$

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(d)

A

b

B   5

C   2   D

i

E

$\triangle ABC \sim \triangle EDC$

$(AA\sim)$

$\dfrac{AB}{ED} = \dfrac{BC}{DC} = \dfrac{AC}{EC}$

$\dfrac{6\checkmark}{i_?} = \dfrac{5\checkmark}{2\checkmark} = \dfrac{AC}{EC}$

$\dfrac{6}{i} = \dfrac{5}{2}$

$5i = 12$

$i = \dfrac{12}{5}$

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13.

A

B

2m

3m

Y

25m

Z

h?

$\triangle ABC \sim \triangle XYZ$

$\dfrac{AB}{XY} = \dfrac{BC}{YZ} = \dfrac{AC}{XZ}$

$\dfrac{AB}{XY} = \dfrac{2}{25} = \dfrac{3}{h}$

$\dfrac{2}{25} = \dfrac{3}{h}$

$2h = 75$

$h = \dfrac{75}{2}$

$h = 37.5$

∴ height of the building is 37.5 m.

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