# L1 - Applying Right Triangles

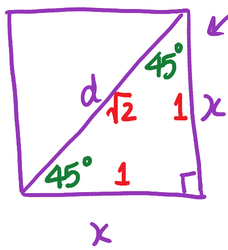
May-26-16
11:27 AM

3 Lessons + Review
Quest 12 : June 7

**Unit 12: Right & Non-Right Triangle Trigonometry**
**Lesson 1 Applying Right Triangles**

Eg1. Answer the following in exact values.

a) Consider a square of any size. Find the length of its diagonal.

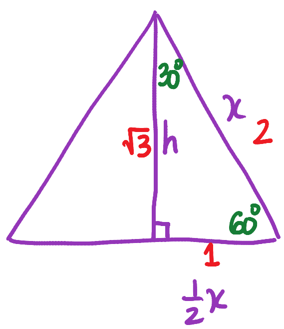



Special Δ!

Scale = $x$ (1 became $x$)

$d = \sqrt{2}x$

b) Find the height of an equilateral triangle of any size.



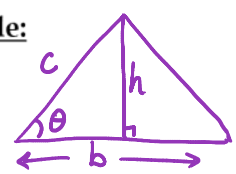

Scale = $\frac{1}{2}x$ (1 became $\frac{1}{2}x$)

$h = \sqrt{3} \times \frac{1}{2}x$

$h = \frac{\sqrt{3}}{2}x$

**Area of any triangle:**

$A = \frac{1}{2} \times b \times h$




$\sin\theta = \frac{h}{c}$

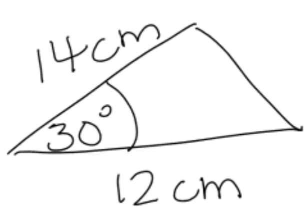
$h = c\sin\theta$

$A = \frac{1}{2}bc\sin\theta$

* θ is between c and b.

Eg3. Find the area of each triangle. Express the area exactly, or, if not possible, to the nearest thousandth.

a)

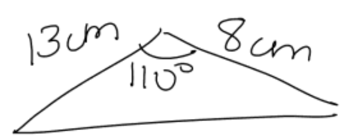



$A = \frac{1}{2}bc\sin\theta$ $\quad \sin 30° = \frac{1}{2}$

$= \frac{1}{2}(12)(14)\sin 30°$

$= \frac{1}{2}(12)(14)(\frac{1}{2}) = 42\text{ cm}^2$

b)




$A = \frac{1}{2}bc\sin\theta$

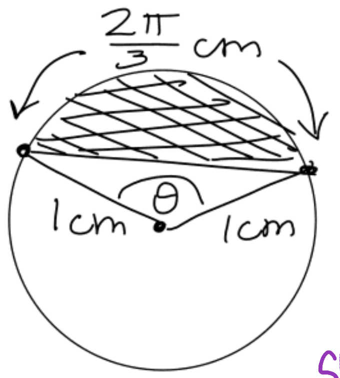
$= \frac{1}{2}(13)(8)\sin 110°$

$= 48.864\text{ cm}^2$

Part of a circle. 


**Area of a Sector:** $A = \frac{1}{2} r^2 \theta$ — θ is in radians.

Eg4. The circle shown has a radius of 1 cm and the central angle $\theta$ subtends an arc of length $\frac{2\pi}{3}$ cm. Find the area of the shaded region.




Plan: Area Sector − Area Triangle = Shaded

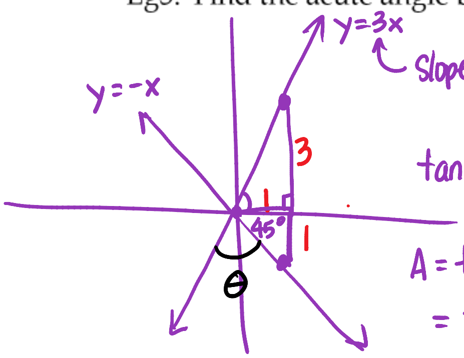
Find θ:
$a = r\theta$
$\theta = \frac{a}{r} = \frac{2\pi/3}{1}$
$\theta = 2\pi/3$

Sector: $A = \frac{1}{2} r^2 \theta$
$= \frac{1}{2}(1)^2\left(\frac{2\pi}{3}\right)$
$= \frac{\pi}{3}$ cm²

Triangle: $A = \frac{1}{2} bc \sin\theta$
$= \frac{1}{2}(1)(1)\sin\frac{2\pi}{3}$
$= \frac{1}{2}(1)\left(\frac{\sqrt{3}}{2}\right) = \frac{\sqrt{3}}{4}$ cm²

Shaded $= \frac{4 \times \pi}{4 \times 3} - \frac{\sqrt{3} \times 3}{4 \times 3} = \frac{4\pi - 3\sqrt{3}}{12}$ cm²

Eg5. Find the acute angle between the lines $y = 3x$ and $y = -x$



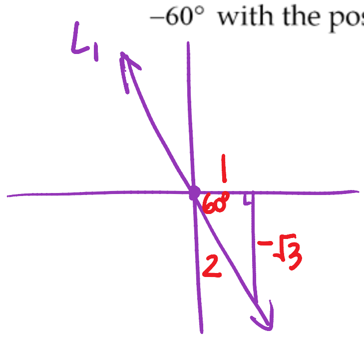

Slope $= \frac{3}{1}$

$\tan A = \frac{3}{1}$

$A = \tan^{-1}(3)$
$= 71.6°$

$\theta = 180° - 45° - 71.6°$
$\theta = 63.4°$

Eg6. Find the exact equation of line $L_1$ that passes through the origin and makes of angle of $-60°$ with the positive direction of the *x-axis*.




Slope $= \frac{-\sqrt{3}}{1}$

tanθ = slope

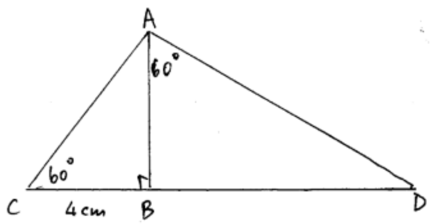
$y = mx + b$
$y = -\sqrt{3}x$

Practice: p.222: # 14 – 17, p.243 # 1 – 4, 8, 9 + Worksheet H4

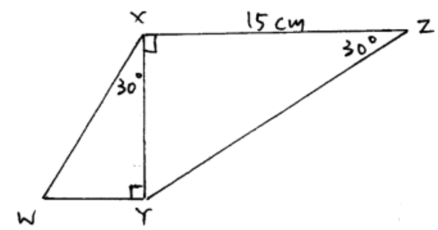
# H1 – Right Triangles Homework

1. Find the length of all missing sides.

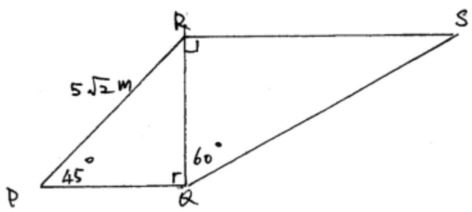
   a)



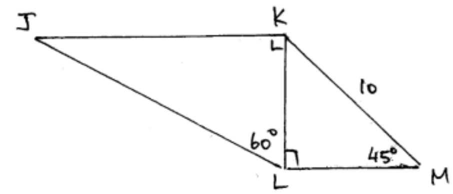

   b)




   c)




   d)

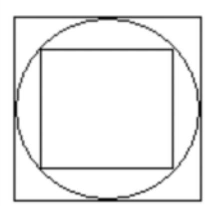



2. An equilateral triangle is inscribed in a circle. Given radius of the circle is 2 cm. Calculate the area of the triangle.

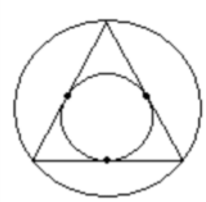
3. Using the same figure again. Given area of the circle is $64\pi$ m$^2$. Find the area of shaded region.

4. A small square has side length 6 cm.
   a) Calculate the side length of the larger square.

   b) Determine the area of the larger square.



5. A circle is touching all three sides of a triangle at their midpoints. This triangle is also inscribed in a larger circle. The smaller circle inside the triangle has a radius of 3 cm.
   a) Determine the radius of the larger circle.
   b) Determine the side length of the equilateral triangle.



**Answers:**

1a) AC = 8 cm, AB = $4\sqrt{3}$ cm , BD = 12 cm , AD = $8\sqrt{3}$ cm

1b) XY = $5\sqrt{3}$ cm , YZ = $10\sqrt{3}$ cm , WY = 5 cm, WX = 10 cm

1c) PQ = RQ = 5 cm, SQ = 10 cm, RS = $5\sqrt{3}$ cm

1d) LM = KL = $5\sqrt{2}$ cm , JL = $10\sqrt{2}$ cm , JK = $5\sqrt{6}$ cm

2. Area = $3\sqrt{3}\ cm^2$

3. Area of shaded region = $64\pi - 48\sqrt{3}\ cm^2$

4a) sidelength = $6\sqrt{2}$ cm    4b) Area = $72\,cm^2$

5a) radius = 6 cm    5b) $16\sqrt{3}$ cm