

# Trigonometry

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Weeks: 2

Dates: Monday 6/1, Wednesday 8/1, Thursday 9/1, Tuesday 14/1, Thursday 16/1, Friday 17/1

## Monday 6/1

**1st half module:**

- Exam - Anu

**2nd half module:**

- Math Activity

## Wednesday 8/1

**1st half module:**

**Trigonometrical functions**

- Sine Ratio
- Cosine Ratio
- Tangent Ratio

**2nd half module:**

**Choosing the right trig function?**

- SohCahToa
- How to use the SohCahToa triangles.
- Questions

## Thursday 9/1

**1st half module:**

**Recap of the trigonometrical functions**

**Finding an unknown angle**

- Inverse functions
- Questions

#### **Angles of elevation and depression**

- Elevation
- Depression
- Questions

#### **2nd half module: Multi-stage problems**

- Triangles split into two right angle triangles.
- Pythagoras' Theorem
- Bearings

### **Tuesday 14/1**

#### **1st half module: Sine Rule**

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#### **Ambiguous case of the sine rule**

#### **2nd half module: Cosine Rule**

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### **Thursday 16/1**

#### **1st half module: Recap of Right Angles Recap of Sine rule and Cosine rule**

#### **2nd half module: Area of a Triangle**

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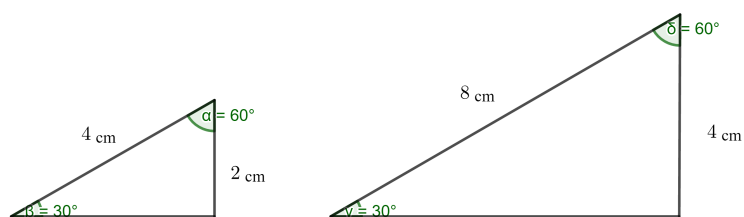
### **Friday 17/1**

#### **Trigonometry in 3-D:**

# 1 Notes Wednesday 8/1

## The Sine Ratio:

Consider two triangles with similar angles. The ratio will be same regardless of the different lengths. The larger triangle has been enlarged by a scale factor.

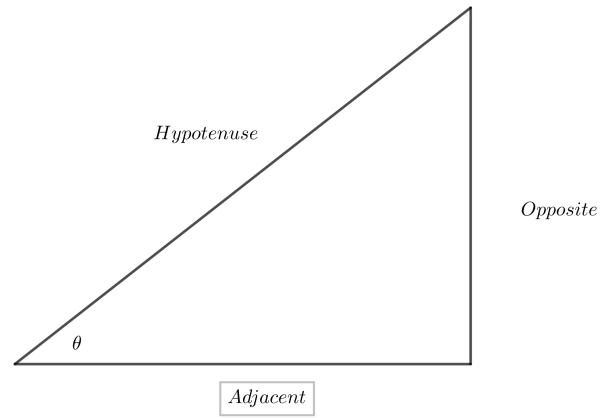


In right angle triangles, the answer obtained by dividing the length opposite the angle by the hypotenuse is called the sine of that angle.

$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}} \quad (1)$$

Remember - Calculators set to degrees (DEG)

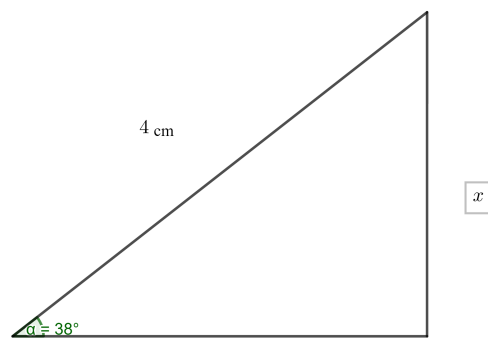
To calculate a missing length, Isolate the missing length from the sine formula.



$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}} \quad (2)$$

$$\implies \text{opposite} = \sin(\theta) \times \text{hypotenuse} \quad (3)$$

**Example:**



$$\text{opposite} = \text{hypotenuse} \times \sin(\theta) \quad (4)$$

$$x = 4 \times \sin(38^\circ) \quad (5)$$

$$x = 2.462645901^\circ \approx 2.46^\circ \quad (6)$$

Show that the hypotenuse can also be isolated.

#### **Cosine Ratio:**

Instead of trying to find the opposite length, the adjacent length can be found using the cosine ratio.

$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}} \quad (7)$$

$$\implies \text{adjacent} = \text{hypotenuse} \times \cos(\theta) \quad (8)$$

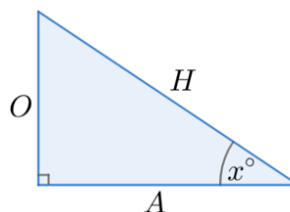
#### **Tangent Ratio:**

The last ratio is defined as:

$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}} \quad (9)$$

$$\implies \text{opposite} = \text{adjacent} \times \tan(\theta) \quad (10)$$

**SohCahToa** When solving questions the trigonometrical ratio rhyme can be used and triangles can be drawn to help isolate the missing length or angle (but more on that later).



**How to use:** Cover the quantity you are looking for and the triangle will tell to either multiple or divide the quantities you were given in the question.

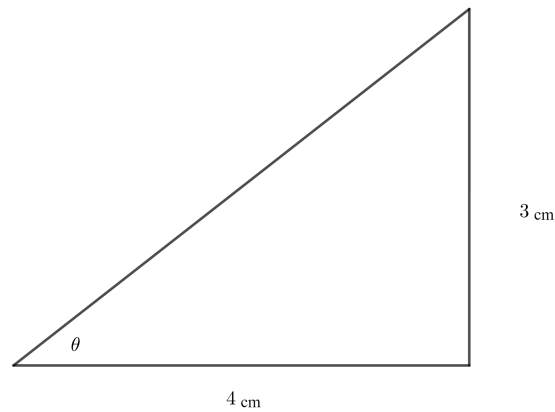
#### **Questions:**

- 1 through to 8 (Page 317)

## **2 Notes Thursday 9/1:**

### **Finding an unknown angle:**

- Inverse - "Reverse" function
- Inverse Angle - Calculators -> shift, sin/cos/tan.



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- $\tan(\theta) = \frac{3}{4} \implies \theta = \arctan(\frac{3}{4}) = 36.86989765^\circ \approx 36.9^\circ$

**Questions:**

- 2,4,6,8,10,12 (Page 319)

**Angles of elevation and depression:**

Angle of elevation - Above the horizontal line

Angle of depression - Below the horizontal line.

These problems are a combination of pythagoras' theorem, trigonometrical equations and alternate angles.

**Example:** A climber is sitting on the summit S of a mountain. He looks down and sees his camp C in the valley below. The direct distance from the summit to the camp is 2200 metres. The summit is at an altitude 420 meters higher than the camp.

a: Calculate the angle of elevation of the summit as seen from the camp. Give your answer to the nearest  $0.1^\circ$ .

$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}} \quad (11)$$

$$\sin(\theta) = \frac{420}{2200} \quad (12)$$

$$\theta = \arcsin(\frac{420}{2200}) = 11.005^\circ \approx 11^\circ \quad (13)$$

(14)

b: Write down the angle of depression of the camp as seen from the summit.  
 $= 11^\circ$

**Questions:**

- 1,3,4 (Page. 325-326)

**Multi-stage problems:**