"Quête pour l'excellence"
"Yumi eim blo kasem exselens"

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Central School

Home School Package

Year : 11 MATHEMATICS 2020

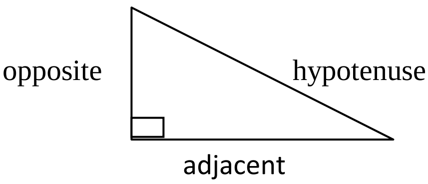
Ministry of Education and Training/Ministère de l'Education et de la Formation
Republic of Vanuatu/République du Vanuatu

HOME SCHOOL PACKAGE CONTENT

GEOMETRY & TRIGONOMETRY

CIRCLE GEOMETRY

LESSON Plan

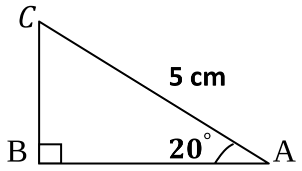
 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 6 Monday : 22/06/20
	Topic : **GEOMETRY & TRIGONOMETRY** **Sub-** Topic : Triangle trigonometry Lesson number : 1
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Identify/State** the equation of sin x / cos x / tan x based on a right angle triangle. • **Identify** the sine, cosine or tangent function on a right angled triangle
 Introduction	If we know the length of one side of the right angled triangle, but we know the angles of the vertices, we can work out the lengths of the missing sides. We can do this by using **SOH, CAH, TOA** which are the three(3) trigonometry ratios.  $\sin\theta = \frac{Opposite}{Hypotenuse}$ $\cos\theta = \frac{Adjacent}{Hypotenuse}$ $\tan\theta = \frac{Opposite}{Adjacent}$
	Catch phrase for the lesson We use the abbreviation SOHCAHTOA to remember the three(3) trig. ratios or formulae.

Learners notes

Summary

Example :

Let's find the length of BC on the triangle below :
If we look at the 20° angle, BC is opposite this and we have the length of the hypotenuse. Remembering the trig. ratios, we need to use the sine formula, as sine uses *opposite* over *hypotenuse.*



$$\sin(20^{\circ}) = \frac{BC}{5}$$
$$5\ x \sin 20^{\circ} = BC$$
$$BC = 1.710 \text{ cm (4 s.f)}$$

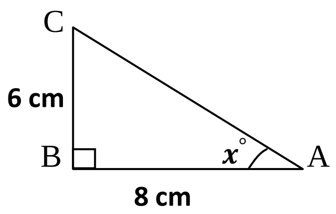
If we had to find AB, we would use the sine formula :

$$\cos(20^{\circ}) = \frac{AB}{5}$$
$$5 \times \cos 20^{\circ} = AB$$
$$AB = 4.698 \text{ cm (4 s.f)}$$

If we are given the lengths of at least two of the sides of a right- angled triangle, we can find the angles of the two remaining angles using the same formulae. You will need to use the sin^{-1}, cos^{-1} and tan^{-1} functions on your calculator.

Example :

Find the unknown angle in the given triangle :



Solution : To find the angle :

$$< x = \tan x = \frac{6}{8}$$
$$\tan x = 0.75$$
$$tan^{-1}(0.75) = 36.9^{\circ}$$
$$x = 36.9^{\circ}\ (1\ d.p)$$

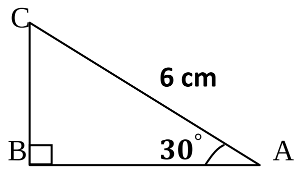
Visual aids

Exercises

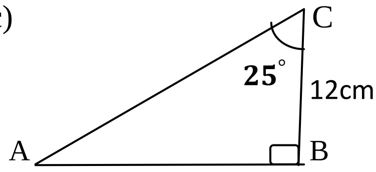
Exercise :

1. Find the missing sides on each of these triangles :

a)



c)



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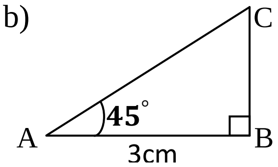
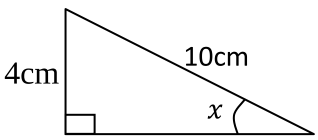


2. Calculate the unknown angles for each of the following right-angled triangles

a)



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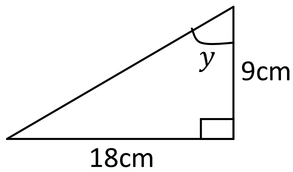

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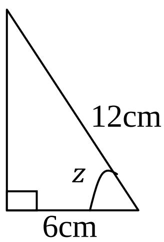

Solutions :

1. a) AB = 5.2 cm, BC = 3 cm

   b) AC = 4.2 cm, BC = 3 cm

   c) AB = 6.0 cm, AC = 12.3 cm

2. a) $x = 23.6^\circ$

   b) $y = 63.4^\circ$

   c) $z = 60^\circ$

Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 6 Tuesday: 23/06/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub- Topic : Triangle Trigonometry Lesson number : 2
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • Solve problems related to navigation, building, surveying and civil engineering using trigonometric ratios
 Introduction	**Angles of Elevation and Depression** The **angle of elevation** is the angle between a horizontal line from the observer and the line of sight to an object that is ***above*** the horizontal line. The **angle of depression** is the angle between a horizontal line from the observer and the line of sight to an object that is ***below*** the horizontal line.
	Catch phrase for the lesson **Angle of elevation** is the angle between a horizontal line from the observer and the line of sight to an object that is ***above*** the horizontal line. **Angle of depression** is the angle between a horizontal line from the observer and the line of sight to an object that is ***below*** the horizontal line.

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Learners notes</td>
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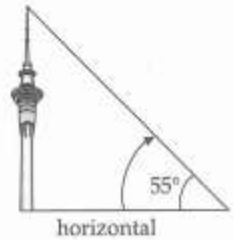
Summary

Angles of elevation and depression

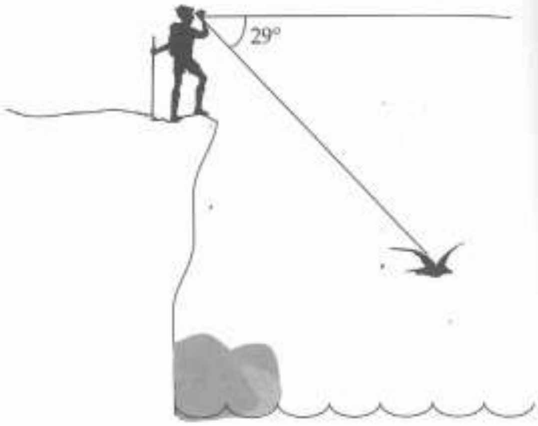
Surveying often involves calculations with angles measured in relation to the horizontal.

Angles of **elevation** are measured *upwards* from the horizontal:



The angle of elevation of the top of this tower from the ground is 55°.

Angles of **depression** are measured *downwards* from the horizontal:



The angle of depression of this seagull from the observer at the top of a cliff is 29°.

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<td>Visual aids</td>
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Exercises</td>
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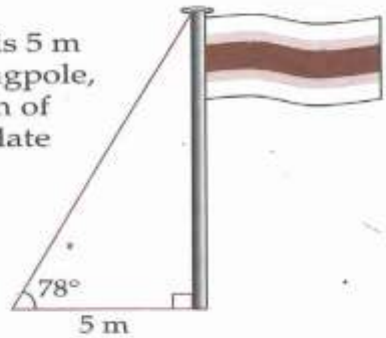
1. From a point which is 5 m from the base of a flagpole, the angle of elevation of the top is 78°. Calculate the height of the flagpole.



2. Two buildings at a university are joined by a walkway. The two buildings are 15.6 metres apart, and the angle of depression of the walkway is 4°. Calculate the length of the walkway.

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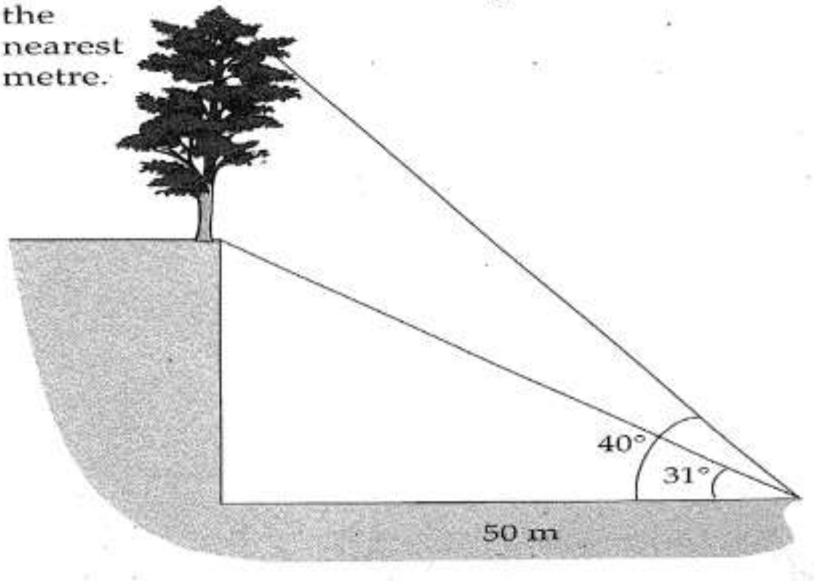
3. An observer standing 50 metres away from a vertical cliff is looking at a tree at the top. The angle of elevation of the top of the tree is 40°, and the angle of elevation of the bottom of the tree is 31°. Calculate the height of the tree to the nearest metre.



4. From the top of a vertical cliff 40 m high, the angle of depression of an object that is level with the base of the cliff is 34°. How far is the object from the base of the cliff?

5. From a plane flying due east at 265 m above sea level, the angles of depression of two ships sailing due east measure 35° and 25°. How far apart are the ships?

Solutions:

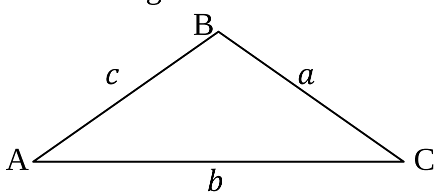
1. 23.5 m   2. 15.64 m   3. 12 m   4. 59.3 m   5. 189.9 m

Assignment

Note : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.

Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 6 Wednesday: 24/06/20
	Topic : GEOMETRY & TRIGONOMETRY Sub- Topic : Triangle Trigonometry Lesson number : 3
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Identify or state** the sine rule • Rearrange the sine rule formulae to make the required side or angle the subject of the formula. • **Apply** the sine rule to find an unknown side in a triangle.
 Introduction	Most triangles are *not* right- angled however, and we use two special rules that apply to *any shape* of triangle. The sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ The cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ We can use single letters to name *sides* and *angles* in a triangle. 

The diagram above shows triangle ABC .

- The three angles can be named A, B and C (capital letters)
- To name sides it is logical to use the same letter as the angle *opposite* it. We use a lower-case letter to name a side in a triangle. In this triangle, the names or labels of the sides are *a*, *b* and *c*.

Catch phrase for the lesson

The **sine rule** can be used to work out the *missing sides* in triangles.

Learners notes

Summary

THE SINE RULE

To calculate sides

The sine rule can be used to work out missing side in triangles if sufficient information is given.

The Sine rule :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Example :

In triangle ABC, B = 21°, C = 46° and AB = 9 cm. Find side *b* (AC).

Solution :
We are given two angles and one side and so the sine rule can be used. Since the angles in a triangle add up to 180° then angle A = 113°. We know that AB(c) = 9 cm.

$$\therefore \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin A} = \frac{b}{\sin 21^\circ} = \frac{9}{\sin 46^\circ}$$

So we don't need to use all 3 ratios, so exclude $\frac{a}{\sin A}$ then use :

$$\frac{b}{\sin 21^\circ} = \frac{9}{\sin 46^\circ}$$ to find side *b*.

$$\frac{b}{\sin 21^\circ} = \frac{9}{\sin 46^\circ}$$ (cross multiply to solve the equation to find *b*)

$$b = \sin 21^\circ \times \frac{9}{\sin 46^\circ}$$

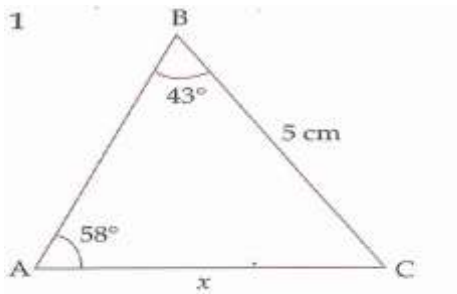
$b = 4.48$ cm (3 *s.f*)

Visual aids

Exercises

Exercise :

Calculate the length marked *x* in each triangle. Give answers correct to 4 sf.



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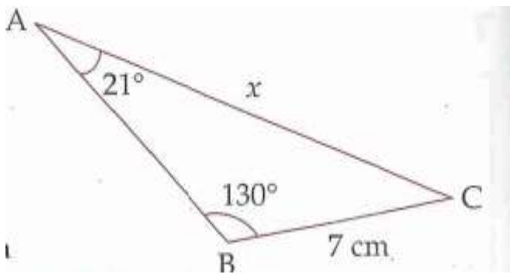

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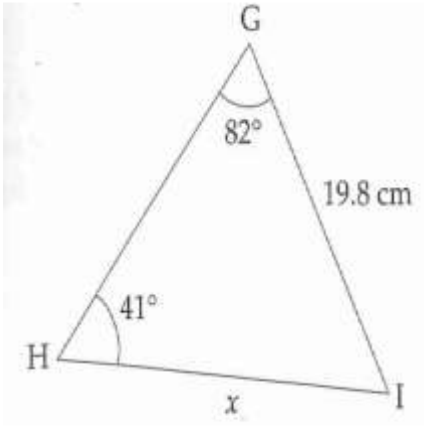

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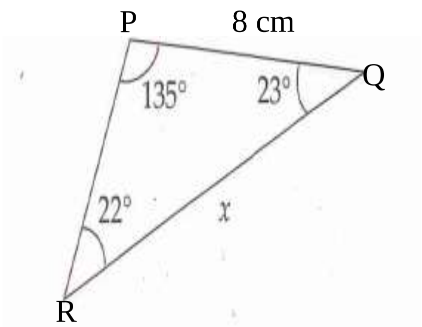

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Solutions :

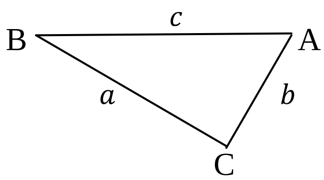
1. 4.021 cm	2. 14.96 cm	3. 29.89 cm	4. 15.10 cm

Assignment

Note : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.

Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 6 Thursday : 25/06/20
	Topic : **Geometry & Trigonometry** Sub- strand : Triangle Trigonometry Lesson number : 4
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • Rearrange the sine rule formulae to make the required angle the subject of the formula. • **Apply** the sine rule to find an unknown angle in a triangle.
 Introduction	**THE SINE RULE** **To calculate angles** The sine rule can be used to work out angle sizes in triangles if sufficient information is given. The most convenient way of working with the sine rule when calculating angles is to write the fractions upside down. **The Sine rule :** $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ 

Catch phrase for the lesson

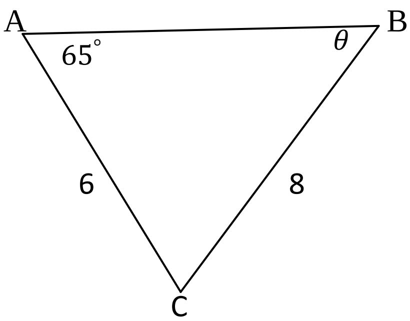
The **sine rule** can be used to work out angle sizes in triangles.

Learners notes

Summary

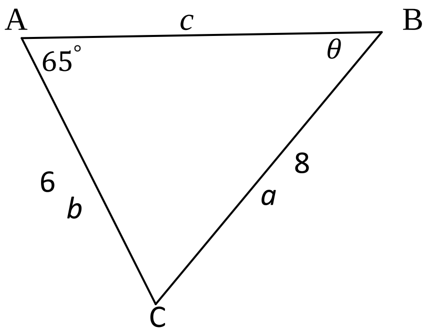
Example :

Calculate the size of angle θ.



Solution :

Firstly it's a convenient approach to label the triangle :



Write down the sine rule and substitute the given values from the diagram

$$\frac{sin\ A}{a} = \frac{sin\ B}{b} = \frac{sin\ C}{c}$$

Use only : $\frac{sin\ A}{a} = \frac{sin\ B}{b}$

We have : $\frac{sin\ 65^{\circ}}{8} = \frac{sin\ \theta}{6}$

$$\sin\theta = \frac{\sin\ 65^{\circ}\times 6}{8}$$

$$\text{Sin}\,\theta = 0.6797$$

$$\theta = 42.8^{\circ}\ (1\ dp)$$

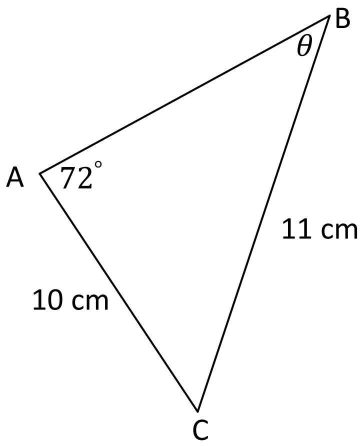
Visual aids

Exercises

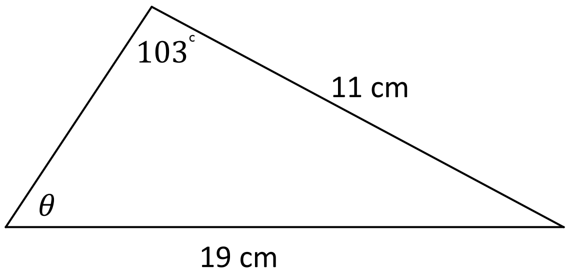
Exercise :

1. Use the *sine rule* to calculate the angle marked θ in each triangle.

a)

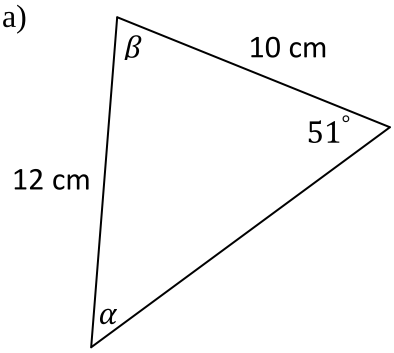


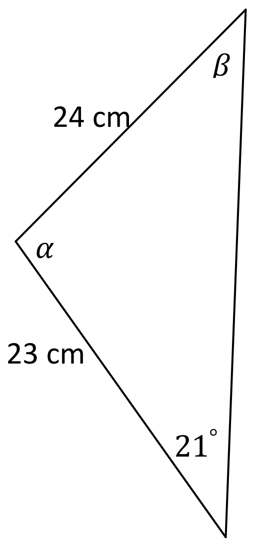
b)



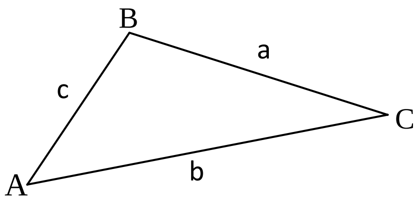
2. Calculate the angles marked α and β in these triangles :

a)



	b)  **Solutions :** 1. 59.8° 2. 34.3° 3. $\alpha = 40.4^{\circ}, \beta = 88.6^{\circ}$ 4. $\alpha = 138.9^{\circ}, \beta = 20.1^{\circ}$
Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 7 Monday : 29/06/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub- strand : Triangle Trigonometry Lesson number : 5
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** I • **Identify or State** the cosine rule. • **Apply** the cosine rule to find an unknown side in a triangle.
 Introduction	**THE COSINE RULE** The cosine rule is used to calculate the third side of a triangle when we are given measurements for two sides and the *included* angle (angle in between). Refer the triangle shown below :  • The three angles can be named A, B and C (capital letters) • To name sides it is logical to use the same letter as the angle *opposite* it. We use a lower-case letter to name a side in a triangle. In this triangle, the names or labels of the sides are *a*, *b* and *c*.

Catch phrase for the lesson

The **cosine rule** is used to calculate the third side of a triangle.

Learners notes

Summary

The cosine rule :

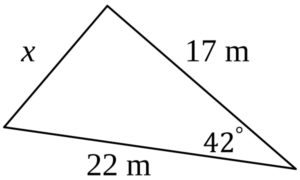
$a^2 = b^2 + c^2 - 2bc \cos A$

$b^2 = a^2 + c^2 - 2ac \cos B$

$c^2 = a^2 + b^2 - 2ab \cos C$

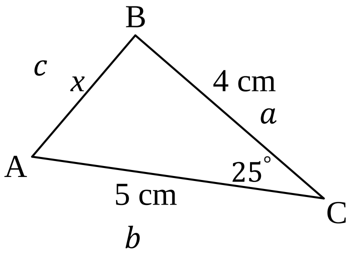
Example :

Calculate side *x*.



Solutions :

Firstly, label the angles and sides of the triangle :



We know side *a* and side *b* and an angle C.
Therefore, the cosine rule to be used to find side c :

$c^2 = a^2 + b^2 - 2ab \cos C$
$x^2 = 4^2 + 5^2 - 2(4)(5) \cos 25^\circ$
$x^2 = 16 + 25 - 40 \cos 25^\circ$
$x^2 = 41 - 40 \cos 25^\circ$
$x^2 = 4.748$
$x = \sqrt{4.748}$
$x = 2.179\ cm\ (4\ sf)$

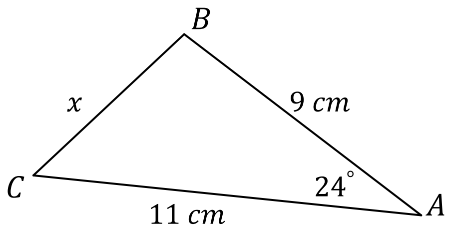
Visual aids

Exercises

Exercise :

Use the cosine rule to calculate the unknown side in each triangle.

1.



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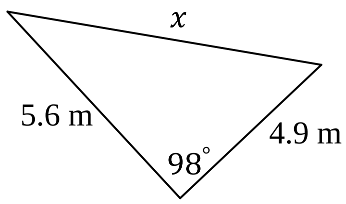
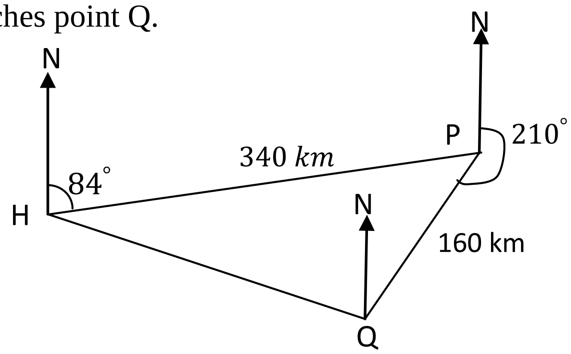


3. ΔDEF : d = 29 m, e = 15 m, <F = 122°, find f.

4. ΔXYZ : y = 31 m, z = 28 m, <X = 62°, find x.

5. A ship leaves port at 1pm travelling north at the speed of 30 miles/hour. At 3pm, the ship adjusts its course on a bearing of N 20° E. How far is the ship from the port at 4pm ? (round to the nearest unit).

6. A ship sails from harbour K on a bearing of 084° for 340 km until it reaches point P. It then sails on a bearing of 210° for 160 km until it reaches point Q.



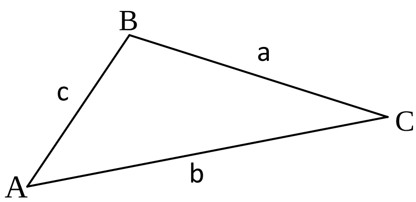
Calculate the distance between point Q and the harbour.

Solutions :

1. 4.595 cm
2. 7.94 cm
3. f= 39.1 m
4. x= 30.5 cm
5. 88.8 miles
6. 278 km

Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 7 Tuesday : 30/06/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub-Strand : Triangle Trigonometry Lesson number : 6
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Rearrange** the cosine rule formulae to make the required angle the subject of the formula. • **Apply** the cosine rule to find an unknown angle in a triangle.
 Introduction	**THE COSINE RULE** If the lengths of all three sides of a triangle are given, we can use the cosine rule to calculate the size of any angle in the triangle. 

Catch phrase for the lesson

The **cosine rule** can be used to find an angle in a non right- angled triangle.

Learners notes

Summary

The Cosine rule :

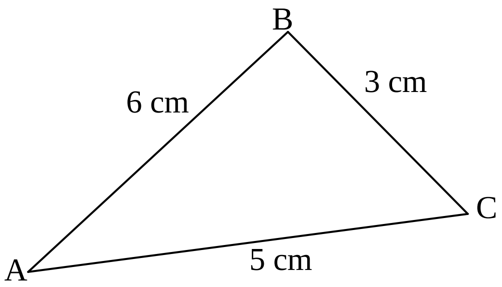
$$\boldsymbol{cos\ A = \frac{b^2 + c^2 - a^2}{2bc}}$$

$$\boldsymbol{cos\ B = \frac{a^2 + c^2 - b^2}{2ac}}$$

$$\boldsymbol{cos\ C = \frac{a^2 + b^2 - c}{2ab}}$$

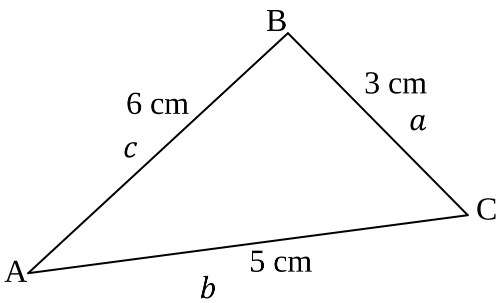
Example :

Use the cosine rule to calculate the size of $< A$ in this triangle.



Solutions :

Firstly, label the angles and sides of the triangle :



We are given three sides of the triangle and the cosine rule to be used to find angle A :

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{5^2 + 6^2 - 3^2}{2 \times 5 \times 6}$$

$$\cos A = \frac{25 + 36 - 9}{60}$$

$$= \frac{52}{60}$$

$$A = \cos^{-1}(0.86) = 29.9^{\circ}\ (1dp)$$

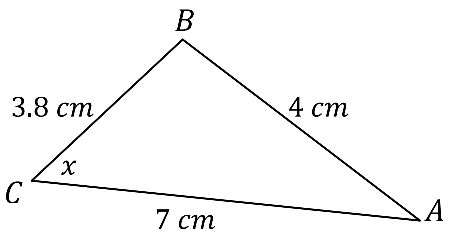
Visual aids

Exercises

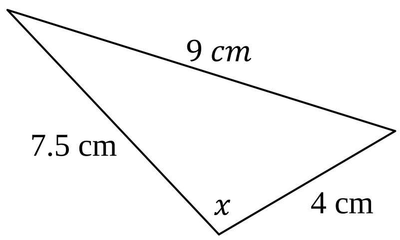
Exercise :

Use the cosine rule to calculate the unknown values to decimal place.

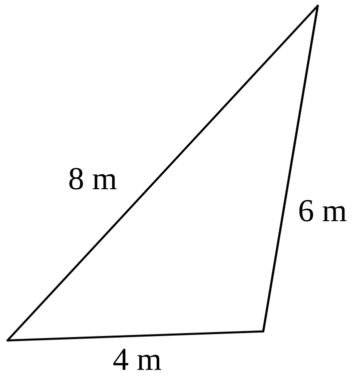
1.



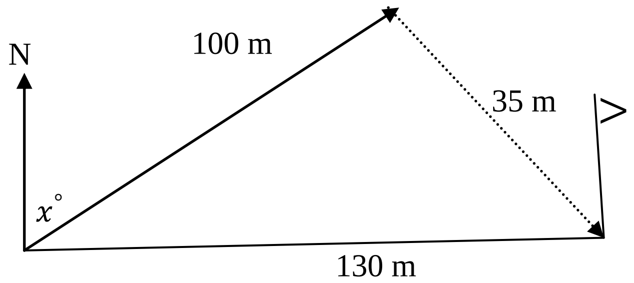
2.



3. A triangular sail has measurements as shown in the diagram. All lengths are in metres. Calculate the size of the largest angle.



4. A par 3 hole on a golf course the tee is a distance of 130 metres due west from the pin. On his first shot, Bruce hits the ball 100 metres but not at the correct angle. On his second shot he hits the ball 35 metres and gets it in the hole. On what bearing, x°, did he hit his first stroke?



Solution :

1. 26.9° 2. 98.4° 3. 104.5° 4. 081°

Assignment

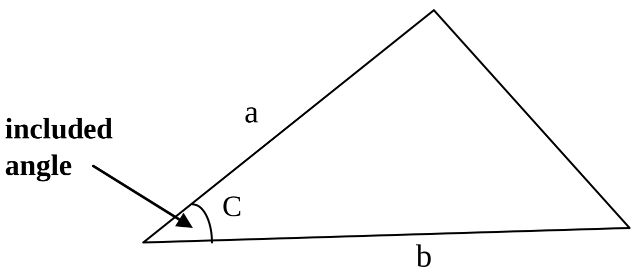
Note : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.

Assessment

Barton,D. (1992). Theta Mathematics

 References	

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 7 Wednesday : 01/07/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub-Strand : Triangle Trigonometry Lesson number : 7
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Use** the general area formula Area A = ½ absinC to find the area of a triangle
 Introduction	**AREA OF A TRIANGLE – Two sides and the 'included angle'** We can use trigonometry to calculate the area of a triangle if we know the lengths of two sides and the size of the angle between the *two* sides. This angle is often referred to as the **included** angle. 

Catch phrase for the lesson

Trigonometry can be used to calculate the area of a non right- angled triangle.

Learners notes

Summary

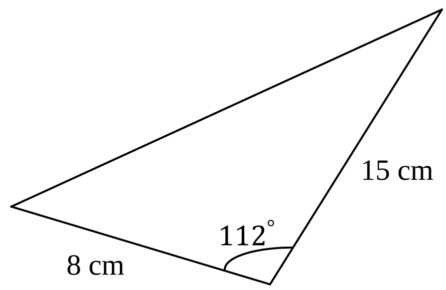
We can find the area of non right – triangles by using the formula :

Area of a triangle formula :

$$Area = \frac{1}{2}\, ab \sin C$$

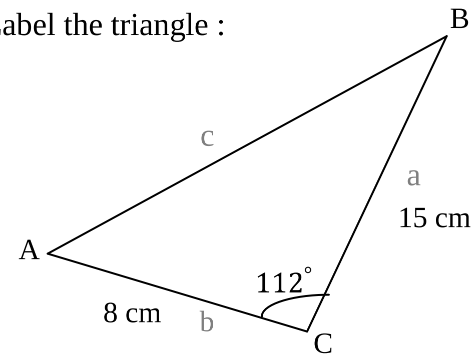
Example :

Calculate the area of this triangle :



Solutions :

Label the triangle :



$$\begin{aligned} Area &= \frac{1}{2}\, ab \sin C \\ &= \frac{1}{2}(15)(8) \sin 112^\circ \\ &= 60 \times \sin 112^\circ \\ &= 55.63\ cm^2 \text{ (4 sf)} \end{aligned}$$

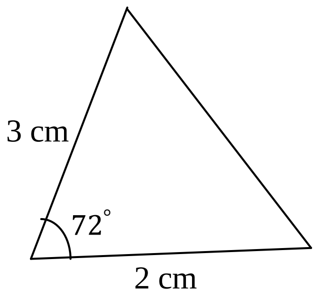
Visual aids

Exercises

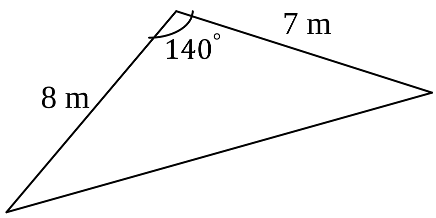
<u>Exercise :</u>

1. Calculate the areas of these triangles :

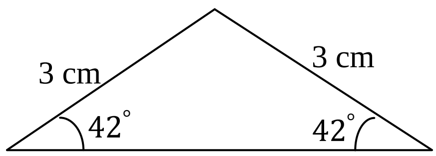
a)



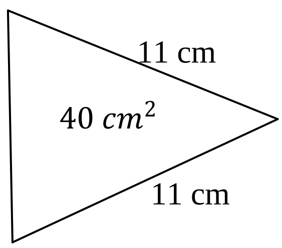
b)



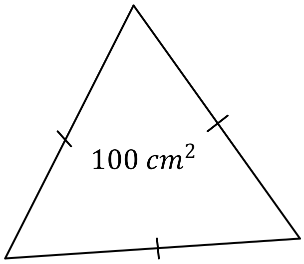
2. Calculate the area of this isosceles triangle :



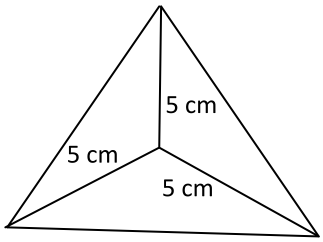
3. An isosceles triangle has two sides of length 11 cm, and its area is 40 cm^2. Calculate the sizes of the interior angles.



4. An equilateral triangle has an area of $100\ cm^2$. Calculate the length of each side.



5. This metal badge has rotational symmetry of order 3. Calculate its area if the distance from the centre to each corner is 5 cm.



Solutions :

1. $a)$ $2.853\ cm^2$

   b) $18.00\ cm^2$

2. $4.475\ cm^2$

3. 41.4°, 69.3°, 69.3°

4. 15.2 cm

5. $32.48\ cm^2$

Assignment

Note : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.

Assessment

References

Barton,D. (1992). Theta Mathematics

LESSON Plan

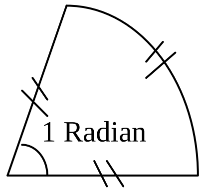
 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 7 Thursday : 02/07/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub-Strand : Circle Geometry Lesson number : 8
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Identify** angle needed and use the appropriate relations: $\pi = 180^\circ,\ 2\pi = 360^\circ$ • **Define** radian • **State** the value of π in degrees or radians • **Convert** angle size from radians to degrees and vice versa

Introduction

RADIAN MEASURE

Up to now we have measured angles in **degrees**. A more natural method is to define a new unit, called a **radian**. We all learn to use **degrees** when measuring angles, but most science and engineering applications use radians.

1 radian = the angle formed in a sector with the arc length the same as the radius.



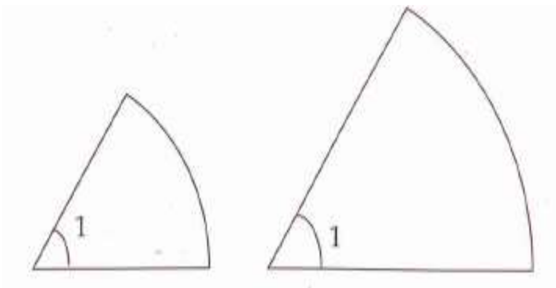
Catch phrase for the Lesson

One way to measure angles is in radians.

Learners notes

Summary

This definition does not depend on the size of the sector. If a sector is drawn with twice the radius and twice the arc length, the angle at the centre is still 1 radian- radian measure us sometimes called **circular measure.**



Conversion of degrees / radians

If we take a full turn (360°), the arc length is just the circumference :

$$360^\circ = \frac{2\pi r}{r} = 2\pi$$

$1^\circ = \frac{\pi}{180}$ and π radians = 180°

To convert **degrees** to **radians**,

Multiply by $\frac{\pi}{180}$

Often it is best to leave your answer in terms of π.

Example (i) :

Convert 45° to radians. Leave your answer in terms of π.

Solution :

$$45^{\circ} = 45^{\circ} \times \frac{\pi}{180^{\circ}} = \frac{1}{4} \times \pi = \frac{\pi}{4}$$

To convert radians to degrees

Multiply by $\frac{180}{\pi}$

Example (ii) :

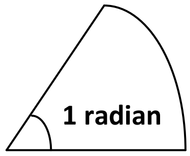
Convert $\frac{2\pi}{3}$ radians to degrees.

Solution :

$$\frac{2\pi}{3} = \frac{2\pi}{3} \times \frac{180^{\circ}}{\pi} = \frac{360^{\circ}}{3} = 120^{\circ}$$

What is 1 radian in degress ?

One radian is the angle at the centre of a sector with an arc length equal to its radius.



The angle if 1 radian looks as though it could be close to 60°. To be precise :

1 radian = $1 \times \frac{180^{\circ}}{\pi} = \frac{180^{\circ}}{3.142} = 57.3^{\circ}$

Visual aids

Exercises

Exercise :

1. Convert these angle measurements to radians in terms of π.

   a) 60°
   b) 150°
   c) 315°

2. Convert these angle measurements to radians to 4 s.f.

   a) 31°

   b) 210°

   c) 529°

3. Convert these angle measurements to degrees :

   a) $\frac{\pi}{2}$

   b) $\frac{4\pi}{5}$

   c) $\frac{4\pi}{9}$

4. Convert these radian measurements to degrees. Give your answers to 1 dp.

   a) 0.613

   b) 2

   c) $\frac{2}{5}$

Solutions :

1. a) $\frac{\pi}{3}$ b) $\frac{5\pi}{6}$ c) $\frac{7\pi}{4}$ 2. a) 0.5411 b) 3.665 c) 9.233

3. a) 90° b) 144° c) 80° 4. a) 35.1° b) 114.6° c) 22.9°

Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 8 Monday : 06/07/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub- strand : Circle Geometry Lesson number : 9
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** I • **Identify** the arc of the circle together with the angle subtended at the centre and the radius • **Use** the formula for the length of an arc of a circle $S = R\theta$ • **Identify** length of the arc • **Identify** and apply the formula for finding the length of an arc of a circle : $\boldsymbol{\theta} = \frac{s}{r}$ where $\boldsymbol{\theta}$ measured in radians.

Introduction

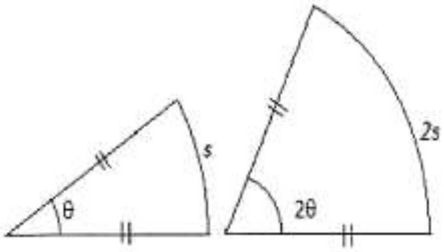
ARC LENGTH

The length of an arc is proportional to both:

- The angle at the centre of the arc
- The radius of the arc

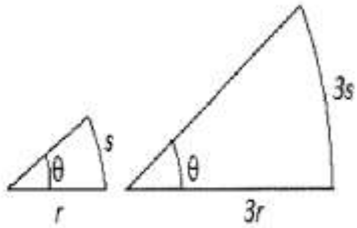
Consider the diagrams below:

1 Two sectors have the same radius:



Sector B has an angle twice the size of sector A. This means the arc length of sector B is twice the arc length of sector A.

2 Two sectors have the same sector angle:



Sector B has a radius three times the length of sector A. This means the arc length of sector B is three times the arc length of sector A.

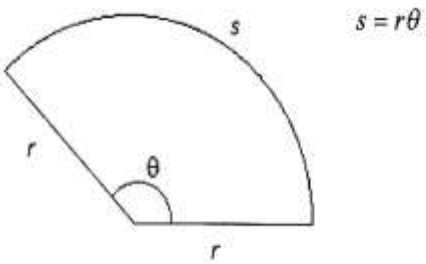
Catch phrase for the lesson

The arc length is the measure of the distance along the curved line making up the arc.

Learners notes

Summary

Because arc length is proportional to both the centre-angle of a sector and the radius, we have the **arc-length formula**:



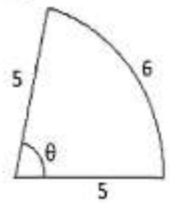
$s = r\theta$

s = arc length
r = length of radius
θ = angle at centre of sector, measured in radians

One consequence of this is that radians *do not have 'units'*

Example

Calculate the size of the angle labelled θ in degrees



Solution:

From the arc length formula:

$$\theta = \frac{s}{r} \text{ (Making } \theta \text{ the subject)}$$

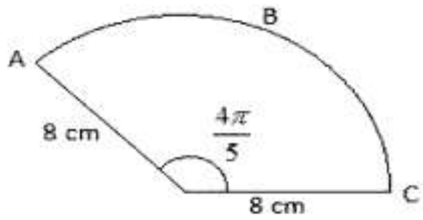
$$\theta = \frac{6}{5} = 1.2 \text{ radians}$$

$$1.2 \text{ radians} = 1.2 \times \frac{180}{\pi} = 68.8^\circ$$

Using the arc length formula

Example

Calculate the length of the arc ABC



Solution:

Using the arc length formula:

$$s = r\theta$$

$$ABC = r\theta$$

$$ABC = 8 \times \frac{4\pi}{5}$$

$$ABC = \frac{32\pi}{5} \text{ cm (or 20. 1cm)}$$

Visual aids

Exercises

Exercise :

1. Calculate the length of the arc for these sectors with these measurements:
   a. Radius 3 cm; centre angle 2 radians
   b. Radius 6 mm; centre angle $\frac{3\pi}{4}$ (leave answer in terms of π)
   c. r = 6 cm; θ = 60°

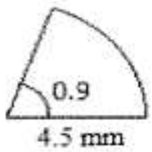
2. Calculate the length of radius for each of the sectors with these measurements. Give answers to 4 s.f:
   a. s = 6.4 m; θ = 2
   b. centre angle = $\frac{2\pi}{3}$; arc length 8π cm
   c. s = 45 cm; θ = 128.7 °

---

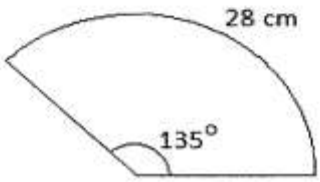
3. Calculate the centre angle in radians for the sectors with these measurements:
   a. s = 12 cm; r = 3 cm
   b. s = 6 π cm; r = 4 cm

4. Calculate the centre angle in degrees for the sectors with these measurements, correct to 1 d.p. where necessary:
   a. s = 3 π cm; r = 6 cm
   b. radius 0.81 m; arc length 0.45 m

5. Calculate the perimeter for these sectors:
   a.



   b.



Solutions :

1. a) 6 cm b) $\frac{9\pi}{2}\ mm$ c) 6.283 cm

2. a) 3.2 m b) 12 cm c) 20.03 cm

3. a) 4 b) 4.712

4. a) 90° b) 31.8°

5. a) 13.05 mm b) 51.77 cm

Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 8 Tuesday : 07/07/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub-Strand : Circle Geometry Lesson number : 10
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • **Identify** the area of a sector of a circle • **Apply** the formula for finding the area of a sector $A = \frac{1}{2}R^2\theta$
 Introduction	**SECTOR AREA FORMULA** The area of a sector is given by the formula : Area $A = \frac{1}{2}r^2\theta$ (Note : θ is in radians)

Catch phrase for the lesson

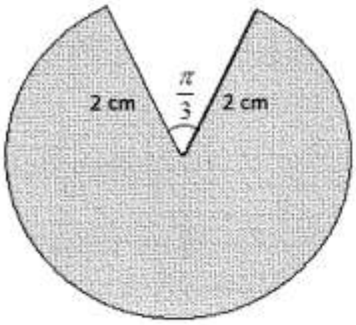
The area enclosed by a sector is proportional to the arc length of the sector.

Learners notes

Summary

Example (i) :

A sector with centre-angle of $\frac{\pi}{3}$ has been removed from a circle.



Calculate the shaded area of the region.

Solution :

The angle at the centre of the shaded sector is:

$$2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$$

Area of sector = $\frac{1}{2}r^2\theta$

$$= \frac{1}{2} \times 2^2 \times \frac{5\pi}{3}$$

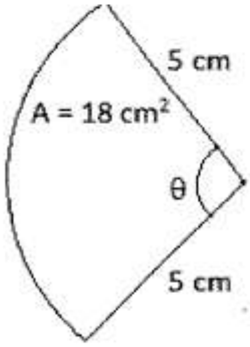
$$= \frac{10\pi}{3} \text{ cm}^2 \text{ or } 10.47 \text{ cm}^2$$

The sector area formula can be rearranged to make either θ or r the subject:

$$\theta = \frac{2A}{r^2} \qquad r = \sqrt{\frac{2A}{\theta}}$$

Example (ii) :

Calculate the angle at the centre of this sector.
Give answer in
(a) radians and
(b) degrees



Solutions :

(a). $\theta = \dfrac{2A}{r^2}$

$= \dfrac{2 \times 18}{5^2}$

$= \dfrac{36}{25}$ = 1.44 radians

(b). To change from radians to degrees, multiply by $\dfrac{180^\circ}{\pi}$

1.44 radians = $1.44 \times \dfrac{180^\circ}{\pi}$ = 82.5°

Visual aids

Exercises

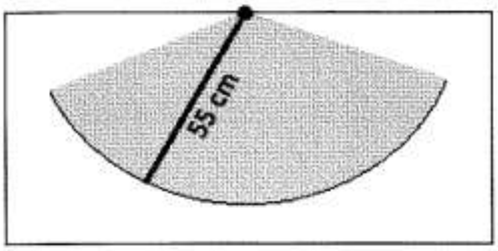
Exercise :

1. Calculate the area for each of these sectors, correct to 4 s.f. where appropriate:
   a. $r = 4$ m; $\theta = 2$
   b. centre angle = $\frac{\pi}{3}$; radius = 7 cm
   c. $r = 2.4$ cm; $\theta = 234°$

2. Calculate the centre angle for these sectors:
   a. $A = 18$ cm^2, $r = 4$ cm (in *radians*)
   b. radius of 1.2 m; area of 0.98 m^2 (in *degrees*)

3. A sector has an arc length of 6 cm and an area of 9 cm^2. Calculate the radius and the centre angle.

4. A World War II army truck has a rectangular windscreen measuring 186 cm by 63 cm. It is fitted with one wiper, hinged at the top, which moves backwards and forwards through an angle of 160°.



   a. Calculate the area covered by the wiper as it cleans the windscreen.
   b. Calculate the area that is ***not*** covered by the wiper.
   c. What percentage of the windscreen does the wiper clean?

Solutions :

1. a. 16 m^2 b. 25.66 cm^2 c. 11.76 cm^2 2. a. 2.25 b. 78.0^o

3. $r = 3\ cm;\ \ \theta = 2$ 4. a. 4224 cm^2 b. 7494 cm^2 c. 36%

Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

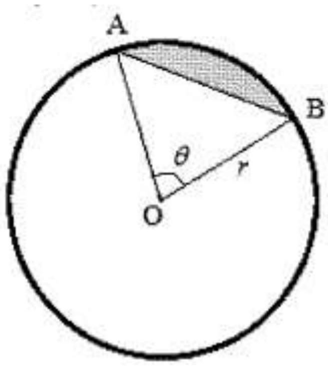
LESSON Plan

 Teacher	Name : Mrs. Suzanne Santhy Subject : Mathematics
 Date	Week : 8 Wednesday : 08/07/20
	Topic : **GEOMETRY & TRIGONOMETRY** Sub-Strand : Circle Geometry Lesson number : 11
 Learning outcomes	➢ **SPECIFIC LEARNING OUTCOMES:** • Find the area of segment using the area of a sector of a circle: $A = \frac{1}{2}r^2\theta$ • **Verify** how the area of the segment of a circle is equal to the area of the sector minus the area of the triangle. $Area\ of\ the\ segment = \frac{1}{2}r^2(\theta - \sin\theta)$ • **Calculate** the area of a segment of a circle

Introduction

AREA OF A SEGMENT

The area enclosed by a chord and an arc of a circle is called a **segment** (shown **shaded** on the diagram).



Catch phrase for the lesson

The area of the segment equals the area of the sector *minus* the area of the triangle formed.

Learners notes

Summary

The area of a segment can be found by subtracting the area of a triangle OAB from the area of a sector OAB.

The area of a segment

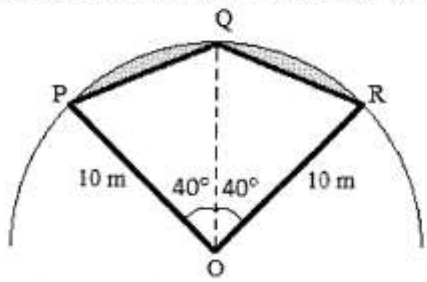
$$Area\ of\ Sector - Area\ of\ triangle$$

$$A = \frac{1}{2}r^2\theta - \frac{1}{2}r^2\ sin\theta$$

OR $$A = \frac{1}{2}r^2\ (\theta - \sin\theta)$$

Example :

The kite OPQR is shown in the sector OPR.



The sides PQ and QR of triangle OPQ and OQR each subtend an angle of 40° at the centre. The circle has a radius of 10 m.

Calaulate :

i) the area of the kite

ii) the shaded area

Solution :

1. For each triangle:

$$\text{Area} = \frac{1}{2}ab\sin C$$
$$= \frac{1}{2}(10)(10)\sin 40^\circ$$
$$= 32.14\,\text{m}^2$$

Area of kite = area OPQ + area of OQR

(*Note*: area of ΔOPQ = area of ΔOQR)

$$= 32.14\,\text{m}^2 + 32.14\,\text{m}^2$$
$$= 64.3\,\text{m}^2$$

2. The required area

= area of sector OPR − area of kite OPQR

$$\text{Area of sector OPR} = \frac{1}{2}r^2\theta$$
$$= \frac{1}{2}\times 10^2 \times \left(80^\circ \times \frac{\pi}{180^\circ}\right)$$

(Change degrees to radians)

$$= \frac{1}{2}\times 100 \times \left(\frac{4\pi}{9}\right)$$
$$= 69.8\,\text{m}^2$$

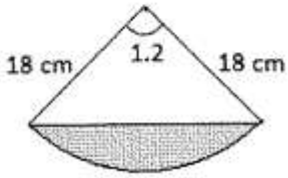
$$\therefore \text{Area required} = 69.8 - 64.3$$
$$= 5.5\,\text{m}^2$$

Visual aids

Exercises

Exercise :

1. The sector below is made up of a triangle (*unshaded*) and a segment (*shaded*). The radius of the sector is 18 cm, and the centre angle is 1.2 radians.



a. Calculate the area of the whole sector

b. Calculate the area of the triangle

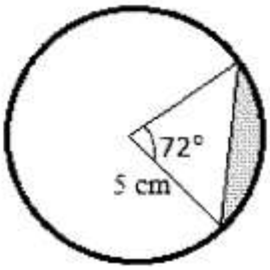
c. Calculate the area of the shaded segment

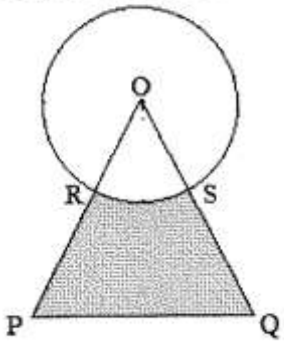
2. An equilateral triangle has sides of 10 cm. A circle (**circumcircle**) passes through all three vertices of the triangle.

    a. Calculate the radius of the circumcircle.

    b. Calculate the total area of all three segments formed by the triangle and the circumcircle.

3. Find the area of the shaded segment in the diagram.



	4. In this diagram the triangle OPQ is an equilateral triangle with sides 2 m long. The circle has a radius of 1 m.  a. Find the area of the shaded figure RSQP. b. Find the perimeter of RSQP. **Solutions :** 1. a. 194.4 cm^2 b. 151.0 cm^2 c. 43.41 cm^2 2. a. 5.77 cm b. 61.4 cm^2 3. 3.82 cm^2 4. a. 1.21 m^2 b. 5.05 m
Assignment	**Note** : It is a must that you (students) do this package and complete it in time allocated because assessments will be given later.
Assessment	
References	Barton,D. (1992). Theta Mathematics

WEEKLY CHECKLIST For Parents:

Term: 2 Week number 1 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 2 Date...... to...... Month: ....

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 3 Date...... to...... Month: ....

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 4 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 5 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 6 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 7 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 8 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 9 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 10 Date...... to...... Month: ....

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 11 Date...... to...... Month: ....

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 12 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				

Term: 2 Week number 13 Date…… to…… Month: …………

Subject	Number of lessons	Days	Tick when activity is complete	Parents comment	Signature
	1				
	2				
	3				
	4				
	5				
	6				