UANL

VISIÓN UANL 2040

La excelencia por principio la educación como instrumento

PORTFOLIO OF EVIDENCES

EXTRAORDINARY 2° OPPORTUNITY

MANAGEMENT OF FORM AND SPACES

Student name: _____

Group: _____

Student ID: _____ Date: _____

Teacher: _____

The present portfolio is part of 50% of your grade. This value will be obtained as long as it meets the following requirements:

1. Write your complete identification data.
2. The portfolio must be delivered person as a requirement the day of the exam.

FOLLOW THE INSTRUCTIONS PROVIDED BY YOUR TEACHER FOR THE COMPLETION OF THIS PORTFOLIO

¡¡¡WARNING!!!

Plagiarisms and trade of academic material contained in this portfolio will be punished under the terms of the University Legislation.

Course Objective:

In the "**Management of Forms and Spaces**" learning unit, students apply the principles of plane geometry and trigonometry to model and solve real-world problems. To this end, mathematical skills such as observation, analysis, and synthesis are developed through the study of the properties of geometric figures represented on a plane and the application of trigonometric knowledge, which helps strengthen spatial mathematical reasoning.

Contents:

Stage 1: Angles and Triangles

- Select the postulates and theorems of plane geometry to solve mathematical problems.

Stage 2: Properties of Polygons and the circumference

- Analyze the properties of polygons, quadrilaterals, and circles.

Stage 3: Right Triangles

- Apply the trigonometric ratios of a right triangle to solve problems in various contexts.

Stage 4: Oblique Triangles

- Calculate the values of trigonometric functions for angles of any size and solve everyday problems involving right-angled triangles.

General Guidelines

- The activities in the portfolio of evidence must be submitted on time and in accordance with the guidelines specified by the teacher.

• In the event of plagiarism and/or misconduct in the portfolio of activities, the student must take responsibility for their actions.

Policies and Guidelines

The student and their advisor must read and sign to acknowledge the policies and guidelines

- Work on the portfolio is required.
- Problems must have a correct, clear, understandable, and complete procedure.
- The procedures must be completed **in pencil.**
- The use of apps to solve problems in the portfolio will not be permitted.
- The use of a calculator is required. (Cell phones are not allowed.)
- The portfolio must be submitted on time and in the required format, as requested by the instructor.
- Grading will be based on the following: 50% portfolio of evidence and 50% exam.
- In order for the student to earn 50 points on the portfolio, it must be 100% correct; points will be deducted for each question answered incorrectly or left blank..
- The portfolio will **NOT** be accepted after the deadline. If a student needs to reschedule their exam, the portfolio must not be submitted after the date set by the instructor.
- Every problem must have a clear and correct solution. If only the answer is provided, it is considered incomplete.
- The guidelines must be signed by the student and their guardian; if they are not signed, the teacher will not be able to review the student's assignments, as this is a requirement.

_____ _____

Student's name and signature | Name and signature of the tutor

STAGE 1: ANGLES AND TRIANGLES

Dimension 2: Comprehension

Solve each of the following exercises:

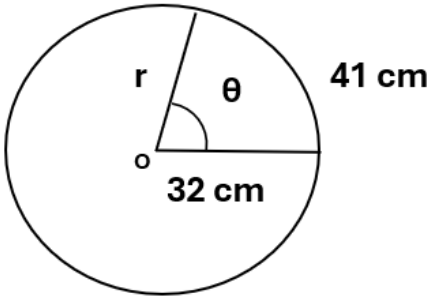
1. Convert 60° to radians and express the result in terms of π

2. Convert 4π/9 radians to sexagesimal degrees.

Dimension 3: Analysis

Solve each of the following exercises:

3. Find the measure of the central angle of the circle, given that the arc measures 41 cm and its radius is 32 cm. Express the angle in the sexagesimal system.

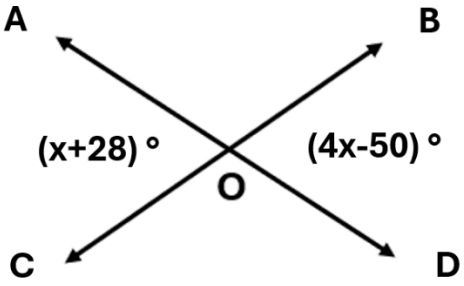


4. The angles ∠A = 12(x-5)° and ∠B = 8(x-10)° are conjugate. Find the measure of each angle.

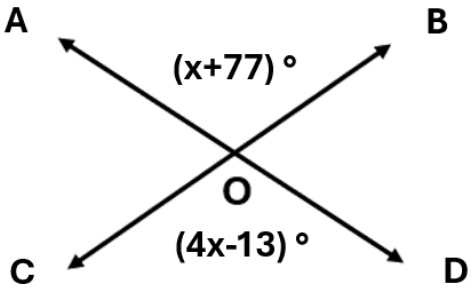
5. If the angles ∠A = (3x + 25)° and ∠B = (4x - 12)° are complementary, what is the measure of angle ∠A?

6. Given that angles A = 2(x-5)° and B = 3(15+x)°, determine the measure of angle B, if the angles are supplementary.

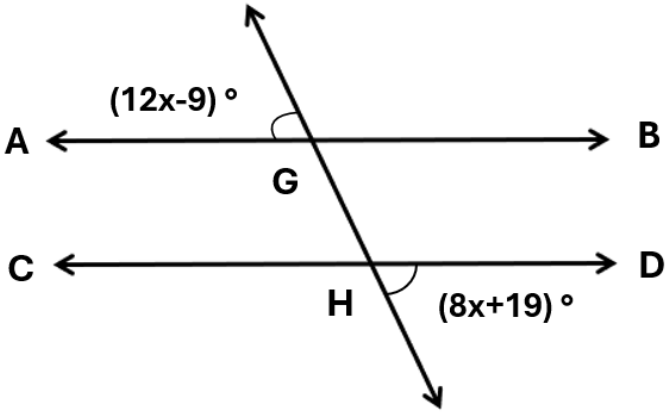
7. Based on the figure, determine the value of “x”.



8. Based on the figure below, determine the measure of ∠AOC.



9. Based on the figure shown, where AB is perpendicular to CD, find the value of “x”.

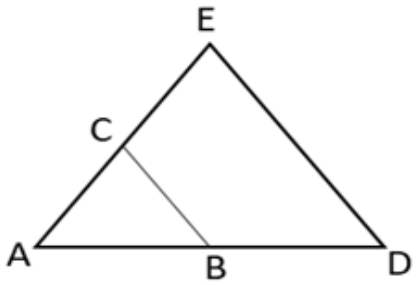


10. Let A, B, and C be the interior angles of a triangle, where A = (5x + 13)°, B = (7x - 2)°, and C = (4x + 25)°. Find the measure of angle A.

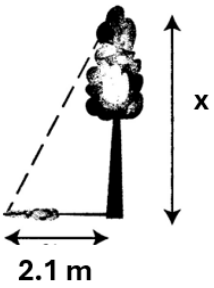
11. The angles of a triangle are in the ratio 2:7:9. Find the measure of each angle.

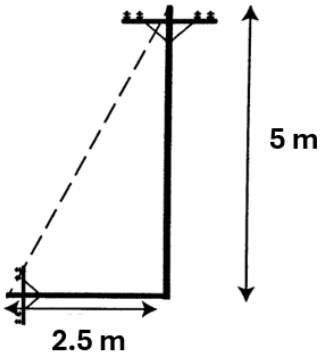
12. In the triangle ADE, DE ≠ BC. Find the value of “x” if:

AC= x+4
AE= 52
BC=10
DE=40



13. A vertical pole 5 meters tall casts a shadow 2.5 meters long. How tall is a vertical tree that, at the same time, casts a shadow 2.1 meters long?





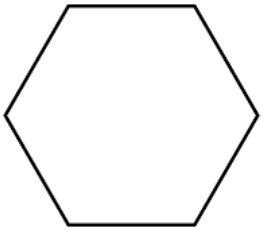
CHECKLIST SELF-ASSESSMENT PERFORMANCE EVALUATION STAGE 1			
Performance indicator	**YES**	**NO**	**COMMENTS**
I can correctly identify angle measurement systems.			
I express angles in the sexagesimal and circular systems.			
I establish the relationship between the radius, the arc, and the central angle.			
I identify the types of angles based on their sum.			
I can identify the types of angles based on their position.			
I identify the properties of the angles to be used based on the context of the problem.			
I can identify the different types of triangles based on the measures of their angles.			
I correctly determine the ratios in situations involving similar triangles.			
I am writing down the steps needed to solve a problem.			
I bring order and consistency to procedures.			
I have a clear understanding of all the topics in Stage 1.			

STAGE 2: Properties of polygons and the circumference

Dimension 3: Analysis

Do each of the following exercises.

14. Calculate the area of regular hexagon:



a) Sum of the interior angles.

b) The measure of each interior angle.

c) The measure of each exterior angle.

d) The number of diagonals.

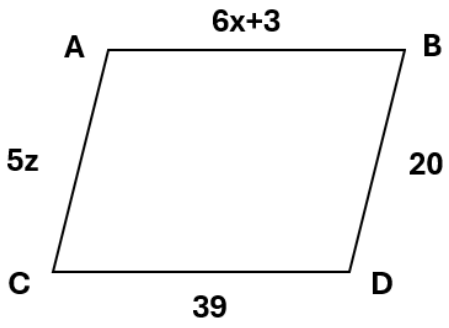
15. Calculate the sum of the interior angles of a regular pentagon

16. Find the measure of the interior angle of a regular octagon

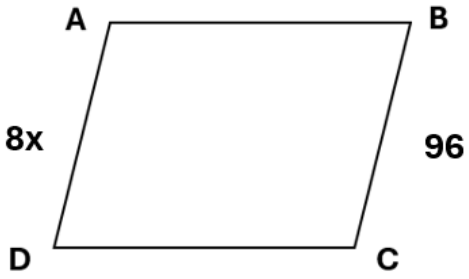
17. How many sides does a regular polygon have if the sum of its interior angles is 1080°?

18. What is the regular polygon in which 27 diagonals can be drawn?

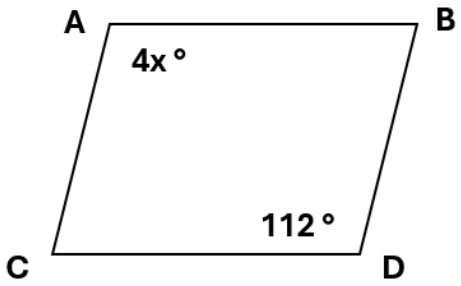
19. If ABCD is a parallelogram, find the values of “x” and “z”.



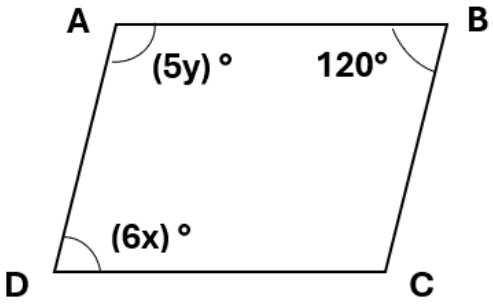
20. If ABCD is a parallelogram, find the value of “x”



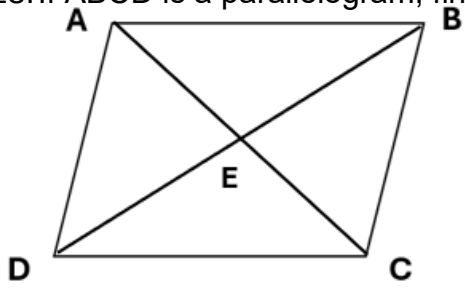
21. If ABCD is a parallelogram, find the value of “x” and the measure of ∠B.



22. If ABCD is a parallelogram, find the values of “x” and “y”.

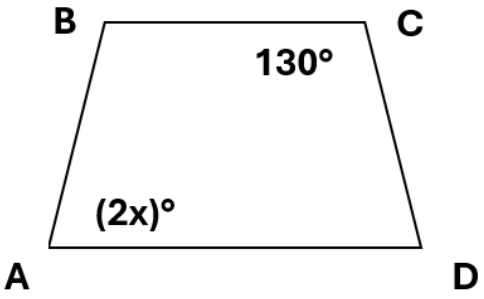


23. If ABCD is a parallelogram, find the values of “x” and “y”.

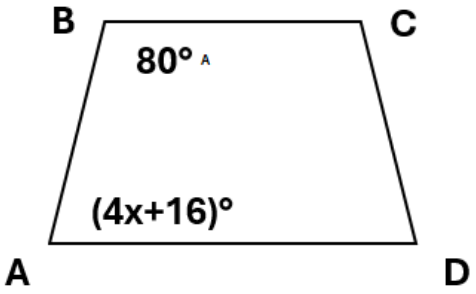


AE=2x
AC=44
DE=4y
BE=20

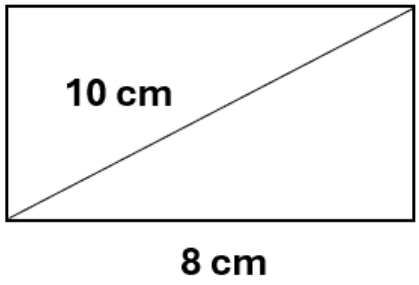
24. If ABCD is an isosceles trapezoid, find the value of “x”.



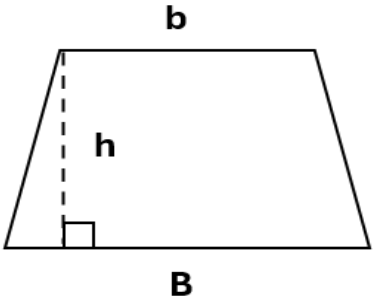
25. If ABCD is a trapezoid, find the value of “x”.



26. Find the area of the rectangle if its base is 8 cm and one of its diagonals measures 10 cm.

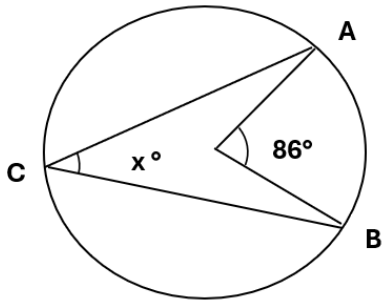


27. Find the area of the trapezoid if the longer base is 16 cm, the shorter base is 12 cm, and the height is 8 cm.



28. Find the area of the rhombus if its longer diagonal is 30 cm and its shorter diagonal is 12 cm.

29. Find the measure of $\angle x$, given that O is the center of the circle.



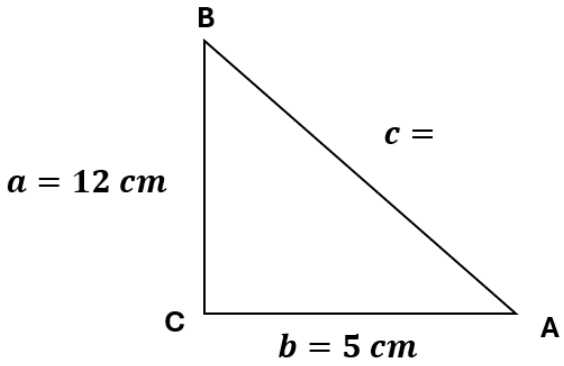
CHECKLIST SELF-ASSESSMENT PERFORMANCE EVALUATION STAGE 2			
Performance indicator	**YES**	**NO**	**COMMENTS**
I can correctly identify the elements and properties of the relevant polygon to solve problems.			
I correctly identify the properties of quadrilaterals in order to solve problems involving them.			
I calculate the area of the figures.			
I recognize and distinguish the different types of angles associated with a circle.			
I correctly calculate the inscribed angle of the circle.			
I am writing down the steps needed to solve the problem.			
I have a clear understanding of all the topics in Stage 2.			

STAGE 3: RIGHT TRIANGLES

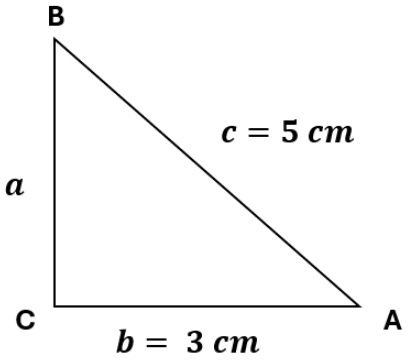
Dimension 3: Analysis

Solve each of the following exercises

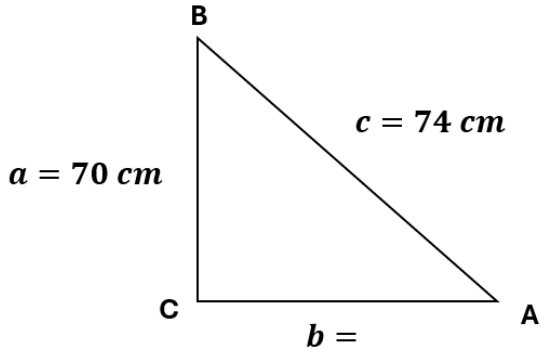
30. Find the length of side c in the following right triangle.



31. Find the length of the missing side in the following right triangle.



32. Find the length of the missing side in the following right triangle.



33. Determine, in each case, which trigonometric ratio is being referred to.

a) The trigonometric ratio obtained by dividing the adjacent side by the hypotenuse. _____

b) The trigonometric ratio obtained by dividing the opposite side by the hypotenuse. _____

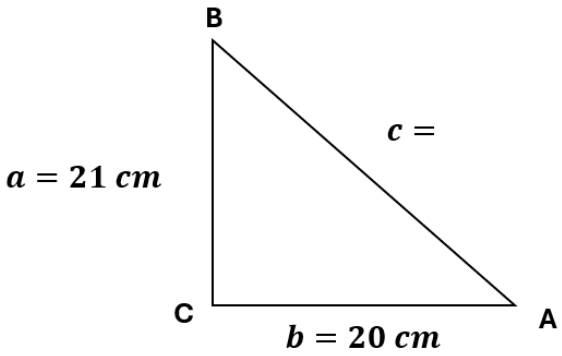
c) The trigonometric ratio obtained by dividing the adjacent side by the opposite side**.** _____

d) The trigonometric ratio obtained by dividing the opposite side by the adjacent side. _____

e) The trigonometric ratio obtained by dividing the hypotenuse by the adjacent side. _____

f) The trigonometric ratio obtained by dividing the hypotenuse by the opposite side. _____

34. Given the following right triangle, calculate the length of the missing side and determine the trigonometric ratios of its two acute angles.



Sin A =	Sin B =
Cos A =	Cos B =
Tan A =	Tan B =
Cot A=	Cot B=
Sec A=	Sec B=
Csc A=	Csc B=

Dimension 2: Comprehension

Solve each of the following exercises.

35. Find the value of sin 76°.

35. Determine the value of the coordinate 54°30´

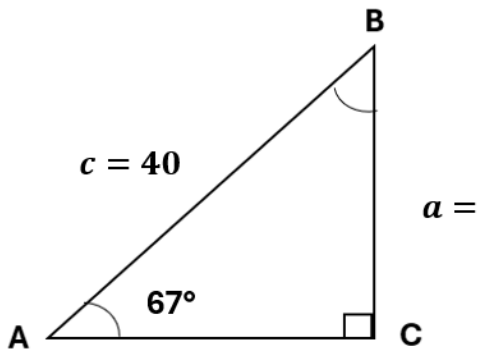
36. Given that the sine of θ is 0.3907, find the measure of the acute angle in decimal degrees and in degrees, minutes, and seconds.

37. Given that sec θ = 2.1300, find the measure of the acute angle in decimal degrees and in degrees, minutes, and seconds.

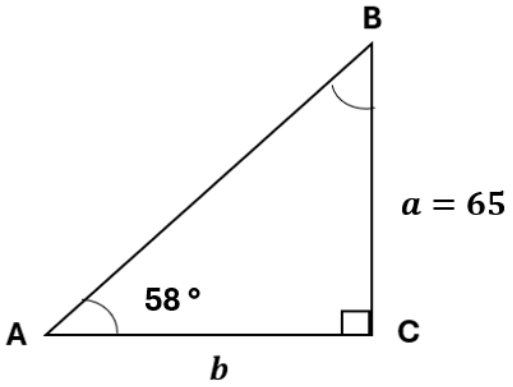
Dimension 3: Analysis

Solve each of the following exercises.

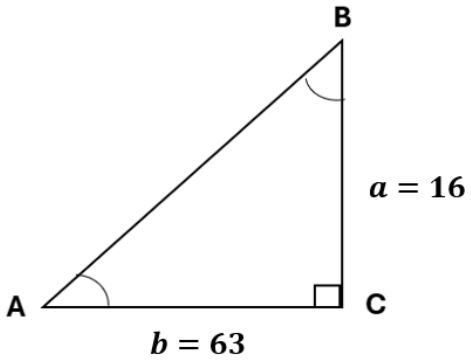
38. Find the length of side a in the following right triangle.



39. Find the length of side b in the following right triangle.



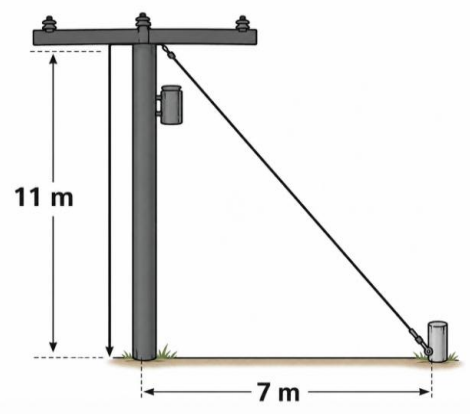
40. Find the measure of angle A in the following right triangle.



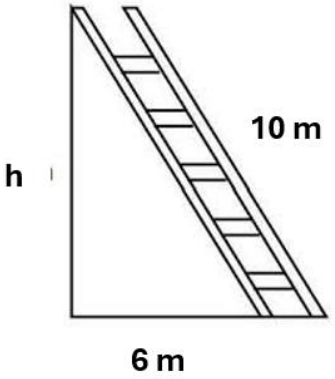
Dimension 4: Application

Solve each of the following exercises.

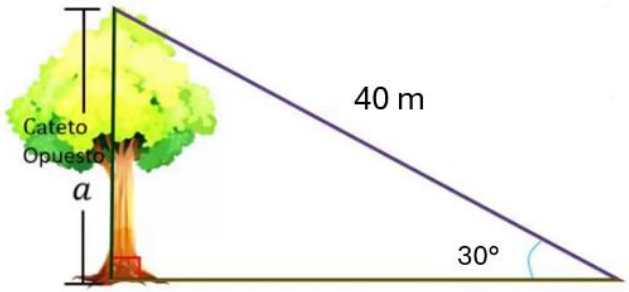
41. A 11-meter-tall pole is to be secured with a steel cable running from the top of the pole to a stake located 7 meters from its base. What is the length of the cable?



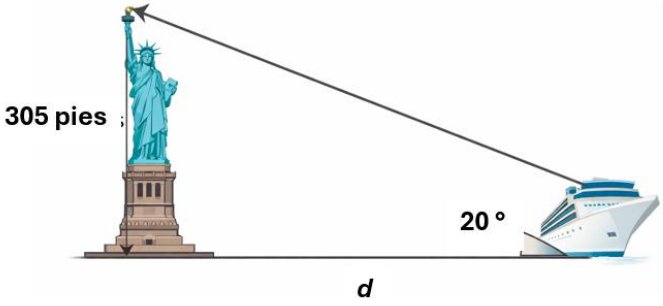
42. A 10-meter ladder is leaning against a wall. If the base of the ladder is 6 meters from the wall, how high does the ladder reach on the wall?



43. A 40-meter rope is suspended from the highest point of a tree's crown, forming a 30° angle with a completely horizontal surface. What is the height of the tree?



44. A boat is in New York Harbor, from which the Statue of Liberty, which is approximately 305 feet tall, can be seen. If the angle of elevation to the top of the torch is 20°, how far is the boat from the base of the statue?



CHECKLIST SELF-ASSESSMENT PERFORMANCE EVALUATION STAGE 3			
Performance indicator	**YES**	**NO**	**COMMENTS**
I use the Pythagorean theorem to find the missing side of the right triangle.			
I identify the six trigonometric ratios for a given acute angle in a right triangle.			
I use the calculator to find the values of trigonometric functions.			
I use the calculator to find the angle in degrees.			
I identify the appropriate trigonometric ratios for solving the triangle.			
I am writing down the steps needed to solve a problem.			
I bring order and consistency to procedures.			
I have a clear understanding of all the topics in Stage 3.			

STEP 4: OBLIQUE TRIANGLES

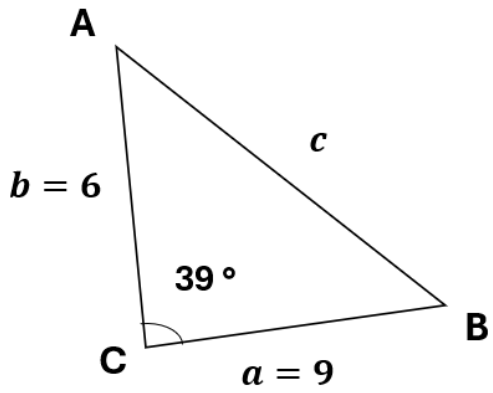
Dimension 3: Analysis

Solve each of the following exercises

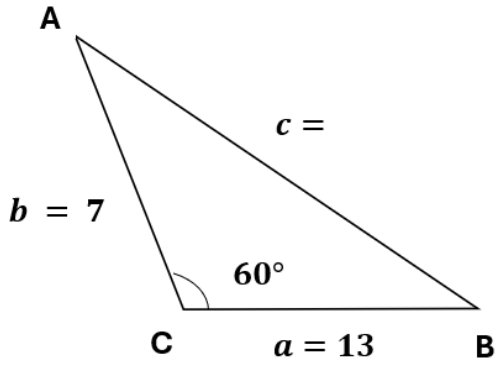
45. Determine the reference angle θ, where θ = 130°

46. Find the values of the trigonometric functions of angle Θ if its terminal side passes through the point (-3,4)

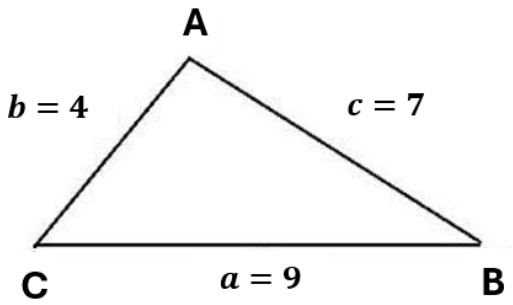
47. Find the length of side c in the triangle below.



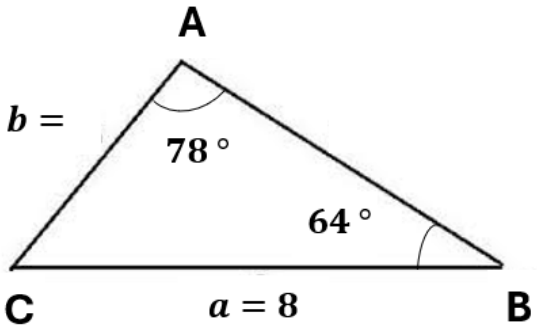
48. Find the length of side c in the triangle below.



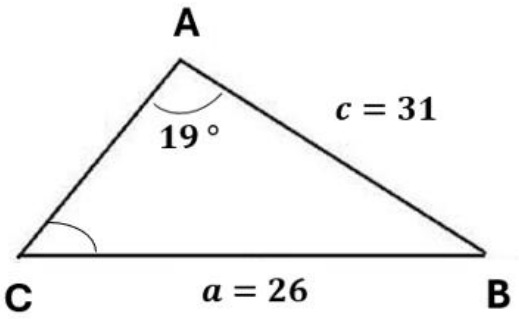
49. In triangle ABC, if a = 9, b = 4, and c = 7, find the measure of angle A.



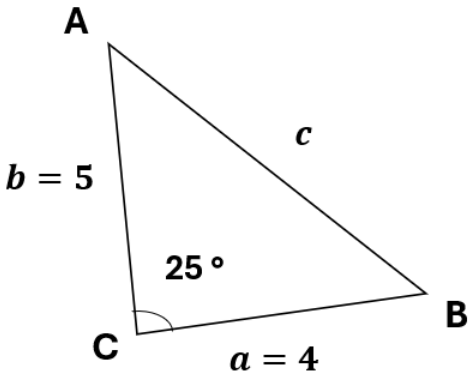
50. In triangle ABC, a = 8, ∠A = 78°, and ∠B = 64°. Find the length of the side b.



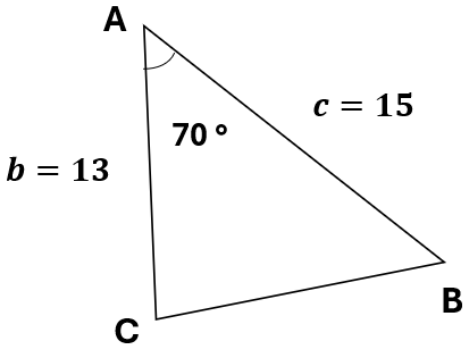
51. In triangle ABC, ∠A = 19°, a = 26, and c = 31. Find the measure of ∠C.



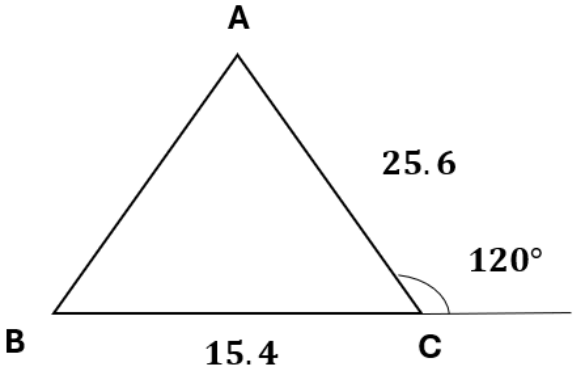
52. Find the area of the following triangle.



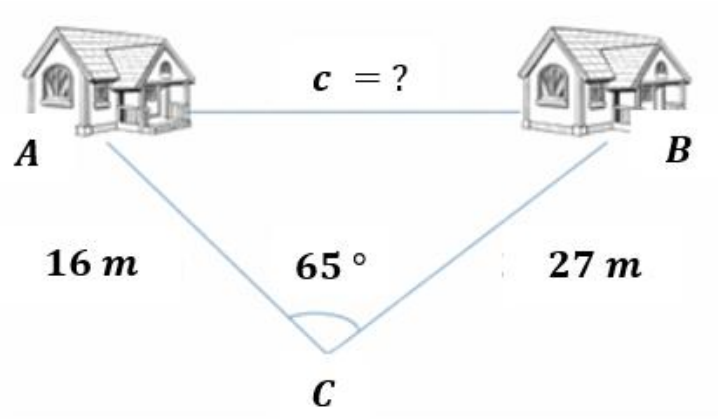
53. Find the area of the following triangle.



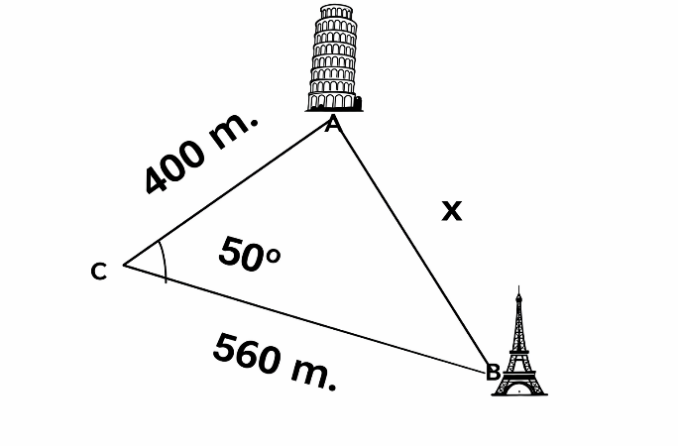
54. Find the area of the following triangle.



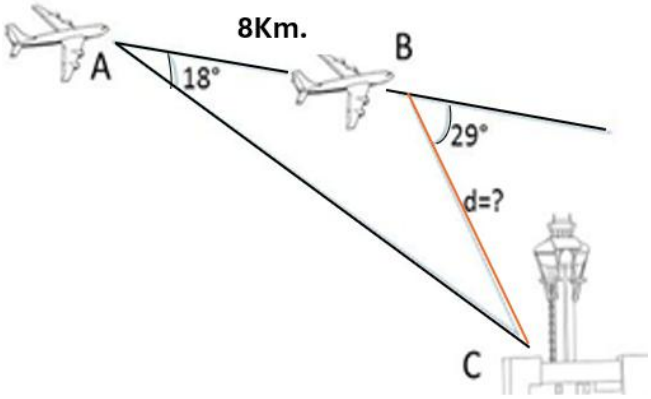
55. To calculate the distance between two cabins located on opposite shores of a lake, a surveyor stood at point “P.” He then walked to each cabin and measured 16 meters and 27 meters, respectively. Finally, he measured the angle of observation between the cabins, which turned out to be 65°. What is the distance between the cabins?



56. A tourist is standing at point C, from which he can see two towers, A and B. The distance between the tourist and tower A is 400 m, and the distance between the tourist and tower B is 560 m. The angle formed between point C and the lines of sight extending from there toward the towers is 50°. Calculate the distance between points A and B.

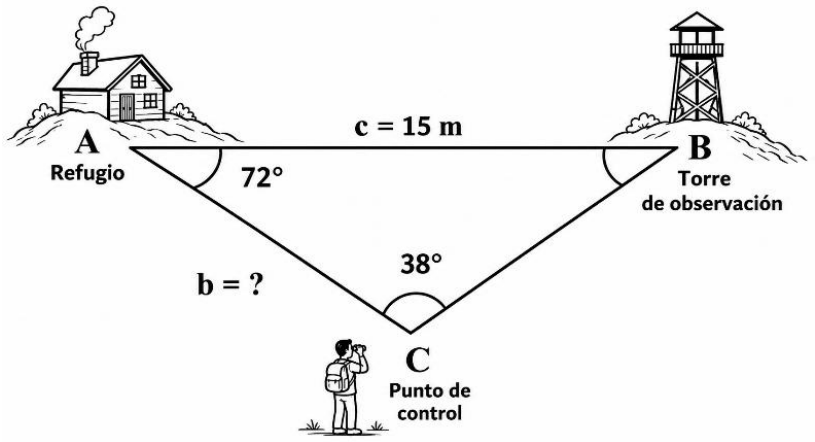


57. An airplane pilot notices on the radar that the airport where he is to land is at 18°. After flying 8 km in the same direction, he looks at the radar again and now sees that it is at 29°, as shown in the figure below. How far is he from the airport?

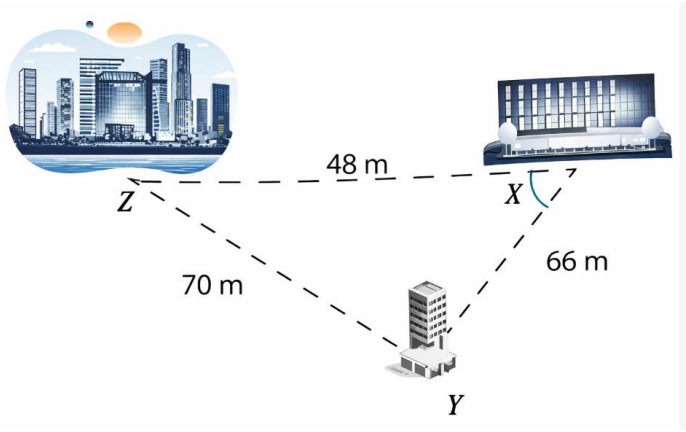


58. A rescue team wants to determine the distance between a checkpoint and a shelter in mountainous terrain. It is known that the distance between the shelter and an observation tower is 15 m.

If the angle at the control point is 38° and the angle at the shelter is 72°, what is the distance between the control point and the shelter?



59. A young man is staying at a hotel in a certain city. Upon leaving, he walks 48 m eastward to reach the auditorium. After watching a play, he walks 66 m southwest toward a restaurant. Since it is late and he wants to rest, he walks 70 m back to the hotel. Find the angle formed by the path between the hotel and the auditorium and the path between the auditorium and the restaurant.

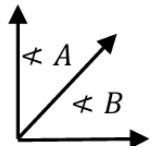
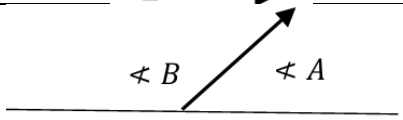
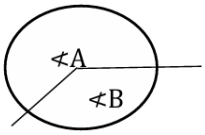


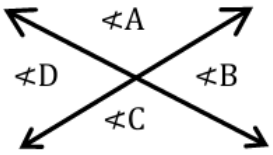
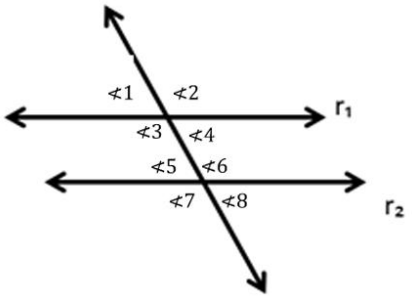
CHECKLIST SELF-ASSESSMENT PERFORMANCE EVALUATION STAGE 4			
Performance indicator	**YES**	**NO**	**COMMENTS**
I correctly identify the reference angle based on its angle in the normal position.			
Determine the values of the trigonometric functions for a normal angle whose terminal side passes through the point (x, y).			
I understand the conditions for applying the sine and cosine laws.			
I correctly apply the law of cosines to solve right-angled triangles.			
I correctly apply the law of sines to solve isosceles right triangles.			
I can correctly calculate the area of a triangle.			
I solve real-world problems by applying the laws of sines and cosines.			
I am writing down the steps needed to solve a problem.			
I bring order and consistency to procedures.			
I have a clear understanding of all the topics in Stage 4.			

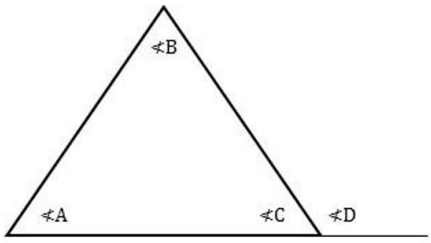
Management of Forms and Spaces

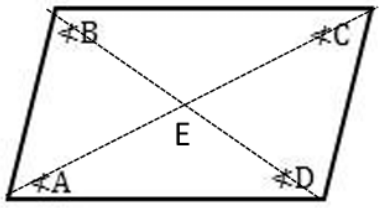
Properties

Conversion from Sexagesimal Degrees to Radians	Conversion from Radians to Sexagesimal Degrees
$\boldsymbol{Grados}\left\lvert\frac{\pi}{180°}\right\rvert$	$\boldsymbol{Radianes}\left\lvert\frac{180°}{\pi}\right\rvert$

Classification of angle pairs	Diagram	Equation
Supplementary		$\boldsymbol{A + B = 90°}$
Extra		$\boldsymbol{A + B = 180°}$
Conjugates		$\boldsymbol{A + B = 360°}$

Two lines intersecting in a plane		
Diagram	**Property**	**Equation**
	**Angles opposite** the same vertex are equal.	$\boldsymbol{\angle A = \angle C}$ $\boldsymbol{\angle B = \angle D}$
	The **adjacent angles** are supplementary.	$\boldsymbol{\angle A + \angle B = 180°}$ $\boldsymbol{\angle B + \angle C = 180°}$ $\boldsymbol{\angle C + \angle D = 180°}$ $\boldsymbol{\angle D + \angle A = 180°}$
Two lines intersected by a transversal		
Diagram	**Property**	**Equation**
	The **angles subtended** by the same vertex are equal	$\boldsymbol{\angle 1 = \angle 4 = \angle 5 = \angle 8}$ $\boldsymbol{\angle 2 = \angle 3 = \angle 6 = \angle 7}$

Triangles		
Diagram	**Property**	**Equation**
	The **three interior angles** of a triangle add up to 180°.	$\angle A + \angle B + \angle C = 180°$
	An **exterior angle** is equal to the sum of the two opposite interior angles.	$\angle D = \angle A + \angle B$
	The **exterior angle** and the corresponding **interior angle** are supplementary.	$\angle D + \angle C = 180°$

Parallelogram		
Diagram	**Property**	**Equation**
	**Opposite angles** of a parallelogram are equal.	$\angle A = \angle C$ $\angle B = \angle D$
	The **adjacent angles** of a parallelogram are supplementary.	$\angle A + \angle B = 180°$ $\angle B + \angle C = 180°$ $\angle C + \angle D = 180°$ $\angle D + \angle A = 180°$
	The **diagonals** bisect each other,	$\overline{AB} = \overline{EC}$ $\overline{BE} = \overline{ED}$
	Opposite sides of a parallelogram are equal.	$AB = CD$ $AD = BC$

Trapezoid		
Diagram	**Property**	**Equation**
	The angles at **the bases of an isosceles trapezoid** are equal.	$\angle A = \angle D$ $\angle B = \angle C$
	The **angles of the non-parallel sides** are supplementary.	$\angle A + \angle B = 180°$ $\angle C + \angle D = 180°$

Form

Central Angle
$\theta = \frac{S}{r}$
Converting Radians to Degrees
Radians $\left\lvert\frac{180°}{\pi\ rad}\right\rvert$

Industrial Park
$S_{int} = 180°(n-2)$
$A_i = \frac{180°(n-2)}{n}$
$A_{ext} = \frac{360°}{n}$
$d = \frac{n(n-3)}{2}$
$Donde\ \boldsymbol{n = lados}$

Right Triangles

$$c^2 = a^2 + b^2$$
$$a^2 = c^2 - b^2$$
$$b^2 = c^2 - a^2$$

$$Sin\theta = \frac{co}{h} \qquad Csc\theta = \frac{h}{co}$$
$$Cos\theta = \frac{ca}{h} \qquad Sec\theta = \frac{h}{ca}$$
$$Tan\theta = \frac{co}{ca} \qquad Cot\theta = \frac{ca}{co}$$

Areas of Oblique-Angled Triangles

$$A = \frac{1}{2}bcSenA$$
$$B = \frac{1}{2}acSenB$$
$$C = \frac{1}{2}abSenC$$

Industrial Park Areas		
Industrial Park	Perimeter	Area
Square	$P = 4l$	$A = l^2$
Rectangle	$P = 2h + 2b$	$A = bh$
Triangle	$P = a + b + c$	$A = \frac{bh}{2}$
Rhombus	$P = 4l$	$A = \frac{d_1 d_2}{2}$
Trapezoid	$P = a + b + c + d$	$A = \frac{h(b_1 + b_2)}{2}$

Triangles and Oblique Triangles

- Law of Cosines

SIDES

$$a^2 = b^2 + c^2 - 2bcCosA$$
$$b^2 = a^2 + c^2 - 2acCosB$$
$$c^2 = a^2 + b^2 - 2abCosC$$

ANGLES

$$A = Cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right)$$
$$B = Cos^{-1}\left(\frac{a^2 + c^2 - b^2}{2ac}\right)$$
$$C = Cos^{-1}\left(\frac{a^2 + b^2 - c^2}{2ab}\right)$$

- • Law of Sines

SIDES

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

ANGLES

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

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