A. Lesson Context

BIG PICTURE of this UNIT:	• How do I determine the measure of angles in geometric shapes, without direct measurement? • How do I solve for sides or angles in right triangles? • How can I solve problems that require geometric models using right triangles??

B. Lesson Objectives

    i.   Learn how to work with trigonometric functions from the perspective of trigonometric ratios as applied to simple right triangles

    ii. Create geometric models (obviously involving right triangles) that then require trigonometry to solve

PART 1 – Skills REVIEW

SKILL #1: Solving "proportions/ratios" for the unknown:

1) $\dfrac{n}{8} = \dfrac{12}{16}$

2) $\dfrac{3}{k} = \dfrac{5}{15}$

3) $\dfrac{18}{30} = \dfrac{y}{4}$

4) $\dfrac{2.8}{4} = \dfrac{7}{x}$

5) $\dfrac{8}{20} = \dfrac{30}{c}$

6) $\dfrac{24}{n} = \dfrac{30}{100}$

7) $\dfrac{8+x}{20} = \dfrac{30}{7}$

8) $\dfrac{0.24+a}{a} = \dfrac{3}{9.6}$

9) $\dfrac{1+x}{x} = \dfrac{x}{1}$

SKILL #2: The Concept of "Inverse"

1. Explain how to solve the equation $x + 5 = 8$.

2. Explain how to solve the equation $x - 5 = 8$.

3. Explain how to solve the equation $5x = 8$.

4. Explain how to solve the equation $\dfrac{x}{5} = 8$.

5. Explain how to solve the equation $x^2 = 8$.

6. Explain how to solve the equation $\sqrt{x} = 8$.

7. Explain how to solve the equation $\sin(30°) = x$.

8. Explain how to solve the equation $\sin(x) = 0.58$

SKILL #3: Working with Trig Ratios

In a right triangle:

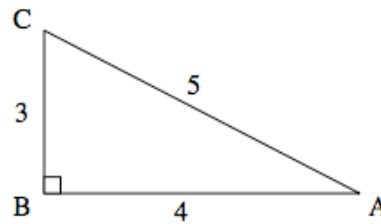| tangent of an angle $=$ | $\dfrac{\text{leg opposite of the angle}}{\text{leg adjacent to the angle}}$ |

Exercise #3: $\tan A =$ $\tan C =$

| sine of an angle $=$ | $\dfrac{\text{leg opposite of the angle}}{\text{hypotenuse}}$ |

Exercise #4: $\sin A =$ $\sin C =$

| cosine of an angle $=$ | $\dfrac{\text{leg adjacent to the angle}}{\text{hypotenuse}}$ |

Exercise #5: $\cos A =$ $\cos C =$

A Helpful Mnemonic For Remembering the Ratios:

SOH-CAH-TOA

Sine is Opposite over Hypotenuse – Cosine is Adjacent over Hypotenuse – Tangent is Opposite over Adjacent

Exercise #3: Find each of the following ratios for the right triangle shown below.

(a) $\sin A =$ (b) $\tan B =$

(c) $\cos A =$ (d) $\tan A =$

(e) $\cos B =$ (f) $\sin B =$
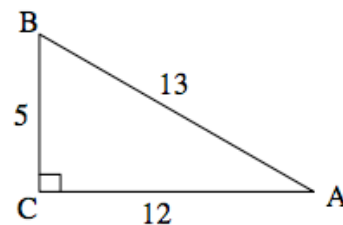
SKILL #4: Solving for Sides and Angles in Right Triangles
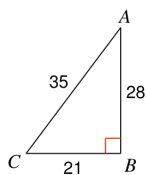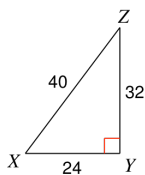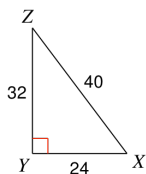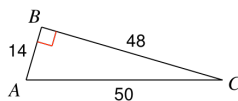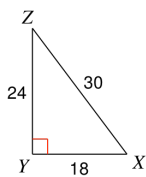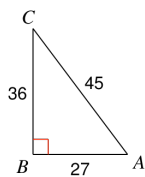
Kuta Software - Infinite Geometry

Name_____

Trigonometric Ratios

Date_____ Period_____

Find the value of each trigonometric ratio.

1) tan Z

2) cos C

3) sin C

4) tan X

5) cos A

6) sin A

7) sin Z

8) sin C

9) cos Z
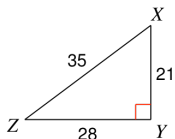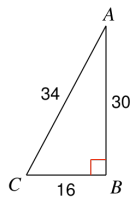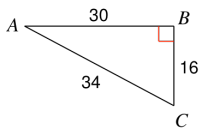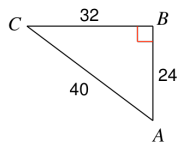
10) tan C

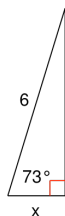Kuta Software - Infinite Geometry

Name_____

Solving Right Triangles

Date_____ Period_____
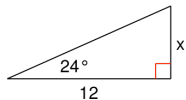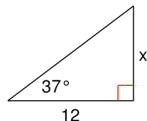
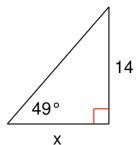**Find the missing side. Round to the nearest tenth.**

1)

x

72°

6

2)

6

73°

x

3)

24°

12

x

4)

37°

12
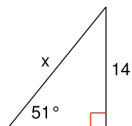
x
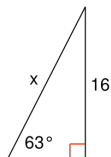
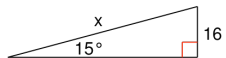5)

14

49°

x

6)

x

14

51°

7)

x

16

63°

8)

x

16

15°

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Name_____

Inverse Trigonometric Ratios

Date_____ Period____

Find each angle measure to the nearest degree.

1) $\sin B = 0.4848$

2) $\sin A = 0.5150$

3) $\cos A = 0.7431$

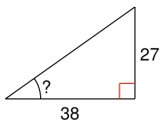4) $\cos W = 0.6157$

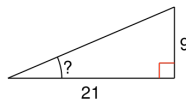5) $\cos A = 0.5878$

6) $\tan W = 19.0811$

7) $\cos A = 0.4226$

8) $\tan W = 0.5317$

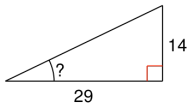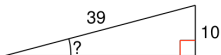**Find the measure of the indicated angle to the nearest degree.**

9)

10)

11)
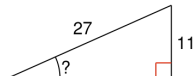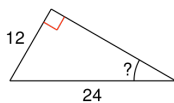

12)

13)

14)

15)

12
?
24

16)

20
?
13

17)

8
?
6

18)

5
?
4

19)

14
48
50
?

20)

51
?
85
68

21)

7
?
25
24

22)

16
34
?
30

23)

68
?
51
85

24)

?
56
70
42
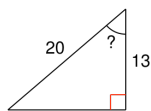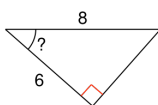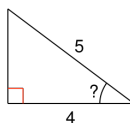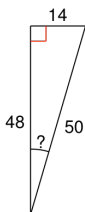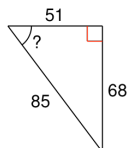
Critical thinking questions:

25) Find an angle x where $\sin x = \cos x$.

26) Draw and label all three sides of a right triangle that has a 40° angle and a hypotenuse of 10 cm.

The Primary Trigonometric Ratios – <u>Word Problems</u>

When we want to measure the height of an "inaccessible" object like a tree, pole, building, or cliff, we can utilize the concepts of trigonometry.

To solve such inaccessible heights or depths using trigonometry, the following angle definitions are necessary:
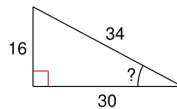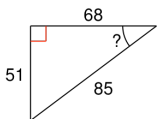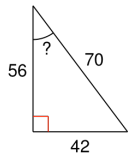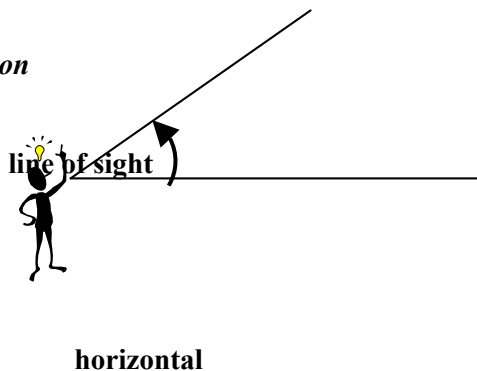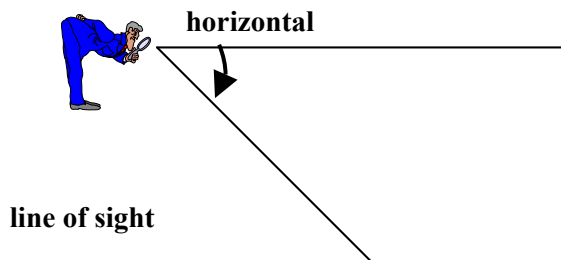
Angle of Elevation

line of sight

horizontal

The Angle of Elevation is the angle from the horizontal to your line of sight. (i.e. you are looking upwards at the object)

Angle of Depression

horizontal

line of sight

The Angle of Depression is the angle from the horizontal to the line of sight. (i.e. you are looking downwards at the object)


SOLVING FOR AN UNKNOWN SIDE OR ANGLE

Where Do I Begin…Where Does It End?

1. Sketch the triangle, if one has not been provided for you.
2. Label the given angle(s) and side(s). Include the variable for the unknown side or angle, where needed.
3. "Looking" from the given angle, label the opposite side, adjacent side, and hypotenuse.
4. Write the trig ratio (sin, cos, tan) that contains the given information and the unknown you want to find.
5. Substitute the given information, and solve for the unknown.

Example 1

If your distance from the foot of the tower is 20 m and
the angle of elevation is 40°, find the height of the tower.
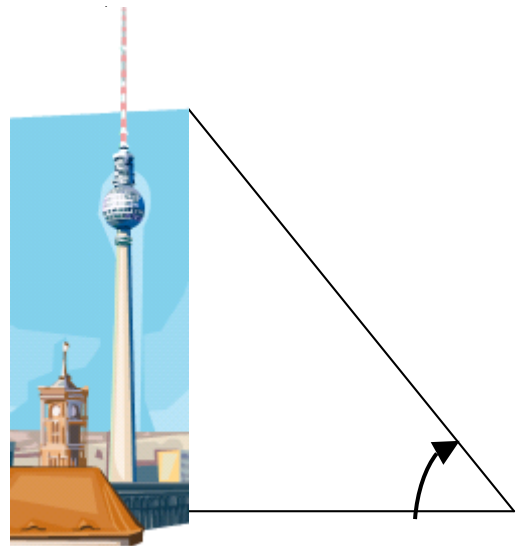
Example 2

The angle of depression from the top of the pagoda

to boat is 25°. If the boat is 50 m from

the base of the pagoda, how high is the pagoda

(to the nearest meter)?

1. The stringer, that supports the stairs, makes an angle of 50° with the floor. It reaches
    3.2 m up the wall. How far is the base of the stringer from the wall?

    3.2 m

    50°

    x
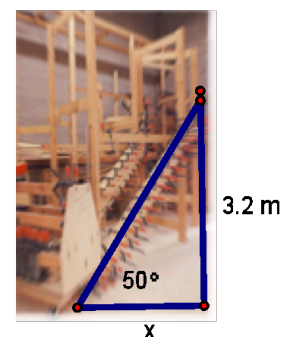
2. A ship is 130 m away from the centre of a barrier that measures 180 m from end to end. What is the minimum angle that the boat must be turned to avoid hitting the barrier?

180 m

x

130 m
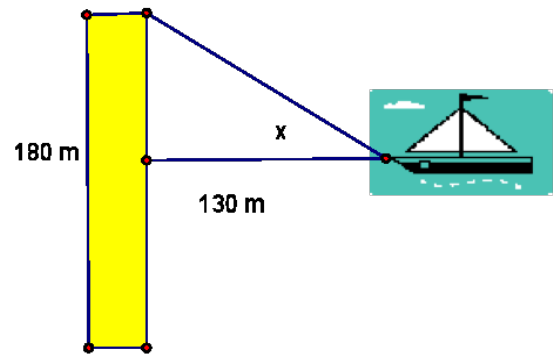
3. A ramp has an angle of inclination of 20°. It has a vertical height of 1.8 m. What is the length, L metres, of the ramp?

L

1.8 m

20°
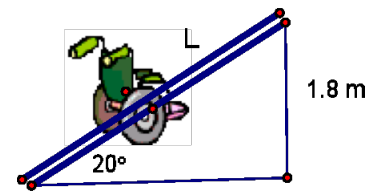
A damaged tree is supported by a guy wire 10.0 m long. The wire makes an angle of 61° with the ground. Calculate the height at which the guy wire is attached to the tree.

h

10.0 m

61°
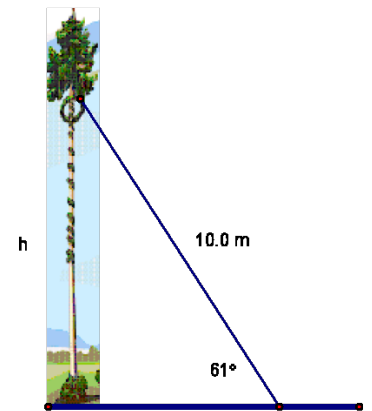
5. A helicopter is hovering above a road at an altitude of 24 m. At a certain time, the distance between the helicopter and a car on the road is 45.0 m. Calculate the angle of elevation of the helicopter from the car.

45.0 m

24 m

x
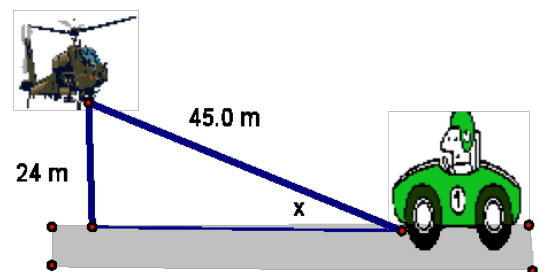
Answers: 1) 2.7 m   2) 34.7°   3) 5.3 m   4) 8.7 m   5) 32.2°