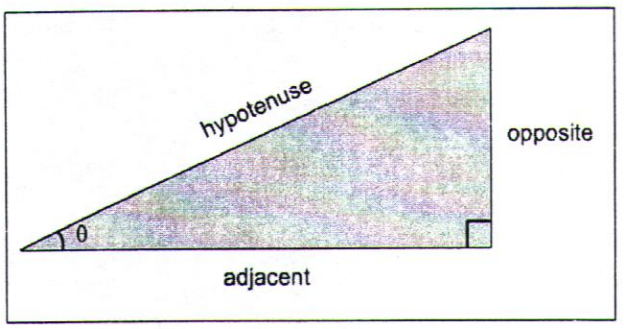
West Spring Secondary School
2011 3E Elementary Mathematics Assignment 33: Trigonometry

Name: _____ ( ) **Class:** _____ **Date:** _____

Overview

This worksheet revises the following:

1. **Basic trigonometric ratios**
2. **Trigonometric ratios of obtuse angles**
3. **Area of triangle**



The Three Trigonometric Ratios

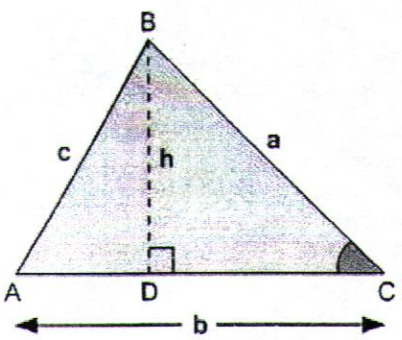
$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

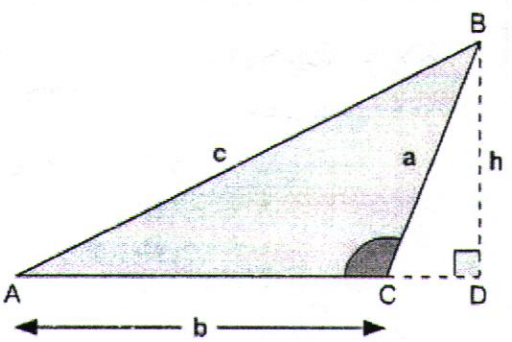
$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

Area of Triangle

The area of a triangle can be found if two of its sides and the included angle (acute or obtuse) are given. An included angle is an angle between two given sides of a triangle.



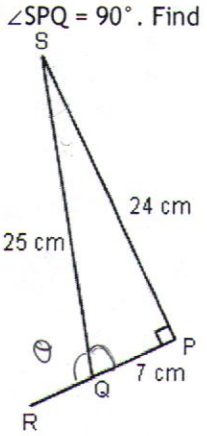
$$\text{Area of a } \Delta = \frac{1}{2}ab\sin C$$
$$= \frac{1}{2}bc\sin A$$
$$= \frac{1}{2}ac\sin B$$



where a is the side opposite $\hat{A}$, b is the side opposite $\hat{B}$ and c is the side opposite $\hat{C}$.

Examples:

1. In the diagram, PQR is a straight line. PQ = 7 cm, PS = 24 cm, QS = 25 cm and ∠SPQ = 90°. Find
   a. tan ∠PSQ
   b. cos ∠SQR
   Give both answers as fractions.



(a) $\tan \hat{PSQ} = \frac{O}{a} = \frac{7}{24}$

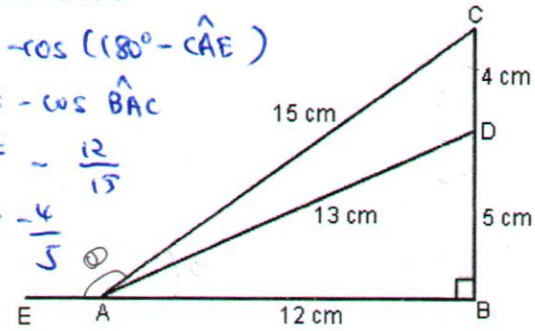
(b) $\cos \hat{SQR} = -\cos(180° - \hat{SQR})$

$\cos \hat{SQR} = -\cos \hat{SQP}$

$= -\frac{7}{25}$

2. In the right-angled triangle ABC, D is a point on BC. Given that CD = 4cm, BD = 5cm, AB = 12cm, AC = 15cm and AD = 13cm, write down in terms of fraction, the value of

a. tan ∠BDA,
b. sin ∠ACB,
c. sin ∠CDA,
d. cos ∠CAE.



(d) $\cos \hat{CAE} = -\cos(180° - \hat{CAE})$

$\cos \hat{CAE} = -\cos \hat{BAC}$

$= -\frac{12}{15}$

$= -\frac{4}{5}$

(a) $\tan \hat{BDA} = \frac{O}{A} = \frac{12}{5}$

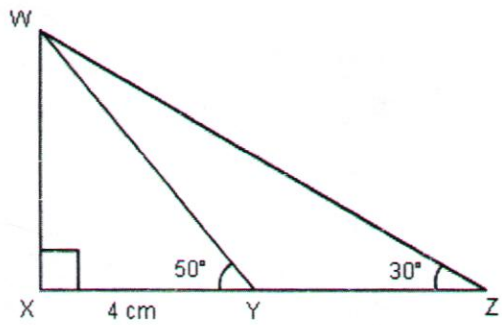
(b) $\sin \hat{ACB} = \frac{O}{h} = \frac{12}{15} = \frac{4}{5}$

(c) $\sin \hat{CDA} = \sin(180° - \hat{CDA})$

$\sin \hat{CDA} = \sin \hat{ADB} = \frac{12}{13}$

3. In the diagram, ∠WZY = 30°, ∠WYX = 50°, ∠WXY = 90° and XY = 4 cm. Calculate

a. length of WX,
b. length of WZ,
c. The angle ZWY.



(a) $\tan 50° = \frac{WX}{4}$

$WX = 4 \tan 50°$

$WX = 4.7670$

$WX = 4.77$ (3 sig. fig.)

(b) $\sin 30° = \frac{4.767}{WZ}$

$WZ = \frac{4.767}{\sin 30°}$

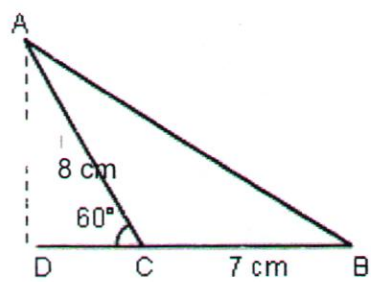
$WZ = 9.534$

$WZ = 9.53$ cm. (3 sig. fig.)

Practice

1. In the figure, AC = 8 cm, CB = 7 cm and ∠ACD = 60°. Find

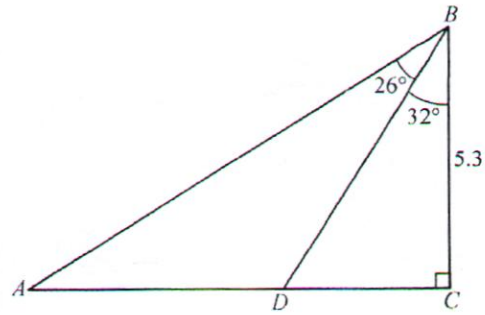
a. the value of cos ∠BCA
b. the perpendicular height AD
c. the area of ΔACB



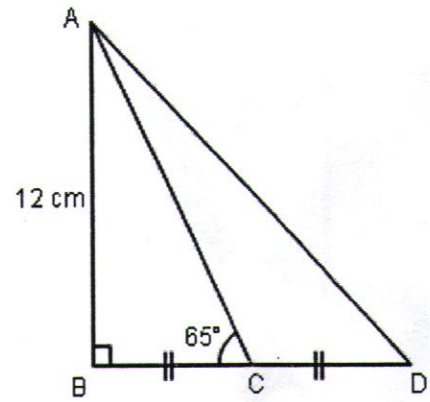
$\cos 120° = -0.5$

2. In the diagram, not drawn to scale, *BC* = 5.3 cm, ∠*ACB* = 90°, ∠*ABD* = 26°, and ∠*DBC* = 32°. Calculate the length of

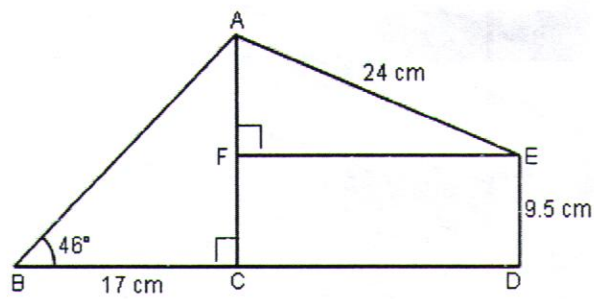
a. *CD*,
b. *AB*.



3. In the diagram, $\angle ACB = 65°$, $\angle ABD = 90°$, AB = 12 cm and DC = BC. Find
   a. BC,
   b. AD,
   c. $\angle ADB$.



4. In the diagram, AE = 24 cm, DE = 9.5 cm, BC = 17 cm and $\angle ABC = 46°$. Triangles ABC and AEF are right-angled triangles. CDEF is a rectangle
   Calculate
   a. the length of AC
   b. $\angle AEF$



Answers:

1a) 7/24	b) -7/25	2a) 12/5	b) 4/5	c) 12/13	d) -4/5
3a) 4.77 cm	b) 9.53 cm	c) 20°			

Practice

1a) -0.5	b) 6.93 cm	c) 24.2 cm^2	2a) 3.31cm	b) 10.0 cm
3a) 5.60cm	b) 16.4 cm	c) 47.0°	4a) 17.6 cm	b) 19.7°

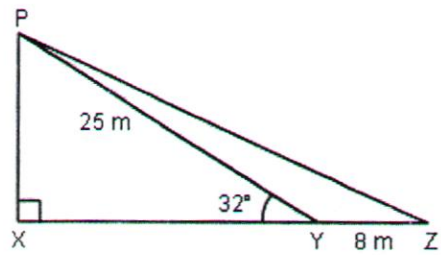
Homework

1. In the diagram, a pole P, is supported by two ropes (Y and Z) that are tied to the ground at a distance of 8 m apart. X is the point the pole meets the ground. Rope Y is 25 m long and it makes an angle of 32(with the ground.
Calculate

a. the height of the pole PX.

b. the distance of Z from the base of the pole X.

c. the length of rope PZ.



(a) $\sin 32^\circ = \frac{PX}{25}$

$PX = 13.247$

$PX = 13.2$ m (3 sig. fig.)

(b) $\cos 32^\circ = \frac{XY}{25}$

$XY = 21.201$ m

$XZ = 21.201 + 8$

$= 29.201$

$= 29.2$ m (3 sig. fig.)

(c) $PZ = \sqrt{(29.201)^2 + (13.247)^2}$

$PZ = 32.065$

$PZ = 32.1$ m (3 sig. fig.)

2. Find the possible values of θ for $0^\circ \le \theta \le 180^\circ$ in each of the following:

(a) cos θ = -0.06 (b) sin θ = 0.98

(a) $\cos \theta = -0.06$

$\theta = 93.43^\circ$

$\theta = 93.4^\circ$

(1 dec. pl.)

→ θ = _____

$\theta = 78.5216$

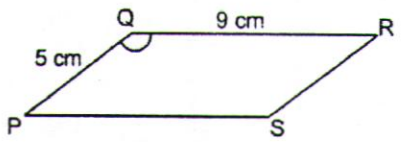
$\sin \theta = \sin (180^\circ - 78.521^\circ)$

$\sin 78.521^\circ = \sin 101.479^\circ$

→ θ = 78.5° and 101.5°

3.

. If the area of the parallelogram PQRS = 27 cm^2, find ∠PQR correct to 3 significant figures.



Area of $\Delta PQR = 27 \div 2$

$= 13.5\ cm^2$

$\frac{1}{2}(5)(9)\sin\theta = 13.5$

$\sin\theta = \frac{2(13.5)}{45}$

$\theta = 36.869°$

$P\hat{Q}R = 180° - 36.869°$

$= 143.13°$

$= 143°$ (3 sig. fig.)

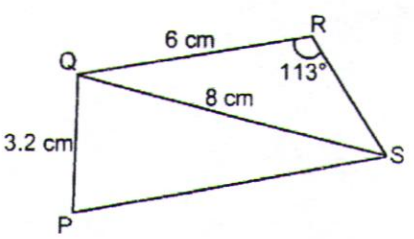
4.

. In a quadrilateral PQRS, ∠ PQS is obtuse. If the area of ΔPQS = 12.5 cm^2, calculate

(a) ∠PQS (correct to 1 d.p)

(b) length RS (correct to 2 d.p)

(c) area of ΔQRS (correct to 2 d.p)



(a) $\frac{1}{2}(3.2)(8)\sin\theta = 12.5$

$\sin\theta = \frac{2(12.5)}{8(3.2)}$

$\theta = 77.570$

$P\hat{Q}S = 180° - 77.57°$

$= 102.43°$

$= 102.4°$ (1 dec. pl.)

(b)

$\frac{8}{\sin 113°} = \frac{6}{\sin R\hat{S}Q}$

$\sin R\hat{S}Q = \frac{6\sin 113°}{8}$

$R\hat{S}Q = 43.660°$

$R\hat{Q}S = 180° - 43.660° - 113°$

$= 23.34°$

$\frac{RS}{\sin 23.34°} = \frac{8}{\sin 113°}$

$RS = 3.443$

$RS = 3.44\ cm$ (2 dec. pl.)

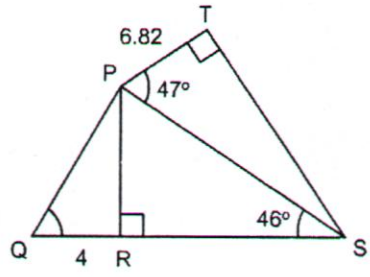
(c) Area of ΔQRS

$= \frac{1}{2}(6)(3.443)\sin 113°$

$= 9.5078$

$= 9.51\ cm^2$ (2 dec. pl.)

5. Find $P\hat{Q}R$ in the diagram, giving your answer correct to 1 decimal place.



$\cos 47^\circ = \frac{6.82}{PS}$

$PS = 10.000$

$\sin 46^\circ = \frac{PR}{10.000}$

$PR = 7.1933$

$\tan P\hat{Q}R = \frac{7.1933}{4}$

$P\hat{Q}R = 60.922^\circ$

$P\hat{Q}R = 60.9^\circ$ (1 dec. pl.)

Answers

1a) 13.2m b) 29.2m c) 32.1m
2a) 93.4° b) 78.5°, 101.5°
3) 143°
4a) 102.4° b) 3.44cm c) 9.51cm^2
5) 60.9°

Deadline: Jun 2011

My Reflection: