

MAT 056 EXAM

1. Solve for x

$$\log_2(x) = 4 \quad \text{Applying the rule } \log_b x = y \Leftrightarrow b^y = x$$

$$\text{thus } 2^4 = x$$

$$x = 16$$

$$\underline{\underline{x = 16}}$$

2. Expression as a single logarithm

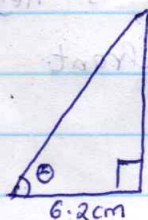
$$8\log_{10} x - \frac{1}{3}\log_{10} y - 4\log_{10} z$$

$$= \log_{10} x^8 - \log_{10} y^{\frac{1}{3}} - \log_{10} z^4$$

$$= \log_{10} \left(\frac{x^8}{y^{\frac{1}{3}} z^4} \right)$$

$$= \log_{10} \left(\frac{x^8}{y^{\frac{1}{3}} z^4} \right)$$

3.



Applying SOHCAHTOA

$$\tan \theta = \frac{27.6 \text{ cm}}{6.2 \text{ cm}} \quad \theta = \tan^{-1} \left(\frac{27.6}{6.2} \right) \text{ cm}$$

$$\underline{\underline{\theta = 77.3^\circ}}$$

4

x

$\cos(x)$

$\sec(x)$

90°

0

Undefined

60°

$\frac{1}{2}$

2

45°

$\frac{1}{\sqrt{2}}$

$\sqrt{2}$

30°

$\frac{\sqrt{3}}{2}$

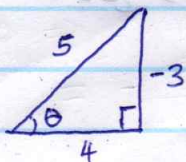
$\frac{2\sqrt{3}}{3}$

0°

1

1

5 $\sin \theta = -\frac{3}{5}, \cos \theta = \frac{4}{5}$

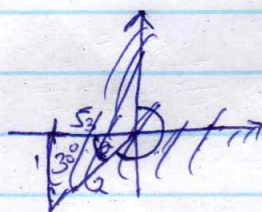


$$\tan \theta = \frac{\text{opposite}}{\text{Hypotenuse}} = \frac{-3}{4}$$

$$\tan \theta = -\frac{3}{4}$$

6. Exact Value

$$\cos(-240^\circ)$$



$$360 - 240 = 120^\circ$$

$$\theta' = 120^\circ$$

$$\cos \theta =$$

$$\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{-1}{2} = -\frac{1}{2}$$

$$\cos(-240^\circ) = -\frac{1}{2} \quad \text{Since } \cos \text{ is negative in the } 3^{\text{rd}} \text{ Quadrant.}$$

7 $\theta = -405^\circ$

$$\sin(-405^\circ) \Rightarrow 360 + 405^\circ \quad 405^\circ - 360 =$$

$$\text{Reference Angle} = 45^\circ, \sin(45^\circ) = \frac{\sqrt{2}}{2}$$

$$\text{Thus } \sin(-405^\circ) = -\frac{\sqrt{2}}{2}$$

$$\cos(-405^\circ), \text{ Again Reference angle} = 45^\circ$$

$$\Rightarrow \cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\text{Thus } \cos(-405^\circ) = \frac{\sqrt{2}}{2}$$

$$\tan(-405^\circ), \quad \theta' = 45^\circ$$

$$\Rightarrow \tan 45^\circ = 1$$

$$\text{Thus } \tan(-405^\circ) = -1$$

$$8 \quad \theta = 660^\circ$$

$$\text{Reference Angle } \theta' = 720 - 660 = 60^\circ$$

$$\theta' = 60^\circ$$

$$\begin{aligned} \sin 660^\circ &\Rightarrow \sin(60^\circ) = \frac{\sqrt{3}}{2} \\ &= -\frac{\sqrt{3}}{2} \end{aligned}$$

$$\begin{aligned} \cos 660^\circ &\Rightarrow \cos(60^\circ) = \frac{1}{2} \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \tan 660^\circ &\Rightarrow \tan(60^\circ) = \sqrt{3} \\ &= -\sqrt{3} \end{aligned}$$



$$9. \quad \theta = \frac{3\pi}{4} = 135^\circ$$

$$\sin\left(\frac{3\pi}{4}\right) \Rightarrow \frac{3\pi}{4} \text{ radians to degrees} =$$

$$\theta = 135^\circ, \text{ Reference Angle} = 45^\circ$$

$$\sin 45^\circ = \frac{\sqrt{2}}{2} \text{ Thus } \sin \frac{3\pi}{4} = \frac{\sqrt{2}}{2}$$

$$\cos\left(\frac{3\pi}{4}\right) \Rightarrow \cos 45^\circ = \frac{\sqrt{2}}{2}$$

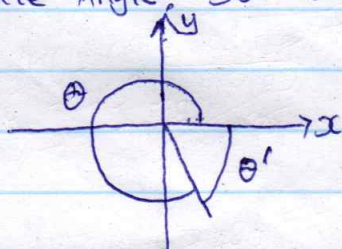
$$\text{Thus } \cos\left(\frac{3\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

$$\tan\left(\frac{3\pi}{4}\right) \Rightarrow \tan 45^\circ = 1$$

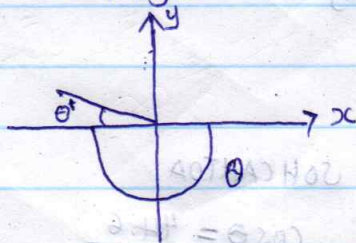
$$\text{Thus } \tan\left(\frac{3\pi}{4}\right) = -1$$

$$10. \quad \theta = 289, \text{ Reference Angle} = 360 - 289 = 71^\circ$$

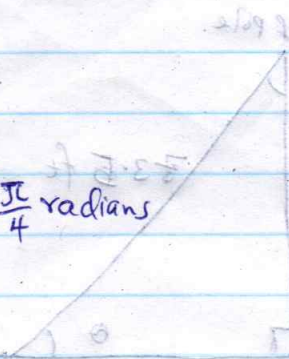
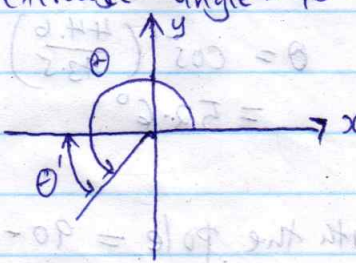
$$\theta' = 71^\circ$$



$$11 \quad \theta = -195^\circ \text{ Reference Angle} = 15^\circ$$



$$12 \quad \theta = \frac{5\pi}{4} = 225^\circ, \text{ Reference angle} = 45^\circ = \frac{\pi}{4} \text{ radians}$$



13 Trigonometric Function — Cofunction

(a) Sine

—

Cosine

(b) secant

—

Cosecant

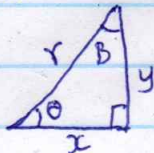
(c) Tangent

—

Cotangent

14 Cofunction Theorem

$\sin 15^\circ$



Cofunctions

$$\sin(90^\circ - \theta) = \cos \theta$$

$$\tan(90^\circ - \theta) = \cot \theta$$

$$\sec(90^\circ - \theta) = \csc \theta$$

$$\sin \theta = \frac{y}{r}, \cos \theta = \frac{x}{r}, \text{ but } \theta = 15^\circ$$

$$\sin \theta = \cos(90^\circ - \theta)$$

$$90^\circ - 15^\circ = 75^\circ \text{ Therefore } \sin 15^\circ = \cos 75^\circ$$

15 Cofunction Theorem

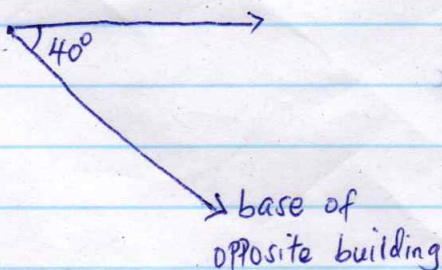
$$\tan(90^\circ - x^\circ) = \cot x^\circ$$

16. 140° — is an obtuse angle

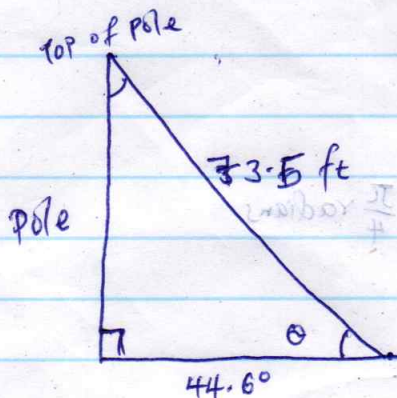
complement = It does not exist.

supplement = 40°

17. Surveyor



18.



SOHCAHTOA

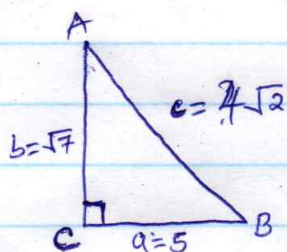
$$\cos \theta = \frac{44.6}{73.5}$$

$$\theta = \cos^{-1}\left(\frac{44.6}{73.5}\right) = 52.6^\circ$$

Angle the rope makes with the pole = $90^\circ - 52.6^\circ = 37.4^\circ$

$$= \underline{\underline{37.4^\circ}}$$

19



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

$$5^2 + (\sqrt{7})^2 = c^2$$

$$c^2 = 32 \quad c = 4\sqrt{2}$$

SOHCAHTOA

$$S = P + \cos$$

SS

$$x = \frac{y}{\cos} \quad y = x \cos$$

$$P + = x$$

$$P + = \sqrt{7}$$

$$\sin(A) = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{5}{4\sqrt{2}}$$

$$\cot(A) = \frac{1}{\tan A} = \frac{\text{Adjacent}}{\text{Opposite}} = \frac{\sqrt{7}}{5}$$

$$\cos(A) = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{\sqrt{7}}{4\sqrt{2}}$$

$$\sec(A) = \frac{1}{\cos A} = \frac{\text{Hypotenuse}}{\text{Adjacent}} = \frac{4\sqrt{2}}{\sqrt{7}}$$

$$\tan(A) = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{5}{\sqrt{7}}$$

$$\csc(A) = \frac{1}{\sin A} = \frac{\text{Hypotenuse}}{\text{Opposite}} = \frac{4\sqrt{2}}{5}$$

20

$$f(x) = \frac{x-5}{9}$$

$$y = \frac{x-5}{9} \quad \text{Replace } x \text{ with } y \text{ and } y \text{ with } x$$

$$x = \frac{y-5}{9} \quad \text{solve for } y$$

$$9x = y - 5 \quad y = 9x + 5$$

$$f(x) = 9x + 5$$

$$21. \log_{25} 0.0016 = -2$$

Rule

$$\log_b x = y \Rightarrow b^y = x$$

$$b = 25$$

$$x = 0.0016$$

$$y = -2$$

$$\text{EXPONENTIAL form } 25^{-2} = 0.0016$$

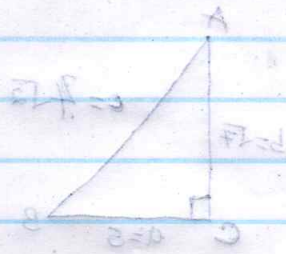
22 $\log_x 49 = 2$

$\log_b^x = y, \Leftrightarrow b^y = x$

$x^2 = 49$

$\sqrt{x^2} = \sqrt{49}$

$x = 7$



23

Expand

$\log_b \sqrt[4]{\frac{x^5 y}{x^3}}$

$= \log_b \left(\frac{x^2 y}{x} \right)^{1/4}$

$= \log_b (x^2 y)^{1/4} = \log_b (x^2)^{1/4} + \log_b (y)^{1/4}$

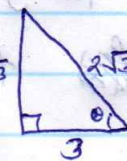
$= \frac{\log_b (x^2) + \log_b (y)}{4}$

24

$\sec \theta = -\frac{2\sqrt{3}}{3}$

$\sec \theta =$

$\sec \theta = \frac{1}{\cos \theta} = \frac{\text{hypotenuse}}{\text{adjacent}} = -\frac{2\sqrt{3}}{3}$



~~Answer~~

$\sin \theta = \frac{2\sqrt{3}}{3}$

$\cos \theta = -\frac{3}{2\sqrt{3}}$

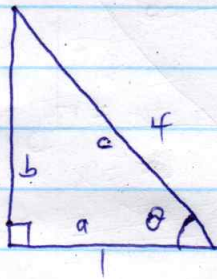
$\tan \theta = \frac{2\sqrt{3}}{3}$

$\cot \theta = \frac{3}{2\sqrt{3}}$

$\csc \theta = \frac{2\sqrt{3}}{3} = -1$

25.

$$\cos \theta = \frac{1}{4}$$



$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{1}{4}$$

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

$$a^2 + 1^2 = 4^2 \Rightarrow a^2 = 15$$

$$a = \sqrt{15}$$

$$\text{Then } \sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{\sqrt{15}}{4}$$

$$\sin \theta = \frac{\sqrt{15}}{4}$$
