13-1 to 13-5 Test Review

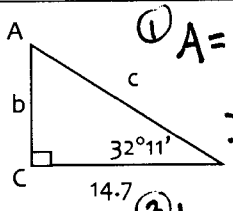
Name Master E

Date _____ Block 11

OBJ: Know how to solve a right triangle.

1-6: Find each missing value. Round sides to the nearest tenth & angles to degrees and minutes

1.



① $A = 90 - 32°11'$

$89\,60$

$-\,32\,11$

$B\ 57°49'$

② $\cos 32°11 = \frac{14.7}{c}$

$c = \frac{14.7}{\cos 32°11}$

$c = 17.368$

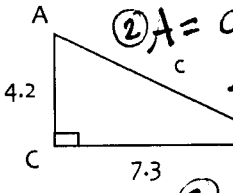
③ $\tan 32°11 = \frac{b}{14.7}$

$b = 14.7 \tan 32°11$

$b = 9.251$

A = 57°49' b ≈ 9.3 c ≈ 17.4

2.



② $A = 90 - 29°55'$

$89\,60$

$-\,29\,55$

$60°05'$

① $\tan B = \frac{4.2}{7.3}$

$\tan^{-1}\left(\frac{4.2}{7.3}\right) = B$

$29.91 = B$

$29°54'49.126''$

③ $4.2^2 + 7.3^2 = c^2$

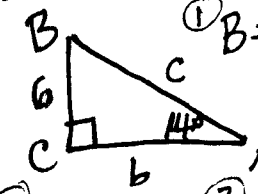
$70.93 = c^2$

$\sqrt{70.93} = c$

$8.421 = c$

A = 60°05' B = 29°55' c ≈ 8.4

3. A = 14°, C = 90°, a = 6



① $B = 90° - 14° = 76°$

② $\tan 14 = \frac{6}{b}$

$b = \frac{6}{\tan 14}$

$b = 24.064$

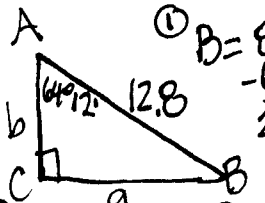
③ $\sin 14 = \frac{6}{c}$

$c = \frac{6}{\sin 14}$

$c = 24.801$

B = 76° b ≈ 24.1 c ≈ 24.8

4. A = 64°12', C = 90°, c = 12.8



① $B = 89°60'$

$-\,64°12$

$25°48'$

② $\sin 64°12' = \frac{a}{12.8}$

$12.8 \sin 64°12' = a$

$11.524 = a$

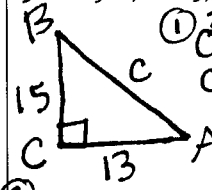
③ $\cos 64°12' = \frac{b}{12.8}$

$12.8 \cos 64°12' = b$

$5.51 = b$

B = 25°48' a ≈ 11.5 b ≈ 5.6

5. C = 90°, a = 15, b = 13



① $c^2 = 15^2 + 13^2$

$c^2 = 394$

$c = \sqrt{394} = 19.849$

② $\tan A = \frac{15}{13}$ or ③ $\tan B = \frac{13}{15}$

$\tan^{-1}\left(\frac{15}{13}\right) = A$

$49.085 = A$

$49°5'8.22''$

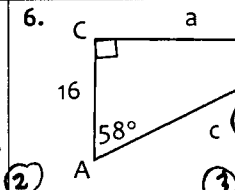
$\tan^{-1}\left(\frac{13}{15}\right) = B$

$40.914 = B$

$40°54'51.78''$

A = 49°5' B = 40°55' c ≈ 19.8

6.



① $B = 90 - 58 = 32$

② $\tan 58 = \frac{a}{16}$

$a = 16 \tan 58$

$a = 25.605$

③ $\cos 58 = \frac{16}{c}$

$c = \frac{16}{\cos 58}$

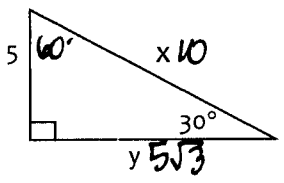
$c = 30.193$

B = 32° a ≈ 25.6 c ≈ 30.2

OBJ: Know how to solve a special right triangle without a calculator, which means no decimal answers!

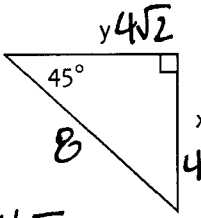
7-12: Find the missing side lengths (x and y) without a calculator.

7.



x = 10 y = 5√3

8.



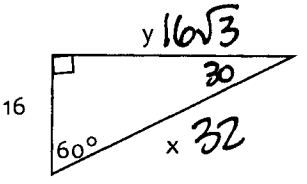
$\frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{8\sqrt{2}}{2}$

$4\sqrt{2}$

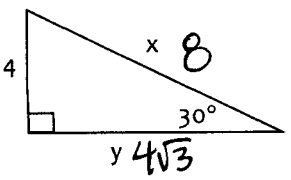
x = 4√2 y = 4√2

9.



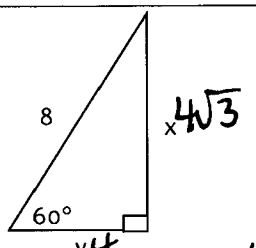
x = 32 y = 16√3

10.



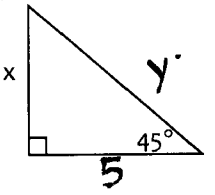
x = 8 y = 4√3

11.



x = 4√3 y = 4

12.

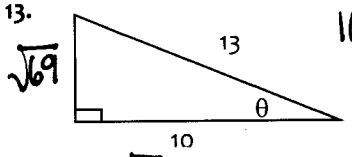


x = 5 y = 5√2

OBJ: Find the 6 trigonometric ratios when given 2 sides of a right triangle.

13-14: Find the exact values of the six trigonometric functions of the given angle θ.

13.



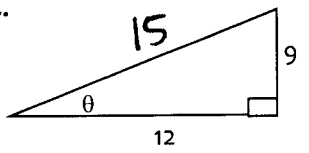
$10^2+x^2=13^2 \rightarrow x=\sqrt{69}$, $x^2=69$

$\sin\theta = \frac{\sqrt{69}}{13}$ $\quad \csc\theta = \frac{13}{\sqrt{69}} = \frac{13\sqrt{69}}{69}$

$\cos\theta = \frac{10}{13}$ $\quad \sec\theta = \frac{13}{10}$

$\tan\theta = \frac{\sqrt{69}}{10}$ $\quad \cot\theta = \frac{10}{\sqrt{69}} = \frac{10\sqrt{69}}{69}$

14.



$9^2+12^2=c^2 \rightarrow c=\sqrt{225}$, $225=c^2$, $c=15$

$\sin\theta = \frac{9}{15} = \frac{3}{5}$ $\quad \csc\theta = \frac{5}{3}$

$\cos\theta = \frac{12}{15} = \frac{4}{5}$ $\quad \sec\theta = \frac{5}{4}$

$\tan\theta = \frac{9}{12} = \frac{3}{4}$ $\quad \cot\theta = \frac{4}{3}$

OBJ: Find the 6 trigonometric ratios when given the coordinate of a terminal side of an angle in standard position.

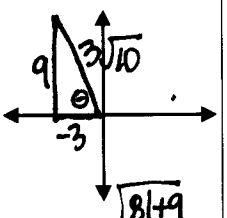
15-16: The terminal side of θ in standard position contains each point. Find the exact values of the six trigonometric functions of θ.

15. (-3, 9)

$\sin\theta = \frac{9}{3\sqrt{10}} = \frac{3\sqrt{10}}{10}$ $\quad \csc\theta = \frac{\sqrt{10}}{3}$

$\cos\theta = \frac{-3}{3\sqrt{10}} = \frac{-\sqrt{10}}{10}$ $\quad \sec\theta = -\sqrt{10}$

$\tan\theta = \frac{9}{-3} = -3$ $\quad \cot\theta = -\frac{1}{3}$



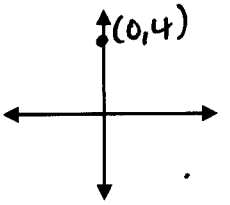
$\sqrt{81+9}$, $\sqrt{90} = 3\sqrt{10}$

16. (0, 4) $r=4$

$\sin\theta = \frac{y}{r} = \frac{4}{4} = 1$ $\quad \csc\theta = 1$

$\cos\theta = \frac{x}{r} = \frac{0}{4} = 0$ $\quad \sec\theta = \varnothing$

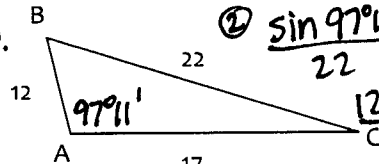
$\tan\theta = \frac{y}{x} = \frac{4}{0} = \varnothing$ $\quad \cot\theta = 0$



OBJ: Know how to solve an acute or obtuse triangle using the Law of Sines and/or Cosines.

17-20: Find the missing sides and angles (Round sides to the nearest tenth & angles to degrees and minutes).

17. SAS!



② $\frac{\sin 97°11}{22} = \frac{\sin C}{12}$, $\frac{12\sin 97°11}{22} = \sin C$

① $22^2 = 12^2+17^2-2(12)(17)\cos A$

$484 = 433 - 408\cos A$

$51 = -408\cos A$

$\frac{51}{-408} = \cos A$

$A = 97.18 = 97°10'50.721''$

$C = 32.76$

$C = 32°45'48.775''$

③ $180-(97°11'+32°46')$

$129°57'$

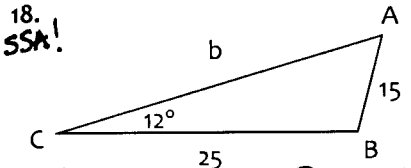
$179\ 60$

$-129\ 57$

$50°03$

$A = 97°11'$ $\quad B = 50°03'$ $\quad C = 32°46'$

18. SSA!



① $\frac{\sin 12}{15} = \frac{\sin A}{25}$

$\frac{25\sin 12}{15} = \sin A$

$20.274 = A$

$20°16'28.462''$

② $B = 180-(12°+20°16')$

$179\ 60$

$-\ 32\ 16$

$147°\ 44'$

③ $\frac{\sin 147°44'}{b} = \frac{\sin 12}{15}$

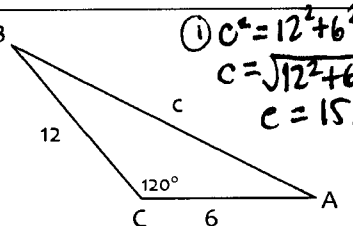
$15\sin 147°44' = b\sin 12$

$b = \frac{15\sin 147°44'}{\sin 12}$

$b = 38.515$

$A = 20°16'$ $\quad B = 147°44'$ $\quad b \approx 38.5$

19. SAS!



① $c^2 = 12^2+6^2-2(12)(6)\cos 120$

$c = \sqrt{12^2+6^2-2(12)(6)\cos 120}$

$c = 15.874$

② $\frac{\sin 120}{15.9} = \frac{\sin A}{12}$ or $\frac{\sin B}{6} = \frac{\sin 120}{15.9}$

$\sin A = \frac{12\sin 120}{15.9}$ $\quad \sin B = \frac{6\sin 120}{15.9}$

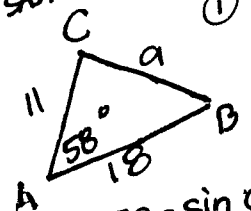
$A = 40.81 = 40°48'49.998''$ $\quad B = 19.07 = 19°4'29.23''$

$A = 40°49'$ $\quad B = 19°4'$ $\quad c \approx 15.9$

If you found A first & subtract A from 90: $B = 19°11'$

If you find B first & subtract it from 90: $A = 40°56'$ ★ SEE extra paper!

20. A = 58°, b = 11, c = 18 SAS!



① $a^2 = 11^2+18^2-2(11)(18)\cos 58$

$a = \sqrt{11^2+18^2-2(11)(18)\cos 58}$

$a = 15.33$

② $\frac{\sin 58}{15.3} = \frac{\sin C}{18}$

$\frac{18\sin 58}{15.3} = \sin C$

$C = 86.11 = 86°6'58.8''$

③ $B = 180°-(58°+86°7')$

$179\ 60$

$-144\ 07$

$35°53$

$B = 35°53'$ $\quad C = 86°7'$ $\quad a \approx 15.3$

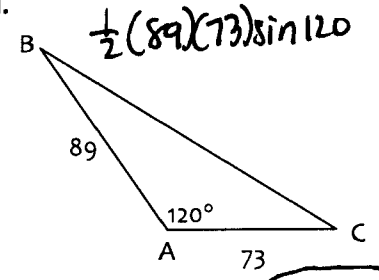
★ $\frac{\sin 58}{15.3} = \frac{\sin B}{11} \Rightarrow \sin B = \frac{11\sin 58}{15.3}$

or $B = 37.56 = 37°34'$ $\quad C = 84°26'$

OBJ: Know how to find the area of a triangle that does not have the height given.

21-23: Find the area of each triangle rounded to the nearest tenth.

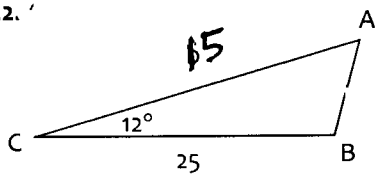
21.



$\frac{1}{2}(89)(73)\sin 120$

$2813.28 \approx 2813.3$

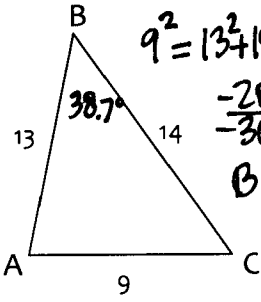
22.



$\frac{1}{2}(15)(25)\sin 12$

$38.98 \approx 39.0$

23.



$9^2 = 13^2 + 14^2 - 2(13)(14)\cos B$

$\frac{-284}{-364} = \cos B$

$B = 38.7°$

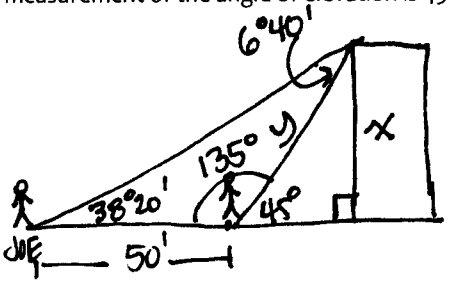
$\frac{1}{2}(13)(14)\sin 38.7°$

$= 56.89$ 56.9

OBJ: Apply your knowledge of solving triangles to real-life applications.

24-28: Solve each word problem below. Round all answers to the nearest tenth.

24. Joe and Rob are standing in a straight line with the base of a building. The measurement of the angle of elevation to the top of the building from the point where Joe is standing is 38°20'. From the point where Russ is standing, 50 feet closer to the building, the measurement of the angle of elevation is 45°. How tall is the building?



① $\frac{\sin 6°40'}{50} = \frac{\sin 38°20}{y}$

$y \sin 6°40' = 50 \sin 38°20$

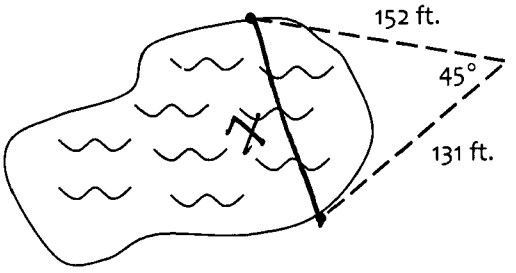
$y = \frac{50 \sin 38°20}{\sin 6°40'}$

$y = 267.128$

② $x = \frac{y}{\sqrt{2}} = \frac{267.1}{\sqrt{2}}$

$= 188.9$ feet

25. How wide (to the nearest tenth) is the pond?



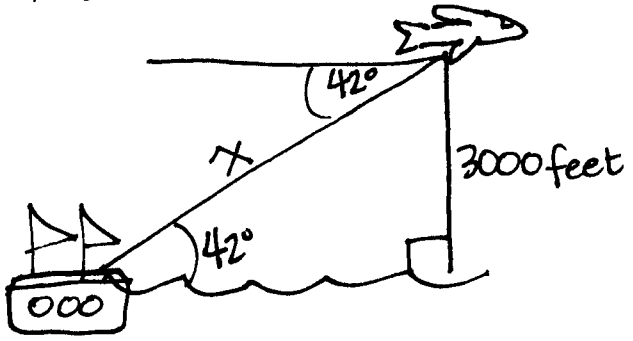
$x^2 = 152^2 + 131^2 - 2(152)(131)\cos 45$

$x = \sqrt{152^2 + 131^2 - 2(152)(131)\cos 45}$

$x = 110.02$

110.0 feet

26. A pilot 3000 feet above the ocean notes the measure of the angle of depression to a ship is 42°. How far is the plane from the ship?

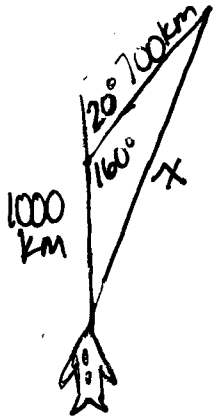


$\sin 42 = \frac{3000}{x}$

$x = \frac{3000}{\sin 42} = 4483.429$

4483.4 feet

27. A plane flew 1000 kilometers north. Then it changed direction by turning 20° clockwise and flew for another 700 kilometers. How far was the plane from its starting point?



$x^2 = 1000^2 + 700^2 - 2(1000)(700)\cos 160$

$x = \sqrt{1000^2 + 700^2 - 2(1000)(700)\cos 160}$

$x = 1674.98$

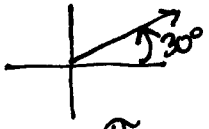
1675.0 kilometers

OBJ: Know how to draw an angle in standard position.
OBJ: Know how to convert from degrees to radians and vice versa.
OBJ: Know how to find the reference angle of any angle.

28-33: Draw each angle. Then rewrite each degree measure in radians and each radian measure in degrees. Then state the reference angle.

28. 30°

$30 \cdot \frac{\pi}{180}$

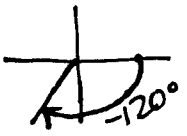


Radians: $\frac{\pi}{6}$

Reference ∠: 30°

29. -120°

$-120 \cdot \frac{\pi}{180}$

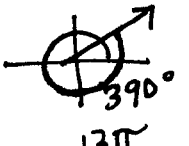


Radians: $-\frac{2\pi}{3}$

Reference ∠: 60°

30. 390°

$390 \cdot \frac{\pi}{180}$



Radians: $\frac{13\pi}{6}$

Reference ∠: 30°

31. $-\frac{7\pi}{4}$

$-\frac{7\pi}{4} \cdot \frac{180}{\pi}$

Degrees: −315°

Reference ∠: $\frac{\pi}{4}$

32. $\frac{17\pi}{6}$

$\frac{17\pi}{6} \cdot \frac{180}{\pi}$

Degrees: 510°

Reference ∠: $\frac{\pi}{6}$

33. $\frac{5\pi}{3}$

$\frac{5\pi}{3} \cdot \frac{180}{\pi}$

Degrees: 300°

Reference ∠: $\frac{\pi}{3}$

OBJ: Know how to find coterminal angles.

34-41: Find the smallest positive and smallest negative coterminal angles for each given angle in the form it is presented.

34. -380°	+ 340°	**35.** 20°	+ 380°	**36.** -1500°	+ 300°	**37.** 900°	+ 180°
	− -20°		− -340°		− -60°		− -180°
38. $\frac{9\pi}{2} \pm 2\pi$ $\frac{9\pi}{2} - \frac{4\pi}{2}$ $\frac{5\pi}{2} - \frac{4\pi}{2}$ $= \frac{\pi}{2} - \frac{4\pi}{2}$	+ $\frac{\pi}{2}$	**39.** -18π	+ 0°	**40.** $-\frac{3\pi}{4}$ $-\frac{3\pi}{4} + \frac{8\pi}{4}$ $-\frac{3\pi}{4} - \frac{8\pi}{4}$	+ $\frac{5\pi}{4}$	**41.** $\frac{10\pi}{3}$ $\frac{10\pi}{3} - \frac{6\pi}{3}$ $\frac{4\pi}{3} - \frac{6\pi}{3}$	+ $\frac{4\pi}{3}$
	− $-\frac{3\pi}{2}$		− 0°		− $-\frac{11\pi}{4}$		− $-\frac{2\pi}{3}$

#19 → 3 routes

(A) If you use $c \approx 15.9$ but you STO → X → 15.9

$$\frac{\sin 120}{X} = \frac{\sin A}{12} \qquad \sin A = \frac{12 \sin 120}{X}$$

$A = 40.89 = 40°53'36.221'' = \boxed{40°54' = A}$

$B = 180° - (120° + 40°54')$

$179\ 60$
$-\ 160\ 54$
$\boxed{19°06 = B}$

(B) If you use $c = 15.9$ & don't store for x & find $\angle A$ first

$$\frac{\sin 120}{15.9} = \frac{\sin A}{12} \qquad \sin A = \frac{12 \sin 120}{15.9} = 40.81 = 40°48'49.99 = \boxed{40°49' = A}$$

$B = 180° - (120° + 40°49')$

$179\ 60$
$-\ 160\ 49$
$\boxed{19°11' = B}$

(C) If you don't store for x & find $\angle B$ first

$$\frac{\sin 120}{15.9} = \frac{\sin B}{6} \qquad \sin B = \frac{6 \sin 120}{15.9} = 19.07 = 19°4'29.23 = \boxed{19°4}$$

$A = 180° - (120° + 19°4')$

$179\ 60$
$-\ 139\ 4$
$\boxed{40°56' = A}$

As you can see, you will get different answers depending on the route you take. If your angle measures are close, you are probably doing everything right. Just make sure your work is clearly written.