Ch. 9 Test Review Name: Key

You should be able to do this first part without using a calculator.

1. Pythagorean Theorem:
   a) What is the Pythagorean Theorem? $a^2+b^2=c^2$ or $l_1^2+l_2^2=h^2$

   b) The Pythagorean Theorem is used with right triangles.

   c) What part of the triangle does the *c* represent in the Pythagorean Theorem?

   hypotenuse

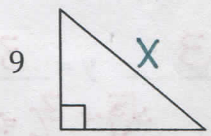
   d) What part of the triangle do the "*a*" and "*b*" represent in the Pythagorean Theorem?

   legs or sides

2. A Pythagorean triple is when *a, b,* and *c* satisfy the equation $a^2+b^2=c^2$ and are whole numbers.

   - Give an example of a Pythagorean triple. 3,4,5 / 5,12,13 / 7,24,25 / 30,40,50
   - Give a non-example of a Pythagorean triple. $\frac{1}{4}, \frac{\sqrt{3}}{4}, \frac{\sqrt{4}}{4}$

3. Find the value of x using the Pythagorean Theorem.



$9^2+15^2=x^2$

$81+225=x^2$

$306=x^2$

$x=\sqrt{306}$

9 34

$\boxed{3\sqrt{34}}$

4. a) Verify that the segment lengths of 3, 4, and 6 form a triangle.

   $3+4>6$ ✓

   b) Is this triangle acute, right, or obtuse? Show your work.

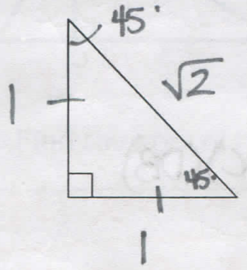
   $3^2+4^2 \_\_ 6^2$

   $9+16 \_\_ 36$

   $25<36$

   $\boxed{\text{Obtuse}}$

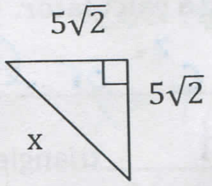
5. Draw the reference triangle and set up the chart for a **<u>45-45-90</u>** triangle below.



leg_1	leg_2	hyp
1	1	$\sqrt{2}$

6. Find the value of x for these **45-45-90** triangles. Refer to the reference triangle.

a)

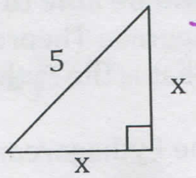


x = 10

$(5\sqrt{2})(\sqrt{2})$

$5(2)=10$

b)



1	1	$\sqrt{2}$
x	x	5

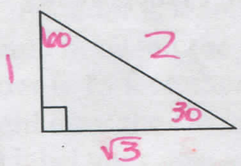
x = $\frac{5\sqrt{2}}{2}$

$\frac{1}{x}=\frac{\sqrt{2}}{5}$

$\sqrt{2}\,x=5$

$x=\frac{5}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}=\frac{5\sqrt{2}}{2}$

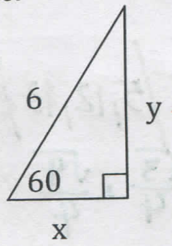
7. Draw the reference triangle and set up the chart for the **30-60-90** triangle below.



sl	ll	hyp
1	$\sqrt{3}$	2

8. Find the value of x and y for these **30-60-90** triangles. Refer to the reference triangle.

a)



sl	ll	hyp
1	$\sqrt{3}$	2
x	y	6

$\frac{1}{x}=\frac{2}{6}$

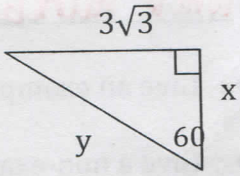
$2x=6$

$x=3$

x = 3 y = $3\sqrt{3}$

$\frac{\sqrt{3}}{y}=\frac{2}{6} \Rightarrow \frac{2y}{2}=\frac{\cancel{6}^{3}\sqrt{3}}{\cancel{2}}$

b)



sl	ll	hyp
1	$\sqrt{3}$	2
x	$3\sqrt{3}$	y

x = 3 y = 6

$\frac{1}{x}=\frac{\cancel{\sqrt{3}}}{3\cancel{\sqrt{3}}}$

$x=3\sqrt{3}$

$\frac{\cancel{\sqrt{3}}}{3\cancel{\sqrt{3}}}=\frac{2}{y}$

$y=6$

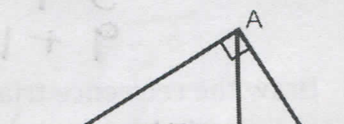
9. a) What is the formula for finding the **arithmetic mean** for *a* and *b*?

$\frac{a+b}{2}$

b) What is the formula for finding the **geometric mean** for *a* and *b*?

$\frac{a}{x}=\frac{x}{b}$ $x=\sqrt{ab}$

10. Refer to the triangle to the right.



a) The geometric **altitude** theorem says that

$AC^2 =$ (DC)(CB)

b) The geometric **leg** theorem says that

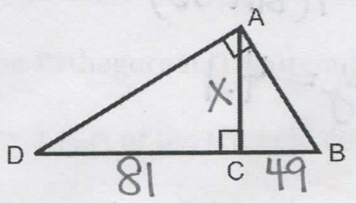
$AB^2 =$ (BC)(DB) and $AD^2 =$ (DC)(DB)

11. Refer to the triangle in problem 10. If DC= 81 and CB= 49, find the value of AC, AB, and AD using the **geometric altitude and geometric leg theorems.**

AC = 63

AB = $7\sqrt{130}$

AD = $9\sqrt{130}$



$\frac{81}{x} = \frac{x}{49}$

$x^2 = (81)(49)$

$x^2 = 3969$

$x = 63$

$49^2 + 63^2 = (AB)^2$

$6370 = x^2$

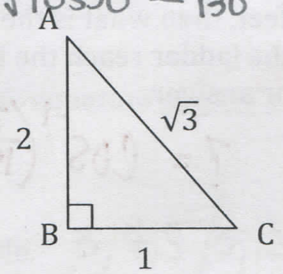
$x = \sqrt{6370} < {}^{49}_{130}$ $\quad x = 7\sqrt{130}$

$81^2 + 63^2 = (AD)^2$

$10530 = (x)^2$

$x = \sqrt{10530} < {}^{81}_{130}$ $\quad x = 9\sqrt{130}$

12. Use the triangle at the right.
Write your answers in <u>simplest radical form</u>.



sin A = $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ sin C = $\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

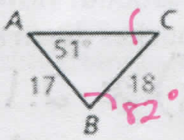
cos A = $\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$ cos C = $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

tan A = $\frac{1}{2}$ tan C = $\frac{2}{1} = 2$

13. Law of sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

You may use a calculator on the rest of the problems.
Solve the triangles using the inverse of trigonometric functions or the law of sines.

14.



$\frac{\sin 51}{18} = \frac{\sin 82}{x}$

$x = \frac{18(\sin 82)}{\sin 51}$

$x \approx 22.936$

$\frac{\sin 51}{18} = \frac{\sin C}{17}$

$\sin C = \frac{17 \sin 51}{18}$

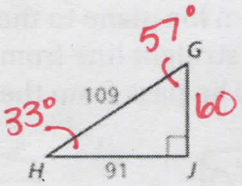
$\sin C = 0.734$

$\boxed{m\angle C = 47°}$

$\boxed{m\angle B = 82°}$

$\boxed{AC = 22.936}$

15.



$91^2 + x^2 = 109^2$

$x^2 = 3600$

$x = 60$

$\tan H = \frac{60}{91}$

$\boxed{JG = 60}$

$\boxed{m\angle H = 33°}$ $\boxed{m\angle G = 57°}$

16. Find the area of the triangles in problems 14 and 15.

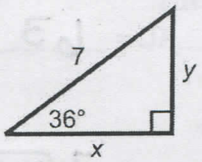
$A_{14} = \frac{1}{2}(17)(22.936)(\sin 51)$

$\boxed{\approx 151.509\,u^2}$

$A_{15} = \frac{1}{2}(91)(60)$

$\boxed{= 2730\,u^2}$

17. Find the value of x and y. Round your answer to the nearest tenth.



$\cos 36 = \frac{x}{7}$ $\sin 36 = \frac{y}{7}$

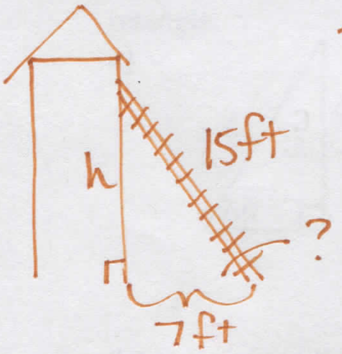
$x = 7(\cos 36)$ $y = 7(\sin 36)$

$x = 5.7$ $y = 4.1$

x≈ 5.7

y≈ 4.1

18. A ladder is leaning against the side of a house so that the distance on the ground between the base of the ladder and the house is 7 feet. If the height of the ladder is 15 feet, then what is the angle at which the ladder is leaning? At what height does the ladder reach the house? Draw a picture, round to the nearest tenth, and label your answer.



$? = \cos^{-1}\left(\frac{7}{15}\right) \approx \boxed{62°}$

$\boxed{13.3\text{ft}}$

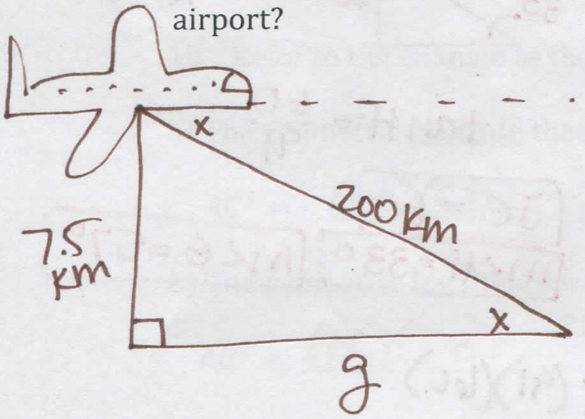
$7^2 + h^2 = 15^2$

$h^2 = 225 - 49$

$h^2 = 176$

$h = \sqrt{176} <^{16}_{11} = 4\sqrt{11} \approx \boxed{13.266\text{ft}}$

19. A pilot needs to begin his descent when his plane is 7.5 km above ground and 200 km from his plane to the airport. At what angle should his descent be so that he can fly in a straight line from the point of initial descent to the ground? How much ground will he pass from the point of initial descent until he touches down at the airport?



$x = \sin^{-1}\left(\frac{7.5}{200}\right) \approx 2.149°$

$\boxed{2°}$

$g^2 + (7.5)^2 = (200)^2$

$g^2 = 39943.75$

$\boxed{g \approx 199.859 \text{ km}}$