Directions: Solve.

1) Write sin 30° in terms of cosine.

$$\sin 30° = \boxed{\cos 60°}$$

2) Write cos 45° as a trigonometric ratio. (Hint: draw a picture).

[triangle with sides $x\sqrt{2}$, x, angle 45°]

$$\frac{x}{x\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$$

3) Given a square with a diagonal of 40 m, what is the perimeter of this square?

[square with diagonal 40, side $20\sqrt{2}$]
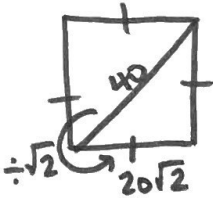
$\div\sqrt{2}$ → $20\sqrt{2}$

$$20\sqrt{2} + 20\sqrt{2} + 20\sqrt{2} + 20\sqrt{2} =$$
$$\boxed{80\sqrt{2} \text{ or } 113.1}$$
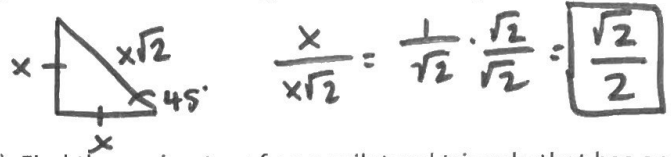
4) Find the perimeter of an equilateral triangle that has an altitude of 10 ft.

[triangle, altitude 10, side $\frac{20\sqrt{3}}{3}$]

$\div\sqrt{3}$ $\frac{10\sqrt{3}}{3}$ · 2

$$\frac{20\sqrt{3}}{3} + \frac{20\sqrt{3}}{3} + \frac{20\sqrt{3}}{3} =$$
$$\boxed{20\sqrt{3} \text{ or } 34.6}$$

5) If tan A = $\frac{5}{8}$, what is the m∠A?

[right triangle, legs 5 and 8, angle x at A]

$$\tan^{-1}\left(\frac{5}{8}\right) = \boxed{32°}$$
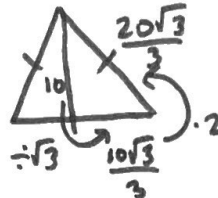
6) The leg of a 45°-45°-90° triangle measures 9 inches. What is the perimeter of this triangle?

[right triangle, legs 9, hypotenuse $9\sqrt{2}$] · $\sqrt{2}$

$$9 + 9 + 9\sqrt{2} =$$
$$\boxed{9\sqrt{2} + 18 \text{ or } 30.7}$$

7) In ΔABC, BC = 10, BA = 12, & m∠BCA = 90°. What is m∠A?

[right triangle B, C, A with BC=10, BA=12, x at A]

$$\sin^{-1}\left(\frac{10}{12}\right) = \boxed{56°}$$
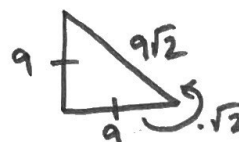
8) In a right triangle, sin x = $\frac{4}{5}$. What is the value of cos x?

[right triangle, sides 4, 5, 3, x]
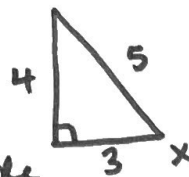
Find missing side 1st →

$$4^2 + b^2 = 5^2$$
$$16 + b^2 = 25$$
$$-16 \qquad -16$$
$$b^2 = 9$$
$$b = 3$$

$$\boxed{\cos x = \frac{3}{5}}$$

Directions: Solve the triangles then use the figure to answer the questions. Round angles to the nearest degree and sides to the nearest tenth.

[triangle A, C, B with A=8...C across top, AB=10, x at B, a=6 along CB]

ΔABC is a right triangle. AB is the hypotenuse. Angle B is 70°. AC = 10.

[triangle with A at top, C and B at bottom, AC=10, angle 70° at B, H on hypotenuse, a along CB]
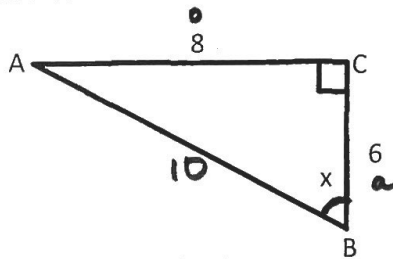
9) What is the length of AB?

$$6^2 + 8^2 = c^2 \qquad 100 = c^2$$
$$36 + 64 = c^2 \qquad c = \boxed{10}$$

10) What is the measure of x?

$$\tan^{-1}\left(\frac{8}{6}\right) = \boxed{53°}$$

11) What trigonometric ratio represents sin x?

S $\frac{o}{H}$

$$\frac{8}{10} = \boxed{\frac{4}{5}}$$

12) What is the ratio of cos x?

C $\frac{A}{H}$

$$\frac{6}{10} = \boxed{\frac{3}{5}}$$
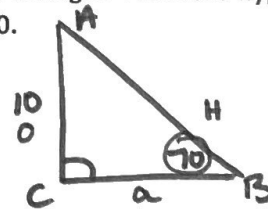
13) What is m∠A?

$$90 - 70 = \boxed{20°}$$

14) What is the length of AB?

$$\sin 70 = \frac{10}{H} \qquad \frac{10}{\sin 70} = \boxed{10.6}$$

15) What is CB?

$$\tan 70 = \frac{10}{a} \qquad \frac{10}{\tan 70} = \boxed{3.6}$$

16) Fill in the blank: cos B = __sin__ A

Directions: Use the scenario to answer questions 17 – 18: *A very adorable kitten is stranded 20 feet high in a tree. A fireman comes to rescue the kitten and wants to place a ladder with an angle of elevation of 53° for ease in climbing it.*
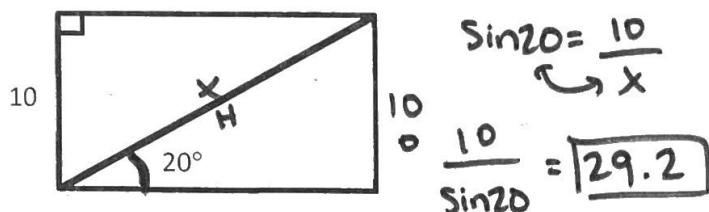
17) What does the length of the ladder need to be (to the nearest whole number) to reach this kitten at this angle of elevation?
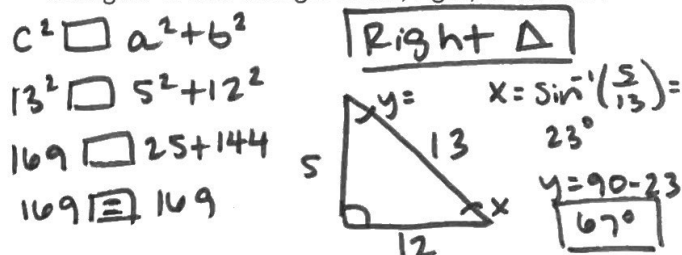
$Sin53 = \dfrac{20}{x}$

$\dfrac{20}{Sin53} = \boxed{25 ft}$
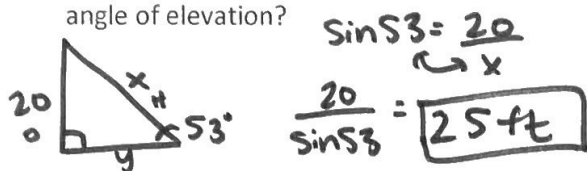
18) How far should he place the ladder from the trunk of the tree?

$Tan53 = \dfrac{20}{y}$

$\dfrac{20}{Tan53} = \boxed{15 ft}$
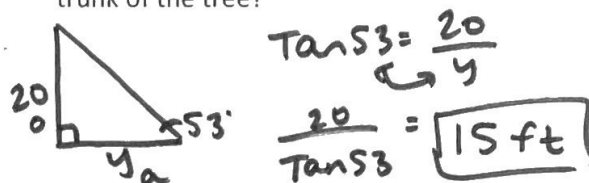
19) What is the length of the diagonal inside the rectangle?

$Sin20 = \dfrac{10}{x}$

$\dfrac{10}{Sin20} = \boxed{29.2}$

20) What is the second largest angle in a 5-12-13 triangle? Is this triangle acute, right, or obtuse?

$c^2 \square a^2 + b^2$

$13^2 \square 5^2 + 12^2$

$169 \square 25 + 144$

$169 \boxed{=} 169$

$\boxed{Right \; \triangle}$

$x = Sin^{-1}\left(\dfrac{5}{13}\right) = 23°$

$y = 90 - 23$

$\boxed{67°}$

21) In a right triangle, $\sin x = \dfrac{6}{10}$. What is $\tan x$?

$6^2 + b^2 = 10^2$

$36 + b^2 = 100$

$-36 \qquad -36$

$b^2 = 64$

$b = 8$

$\tan x = \dfrac{6}{8} = \boxed{\dfrac{3}{4}}$
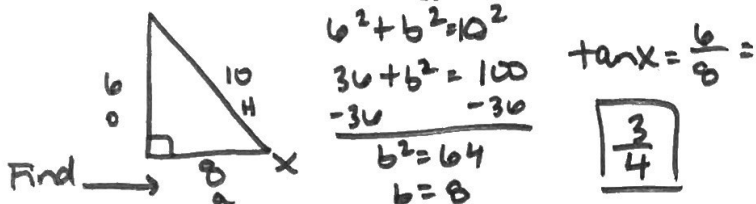
22) What is the perimeter of an equilateral triangle with an altitude of $12\sqrt{3}$ units?

$24 + 24 + 24 = \boxed{72}$
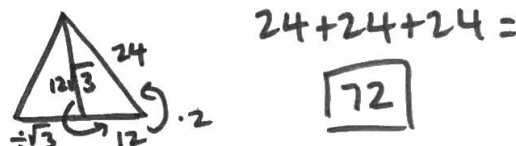
23) A pirate sees a sunken treasure than that is 100 feet below the water. The angle of depression from where his boat is to where the treasure is measures 45°. The pirate puts on scuba gear and decides to swim directly to the treasure. How far does he have to swim?

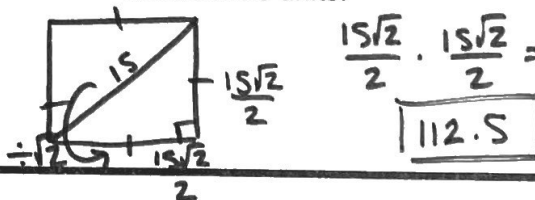$Sin45 = \dfrac{100}{x}$

$\dfrac{100}{Sin45} = \boxed{141.42 ft}$

24) Lucy, whose eye level is 4 feet from the ground, stands 10 feet away from the base of a tree. From her line of sight, she is looking at an angle of elevation of 40° to the top of the tree. How tall is the tree?
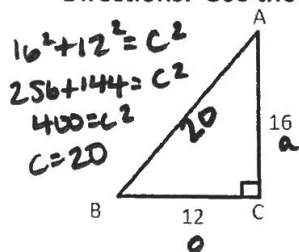
$Tan40 = \dfrac{x}{10}$

$10 Tan40 = 8.39 + 4 = \boxed{12.39 ft}$
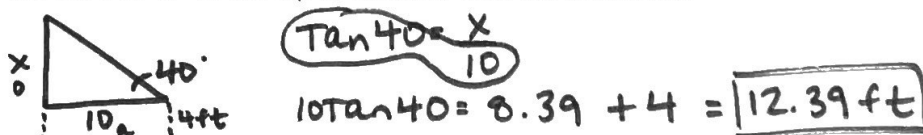
25) A triangle has vertices of M(4, 1), A(-1, 1), & P(4,-3). What is m∠MAP?

See video

26) What is the area of a square with a diagonal that measures 15 units?

$\dfrac{15\sqrt{2}}{2} \cdot \dfrac{15\sqrt{2}}{2} = \boxed{112.5}$

Directions: Use the figure to find each of the following.

$16^2 + 12^2 = c^2$

$256 + 144 = c^2$

$400 = c^2$

$c = 20$

27) sin A

$\dfrac{12}{20} = \boxed{\dfrac{3}{5}}$

28) cos A

$\dfrac{16}{20} = \boxed{\dfrac{4}{5}}$

29) m∠A

$Tan^{-1}\left(\dfrac{12}{16}\right) = \boxed{37°}$

30) m∠B

$90 - 37 = \boxed{53°}$

31) sin (90 – A)

$Sin53 = .80$

$SinB = \dfrac{4}{5}$

32) cos (90 – B)

$Cos57 = .80$

$CosA = \dfrac{4}{5}$