Pythagorean Triples

Ex:　　$\underline{3}, 7, \underline{9}$　　　• largest side is hypotenuse replace "c" with hyp.

$$a^2 + b^2 = c^2$$
$$(3)^2 + (7)^2 = (9)^2$$
$$9 + 49 = 81$$
$$58 \neq 81$$

Since the LHS ≠ RHS this is <u>not</u> a pythagorean triple

Ex. 2　　$\underline{5}, \underline{12}, \underline{13}$
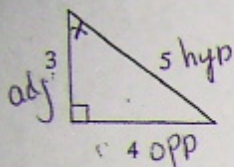
$$a^2 + b^2 = c^2$$
$$(5)^2 + (12)^2 = (13)^2$$
$$25 + 144 = 169$$
$$169 = 169$$

Since the LHS = RHS this <u>is</u> a pythagorean triple

1. Use the diagram to find Cos x as a fraction in lowest terms.

adj 3, 5 hyp, 4 opp

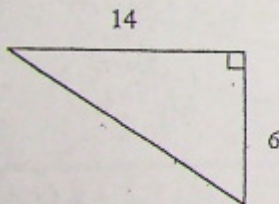$Cos\theta = \dfrac{a}{h}$

$= \dfrac{3}{5}$

a) $\dfrac{3}{4}$ b) $\dfrac{4}{5}$ c) $\dfrac{3}{5}$ d) 1 $\dfrac{1}{3}$

2. Find the length of the hypotenuse.

14

6

$a^2 + b^2 = c^2$
$6^2 + 14^2 = c^2$
$36 + 196 = c^2$
$\sqrt{232} = \sqrt{c^2}$ $c = 15.2$

a) 15   b) 13   c) 20   d) 4

3. If Cos T = 0.4226, what is the value of angle T?

a) 25   b) 23   c) 56   d) 65

4. In triangle ABC, angle A is the right angle and angle B=60°. If the side AB=20m, find the length of side BC.

a) 10   b) 40   c) 17.3   d) 34.6

B, adj 20, 60°, hyp, A, opp x

$tan\theta = \dfrac{o}{a}$
$tan 60° = \dfrac{x}{20}$

a) 25   b) 23   c) :56   d) 65

4. In triangle ABC, angle A is the right angle and angle B=60°. If the side AB=20m, find the length of side BC.
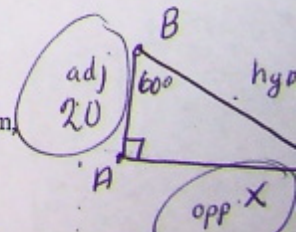
    a) 10   b) 40   c) 17.3   d) 34.6

(handwritten) adj 20, B 60°, hyp X, A, opp, C

$$\cos 60° = \frac{20}{x}$$
$$0.5 = \frac{20}{x}$$
$$0.5x = 20$$
$$x = 40$$

5. A photographer shines a camera light at a particular painting for an angle of 41° with the camera platform. If the light is 55m from the wall where the paining hangs, how high above the platform is the painting?

    a) 1.15m   b) 47.81m   c) 0.87m   d) 63.27m

(handwritten) x opp, hyp, 41°, 55m adj

$$\tan 41° = \frac{x}{55}$$
$$\frac{0.8693}{1} = \frac{x}{55}$$
$$x = 47.8$$

6. From the top of a lighthouse, a sailboat is sighted at an angle of depression of 38°. If the lighthouse is 44.0 m high, how far is the vessel from the base of the lighthouse?

    a) 47.0 m   b) 56.0 m   c) 67.0 m   d) 71.0 m

(handwritten) opp 44, hyp, x adj, 38°

$$\tan\theta = \frac{o}{a}$$
$$\tan 38° = \frac{44}{x}$$
$$\frac{0.7813}{1} = \frac{44}{x}$$
$$x = 56.3$$

7. A forest ranger in a tower 128.0 m high sights two fires in the same line of sight with the angles of depression 61° and 25°. How far apart are the fires?

    a) 203.5 m   b) 71.0 m   c) 274.5 m   d) 110.3 m

8. The face of a cliff rises vertically to a height of 112.0 m. A sighting is made from a boat to the top of the cliff. The angle of elevation is read as 22°. How far is the boat from the base of the cliff?

    a) 299.0 m   b) 45.3 m   c) 277.2 m   d) 120.8 m

(handwritten) hyp, 22, x adj

$$\tan 22° = \frac{112}{x}$$
$$\frac{0.4040}{1} = \frac{112}{x}$$
$$x = 277.2$$

9. Using the measurements given, calculate the height of the other tree.
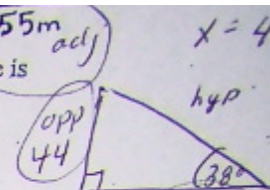
(handwritten) n 48° = 12.4, hyp, opp, hyp

a) 1.15m   b) 47.81m   c) 0.87m   d) 63.27m

6. From the top of a lighthouse, a sailboat is sighted at an angle of depression of 38°. If the lighthouse is 44.0 m high, how far is the vessel from the base of the lighthouse?

   a) 47.0 m   b) 56.0 m   c) 67.0 m   d) 71.0 m

Handwritten: 55m adj, x = 4, hyp, opp 44, x adj, 38°

$$\tan\theta = \frac{o}{a}$$
$$\tan 38° = \frac{44}{x}$$
$$0.7813 = \frac{44}{x}$$
$$x = 56.3$$

7. A forest ranger in a tower 128.0 m high sights two fires in the same line of sight with the angles of depression 61° and 25°. How far apart are the fires?

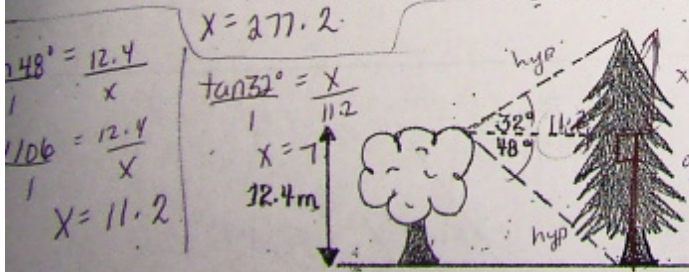   a) 203.5 m   b) 71.0 m   c) 274.5 m   d) 110.3 m

8. The face of a cliff rises vertically to a height of 112.0 m. A sighting is made from a boat to the top of the cliff. The angle of elevation is read as 22°. How far is the boat from the base of the cliff?

   a) 299.0 m   b) 45.3 m   c) 277.2 m   d) 120.8 m

Handwritten:
$$\tan 22° = \frac{112}{x}$$
$$0.4040 = \frac{112}{x}$$
$$x = 277.2$$

9. Using the measurements given, calculate the height of the other tree.

Handwritten left:
$$\frac{48°}{1} = \frac{12.4}{x}$$
$$\frac{1.06}{1} = \frac{12.4}{x}$$
$$x = 11.2$$

$$\tan 32° = \frac{x}{112}$$
$$x = 7$$
12.4m

Handwritten diagram labels: hyp, 32°, 48°, opp 12.4, hyp, x, 7.0, opp 128, 61°, 25°, adj, hyp

$$\tan 61° = \frac{128}{x}$$
$$1.8040x = 128$$
$$x = 71.0$$

$$\tan 25° = \frac{128}{x}$$
$$0.4663 = \frac{128}{x}$$
$$x = 274.4$$
$$274.4 - 71 = 203.50$$

   a) 7.3 m   b) 19.7 m   c) 36.9 m   d) 27.2 m

Which of the following are pythagorean triples?

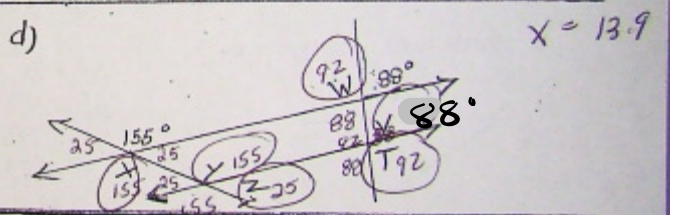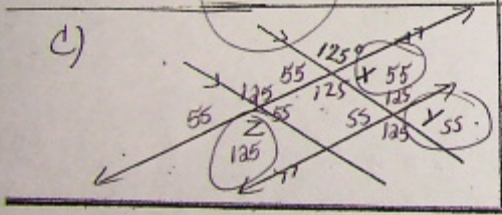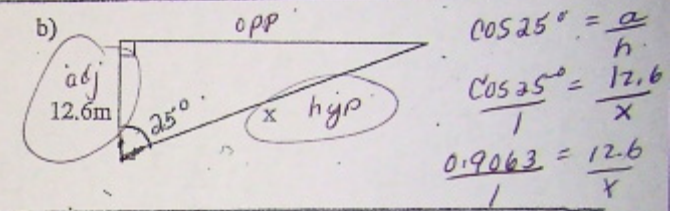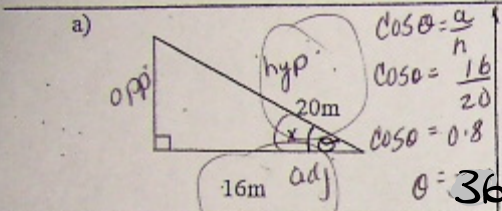a) 4, 3, 5 ✓
$4^2 + 3^2 = 5^2$
$16 + 9 = 25$
$25 = 25$

b) 4, 9, 13 NO
$4^2 + 9^2 = 13^2$
$16 + 81 = 169$
$97 = 169$ X

c) 6, 8, 10 ✓ yes
$6^2 + 8^2 = 10^2$
$36 + 64 = 100$
$100 = 100$

d) 9, 12, 15 ✓ yes
$9^2 + 12^2 = 15^2$
$81 + 144 = 225$

e) 12, 15, 16 NO
$12^2 + 15^2 \ne 16$
$144 + 225 = 25$

f) 1, 6, 9 NO X
$1^2 + 6^2 = 9^2$
$1 + 36 = 81$

a)
opp, hyp, adj
20m, 16m, x, θ
$\cos\theta = \dfrac{a}{h}$
$\cos\theta = \dfrac{16}{20}$
$\cos\theta = 0.8$
θ = **36°**

b)
opp, adj, hyp
12.6m, 25°, x
$\cos 25° = \dfrac{a}{h}$
$\dfrac{\cos 25°}{1} = \dfrac{12.6}{x}$
$\dfrac{0.9063}{1} = \dfrac{12.6}{x}$
x = 13.9

c)
125, 55, x 55, 125, 55, z, 125, Y 55, 55

d)
92 W, 89°, 88°, 88 **88°**
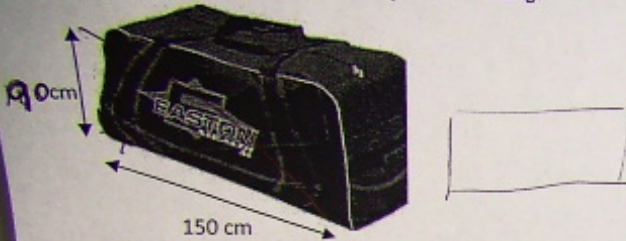25, 155°, Y 155, 25 T 92, 92, 80
155, 25, Z 25, 155

Jack bought a new hockey stick that was 180cm in length. His hockey bag measures 150 cm by 90cm. Will Jack be able to put his new hockey stick in his bag?

90cm

3. Find x

120

2x + 2

$120 + 2x + z = 180$
$2x + 122 = 180 - 122$
$\dfrac{2y = 58}{2} \cdot \dfrac{}{2}$
$x = 29°$

Jack bought a new hockey stick that was 180cm in length. His hockey bag measures 150 cm by 90cm. Will Jack be able to put his new hockey stick in his bag?
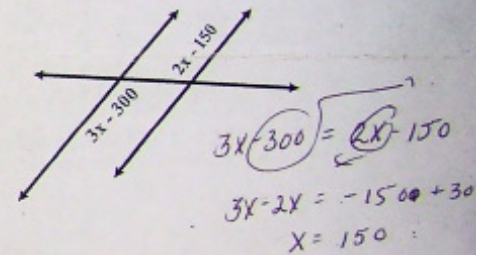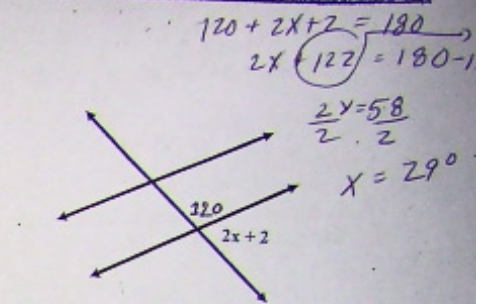
90cm

150 cm

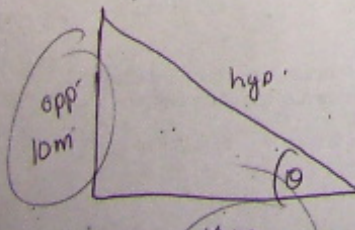$$90^2 + 150^2 = c^2$$
$$8100 + 22500 = c^2$$
$$\sqrt{30600} = \sqrt{c^2}$$
$$c = 174.9$$

No too long

3. Find x

$120 + 2x + 2 = 180$
$2x + 122 = 180 - 1$
$$\frac{2x}{2} = \frac{58}{2}$$
$x = 29°$

120

2x + 2

3x - 300

2x - 150

$3x - 300 = 2x - 150$
$3x - 2x = -150 + 300$
$x = 150$

Ryan and Eldon are having a shouting match. Ryan is on top of the school, which is 10m tall. Eldon is 10m away from the school. Calculate the angle of elevation from Eldon to Ryan.

opp
10m

hyp

θ

$$\tan\theta = \frac{10}{10}$$
$$\tan\theta = 1$$
$$\theta = 45°$$
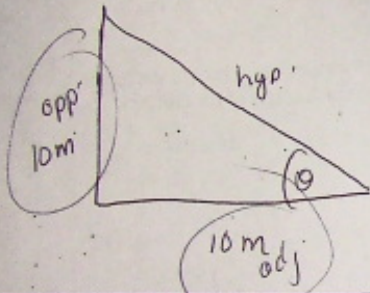
$8100 + 22500 = C$

$\sqrt{30\,600} = C^2$

$C = 174.9$

No too Hong

$3x(300) = (2x)$

$3x - 2x = -15$

$x = 150$

Ryan and Eldon are having a shouting match. Ryan is on top of the school, which is 10m tall. Eldon is 10m away from the school. Calculate the angle of elevation from Eldon to Ryan.

opp 10m

hyp

10 m adj

$\tan \theta = \dfrac{10}{10}$

$\tan \theta = 1$

$\theta = 45°$

State Alternate Interior, Alternate Exterior, Corresponding, or Co-Interior

Co-Interior

A

B

Corresponding

A

B

Alt Interior

A

B