RATIOS IN RIGHT TRIANGLES

Standards 15, 18, 19

INVERSE OF TRIGONOMETRIC RATIOS

END SHOW

PROBLEM 1a | PROBLEM 2a | PROBLEM 3a

PROBLEM 1b | PROBLEM 2b | PROBLEM 3b

PROBLEM 1c | PROBLEM 2c | PROBLEM 3c

USING TABLES AND GRAPHS

ELEVATION VS DEPRESSION

PROBLEM 4 | PROBLEM 5 | PROBLEM 6

PROBLEM 7 | PROBLEM 8 | PROBLEM 9

Standard 15:

Students use the pythagoream theorem to determine distance and find missing lengths of sides of right triangles.

Los estudiantes usan el teorema de Pitágoras para determinar distancia y encontrar las longitudes de los lados de teoremas rectángulos.

Standard 18:

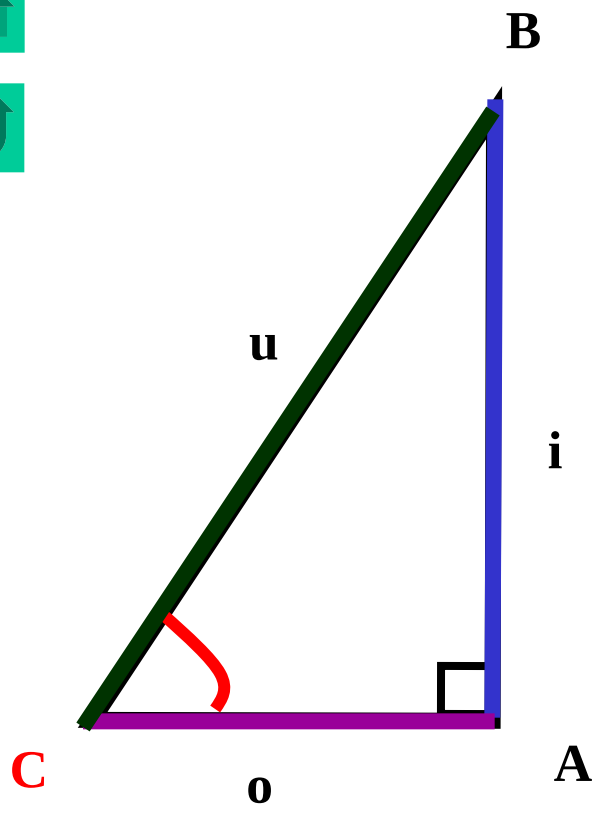
Students know the definitions of the basic trigonometric functions defined by the angles of a right triangle. They also know and are able to use elementary relationships between them, (e.g., tan(x)=sin(x)/cos(x), etc.)

Los estudiantes conocen las definiciones de las funciones básicas trigonométricas definidas para los ángulos de triángulos rectángulos. Ellos también conocen y son capaces de usar relaciones básicas entre ellos. (ej., tan(x)=sin(x)/cos(x), etc.)

Standard 19:

Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.

Los estudiantes usan funciones trigonométricas para resolver para una longitud desconocida de un triángulo rectángulo, dado un ángulo y la longitud de un lado.



SINE

$$\text{Sin } C = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } C = \frac{i}{u}$$

COSINE

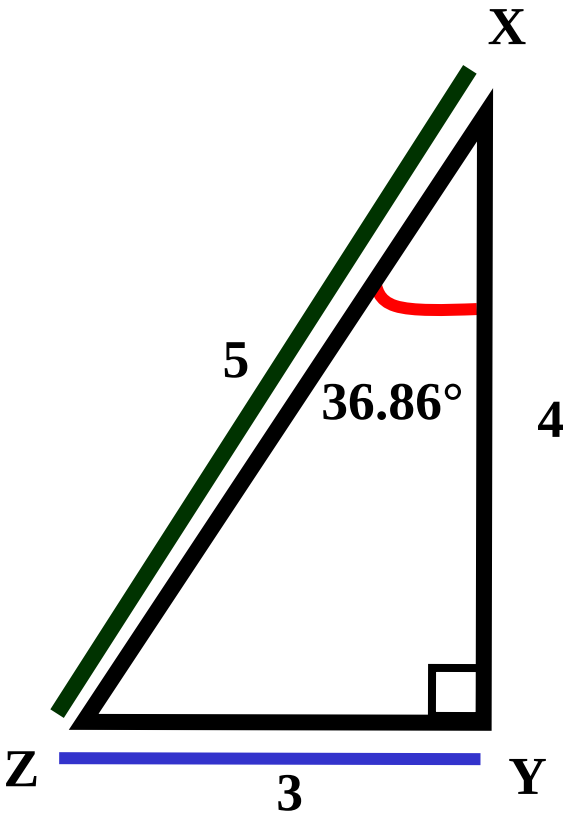
$$\text{Cos } C = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } C = \frac{o}{u}$$

TANGENT

$$\text{Tan } C = \frac{\text{Opposite side}}{\text{Adjacent side}}$$

$$\text{Tan } C = \frac{i}{o}$$



$m\angle X = ?$

$$\text{Sin } X = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } X = \frac{3}{5}$$

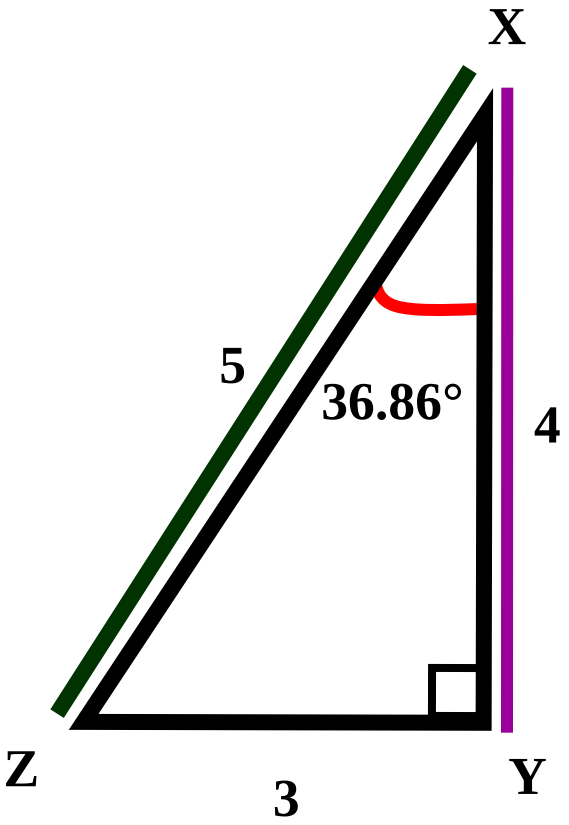
$$\text{Sin } X = 0.6$$

$$m\angle X = \text{Sin}^{-1}(0.6)$$

$$m\angle X \doteq 36.86°$$

Can we get the ratio again?

$$\text{Sin } (36.86°) = 0.6$$



$m\angle X = ?$

$$\text{Cos } X = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } X = \frac{4}{5}$$

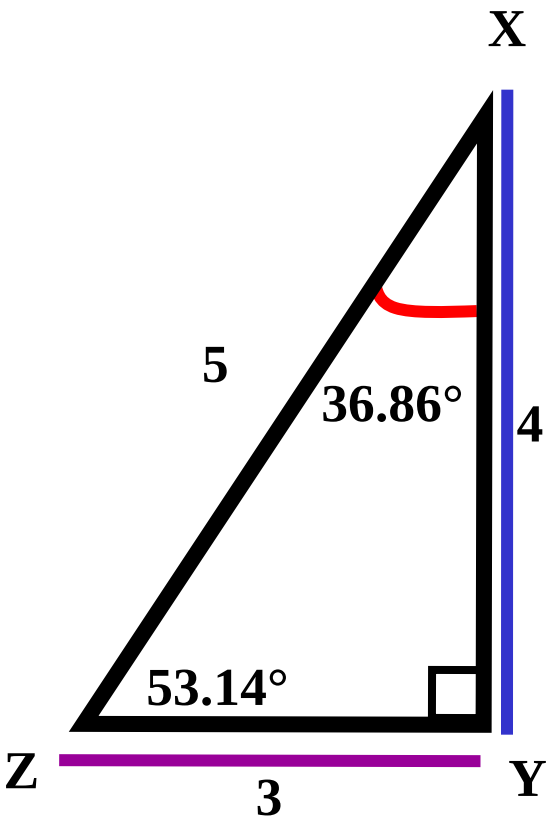
$$\text{Cos } X = 0.8$$

$$m\angle X = \text{Cos}^{-1}(0.8)$$

$$\boxed{m\angle X \doteq 36.86°}$$

Can we get the ratio again?

$$\text{Cos}(36.86°) = 0.8$$



$m\angle X = ?$

$$\text{Tan } X = \frac{\text{Opposite Side}}{\text{Adjacent}}$$

$$\text{Tan } X = \frac{3}{4}$$

$$\text{Tan } X = .75$$

$$m\angle X = \text{Tan}^{-1}(.75)$$

$$\boxed{m\angle X \doteq 36.86°}$$

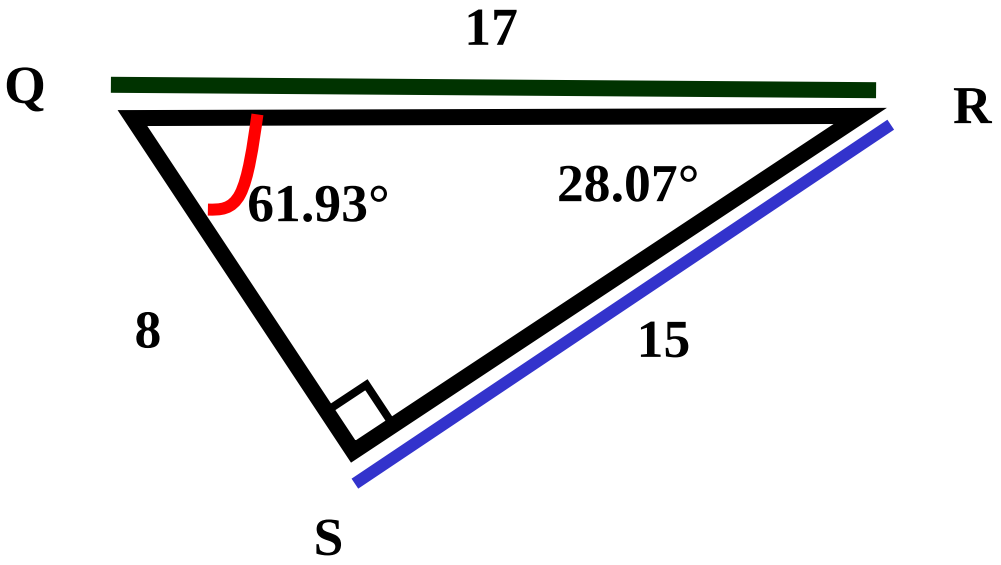
Can we get the ratio again?

$$\text{Tan}(36.86°) \doteq .75$$

What is the value for the remaining angle?

$$m\angle Z = 90° - 36.86° \doteq \boxed{53.14°}$$

$m\angle R = ?,\ m\angle Q = ?$



$$\text{Sin } Q = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } Q = \frac{15}{17}$$

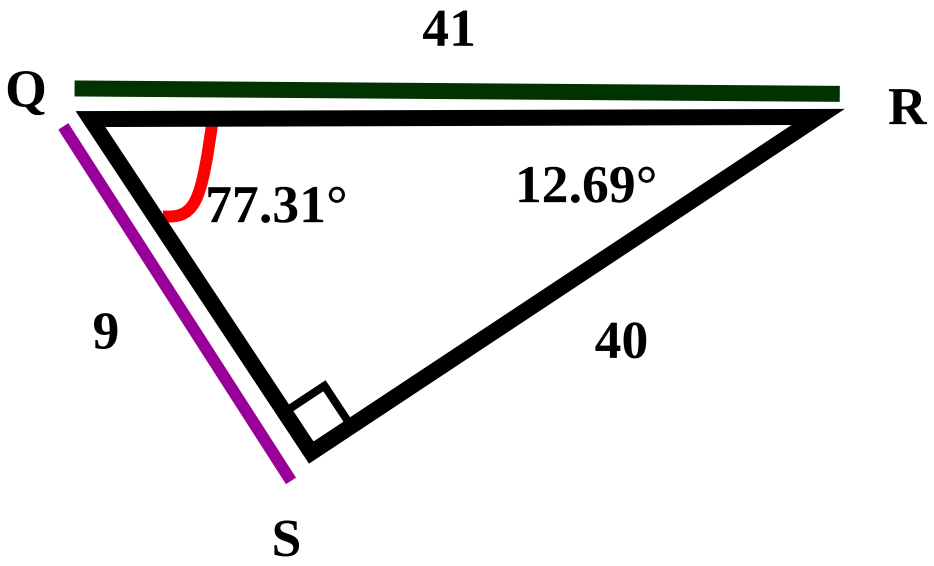
$$\text{Sin } Q \doteq .8824$$

$$m\angle Q = \text{Sin}^{-1}(.8824)$$

$$m\angle Q \doteq 61.93°$$

$$m\angle R = 90° - 61.93° \doteq 28.07°$$

$m\angle R = ?,\ m\angle Q = ?$



$$\text{Cos } Q = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } Q = \frac{9}{41}$$

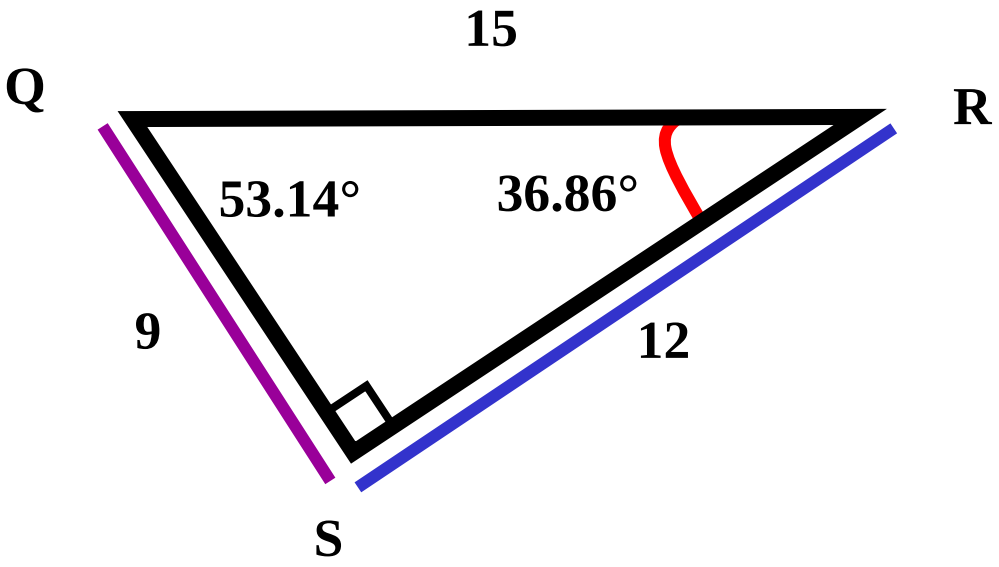
$$\text{Cos } Q \doteq .2195$$

$$m\angle Q = \text{Cos}^{-1}(\ .2195\ )$$

$$m\angle Q \doteq 77.31°$$

$$m\angle R = 90° - 77.31° \doteq 12.69°$$

$m\angle R = ?,\ m\angle Q = ?$



$$\text{Tan } R = \frac{\text{Opposite Side}}{\text{Adjacent}}$$

$$\text{Tan } R = \frac{9}{12}$$

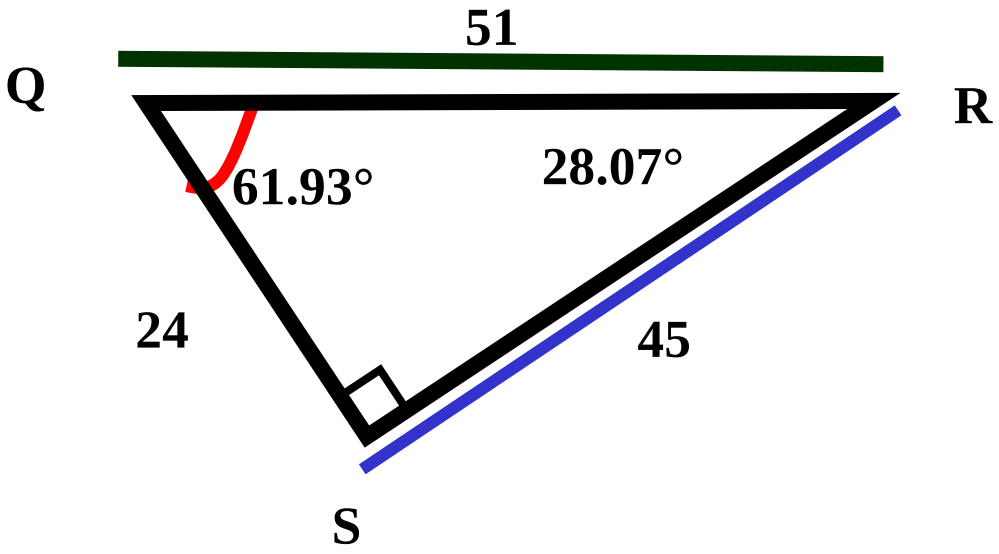
$$\text{Tan } R = .75$$

$$m\angle R = \text{Tan}^{-1}(.75)$$

$$m\angle R \doteq 36.86°$$

$$m\angle Q = 90° - 36.86° \doteq 53.14°$$

m∠ R = ?, m∠ Q = ?



$$\text{Sin } Q = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } Q = \frac{45}{51}$$

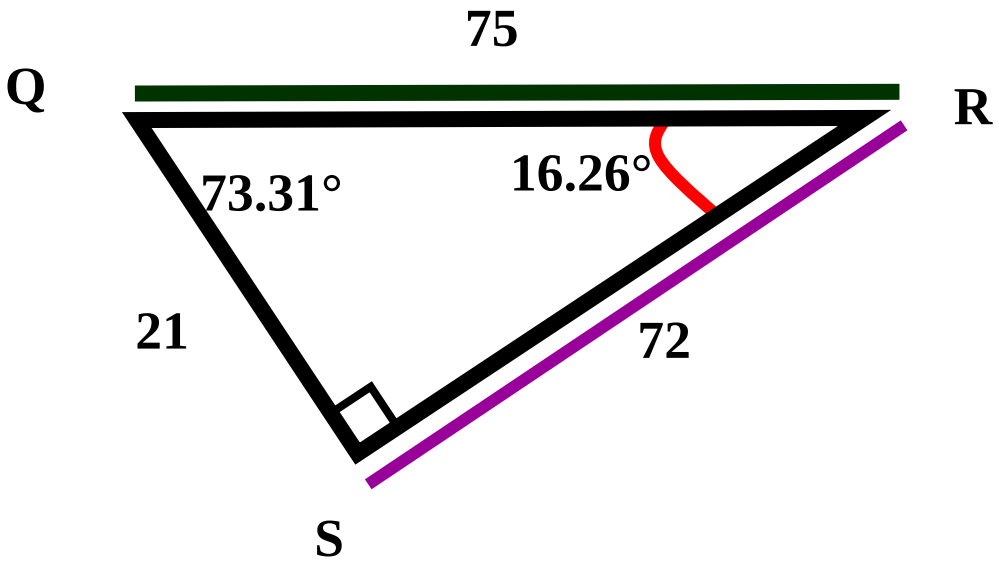
$$\text{Sin } Q \doteq .8824$$

$$m\angle Q = \text{Sin}^{-1}(.8824)$$

$$m\angle R = 90° - 61.93° \doteq 28.07°$$

$$m\angle Q \doteq 61.93°$$

m∠ R = ?, m∠ Q = ?



$$\text{Cos } R = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } R = \frac{72}{75}$$

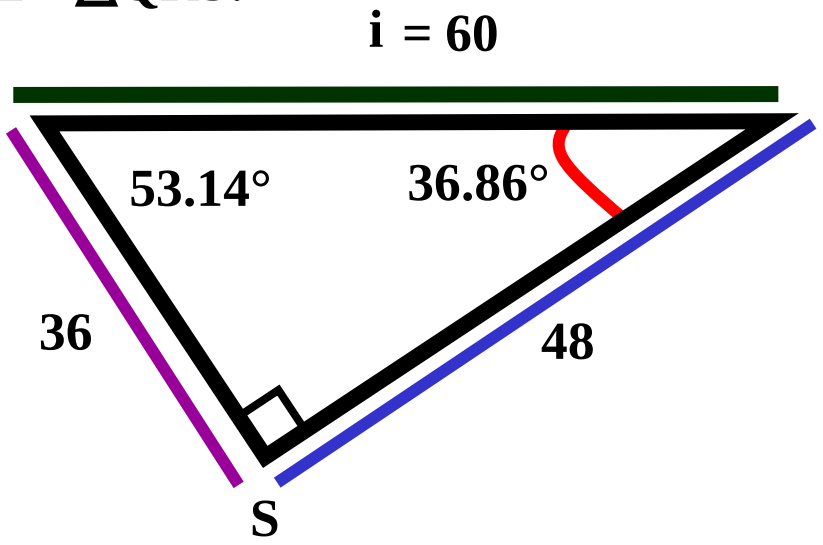
$$\text{Cos } R \doteq .96$$

$$m\angle R = \text{Cos}^{-1}(.96)$$

$$m\angle R \doteq 16.26°$$

$$m\angle Q = 90° - 16.26° \doteq 73.31°$$

SOLVE ΔQRS:



$$\text{Tan } R = \frac{\text{Opposite Side}}{\text{Adjacent}}$$

$$\text{Tan } R = \frac{36}{48}$$

$$\text{Tan } R = .75$$

$$m\angle R = \text{Tan}^{-1}(.75)$$

$$m\angle R \doteq \boxed{36.86°}$$

$$m\angle Q = 90° - 36.86° \doteq \boxed{53.14°}$$

$$36^2 + 48^2 = i^2$$

$$1296 + 2304 = i^2$$

$$i^2 = 3600$$

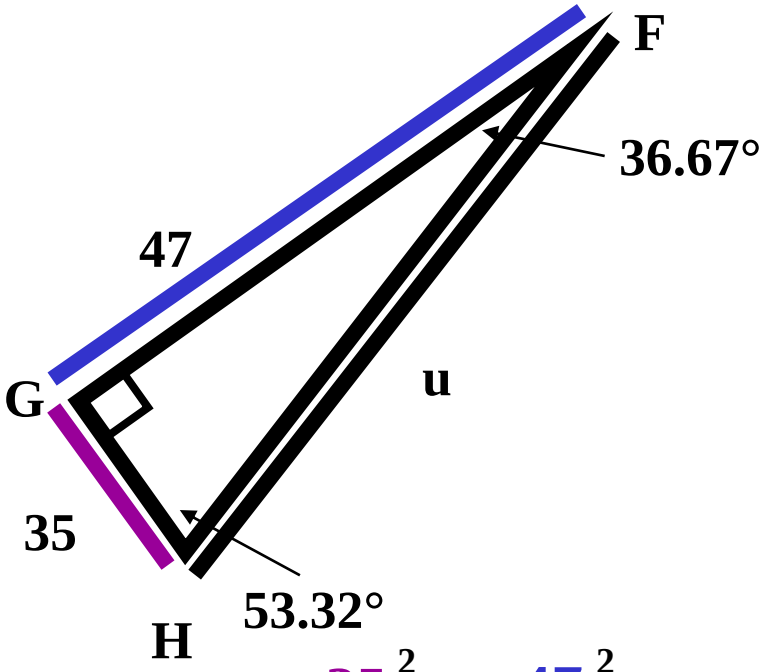
$$\sqrt{i^2} = \sqrt{3600}$$

$$|i| = 60$$

$$\boxed{i=60} \text{ and } \cancel{i=-60}$$

SOLVE ΔFGH:

Standards 15, 18, 19



$$\text{Tan } F = \frac{\text{Opposite Side}}{\text{Adjacent}}$$

$$\text{Tan } F = \frac{35}{47}$$

$$\text{Tan } F \doteq .7446$$

$$m\angle F = \text{Tan}^{-1}(.7446)$$

$$m\angle F \doteq \boxed{36.67°}$$

$$m\angle H = 90° - 36.67° \doteq \boxed{53.32°}$$

$$35^2 + 47^2 = u^2$$

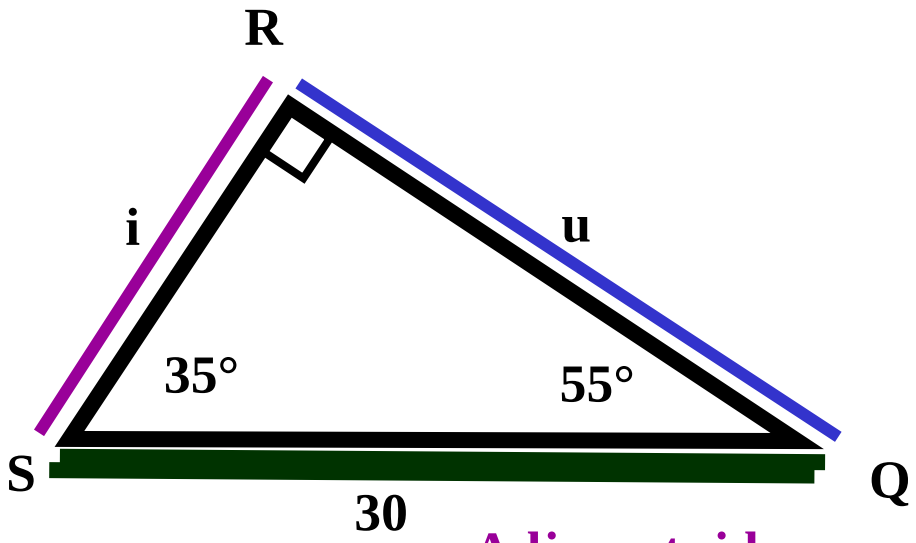
$$1225 + 2209 = u^2$$

$$u^2 = 3434$$

$$\sqrt{u^2} = \sqrt{3434}$$

$$|u| \doteq 58.6 \quad \boxed{u \doteq 58.6} \text{ and } u \doteq -58.6$$

SOLVE ∆SRQ:



$$\text{Sin } S = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } (35°) = \frac{u}{30}$$

$$(30)\,\text{Sin } 35° = \frac{u}{30}(30)$$

$$u = 30 \text{ Sin } 35°$$

$$u = 30(\ .5736\ )$$

$$\boxed{u \doteq 17.2}$$

$$\text{Cos } S = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } 35° = \frac{i}{30}$$

$$(30)\ \text{Cos } 35° = \frac{i}{30}(30)$$

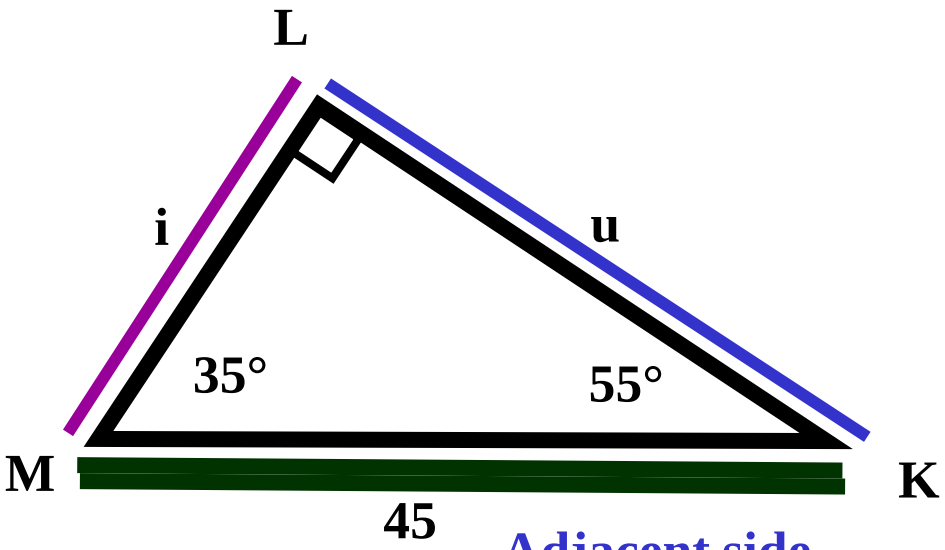
$$i = 30 \text{ Cos } 35°$$

$$i = 30(\ .8192\ )$$

$$\boxed{i \doteq 24.57}$$

$$m\angle Q = 90° - 35° = \boxed{55°}$$

SOLVE ΔLMK:



$$\text{Sin } K = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin}(55°) = \frac{i}{45}$$

$$(45)\ \text{Sin } 55° = \frac{i}{45}(45)$$

$$i = 45 \text{ Sin } 55°$$

$$i = 45(.8191)$$

$$\boxed{i \doteq 36.86}$$

$$\text{Cos } K = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } 55° = \frac{u}{45}$$

$$(45)\ \text{Cos } 55° = \frac{u}{45}(45)$$

$$u = 45 \text{ Cos } 55°$$

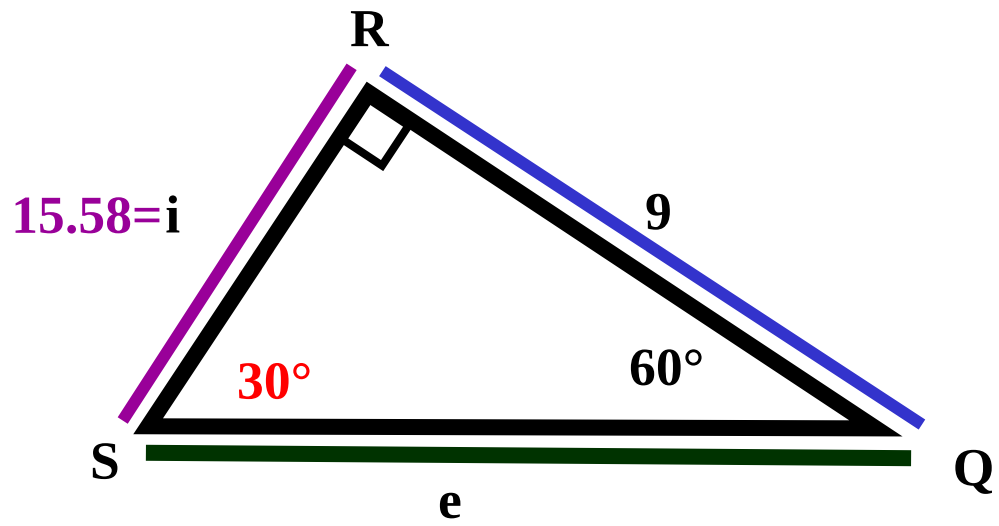
$$u = 45(.5735)$$

$$\boxed{u \doteq 25.81}$$

$$m\angle M = 90° - 55° = \boxed{35°}$$

SOLVE $\triangle QRS$:

Standards 15, 18, 19



$$\tan(30°) = \frac{9}{i}$$

$$\frac{\tan(30°)}{1} = \frac{9}{i}$$

$$i\tan(30°) = 9$$

$$\frac{i\tan(30°)}{\tan(30°)} = \frac{9}{\tan(30°)}$$

$$i = \frac{9}{\tan(30°)}$$

$$i = \frac{9}{.5774}$$

$$i \doteq 15.58$$

$$15.58^2 + 9^2 = e^2$$

$$243 + 81 = e^2$$

$$e^2 = 324$$

$$\sqrt{e^2} = \sqrt{324}$$

$$|e| \doteq 18 \quad e \doteq 18 \text{ and } e \doteq -18$$

$m\angle Q = 90° - 30° = 60°$

SOLVE $\triangle XYZ$:

Standards 15, 18, 19

$$\text{Tan}(36°) = \frac{6}{i}$$

$$\frac{\text{Tan}(36°)}{1} = \frac{6}{i}$$

$$i\,\text{Tan}(36°) = 6$$

$$\frac{i\,\text{Tan}(36°)}{\text{Tan}(36°)} = \frac{6}{\text{Tan}(36°)}$$

$$i = \frac{6}{\text{Tan}(36°)}$$

$$i = \frac{6}{.7265}$$

$$i \doteq 8.26$$

$$8.26^2 + 6^2 = a^2$$

$$68.2 + 36 = a^2$$

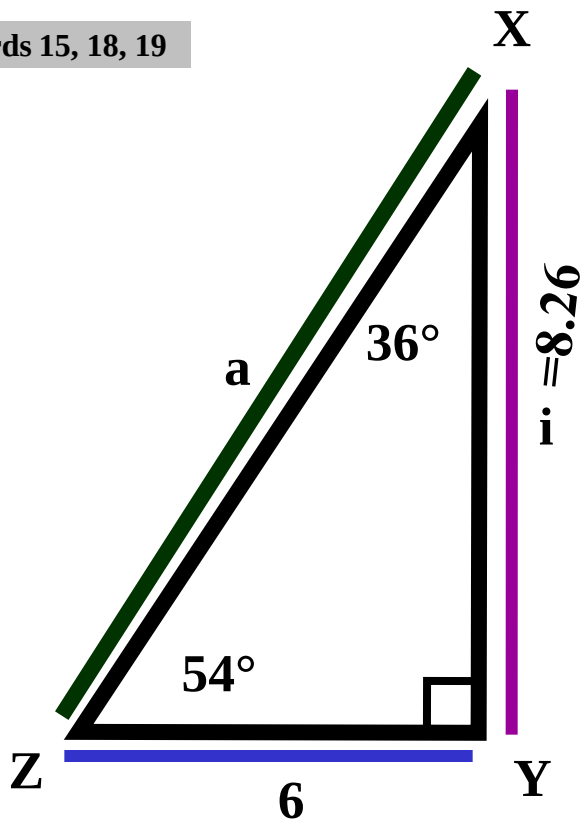
$$a^2 = 104.2$$

$$\sqrt{a^2} = \sqrt{104.2}$$

$$|a| \doteq 10.2$$

$$a \doteq 10.2 \text{ and } a \doteq -10.2$$

$$m\angle Z = 90° - 36° = 54°$$



SOLVE $\triangle FGH$:

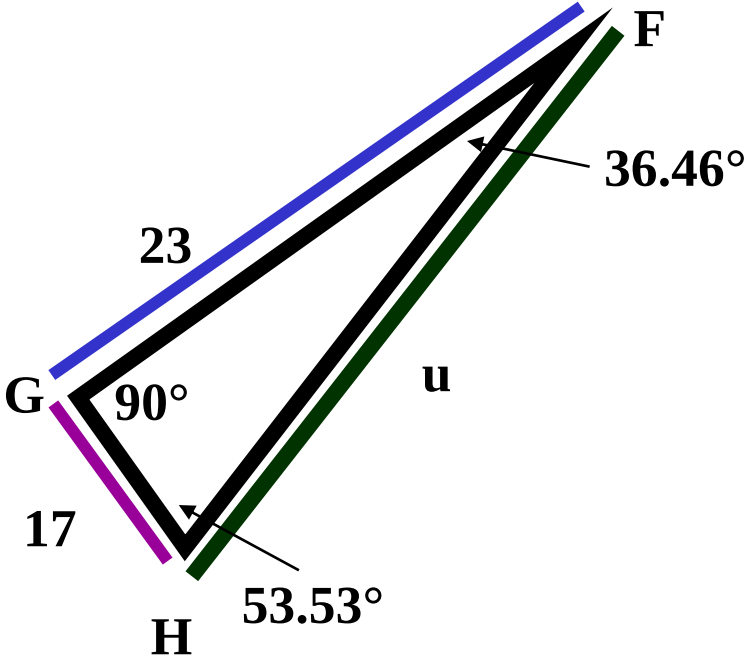
$$\text{Tan } F = \frac{\text{Opposite Side}}{\text{Adjacent}}$$

$$\text{Tan } F = \frac{17}{23}$$

$$\text{Tan } F = .7391$$

$$m\angle F = \text{Tan}^{-1}(\ .7391\ )$$

$$m\angle F \doteq \boxed{36.46°}$$



$$17^2 + 23^2 = u^2$$

$$289 + 529 = u^2$$

$$u^2 = 818$$

$$\sqrt{u^2} = \sqrt{818}$$

$$|u| \doteq 28.6$$

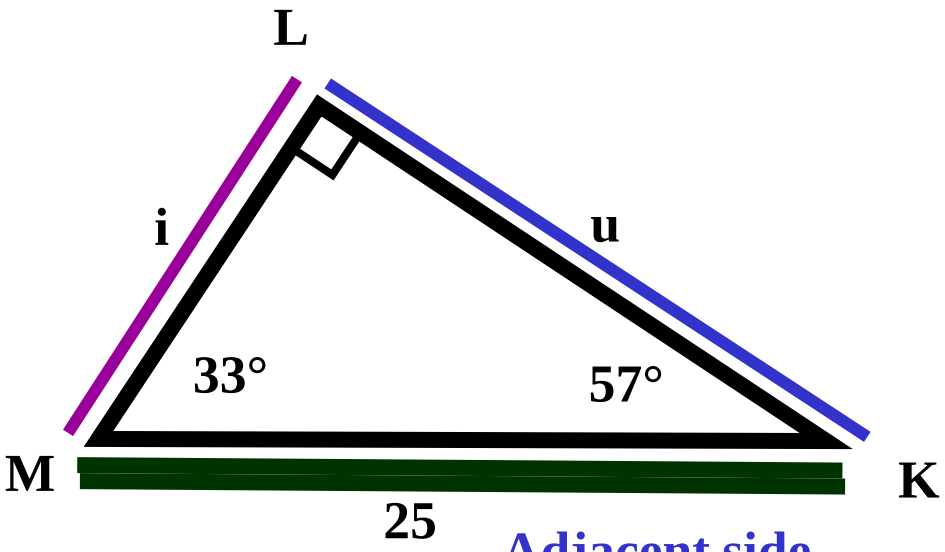
$\boxed{u \doteq 28.6}$ and ~~$u \doteq -28.6$~~

$$m\angle H = 90° - 36.46° \doteq \boxed{53.53°}$$

Standards 15, 18, 19

SOLVE ΔLMK:

Standards 15, 18, 19



$$\text{Sin } 57° = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\text{Sin } 57° = \frac{i}{25}$$

$$(25)\text{Sin } 57° = \frac{i}{25}(25)$$

$$i = 25 \text{ Sin } 57°$$

$$i = 25(.8386)$$

$$\boxed{i \doteq 20.96}$$

$$\text{Cos } 57° = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

$$\text{Cos } 57° = \frac{u}{25}$$

$$(25)\text{Cos } 57° = \frac{u}{25}(25)$$

$$u = 25 \text{ Cos } 57°$$

$$u = 25(.5446)$$

$$\boxed{u \doteq 13.61}$$

$$m\angle M = 90° - 57° = \boxed{33°}$$

SOLVE $\triangle XYZ$:

Standards 15, 18, 19

$$\text{Tan}(29°) = \frac{7}{i}$$

$$\frac{\text{Tan}(29°)}{1} = \frac{7}{i}$$

$$i\,\text{Tan}(29°) = 7$$

$$\frac{i\,\text{Tan}(29°)}{\text{Tan}(29°)} = \frac{7}{\text{Tan}(29°)}$$

$$i = \frac{7}{\text{Tan}(29°)}$$

$$i = \frac{7}{.5543}$$

$$i \doteq 12.62$$

$$12.6^2 + 7^2 = a^2$$

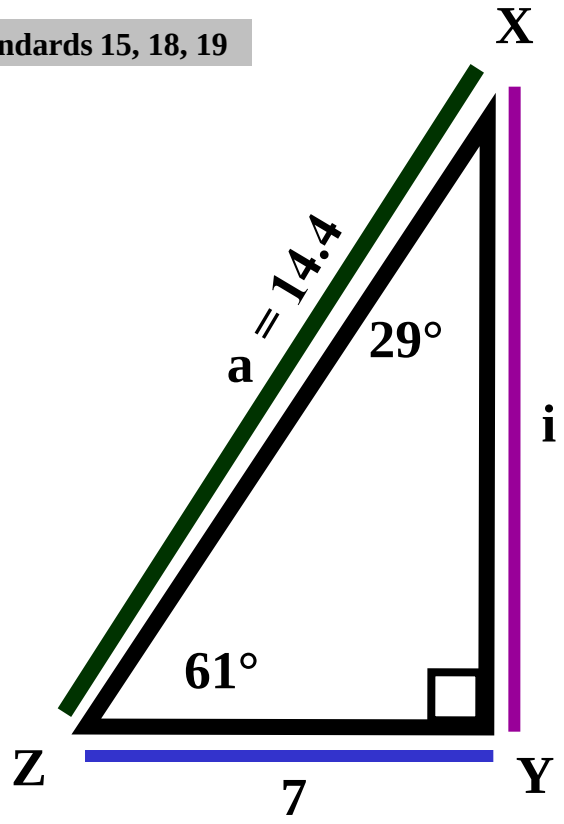
$$159.5 + 49 = a^2$$

$$a^2 = 208.5$$

$$\sqrt{a^2} = \sqrt{208.5}$$

$$|a| \doteq 14.4 \qquad a \doteq 14.4 \text{ and } a \doteq -14.4$$

$$m\angle Z = 90° - 29° = 61°$$



ANGLE	SINE	COSINE	TANGENT	ANGLE	SINE	COSINE	TANGENT
0	0.0000	1.0000	0.0000	46	0.7193	0.6947	1.0355
1	0.0175	0.9998	0.0175	47	0.7314	0.6820	1.0724
2	0.0349	0.9994	0.0349	48	0.7431	0.6691	1.1106
3	0.0523	0.9986	0.0524	49	0.7547	0.6561	1.1504
4	0.0698	0.9976	0.0699	50	0.7660	0.6428	1.1918
5	0.0872	0.9962	0.0875	51	0.7771	0.6293	1.2349
6	0.1045	0.9945	0.1051	52	0.7880	0.6157	1.2799
7	0.1219	0.9925	0.1228	53	0.7986	0.6018	1.3271
8	0.1392	0.9903	0.1405	54	0.8090	0.5878	1.3764
9	0.1564	0.9877	0.1584	55	0.8192	0.5736	1.4282
10	0.1736	0.9848	0.1763	56	0.8290	0.5592	1.4826
11	0.1908	0.9816	0.1944	57	0.8387	0.5446	1.5399
12	0.2079	0.9781	0.2126	58	0.8480	0.5299	1.6003
13	0.2250	0.9744	0.2309	59	0.8572	0.5150	1.6643
14	0.2419	0.9703	0.2493	60	0.8660	0.5000	1.7321
15	0.2588	0.9659	0.2679	61	0.8746	0.4848	1.8041
16	0.2756	0.9613	0.2867	62	0.8829	0.4695	1.8807
17	0.2924	0.9563	0.3057	63	0.8910	0.4540	1.9626
18	0.3090	0.9511	0.3249	64	0.8988	0.4384	2.0503
19	0.3256	0.9455	0.3443	65	0.9063	0.4226	2.1445
20	0.3420	0.9397	0.3640	66	0.9135	0.4067	2.2461
21	0.3584	0.9336	0.3839	67	0.9205	0.3907	2.3559
22	0.3746	0.9272	0.4040	68	0.9272	0.3746	2.4751
23	0.3907	0.9205	0.4245	69	0.9336	0.3584	2.6051
24	0.4067	0.9135	0.4452	70	0.9397	0.3420	2.7475
25	0.4226	0.9063	0.4663	71	0.9455	0.3256	2.9042
26	0.4384	0.8988	0.4877	72	0.9511	0.3090	3.0777
27	0.4540	0.8910	0.5095	73	0.9563	0.2924	3.2709
28	0.4695	0.8829	0.5317	74	0.9613	0.2756	3.4875
29	0.4848	0.8746	0.5543	75	0.9659	0.2588	3.7321
30	0.5000	0.8660	0.5774	76	0.9703	0.2419	4.0108
31	0.5150	0.8572	0.6009	77	0.9744	0.2249	4.3315
32	0.5299	0.8480	0.6249	78	0.9781	0.2079	4.7047
33	0.5446	0.8387	0.6494	79	0.9816	0.1908	5.1446
34	0.5592	0.8290	0.6745	80	0.9848	0.1736	5.6714
35	0.5736	0.8192	0.7002	81	0.9877	0.1564	6.3139
36	0.5878	0.8090	0.7265	82	0.9903	0.1392	7.1155
37	0.6018	0.7986	0.7536	83	0.9925	0.1219	8.1446
38	0.6157	0.7880	0.7813	84	0.9945	0.1045	9.5147
39	0.6293	0.7771	0.8098	85	0.9962	0.0872	11.4305
40	0.6428	0.7660	0.8391	86	0.9976	0.0698	14.3014
41	0.6561	0.7547	0.8693	87	0.9986	0.0523	19.0824
42	0.6691	0.7431	0.9004	88	0.9994	0.0349	28.6392
43	0.6820	0.7314	0.9325	89	0.9998	0.0174	57.3019
44	0.6947	0.7193	0.9657	90	1.0000	0.0000	*
45	0.7071	0.7071	1.0000				

Angle to Ratio:

cos 37°=0.7986

sin 19°=0.3256

tan 67°= 2.3559

ANGLE	SINE	COSINE	TANGENT	ANGLE	SINE	COSINE	TANGENT
0	0.0000	1.0000	0.0000	46	0.7193	0.6947	1.0355
1	0.0175	0.9998	0.0175	47	0.7314	0.6820	1.0724
2	0.0349	0.9994	0.0349	48	0.7431	0.6691	1.1106
3	0.0523	0.9986	0.0524	49	0.7547	0.6561	1.1504
4	0.0698	0.9976	0.0699	50	0.7660	0.6428	1.1918
5	0.0872	0.9962	0.0875	51	0.7771	0.6293	1.2349
6	0.1045	0.9945	0.1051	52	0.7880	0.6157	1.2799
7	0.1219	0.9925	0.1228	53	0.7986	0.6018	1.3271
8	0.1392	0.9903	0.1405	54	0.8090	0.5878	1.3764
9	0.1564	0.9877	0.1584	55	0.8192	0.5736	1.4282
10	0.1736	0.9848	0.1763	56	0.8290	0.5592	1.4826
11	0.1908	0.9816	0.1944	57	0.8387	0.5446	1.5399
12	0.2079	0.9781	0.2126	58	0.8480	0.5299	1.6003
13	0.2250	0.9744	0.2309	59	0.8572	0.5150	1.6643
14	0.2419	0.9703	0.2493	60	0.8660	0.5000	1.7321
15	0.2588	0.9659	0.2679	61	0.8746	0.4848	1.8041
16	0.2756	0.9613	0.2867	62	0.8829	0.4695	1.8807
17	0.2924	0.9563	0.3057	63	0.8910	0.4540	1.9626
18	0.3090	0.9511	0.3249	64	0.8988	0.4384	2.0503
19	0.3256	0.9455	0.3443	65	0.9063	0.4226	2.1445
20	0.3420	0.9397	0.3640	66	0.9135	0.4067	2.2461
21	0.3584	0.9336	0.3839	67	0.9205	0.3907	2.3559
22	0.3746	0.9272	0.4040	68	0.9272	0.3746	2.4751
23	0.3907	0.9205	0.4245	69	0.9336	0.3584	2.6051
24	0.4067	0.9135	0.4452	70	0.9397	0.3420	2.7475
25	0.4226	0.9063	0.4663	71	0.9455	0.3256	2.9042
26	0.4384	0.8988	0.4877	72	0.9511	0.3090	3.0777
27	0.4540	0.8910	0.5095	73	0.9563	0.2924	3.2709
28	0.4695	0.8829	0.5317	74	0.9613	0.2756	3.4875
29	0.4848	0.8746	0.5543	75	0.9659	0.2588	3.7321
30	0.5000	0.8660	0.5774	76	0.9703	0.2419	4.0108
31	0.5150	0.8572	0.6009	77	0.9744	0.2249	4.3315
32	0.5299	0.8480	0.6249	78	0.9781	0.2079	4.7047
33	0.5446	0.8387	0.6494	79	0.9816	0.1908	5.1446
34	0.5592	0.8290	0.6745	80	0.9848	0.1736	5.6714
35	0.5736	0.8192	0.7002	81	0.9877	0.1564	6.3139
36	0.5878	0.8090	0.7265	82	0.9903	0.1392	7.1155
37	0.6018	0.7986	0.7536	83	0.9925	0.1219	8.1446
38	0.6157	0.7880	0.7813	84	0.9945	0.1045	9.5147
39	0.6293	0.7771	0.8098	85	0.9962	0.0872	11.4305
40	0.6428	0.7660	0.8391	86	0.9976	0.0698	14.3014
41	0.6561	0.7547	0.8693	87	0.9986	0.0523	19.0824
42	0.6691	0.7431	0.9004	88	0.9994	0.0349	28.6392
43	0.6820	0.7314	0.9325	89	0.9998	0.0174	57.3019
44	0.6947	0.7193	0.9657	90	1.0000	0.0000	*
45	0.7071	0.7071	1.0000				

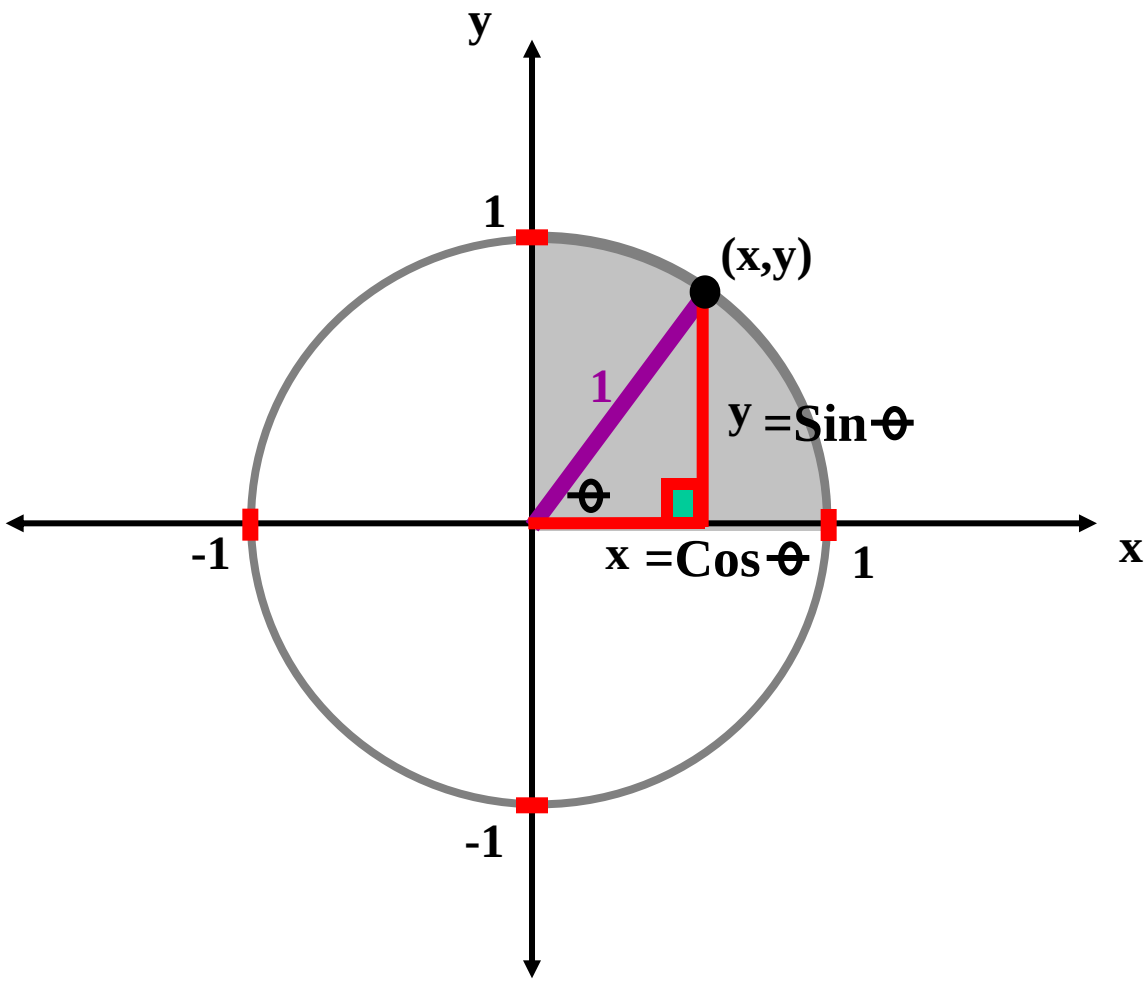
Ratio to Angle:

acos(0.9205) = 23°

asin (0.0872) = 5°

atan (9.5144) = 84°

TRIGONOMETRIC CIRCLE: First Quadrant



$$\text{Sin}\,\theta = \frac{y}{1}$$

$$\text{Sin}\,\theta = y$$

$$\text{Cos}\,\theta = \frac{x}{1}$$

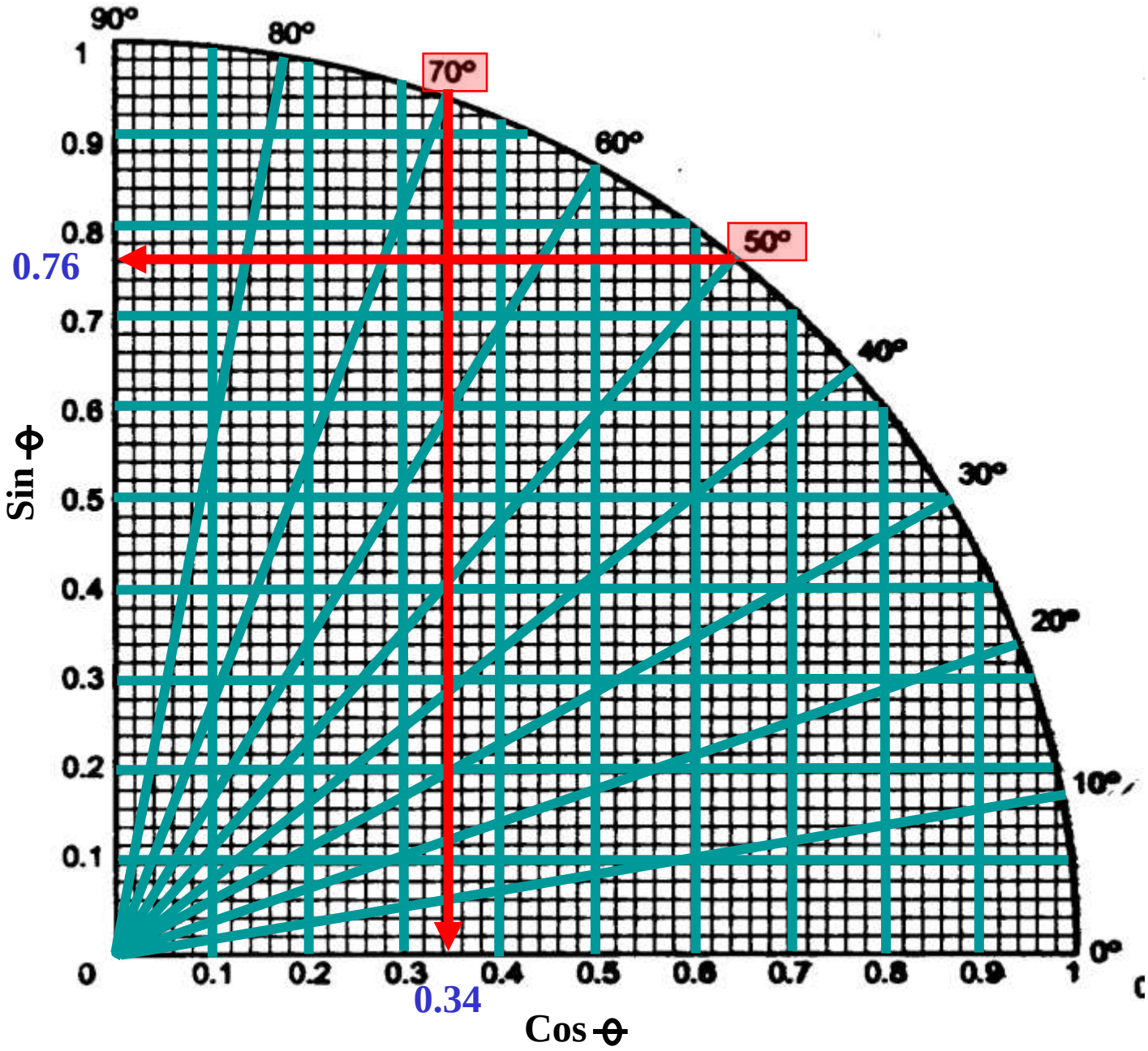
$$\text{Cos}\,\theta = x$$

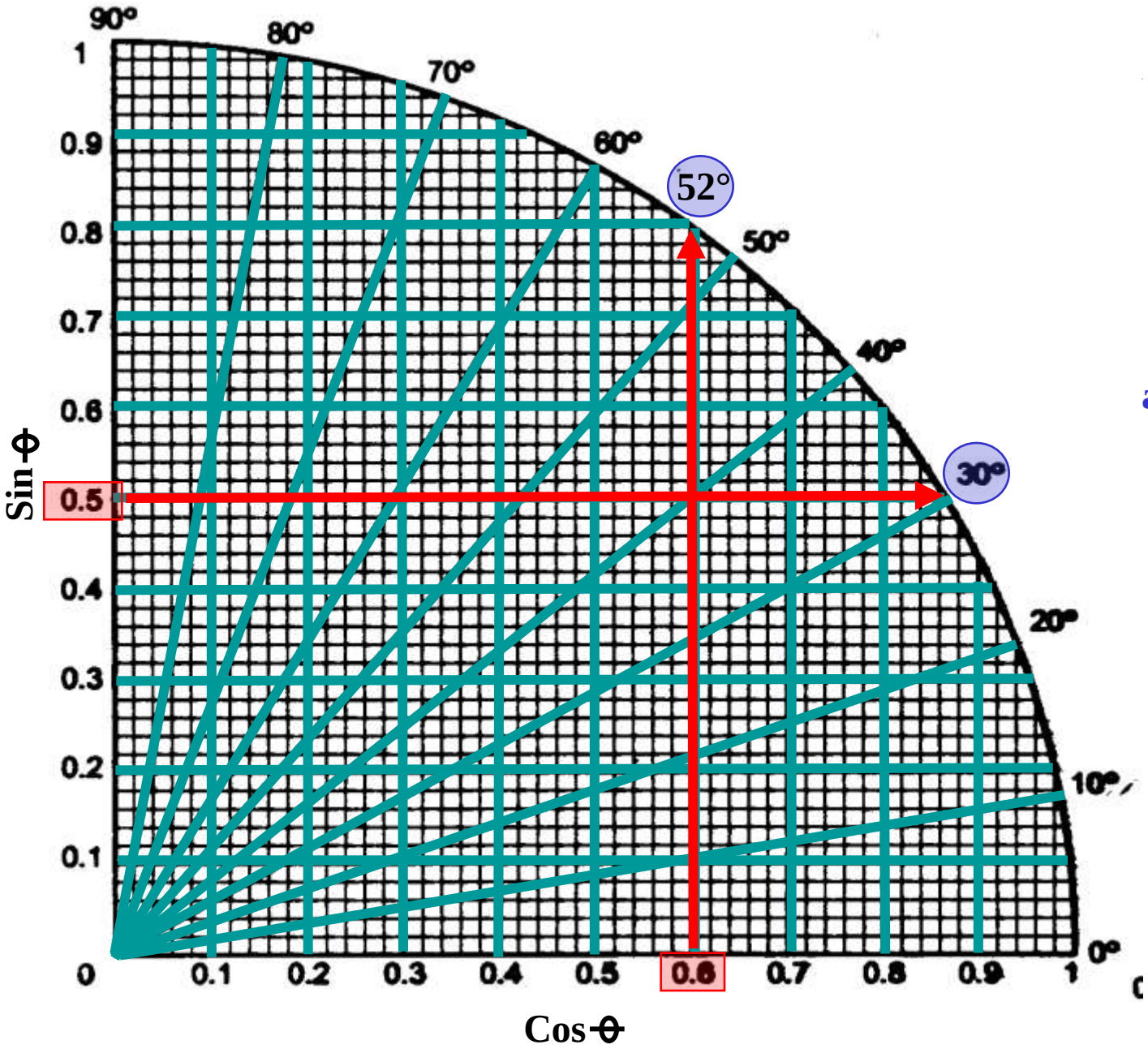
Now, we take the first quadrant and we use it to find Trigonometric ratios from angles and angles from trigonometric ratios.

Angle to Ratio:

cos 70°= .34

sin 50°= .76



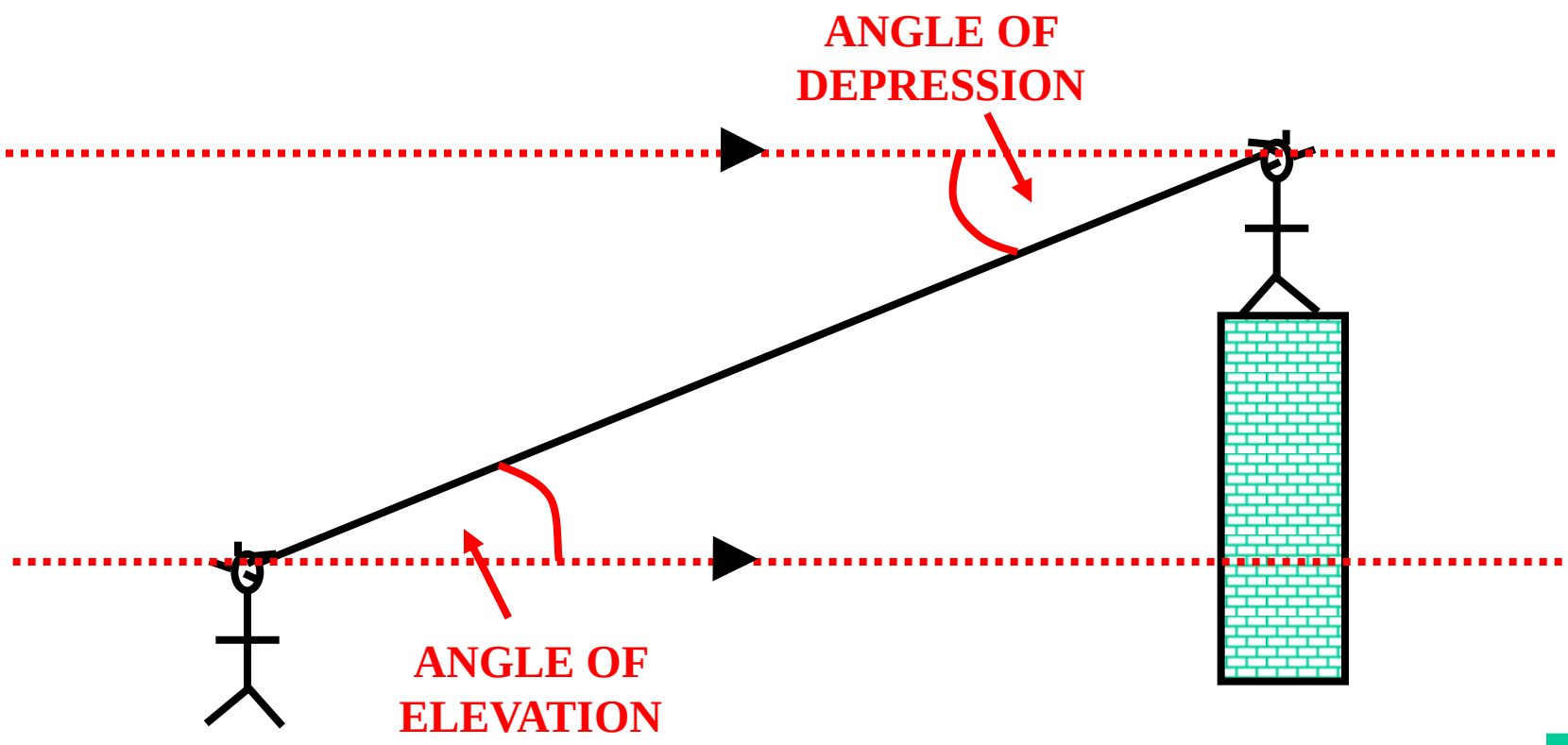


Ratio to Angle:

acos(0.6) = 52°

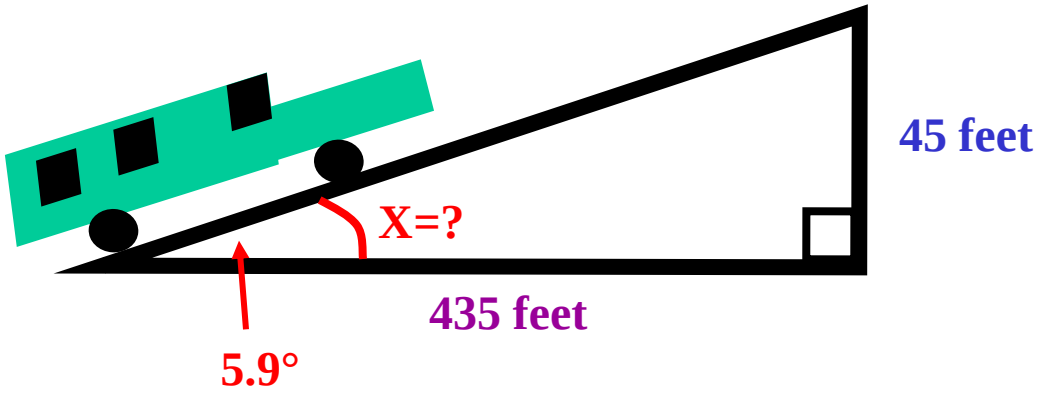
asin (0.5) = 30°

ANGLE OF DEPRESSION AND ANGLE OF ELEVATION



Angles of Depression and Elevation are Alternate Interior Angles and they are congruent.

A car road rises vertically 45 feet, over a horizontal distance of 435 feet. What is the angle of elevation of the road?



$$\text{Tan } X = \frac{45}{435}$$

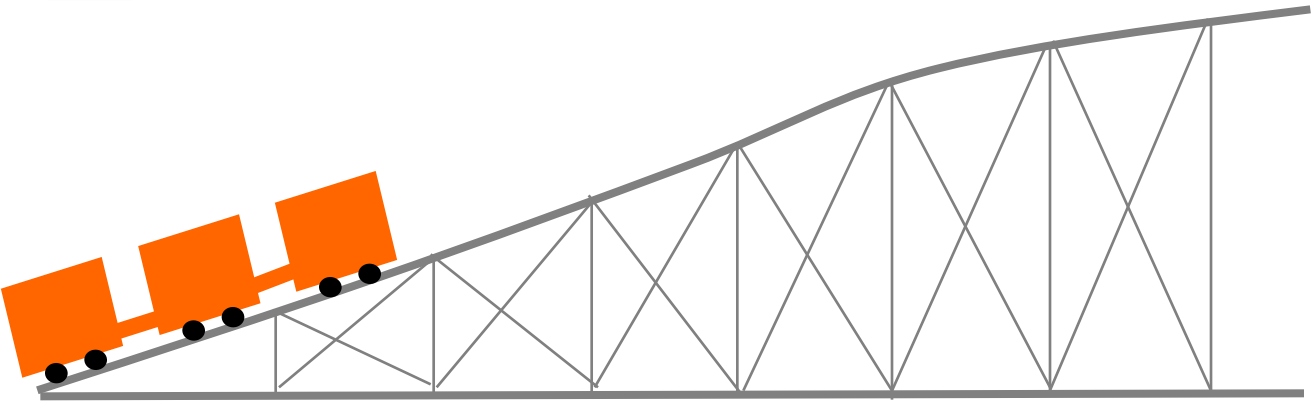
$$\text{Tan } X = .103$$

$$m\angle X = \text{Tan}^{-1}(\ .103\ )$$

$$m\angle X \doteq 5.9°$$

The angle of elevation of the road is about 5.9°.

The slope of a rollercoaster track span has 600 meters in length, with a vertical drop of 210 meters. What is the angle of depression for the slope?



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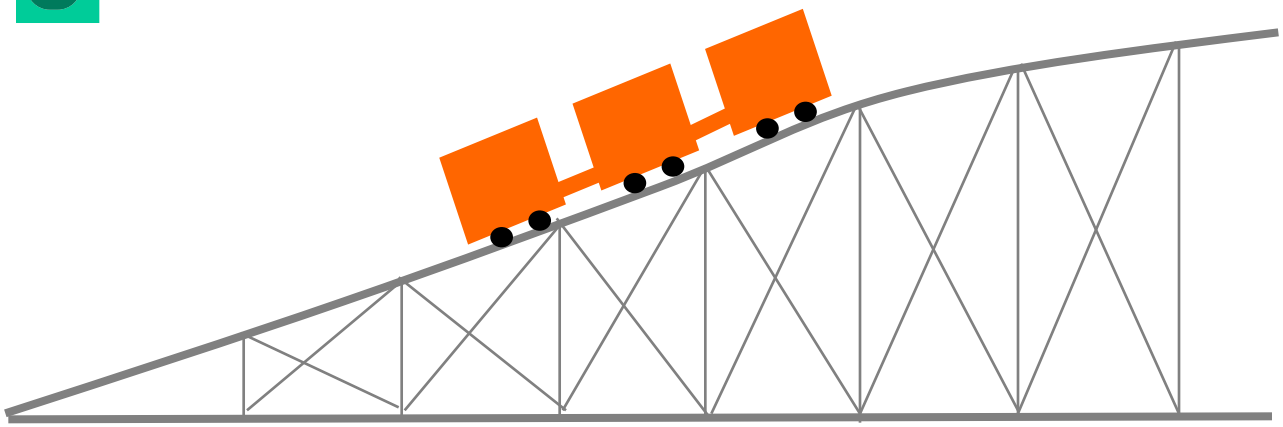

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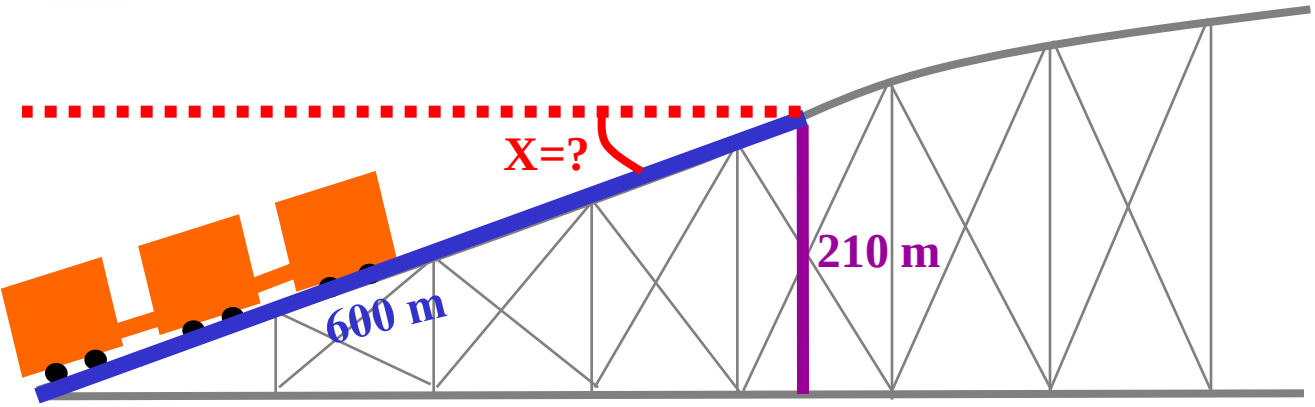

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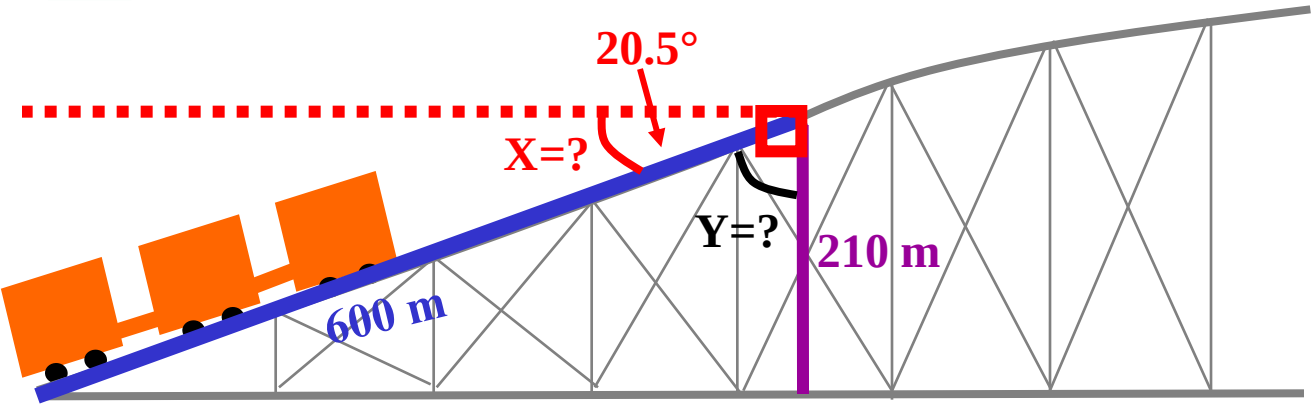
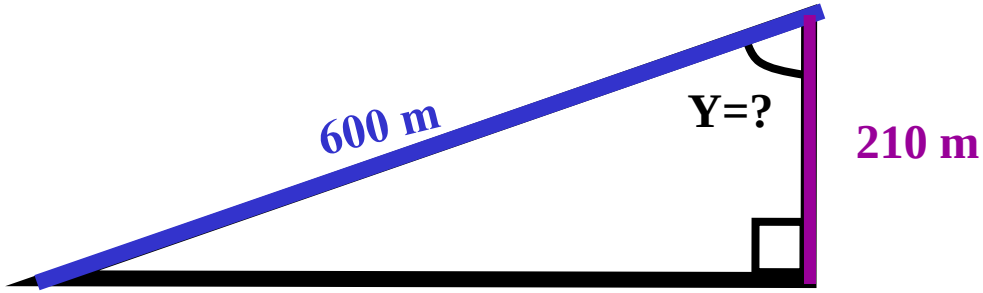




$$\cos Y = \frac{210}{600}$$

$$\cos Y = .35$$

$$m\angle Y = \cos^{-1}(.35)$$

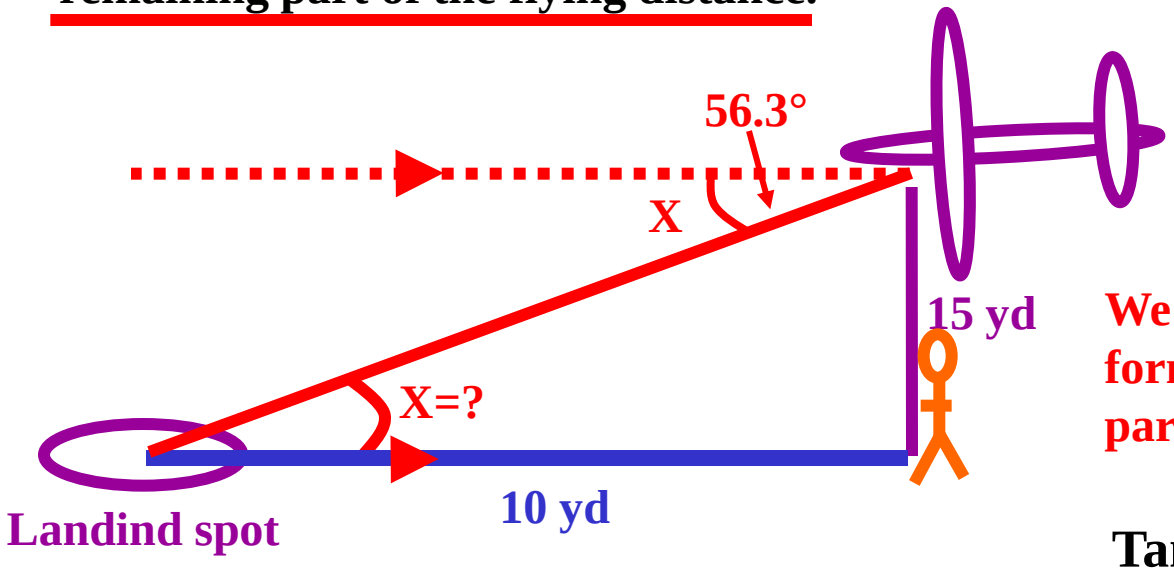
$$m\angle Y \doteq 69.5°$$

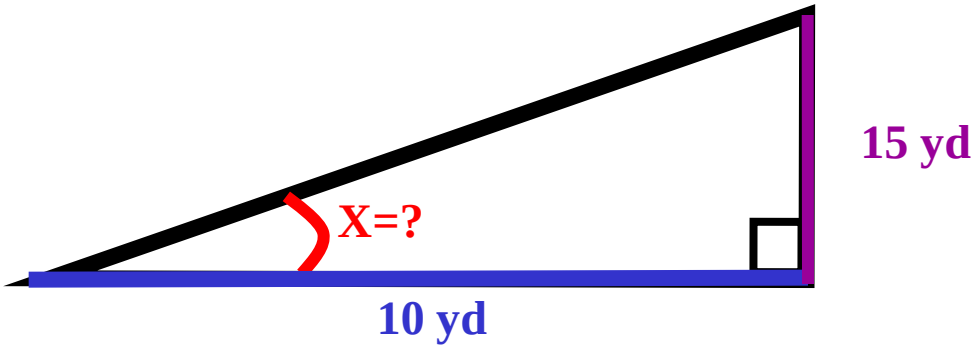
We have a right angle, so the angles together are 90°:

$$m\angle X = 90° - 69.5° \doteq 20.5°$$

The angle of depression of the slope is about 20.5°.

A glider is flying at an altitude of 15 yards, and starts descending when the distance from the expected landing spot is 10 yards away from one person standing below the glider on the ground. Find the angle of depression for the remaining part of the flying distance.





We have alternate interior angles formed by a transversal crossing parallel lines:

$$\text{Tan } X = \frac{15}{10}$$

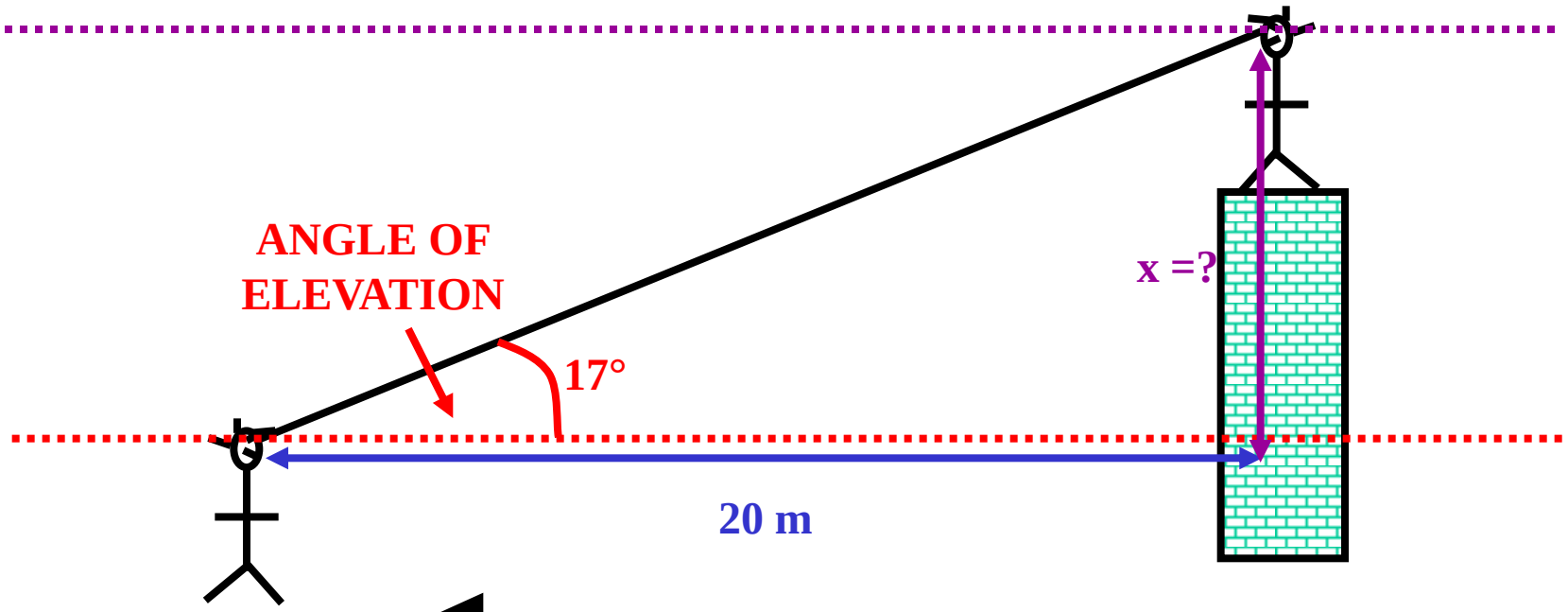
$$\text{Tan } X = 1.5$$

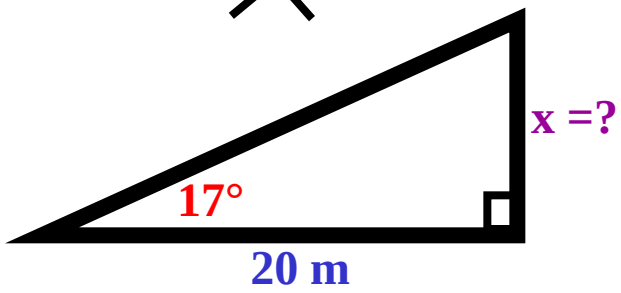
$$m\angle X = \text{Tan}^{-1}(1.5)$$

$$m\angle X \doteq 56.3°$$

The angle of depression of the glider is about 56.3°.

Pedro and Javier are looking at each other. Pedro is on top of a brick wall and Javier is on the ground at 20 meters from the wall. If the angle of elevation from javier's eye is 17°, what is the vertical distance from the horizontal passing through his eye and the horizontal passing through Pedro's eye.





$$\text{Tan } 17° = \frac{x}{20}$$

$$(20)\text{ Tan } 17° = \frac{x}{20}(20)$$

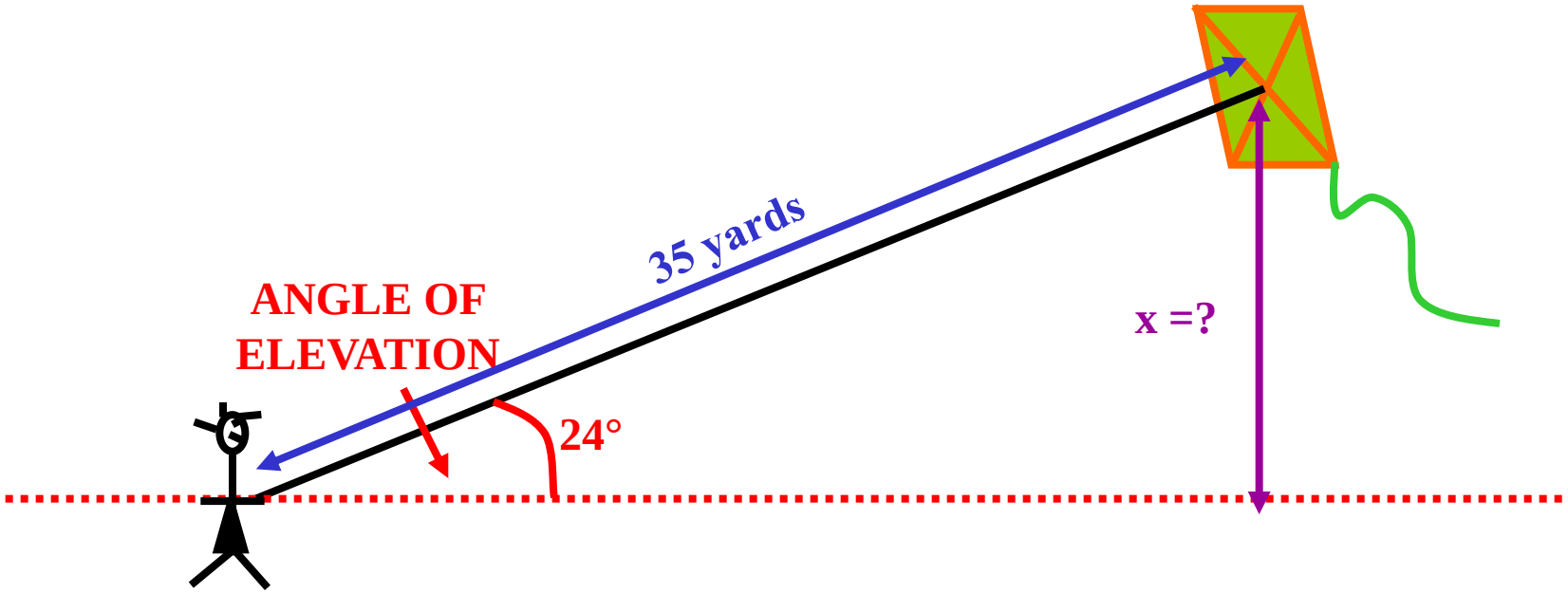
$$x = 20\text{Tan } 17°$$

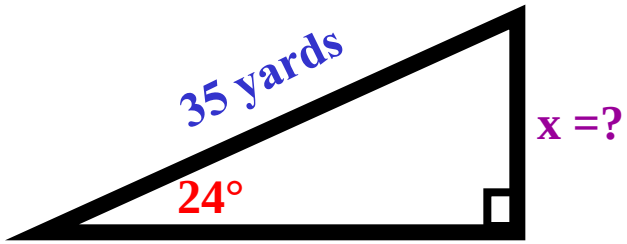
$$x = 20(\ .306\ )$$

$$x \doteq 6.11 \text{ m}$$

So, the Pedro's eye-sight is at about 6 meters above Javier's.

Rachel is flying a kite, and she has let out 35 yards of string. The angle of elevation for the string and the horizontal is 24°. What is the height of the kite from Rachel's hand?





$$\text{Sin } 24° = \frac{x}{35}$$

$$(35)\ \text{Sin } 24° = \frac{x}{35}(35)$$

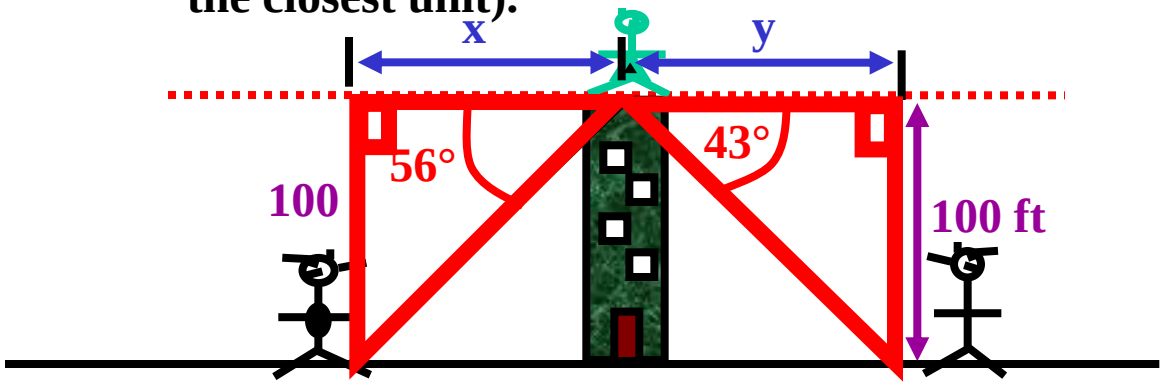
$$x = 35\text{Sin } 24°$$

$$x = 35(\ .407\ )$$

$$x \doteq 14.24 \text{ yd.}$$

So, Rachel was flying her kite at a height of around 14.24 yards from her hand.

Mrs. Xiong is on the top of a building. From that height, she is able to see two pedestrians that walk in opposite directions, going away from the building by the sidewalk. She is standing at the midpoint of the roof and the angles of depression for the pedestrians from that point in the roof are 56° and 43° respectively. The building is 100 feet tall. What is the distance between the pedestrians when they are at those angles of depression. (round final answer to the closest unit).



Total distance = x + y

= 67.45 + 107.2

≐ 174.7

They are approximately 175 feet apart.

Finding x:

$\text{Tan } 56° = \frac{100}{x}$

$(x)\ \text{Tan } 56° = \frac{100}{x}(x)$

$(x)\text{Tan } 56° = 100$

$\frac{(x)\text{Tan } 56°}{\text{Tan } 56°} = \frac{100}{\text{Tan } 56°}$

$x = \frac{100}{\text{Tan } 56°}$

$x = \frac{100}{1.48}$

$x \doteq 67.45 \text{ ft}$

Finding y:

$\text{Tan } 43° = \frac{100}{y}$

$(y)\ \text{Tan } 43° = \frac{100}{y}(y)$

$(y)\text{Tan } 43° = 100$

$\frac{(y)\text{Tan } 43°}{\text{Tan } 43°} = \frac{100}{\text{Tan } 43°}$

$y = \frac{100}{\text{Tan } 43°}$

$y = \frac{100}{0.93}$

$y \doteq 107.2 \text{ ft}$