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Grade 11 – STEM 9

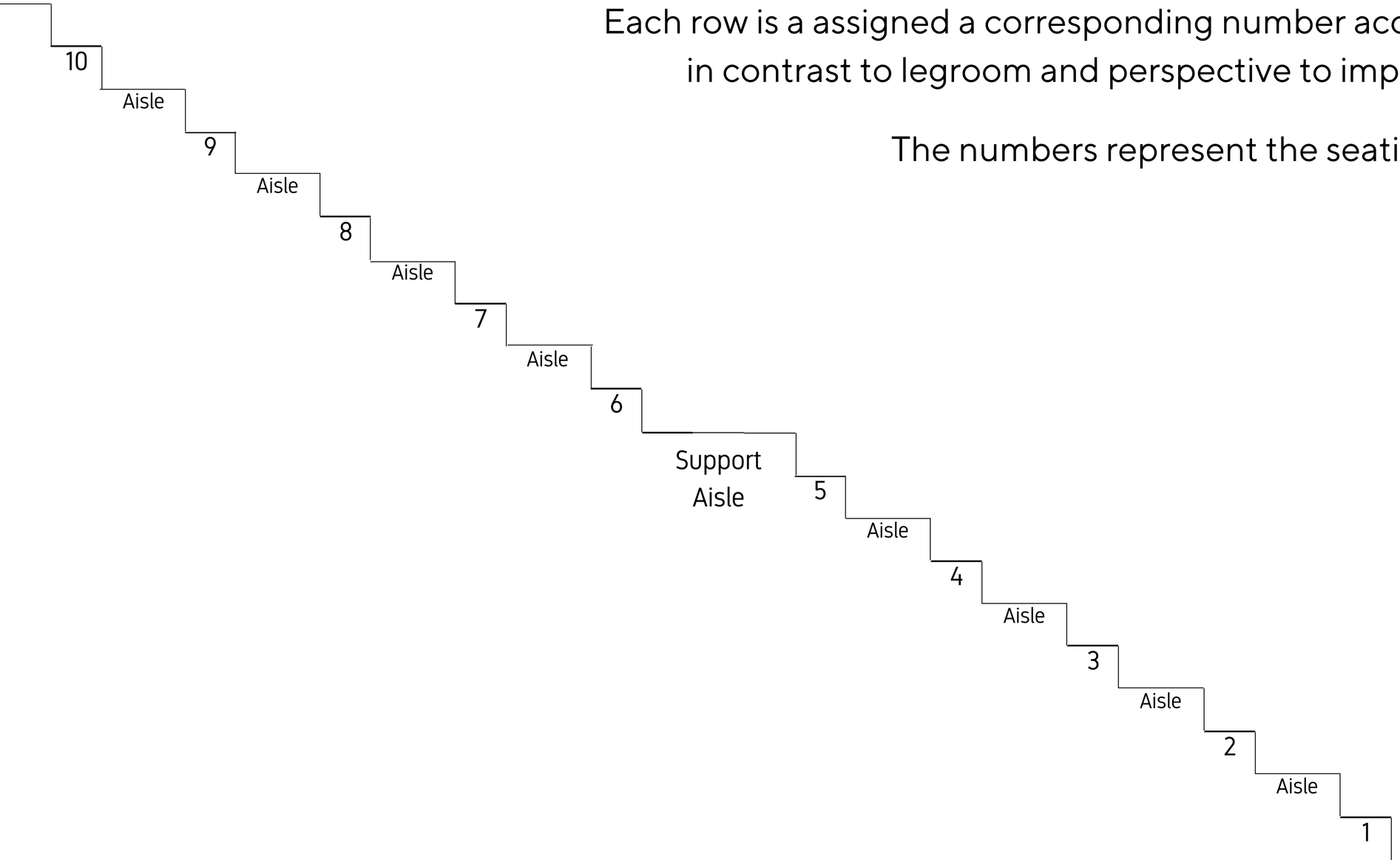
~Amphitheater ~

Pre – Calculus
FINAL PERFORMANCE TASK

DIAGRAM

Each row is a assigned a corresponding number according to the seating plan in contrast to legroom and perspective to improve user experience

The numbers represent the seating rows

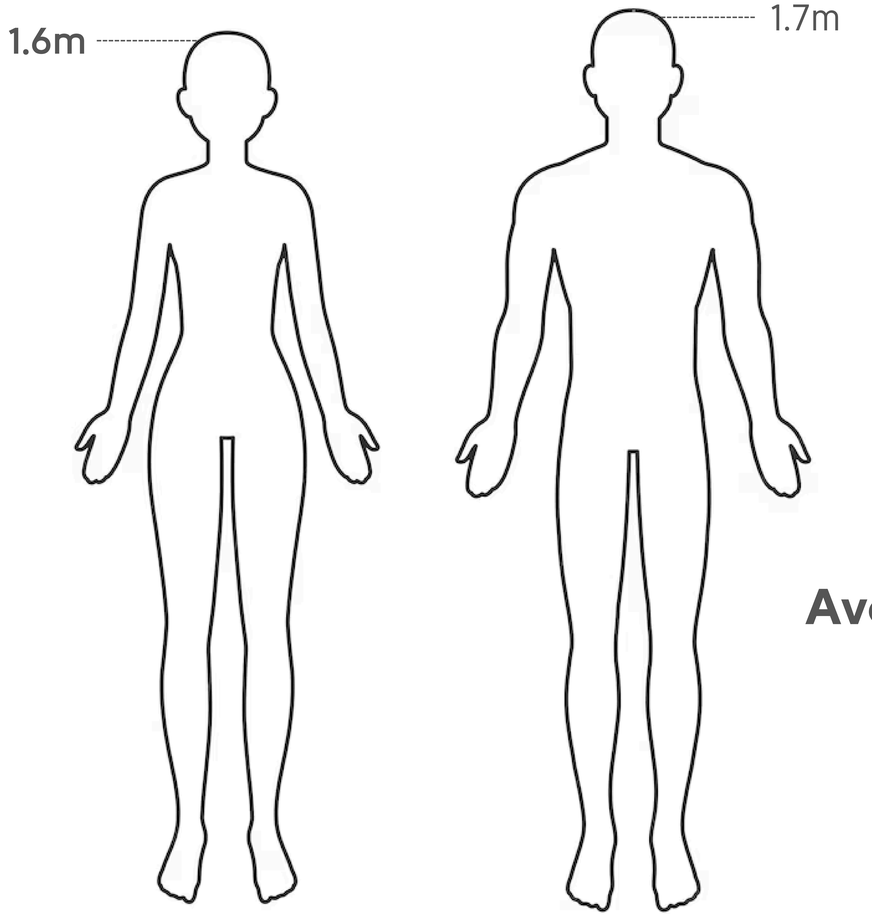


Average height of a human female:

An adult human female standing at an average height of **1.6 meters**
(or 5.2 to 5.4 foot by height)

Average height of a human male:

Adult human male, average height being **1.7 meters**
(or 5.6 to 5.7 foot by height)



Meaning that statistically worldwide, that the height between both parties should be **1.65 meters** for a regular person to stand with both hind legs
(Rough estimation but in accordance to the height of an average person internationally)

Average person having a height of 1.65m or 5.5 ft

The average height of a woman and man sitting down are approximately different but nevertheless the same.

If we differentiate both parties height’s while sitting down then we would get the height of about 43 inches (or 110cm). The male’s height sitting down at a height of 45 inches or 115 cm and for a woman sitting tall at 42 inches or about 107 cm.

Height of a man sitting down: 45 inches or 115 cm

Height of a woman sitting down: 42 inches or 107 cm

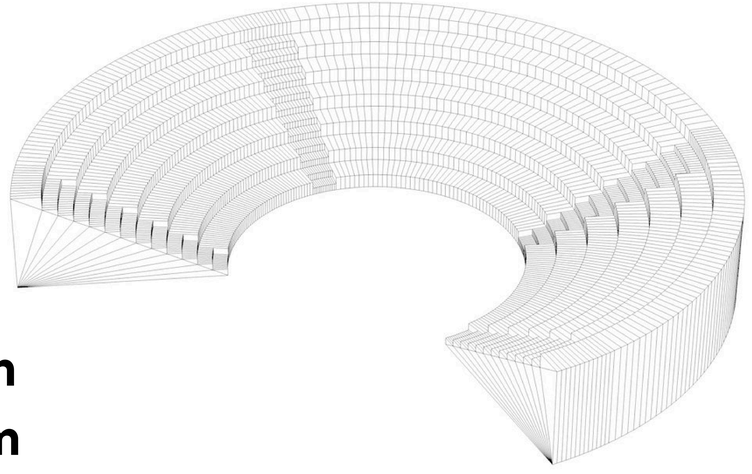
Average height of a person sitting down: 43 inches or 110 cm

The seat’s width will be important for the graph and to calculate the distance between them

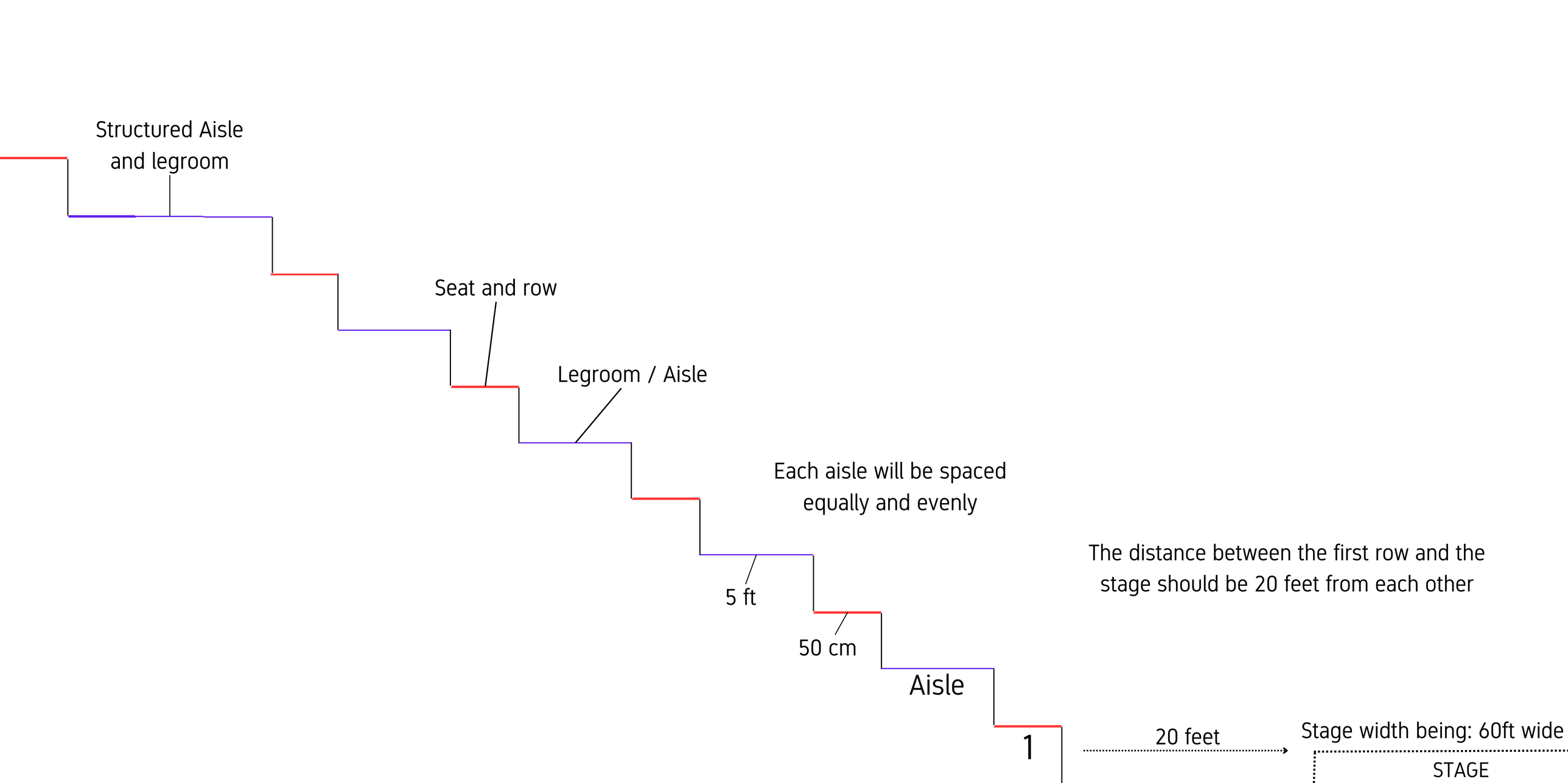
Seat depth measured being 50 cm for optimal seating comfortability in accordance to also the leg room

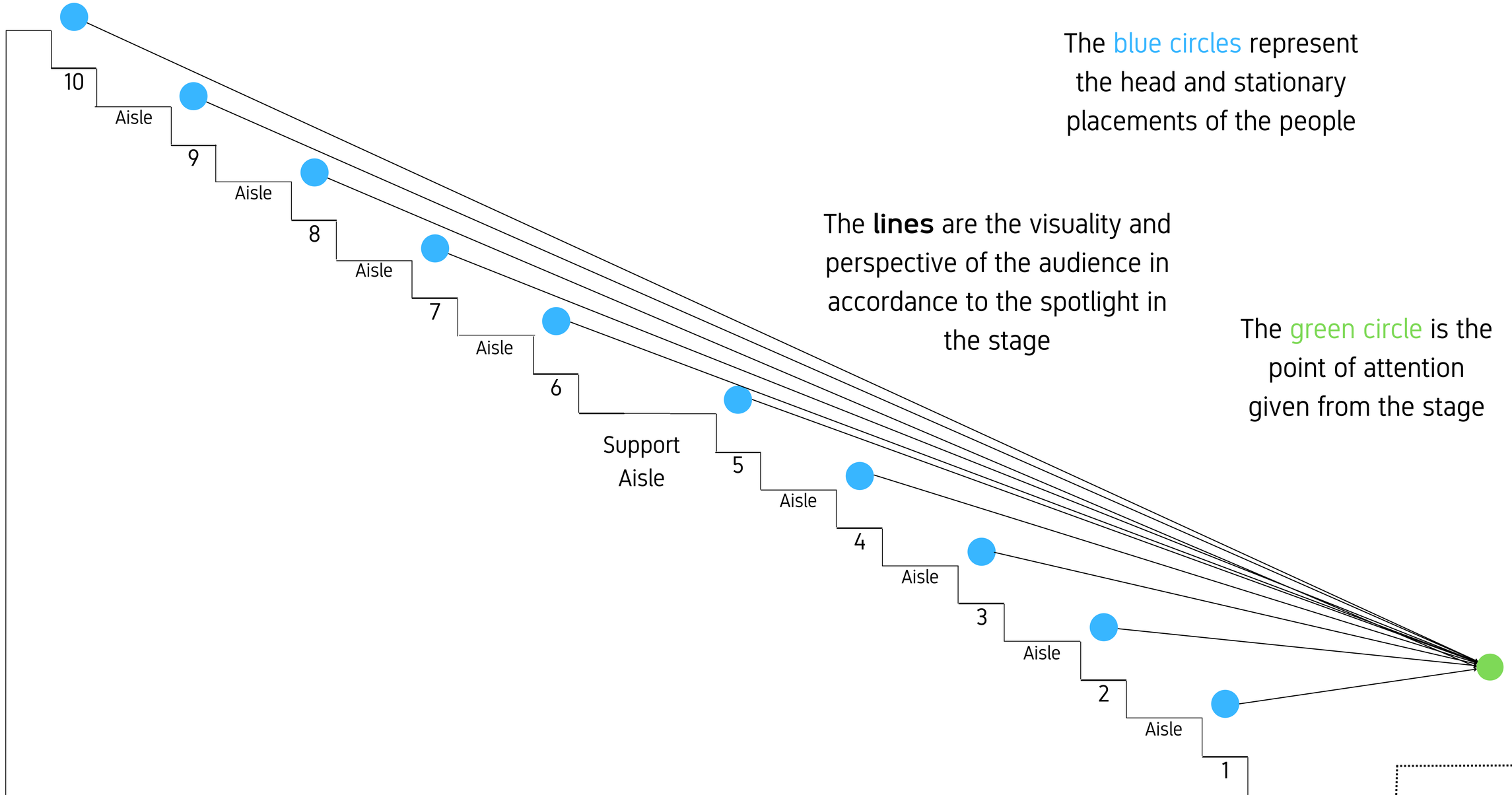
Height of the seat’s differentiating from the height taking place in elevation to the ground. For optimization, the seat’s should be measured at 45 cm.

For each of the seat’s distance between each other however, they would be separated equally into 5 feet wide between them in line with legroom, personal space, and the constructed aisles for easy access (for the separating aisles)



Seat Depth: 50 cm
Seat Height: 45 cm
Seat Aisle Width: 5 ft

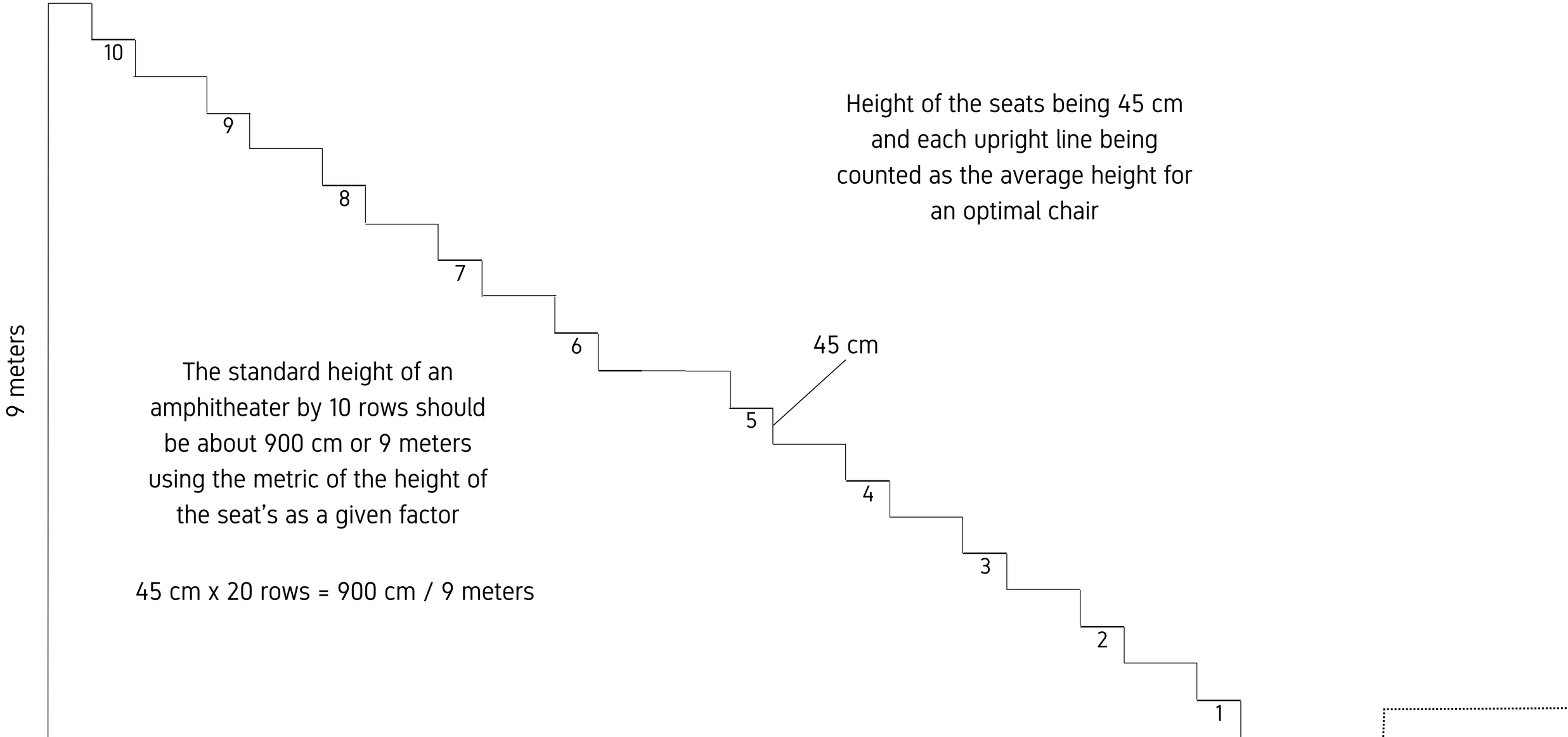

Structured Aisle
and legroom
Seat and row
Legroom / Aisle
Each aisle will be spaced
equally and evenly
5 ft
50 cm
Aisle
1
The distance between the first row and the
stage should be 20 feet from each other
20 feet
Stage width being: 60ft wide
STAGE



The blue circles represent the head and stationary placements of the people

The **lines** are the visuality and perspective of the audience in accordance to the spotlight in the stage

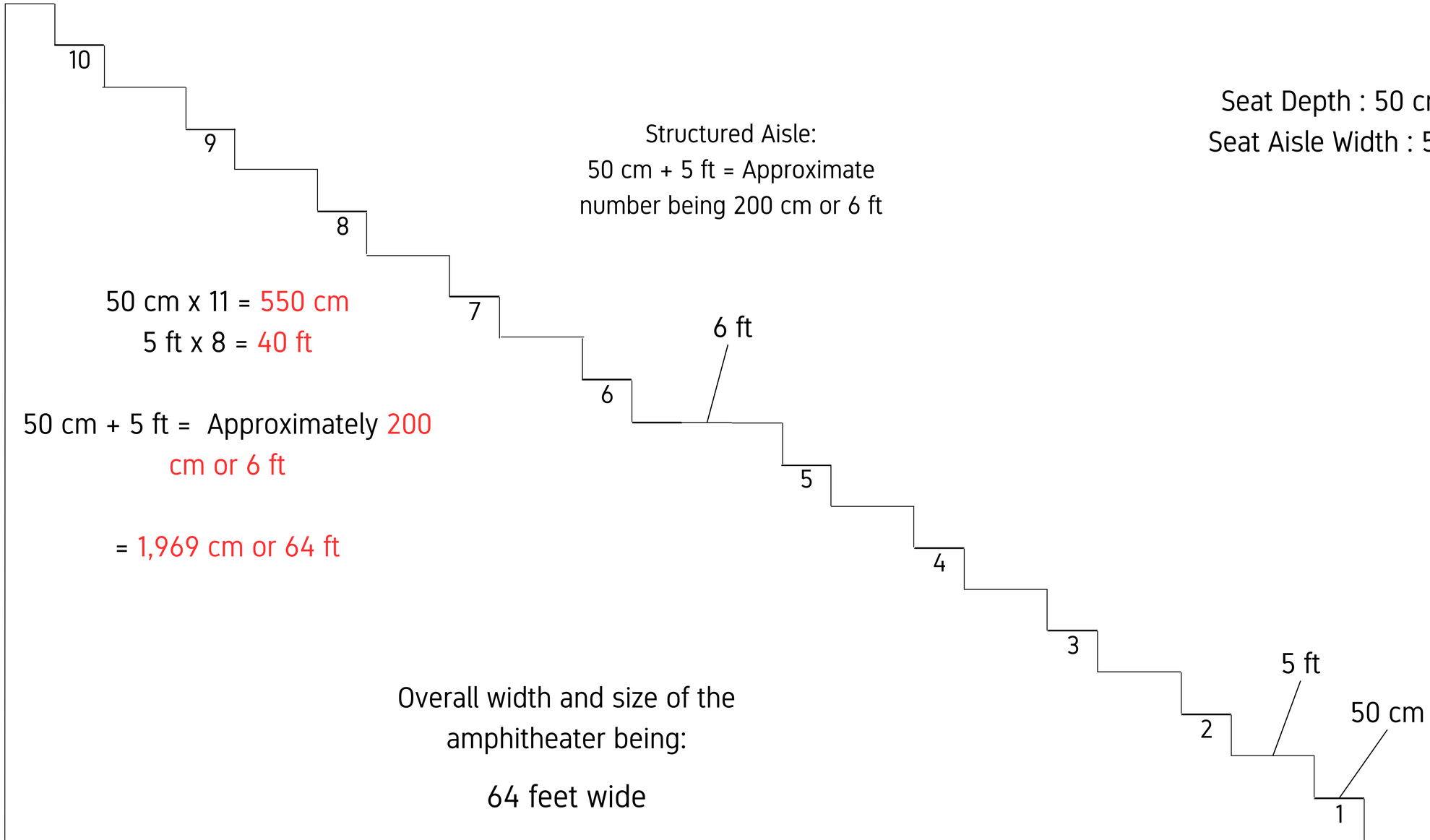
The green circle is the point of attention given from the stage



Height of the seats being 45 cm and each upright line being counted as the average height for an optimal chair

The standard height of an amphitheater by 10 rows should be about 900 cm or 9 meters using the metric of the height of the seat's as a given factor

45 cm x 20 rows = 900 cm / 9 meters



Seat Depth : 50 cm

Seat Aisle Width : 5 ft

Structured Aisle:

50 cm + 5 ft = Approximate number being 200 cm or 6 ft

50 cm x 11 = 550 cm

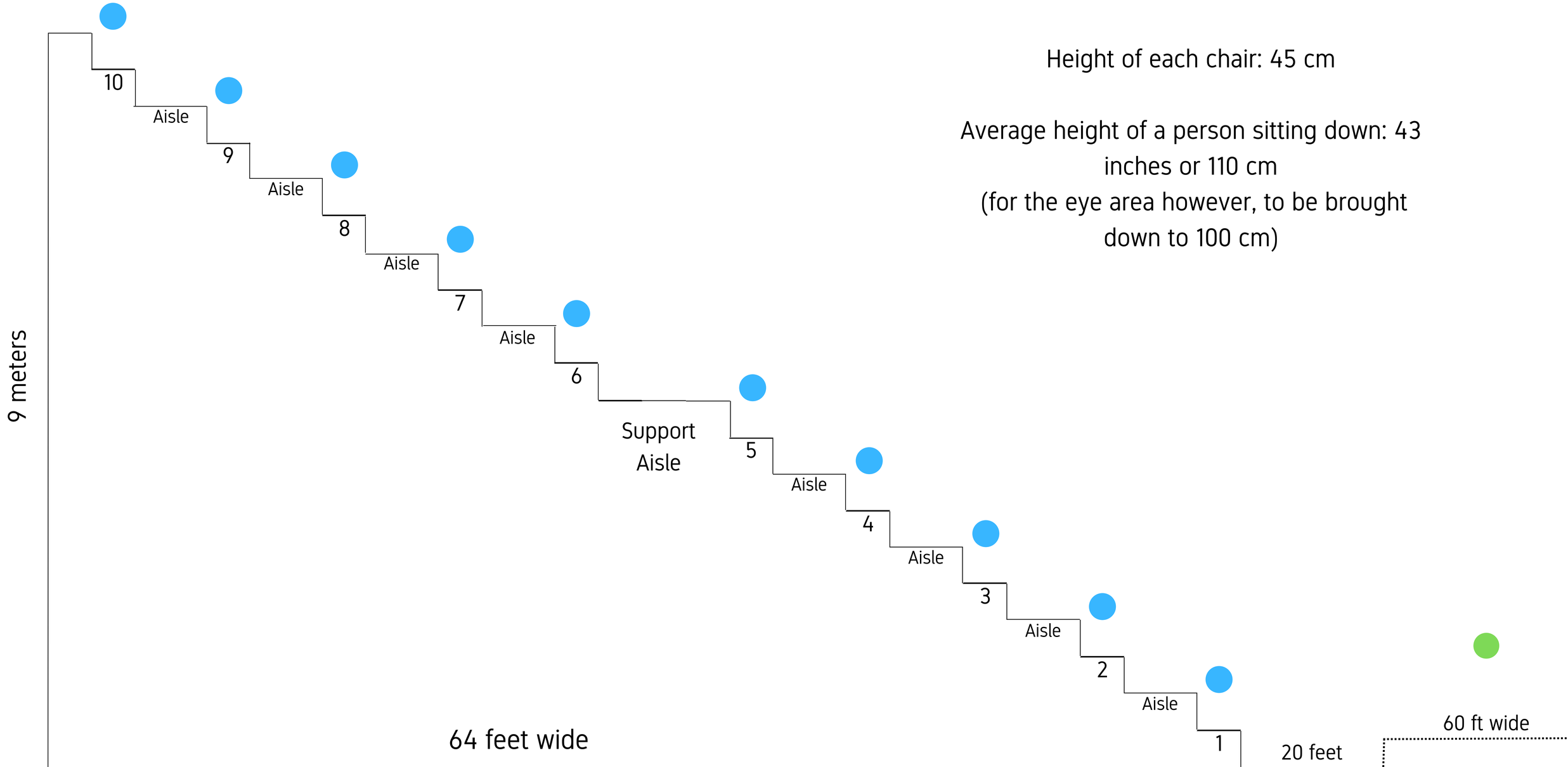
5 ft x 8 = 40 ft

50 cm + 5 ft = Approximately 200 cm or 6 ft

= 1,969 cm or 64 ft

Overall width and size of the amphitheater being:

64 feet wide


Height of each chair: 45 cm
Average height of a person sitting down: 43 inches or 110 cm
(for the eye area however, to be brought down to 100 cm)
9 meters
10
Aisle
9
Aisle
8
Aisle
7
Aisle
6
Support Aisle
5
Aisle
4
Aisle
3
Aisle
2
Aisle
1
64 feet wide
20 feet
60 ft wide

110 cm to ft = 4 feet

45 cm to ft = 1 ft

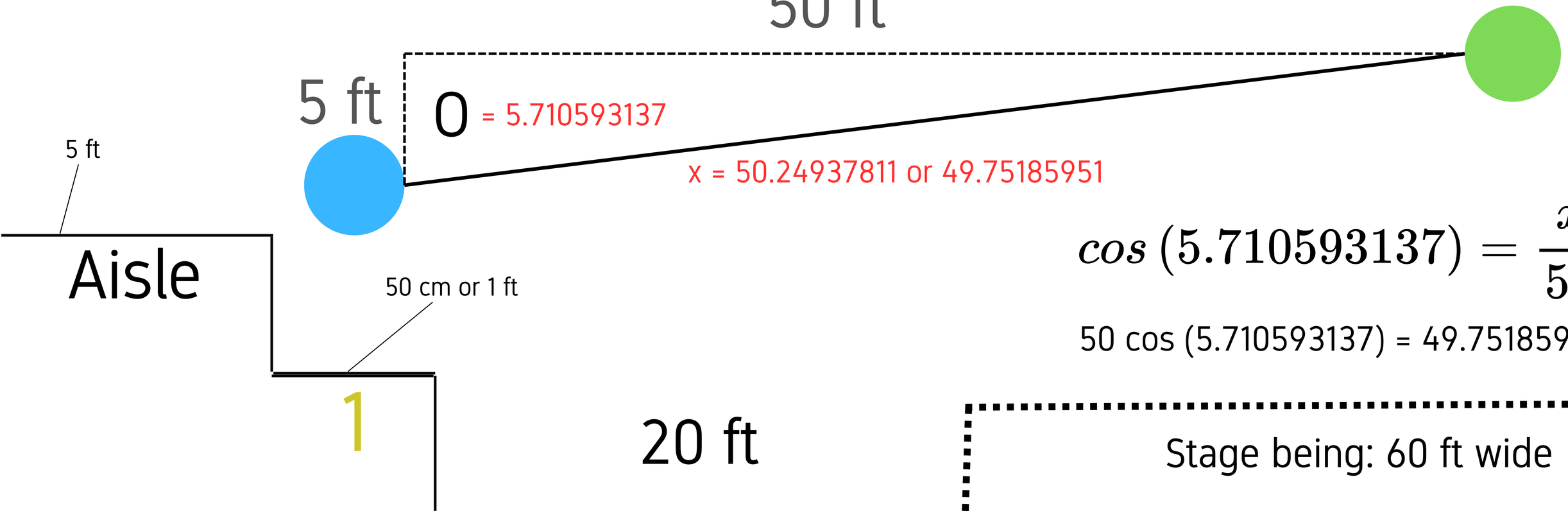
$$tan^{-1}\left(\frac{5}{50}\right)$$

O / Angle = 5.710593137

$$sin\left(5.710593137\right) = \frac{5}{x}$$

$$x = \frac{5}{sin\left(5.710593137\right)}$$

x = 50.24937811



$$cos\left(5.710593137\right) = \frac{x}{50}$$

50 cos (5.710593137) = 49.75185951

110 cm = 4 ft

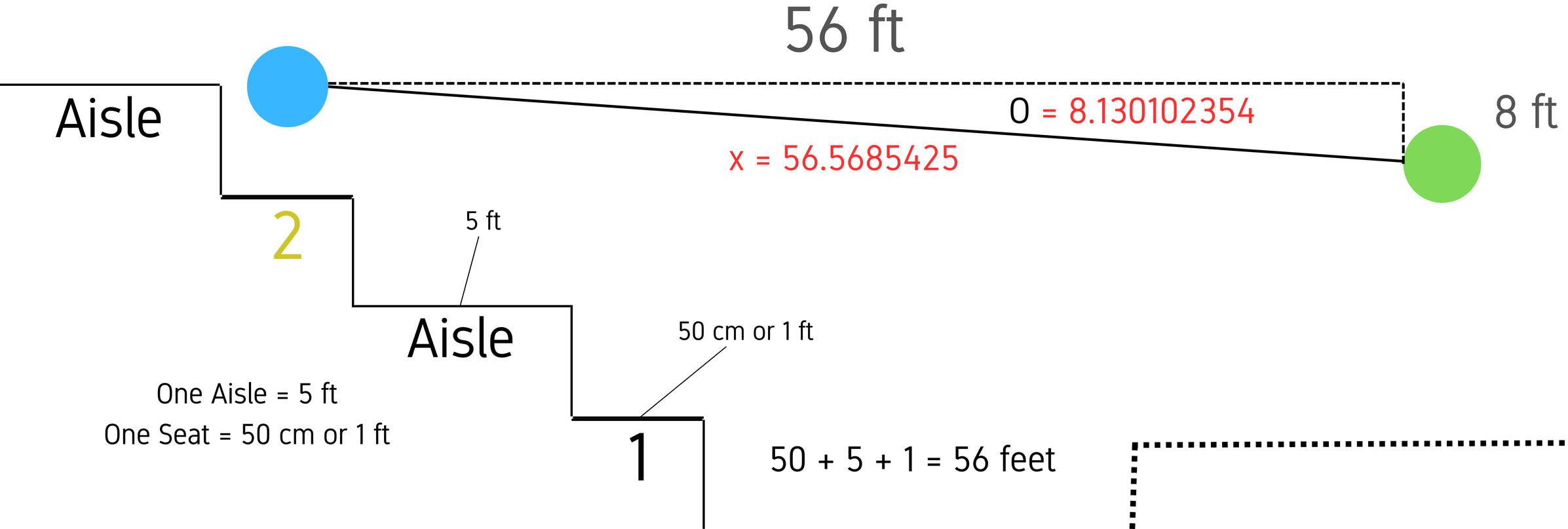
45 cm x 3 = 135 cm or 4 ft

$$tan^{-1}\left(\frac{8}{56}\right) = 8.130102354^\circ$$

$$sin\,(8.130102354) = \frac{8}{x}$$

$$x = \frac{8}{sin\,(8.130102354)}$$

x = 56.5685425



50 + 5 + 1 = 56 feet

110 cm = 4 ft

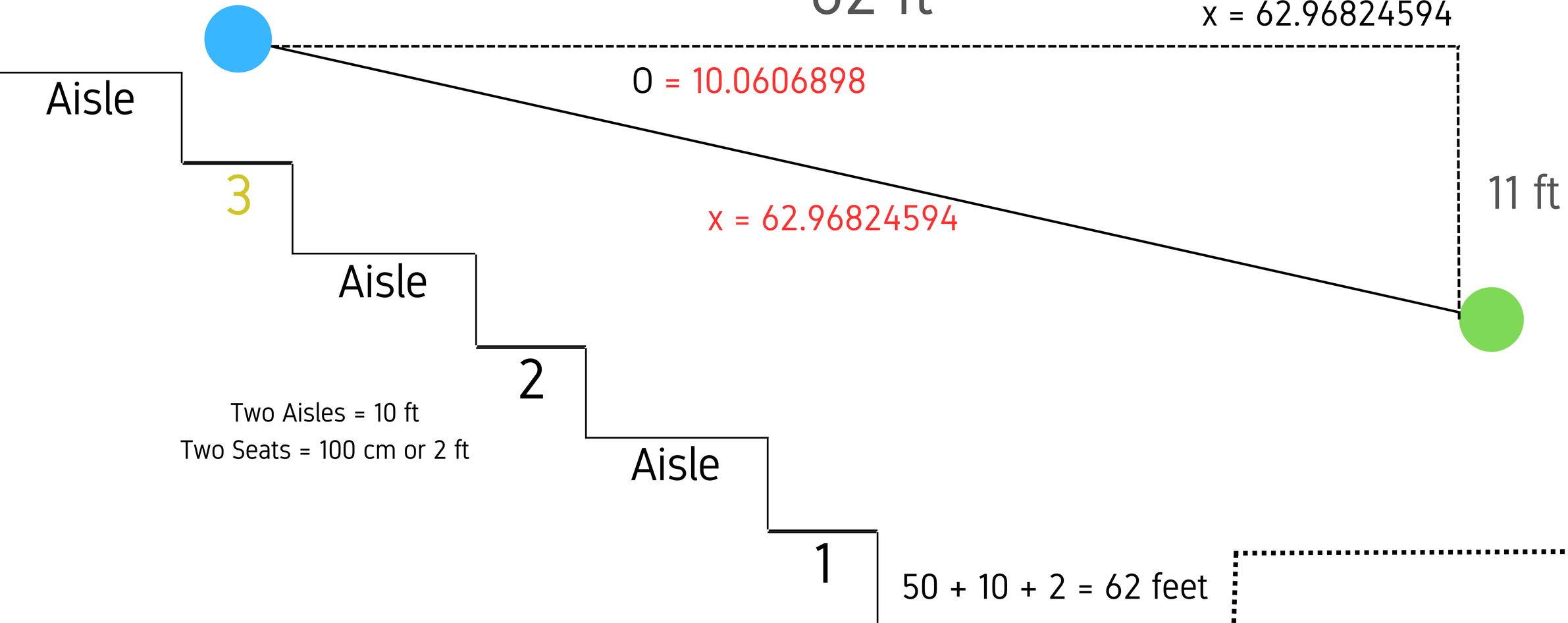
45 cm x 5 = 225 cm or 7 ft

$$tan^{-1}\left(\frac{11}{62}\right) = 10.0606898^{\circ}$$

$$sin\,(10.0606898) = \frac{11}{x}$$

$$x = \frac{11}{sin\,(10.0606898)}$$

x = 62.96824594



Two Aisles = 10 ft

Two Seats = 100 cm or 2 ft

50 + 10 + 2 = 62 feet

110 cm = 4 ft

45 cm x 7 = 315 cm or 10 ft

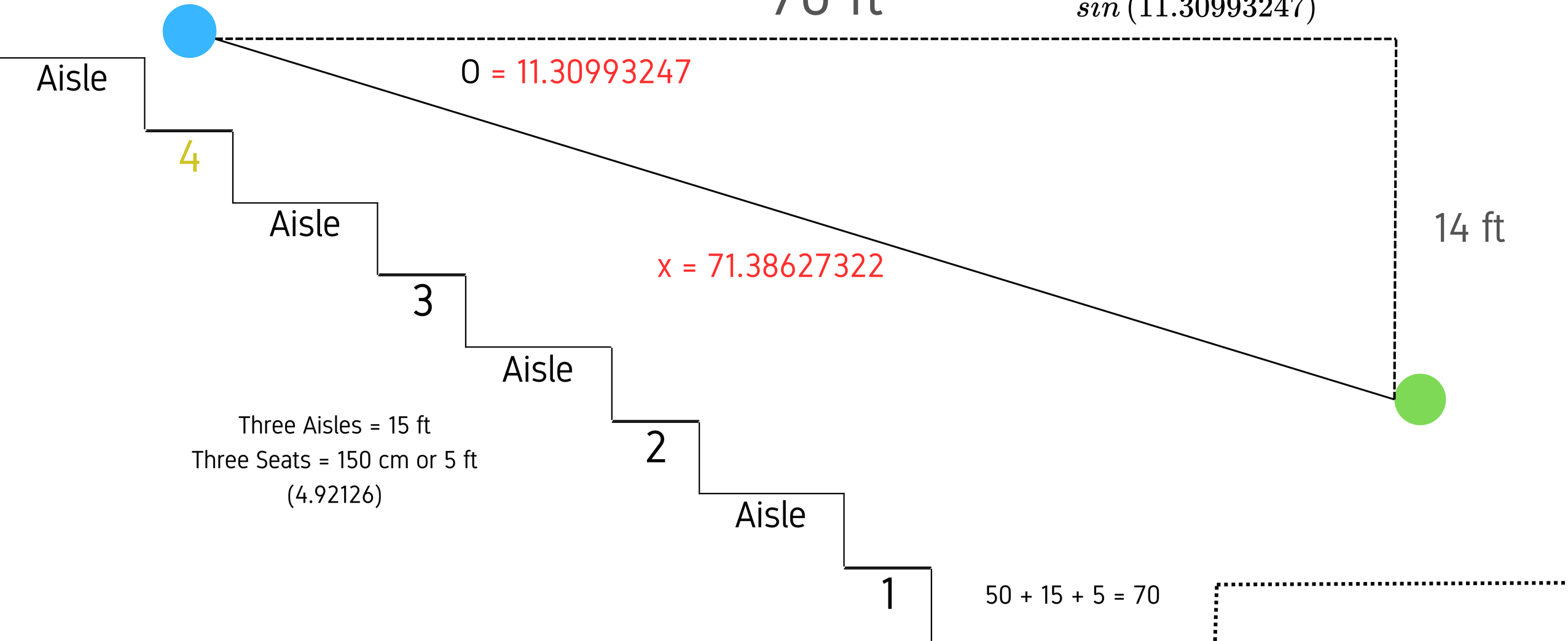
$$tan^{-1}\left(\frac{14}{70}\right) = 11.30993247^\circ$$

$$sin\,(11.30993247) = \frac{14}{x}$$

70 ft

$$x = \frac{14}{sin\,(11.30993247)}$$

x = 71.38627322



Three Aisles = 15 ft

Three Seats = 150 cm or 5 ft

(4.92126)

50 + 15 + 5 = 70

110 cm = 4 ft

45 cm x 9 = 405 cm or 13 ft

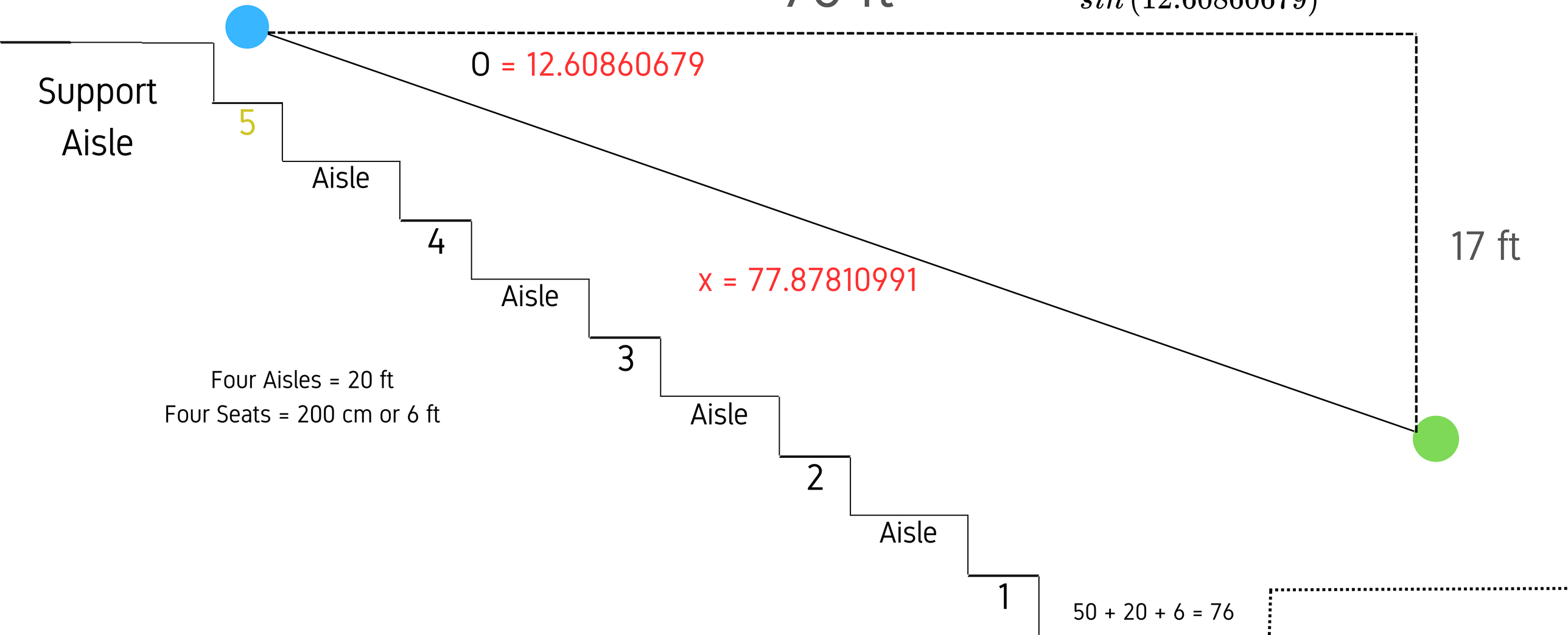
$$tan^{-1}\left(\frac{17}{76}\right) = 12.60860679^\circ$$

76 ft

$$sin\,(12.60860679) = \frac{17}{x}$$

$$x = \frac{17}{sin\,(12.60860679)}$$

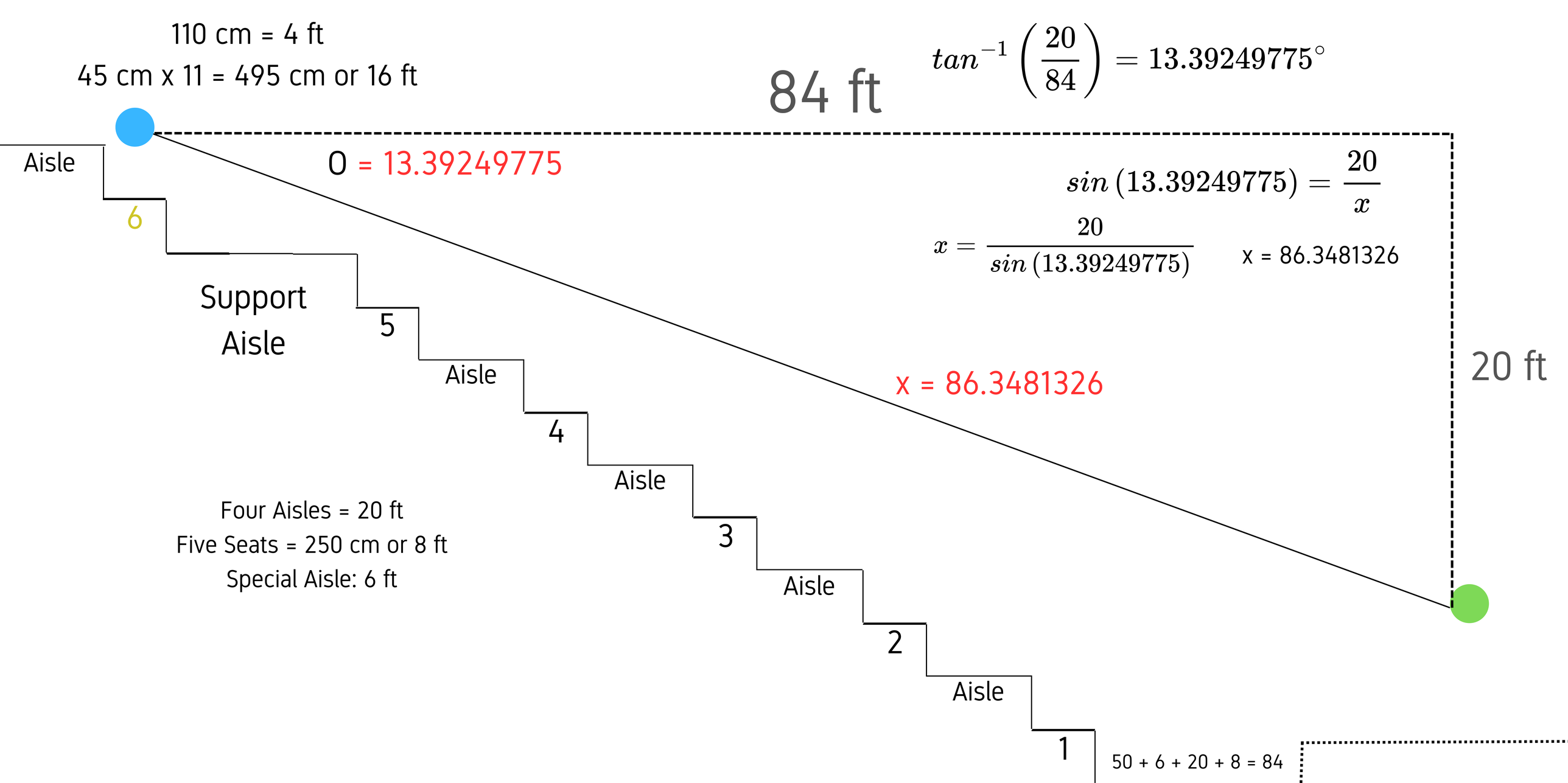
x = 77.87810991

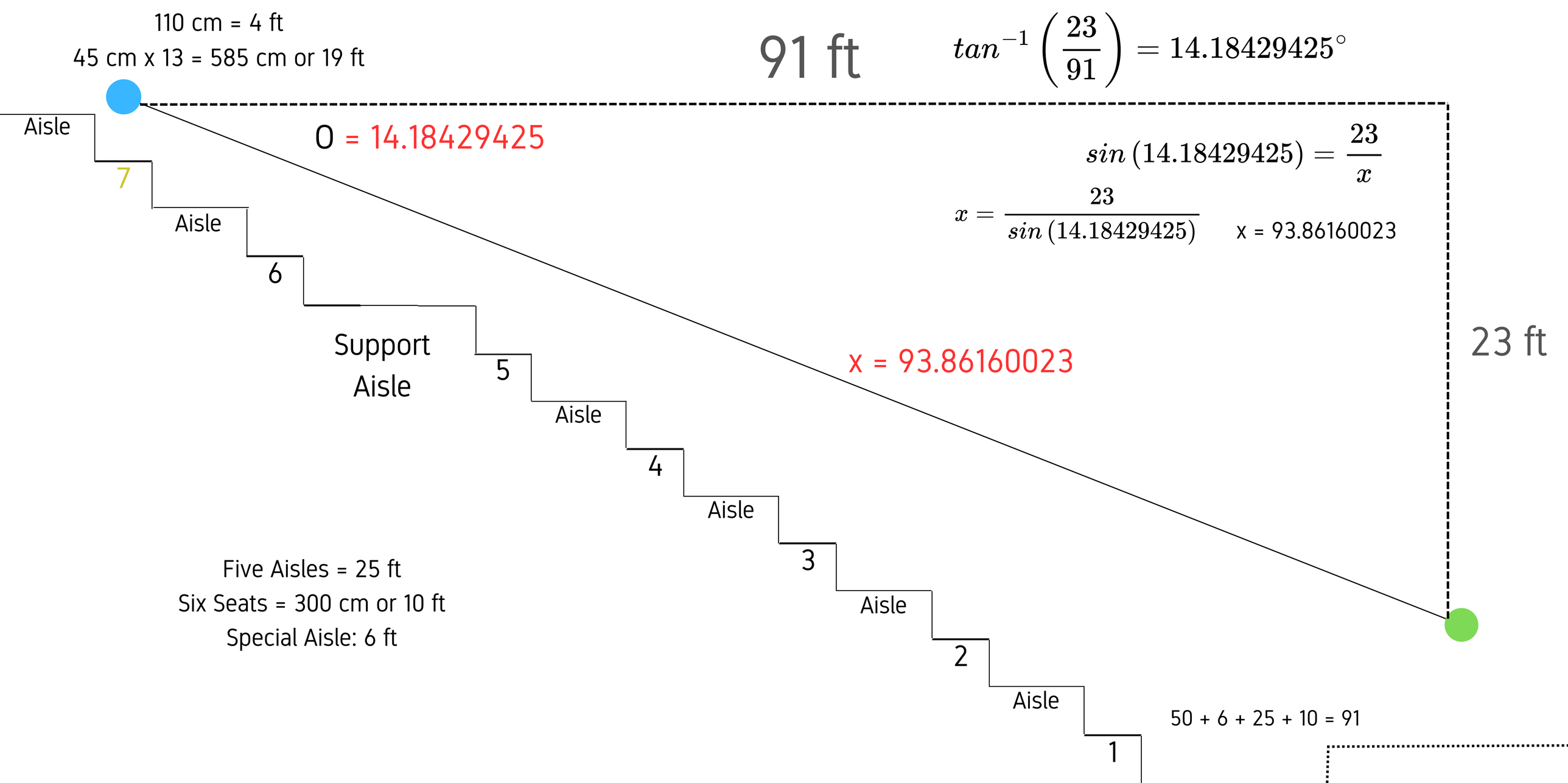


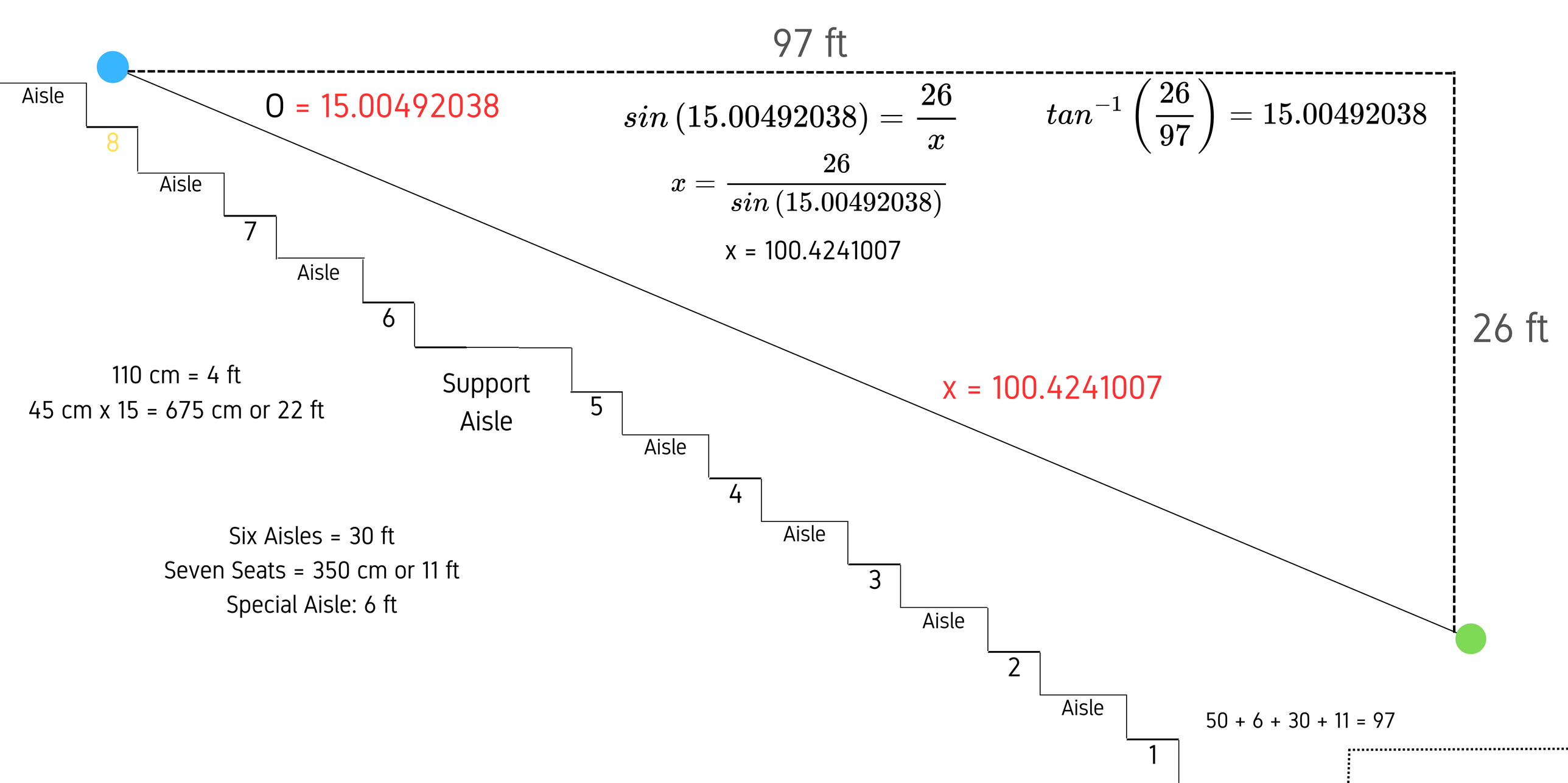
Four Aisles = 20 ft

Four Seats = 200 cm or 6 ft

50 + 20 + 6 = 76


110 cm = 4 ft
45 cm x 11 = 495 cm or 16 ft
84 ft
$tan^{-1}\left(\frac{20}{84}\right) = 13.39249775°$
Aisle
O = 13.39249775
$sin\,(13.39249775) = \frac{20}{x}$
$x = \frac{20}{sin\,(13.39249775)}$
X = 86.3481326
6
Support Aisle
5
Aisle
4
Aisle
3
Aisle
2
Aisle
1
X = 86.3481326
20 ft
Four Aisles = 20 ft
Five Seats = 250 cm or 8 ft
Special Aisle: 6 ft
50 + 6 + 20 + 8 = 84


110 cm = 4 ft
45 cm x 13 = 585 cm or 19 ft
91 ft
$tan^{-1}\left(\frac{23}{91}\right) = 14.18429425°$
Aisle
0 = 14.18429425
$sin\,(14.18429425) = \frac{23}{x}$
$x = \frac{23}{sin\,(14.18429425)}$
x = 93.86160023
7
Aisle
6
Support
Aisle
x = 93.86160023
23 ft
5
Aisle
4
Aisle
3
Aisle
2
Aisle
1
Five Aisles = 25 ft
Six Seats = 300 cm or 10 ft
Special Aisle: 6 ft
50 + 6 + 25 + 10 = 91



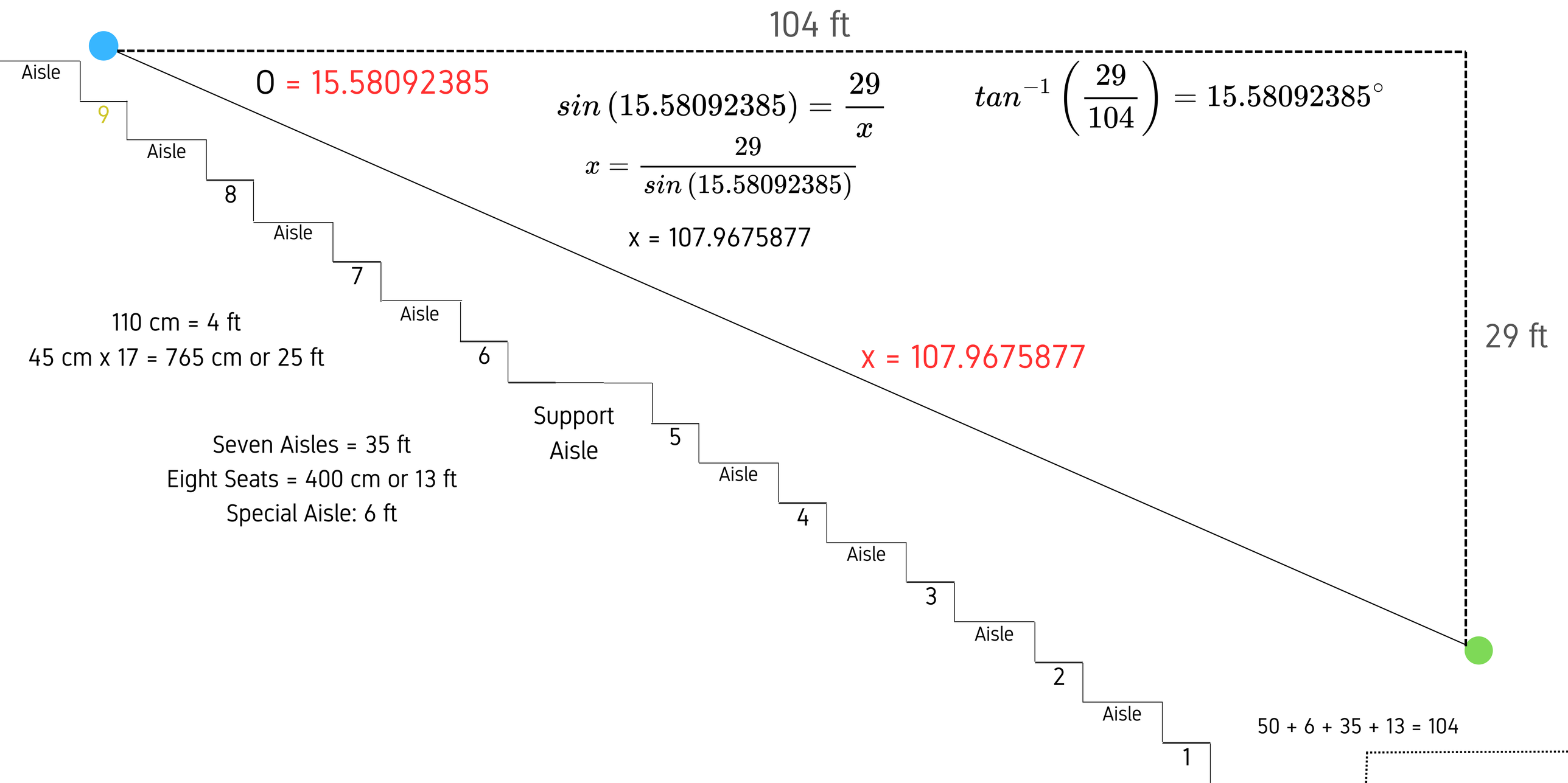
0 = 15.00492038

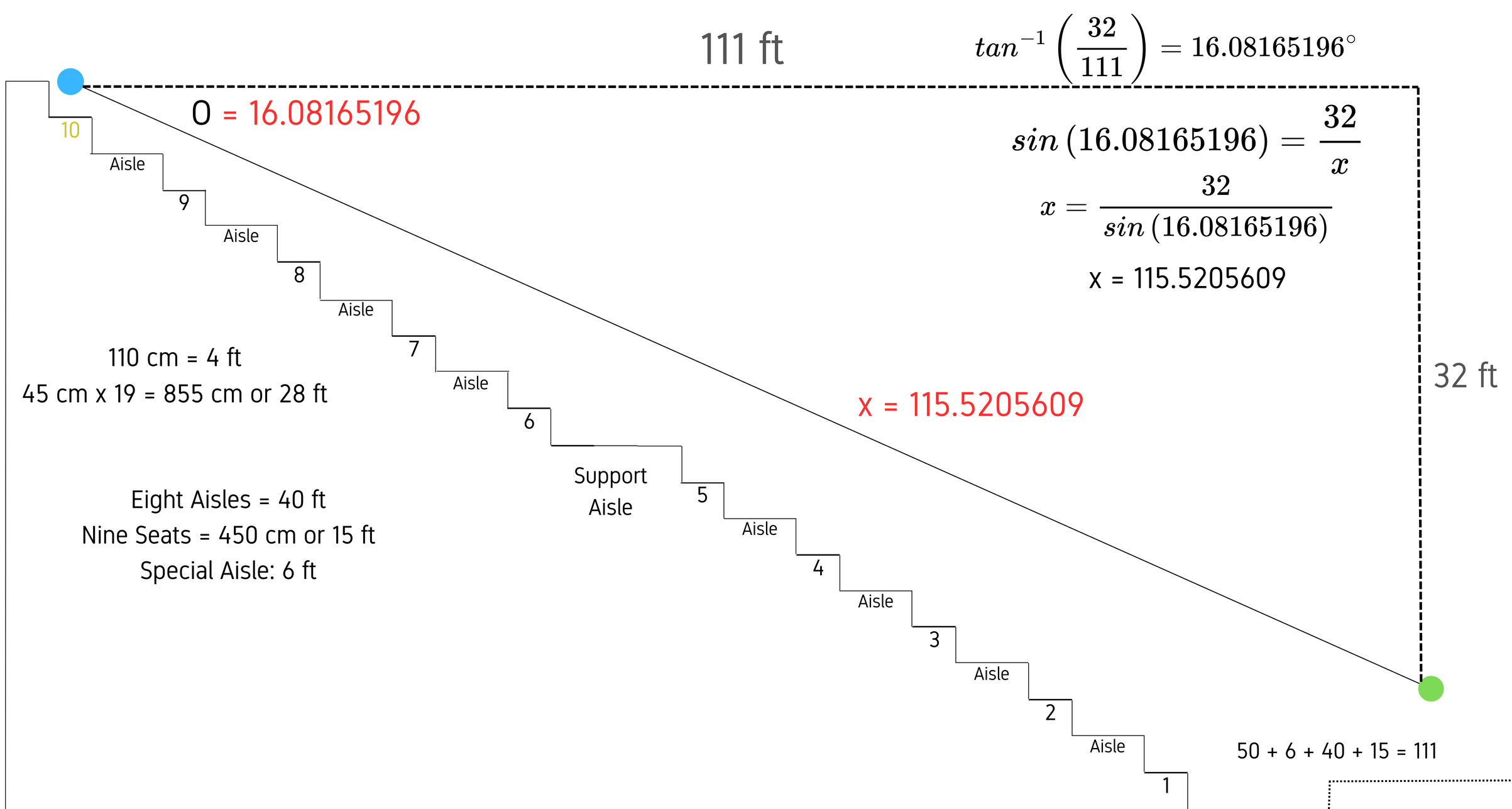
$$sin\left(15.00492038\right) = \frac{26}{x}$$

$$x = \frac{26}{sin\left(15.00492038\right)}$$

x = 100.4241007

$$tan^{-1}\left(\frac{26}{97}\right) = 15.00492038$$


104 ft
Aisle
0 = 15.58092385
$sin\,(15.58092385) = \frac{29}{x}$
$x = \frac{29}{sin\,(15.58092385)}$
$tan^{-1}\left(\frac{29}{104}\right) = 15.58092385°$
x = 107.9675877
9
Aisle
8
Aisle
7
Aisle
6
110 cm = 4 ft
45 cm x 17 = 765 cm or 25 ft
x = 107.9675877
29 ft
Support
Aisle
5
Aisle
4
Aisle
3
Aisle
2
Aisle
1
Seven Aisles = 35 ft
Eight Seats = 400 cm or 13 ft
Special Aisle: 6 ft
50 + 6 + 35 + 13 = 104


111 ft
$tan^{-1}\left(\frac{32}{111}\right) = 16.08165196°$
0 = 16.08165196
10
Aisle
9
Aisle
8
Aisle
7
Aisle
6
Support
Aisle
5
Aisle
4
Aisle
3
Aisle
2
Aisle
1
$sin\,(16.08165196) = \frac{32}{x}$
$x = \frac{32}{sin\,(16.08165196)}$
X = 115.5205609
110 cm = 4 ft
45 cm x 19 = 855 cm or 28 ft
Eight Aisles = 40 ft
Nine Seats = 450 cm or 15 ft
Special Aisle: 6 ft
x = 115.5205609
32 ft
50 + 6 + 40 + 15 = 111

Goal / Objective

This diagram aims to improve user experience and compatibility by enabling optimization for easy access through comfort and perception for each person/user. Expanded by data accumulated for the majority of the human population in assessing necessary factors to be taken in as considerations which are to be solved, developed, and implemented.

Planning

For user comfortability, numerous data is extensively searched in the estimations of apparent dimensions in Body Mass, Seat Length, Seat Height, Seat Depth, Amphitheater Width, and the Amphitheater’s given height. This was done in accordance to following strict guidelines in measuring compatibility and composition between each given measurements.

Planning - Mensurations

Each measurements being...

Average person's height: 165 cm (or 5'5 in feet)
Average person seated: 43 inches(or 110 cm)

Amphitheater Height: 9 meters
Amphitheater Width: 64 feet

Seat Height: 45 cm
Seat Depth: 50 cm
Seat Aisle Width: 5 feet

Process

Each computation for the measurements are done by the use of the internet in determining the adequate and ideal standards for the people. By searching for the distance between the stage and the first row which is approximately 20 feet, the average height of the seat’s (in qualification with normal amphitheaters) which is 45 cm, and the overall construct of each dimension in support for humans by perspectives, arrangements, and satisfaction (for the estimations between the given data).

(The average width of a standard stage should be 60 feet wide)

Process

All of the measurements are done in accordance of the use of the internet. But, it is distinctively different by the enabled use of individualized solving...

Seeing as how each evaluation for the measurements differ from one another, in solving for the complete height, width, and depth comes the presence of highlighting each important dimensions.

Uses of addition/multiplication are evident (to solve for each given):

Seat's Depth and Aisle Length: 50 cm x 10 rows = 500 cm
Equal height's between rows: 45 cm x 19 = 855 cm

(Addition is more present in determining numbers between rows and solutions are different depending on multiple variables)

Solving

After the assessments of data derived from each given, the problem is then solved by the grounds of using the rules of a right triangle in a trigonometric function in finding the respected angle, distance, and factual measurements (based from estimations and collected data).

Followed by the application of perspectives in the elevation and depression by the given objective points for each problem in setting the correct and accurate solutions.

(Simply; the missing terms will be the hypotenuse or distance/point of view of the person to the stage, and the absent angled aligned with determining the problem in elevation/depression).

Conclusion

The diagram of this amphitheater ascertains the fulfillment in finding the correct solution by taking into consideration every apparent dimension for the overall appearance and accurate qualifications in determining the total value of each row, seat, and distance in accordance to the stage to the amphitheater itself.

By advantageously taking part in using the internet to perceive necessary measurements and to ultimately assure or calculate each missing or absent variable in support of the use in trigonometric functions in a right triangle that examines the exact composition of the settings between the amphitheater, the stage, and most importantly the person.