



MATHEMATICS CLASS X

Chapter 8 - Introduction to Trigonometry

Chapter 9 - Some Applications of Trigonometry



ST. ANSELM'S PINK CITY SCHOOL, MALVIYA NAGAR, JAIPUR
Affiliated to C.B.S.E.

Acknowledgement

Firstly, praises and thanks to the almighty, for his blessings throughout the completion of this graphic novel successfully.

‘Teamwork is the ability to work together towards a common vision’

This graphic novel is the product of teamwork.

The following praiseworthy students, teachers and eminent educationists have worked together in the development of this book.

Their contribution, whether directly or indirectly, is gratefully acknowledged.

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PREFACE

This graphic novel has been created keeping in mind new pedagogies and the evolving education environment. The novel is an effort to link what the student learns at school with its application outside the school. Learner-friendly and mentally stimulating, the book explores novel methodologies like- the Palm Trick and the Super Hexagon to elucidate concepts of trigonometry with an innovative approach. The content of the novel gives a detailed study of basic and complex hypotheses of trigonometry through engaging graphics and dialogues. To enhance the learning experience, the novel also includes practice material to help the learners test their knowledge on the topic.



1062CH08



1062CH09



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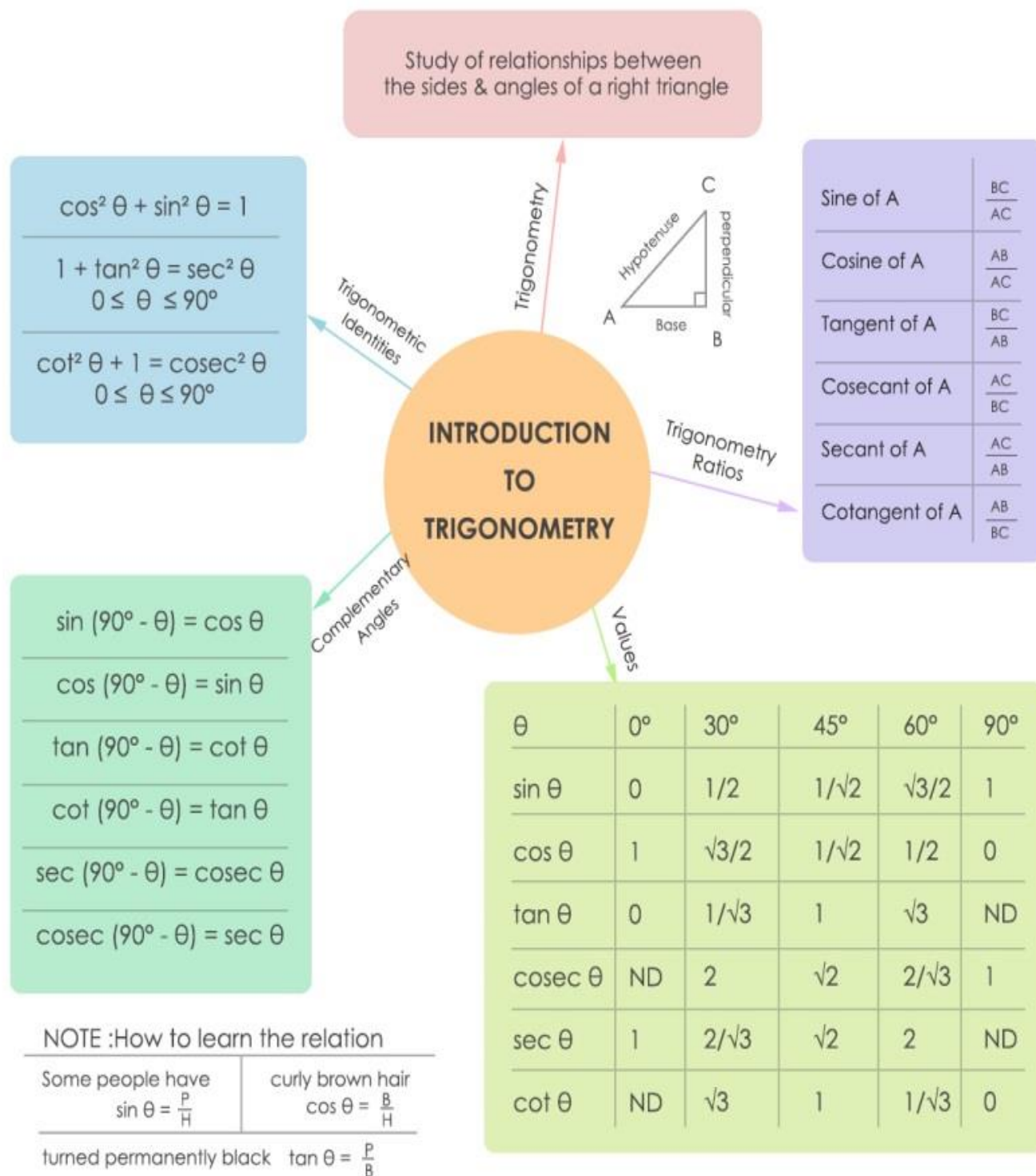
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Disclaimer:

This graphic novel is a work of fiction. All the names, characters, events and views expressed in this novel belong solely to the author.

Any resemblance to actual persons, living or dead, or actual events, is purely coincidental.

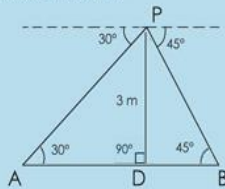
Mind Map-1



Mind Map-2

Distance

Determine width AB

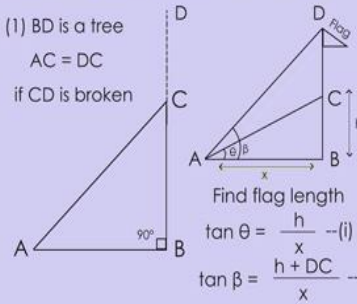


From figure, $AB = AD + DB$
 In right $\triangle APD$, $\angle A = 30^\circ$, $\angle D = 90^\circ$
 $\tan 30^\circ = \frac{PD}{AD}$ i.e., $AD = 3\sqrt{3}m$

In right $\triangle BPD$, $\angle B = 45^\circ$, $\angle D = 90^\circ$
 $\tan 45^\circ = \frac{PD}{BD}$ i.e., $BD = 3$
 $AB = (3\sqrt{3} + 3)m = 3(\sqrt{3} + 1)m$

Height / length of an object

(1) BD is a tree
 $AC = DC$
 if CD is broken



Find flag length

$$\tan \theta = \frac{h}{x} \quad \text{--(i)}$$

$$\tan \beta = \frac{h + DC}{x} \quad \text{--(ii)}$$

HEIGHTS & DISTANCES

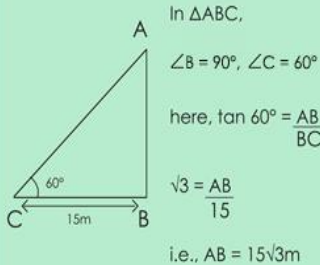
Applications - Trigonometric Ratios (To Determine)

Examples

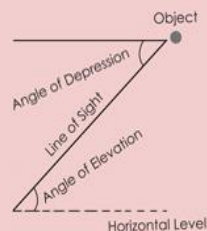
Measuring Angles

Object Height

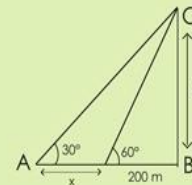
Determine height of the object AB



Angle of Elevation is equal to Angle of Depression



Distance between 2 objects



Find x and h

$$\tan 60^\circ = \frac{h}{200} \quad \text{--(i)}$$

$$\tan 30^\circ = \frac{h}{x + 200} \quad \text{--(ii)}$$

CHARACTERS



Ms. Trigger



Ms. Alka



Costin Arya



Tanuj



Kautilya



Mahesh



Sini



Madhuri



Sunil



Arvind Arya (Costin Arya's Father)



Suresh (Organiser)

SOURCE

NCERT Textbook of Mathematics (Class X)

Chapter	Learning Objectives	Learning Outcomes
Ch 8 – Introduction to Trigonometry	*Describe trigonometry and study the relationship between side and angle of a triangle. *Define and distinguish various trigonometric ratios and describe and verify sine, cosine, tangent, cosecant, secant, cotangent of an angle. *Use given trigonometric ratio(s) to find and verify other trigonometric ratios /angles of the triangle. *Compute the trigonometric ratio for $0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90°. *Compute the trigonometric ratios of complimentary angles and apply the values in solving contextual problems. *Apply trigonometric identities in solving mathematical problems.	Determines all trigonometric ratios with respect to a given acute angle (of a right triangle) in order to use them in solving problems in daily life contexts like finding heights of different structures or distances between two given points.
Ch 9- Some Applications of Trigonometry	* Identify line of sight and determine angle of elevation and angle of depression. * Apply trigonometric ratios (of specific angles) and determine heights and distances of the objects in the real-life context.	Determines all trigonometric ratios with respect to a given acute angle (of a right triangle) in order to use them in solving problems in daily life contexts like finding heights of different structures or distances between two given points.

We all have gathered here to play
'Who Will Be The Trignowizard'



Now let's play a game of
FASTEST FINGER FIRST.



The one who answers the question
the fastest, will get to the 'HOT
SEAT'.... You will get only 15
seconds to answer the question.



Starting from first to last arrange the following Mathematicians according to their year of birth.

A) Roger Penrose

B) Terence Tao

C) Maryam Mirzakhani

D) Katherine Johnson



Costin Arya has answered the question correctly, and in just 5 seconds.

D) Katherine Johnson

A) Roger Penrose

B) Terence Tao

C) Maryam Mirzakhani



TRIGNOWIZARD



Costin Arya, congratulations! How do you feel being here?



I am excited and nervous to be on the show.



Don't worry, relax.



Thank you, Ma'am. I still can't believe it!



Tell us something about yourself and your journey to the hot seat.



Ma'am, my parents are engineers and my sister, Simran is a C.A.

Oh! so that means numbers run in your blood!

Actually I was not aware of my talent in mathematics until I came in 10th grade.



TRIGNOWIZARD

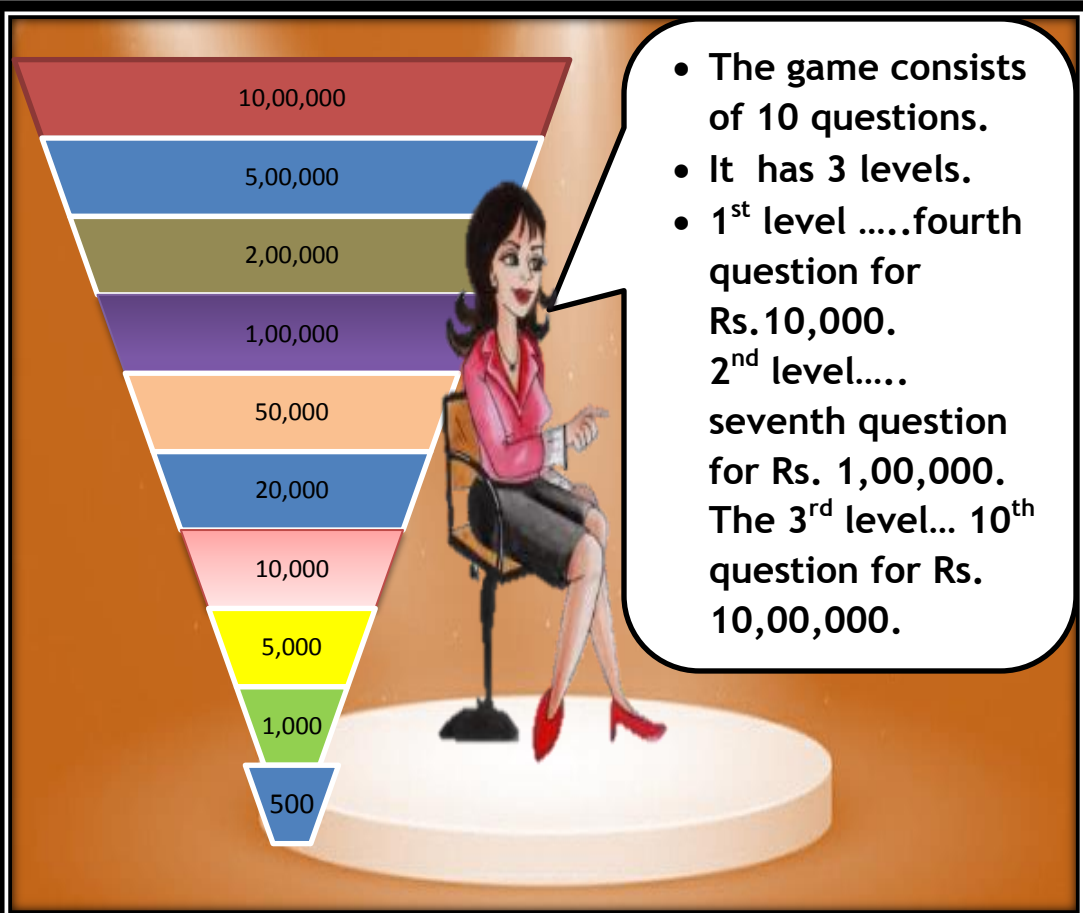
Who is your mentor ?



My math teacher, Ms. Alka, who recognized my talent.



So, Costin Arya before we start, let me tell you the rules.

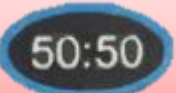


- The game consists of 10 questions.
- It has 3 levels.
- 1st levelfourth question for Rs.10,000.
- 2nd level.....seventh question for Rs. 1,00,000.
- The 3rd level... 10th question for Rs. 10,00,000.

You have three lifelines for your assistance-



1. Audience poll :- You can use this lifeline to get help from the audience.



2. 50-50 - This lifeline will delete two wrong options.



3. Phone a friend: You can call any one to ask the answer. Time limit30 seconds.



You will be provided with paper and pen to work out the solutions.



Ok, Ma'am



All the very best, Costin Arya. Here's your first question.



CHAPTER-1 INTRODUCTION TO RIGHT ANGLE TRIANGLE



1. In the given triangle right angled at B, which pair of angles are complementary?



(A) None

(B) C and A

(C) A and B

(D) B and C

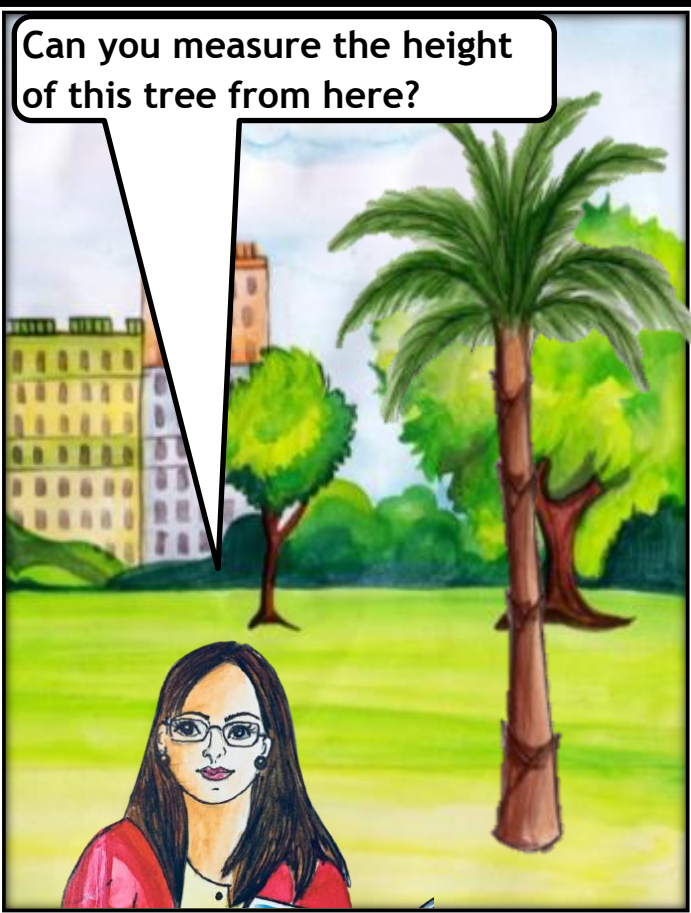
TO ANSWER THIS QUESTION COSTIN ARYA GOES INTO FLASH BACK.



THE TEACHER, MS. ALKA AND THE STUDENTS ARE IN THE SCHOOL GROUND WHERE SHE IS EXPLAINING A CONCEPT OF TRIGONOMETRY.



Can you measure the height of this tree from here?



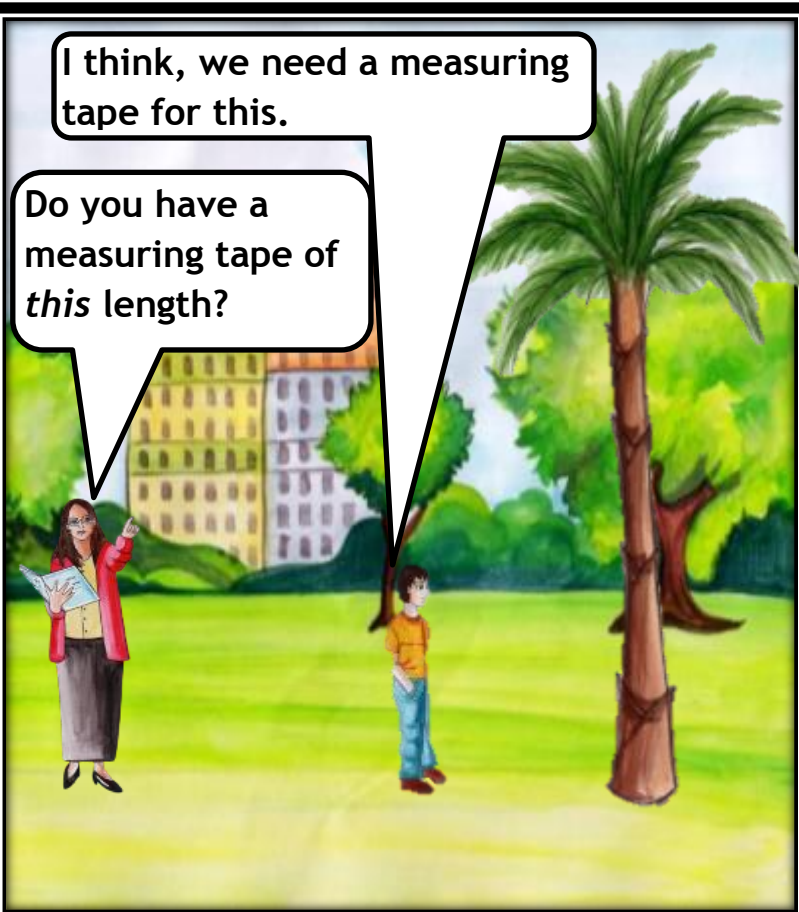
EXCITEDLY, ALL TOGETHER

Yes!
Yes!



I think, we need a measuring tape for this.

Do you have a measuring tape of *this* length?



PUZZLED

No!No!

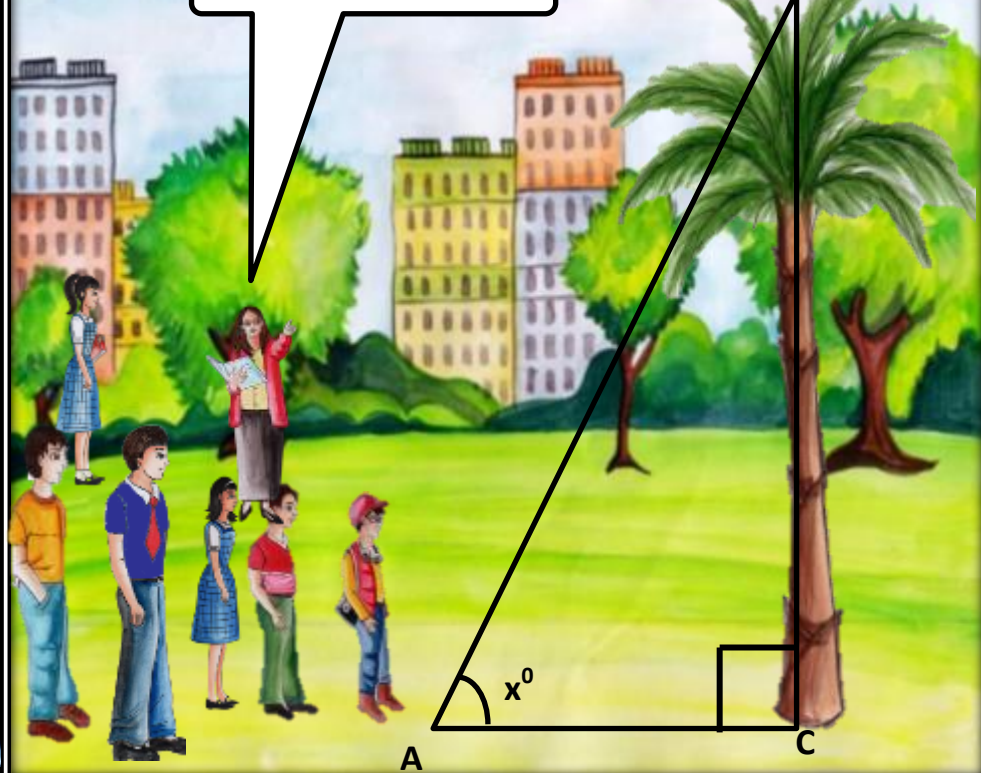


OK! Just look at the top of the tree. Can you imagine a right-angled triangle being formed?

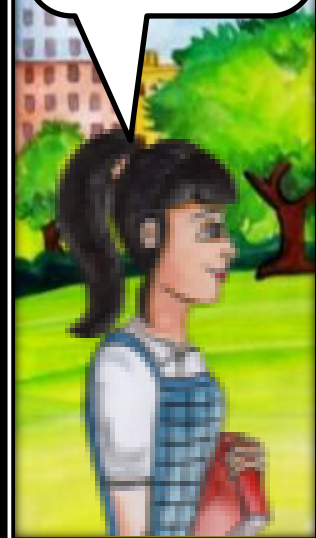


SHOWS THEM BY DRAWING A PICTURE

Look I'll show you.



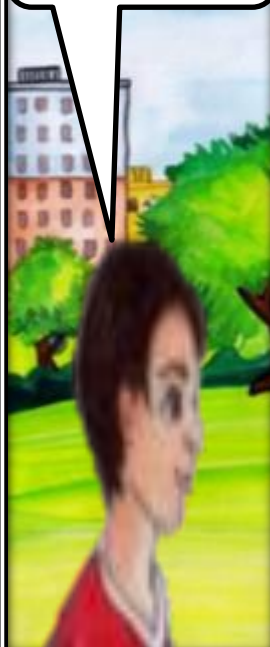
Yes, we can imagine the right triangle being formed.



So, by using this right triangle and standing at the same place, we can find the height of the tree.



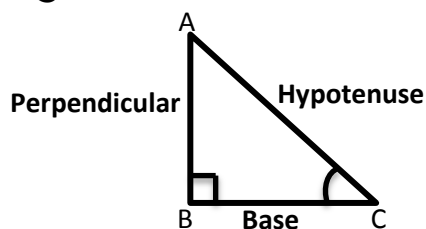
Wow! Is this trigonometry?



Yes!....tell me, if one angle in a right triangle is 90° then what will be the sum of the remaining two angles?



Ma'am, sum of all the angles of a triangle is 180° , if one angle is 90° then the sum of the measures of other two angles will also be 90° .



$$\begin{aligned}\angle A + \angle B + \angle C &= 180^\circ \\ \angle A + 90^\circ + \angle C &= 180^\circ \\ \angle A + \angle C &= 90^\circ\end{aligned}$$

And these angles are known as complementary angles.

Yes, that is absolutely right!

The correct option is B.

That's the right answer. You win Rs. 500.

Thank you, Ma'am.

Your second question for Rs 1000 is...

TRIGNOWIZARD

TRIGNOWIZARD

CHAPTER-2 INTRODUCTION TO TRIGONOMETRIC RATIOS

2. If $\tan A = \frac{4}{3}$, What is the value of $\operatorname{cosec} A$.

(A) $\frac{4}{5}$

(B) $\frac{5}{4}$

(C) $\frac{3}{5}$

(D) $\frac{3}{4}$



COSTIN ARYA
GOES INTO
FLASH BACK



Now we have two angles other than the right angle. Do you know how to use them in trigonometry?



No, Ma'am, but we are excited to know.



First, I will introduce trigonometric ratios to you. Let me take you to the music room and we'll sing a song to learn about them.



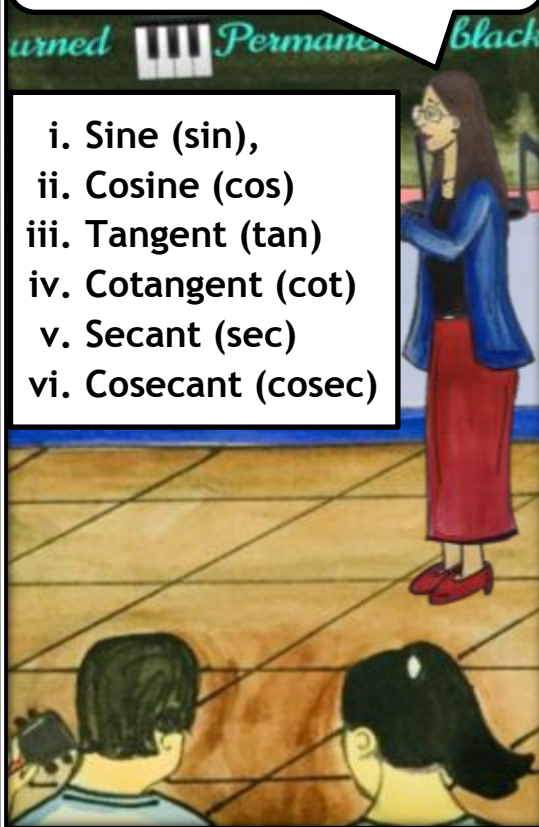
Trigonometry with a song?! Wow!

Some People Have, Curly
Brown Hair, Turned ♪ ♪ ♪
♪ ♪ Permanently Black.



Now let's first know the
names of the trigonometric
ratios:

- i. Sine (sin),
- ii. Cosine (cos)
- iii. Tangent (tan)
- iv. Cotangent (cot)
- v. Secant (sec)
- vi. Cosecant (cosec)



Who kept
such strange
names?



They sound
strange
because you
are not
familiar with
them yet. But
nobody has
asked me why
we sang the
song.



Yes, Ma'am.
Please tell
us why?



The song gives us
the relationship
between the
angles and the
sides of a right
angled triangle.
Want to know
how?



Yes

Yes



The underlined letters of the first three words: Some People Have

express: $S = \frac{P}{H}$

Here,

S in 'Some' indicates 'Sine (sin)'

P in 'People' indicates

'Perpendicular'

H in 'Have' indicates 'Hypotenuse'

$\therefore$ we get $\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$

The underlined letters of the next three words: Curly Brown Hair
Express:

$$C = \frac{B}{H}$$

Here,

C in 'Curly' indicates 'Cosine (cos)'

B in 'Brown' indicates 'Base'

H in 'Hair' indicates 'Hypotenuse'

$\therefore$ we get $\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$

And, the underlined letters of the last three words: Turned Permanently Black express

$$T = \frac{P}{B}$$

Here,

T in 'Turned' indicates 'Tangent (tan)'

P in 'Permanently' indicates 'Perpendicular'

B in 'Black' indicates 'Base'

$\therefore$ we get $\tan\theta = \frac{\text{perpendicular}}{\text{base}}$

Also, $\operatorname{cosec}\theta = \frac{1}{\sin\theta} \quad \therefore \operatorname{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$

Similarly, $\sec\theta = \frac{1}{\cos\theta} \quad \therefore \sec\theta = \frac{\text{hypotenuse}}{\text{base}}$

And, $\cot\theta = \frac{1}{\tan\theta} \quad \therefore \cot\theta = \frac{\text{base}}{\text{perpendicular}}$



Wow Ma'am, it is so easy to remember trigonometric relationships through this song. Please tell us more about them.

Now let us talk about all the trigonometric ratios for $\angle C$. The side opposite to 90° is Hypotenuse. The side opposite to $\angle C$ will be Perpendicular and the remaining side is said to be the Base of the triangle.

$$\sin C = \frac{P}{H} = \frac{AB}{AC}; \cos C = \frac{B}{H} = \frac{BC}{AC}$$

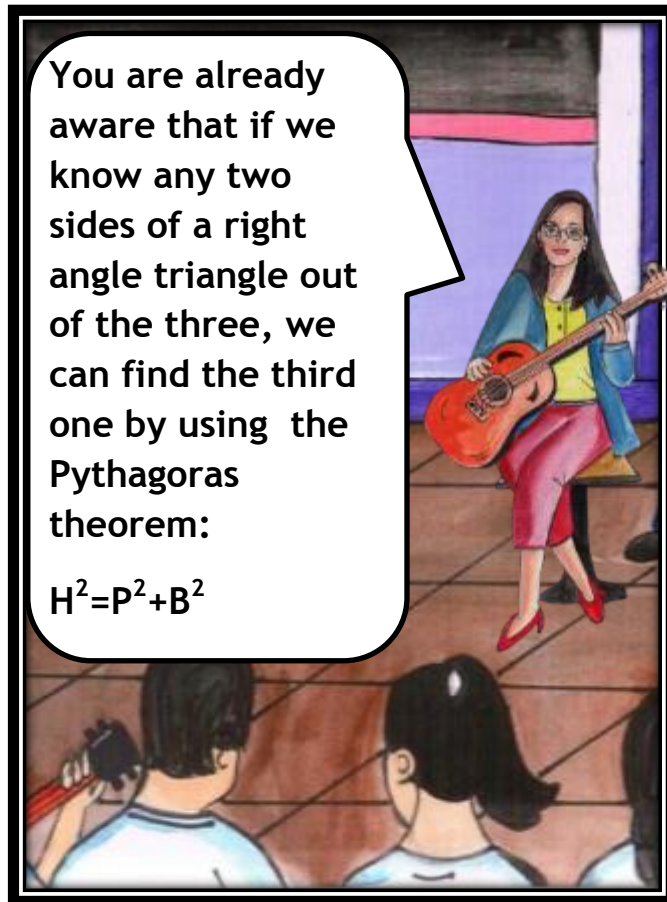
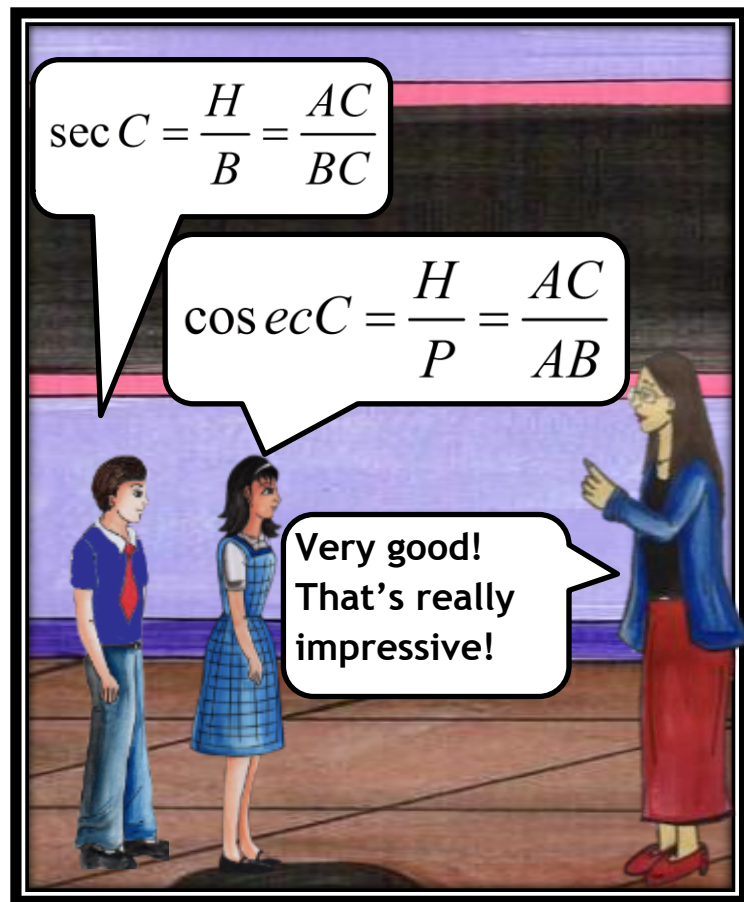
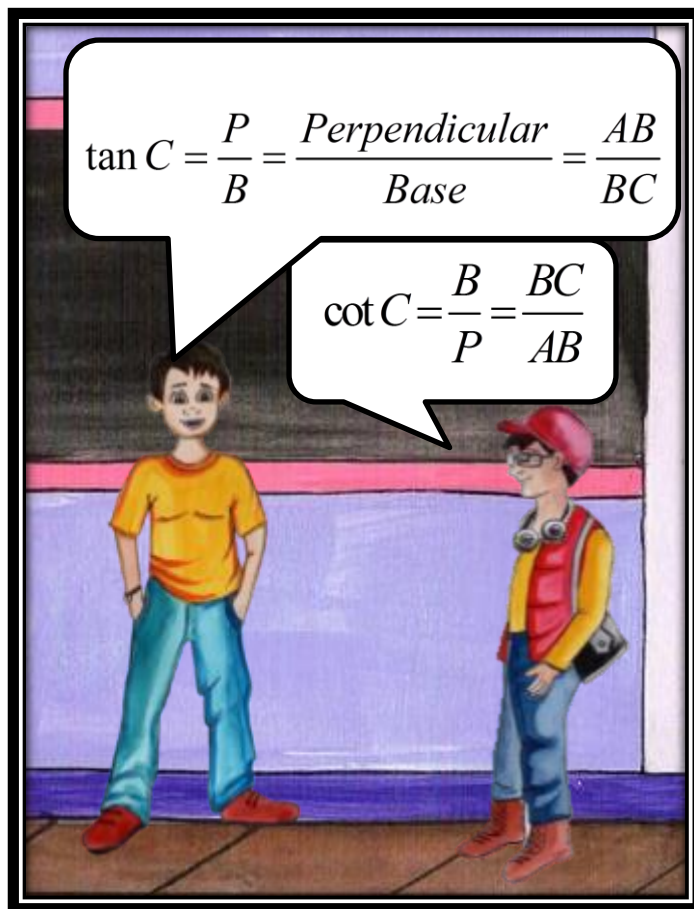
Perpendicular

Hypotenuse

B

Base





Q. If $\tan A = \frac{4}{3}$, What is the value of cosec A.

SOLUTION

STEP 1

In right $\triangle ABC$, applying Pythagoras theorem

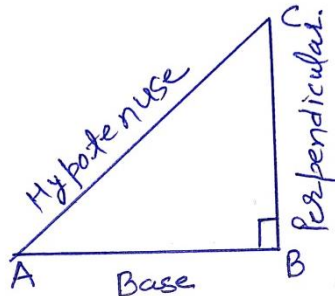
$$(\text{hypotenuse})^2 = (\text{perpendicular})^2 + (\text{Base})^2$$

Given

$$\tan A = \frac{4}{3}$$

$$\Rightarrow \frac{\text{perpendicular}}{\text{base}} = \frac{4}{3}$$

Let, $BC = 4x$, $AB = 3x$



STEP 2

$$(AC)^2 = (BC)^2 + (AB)^2$$

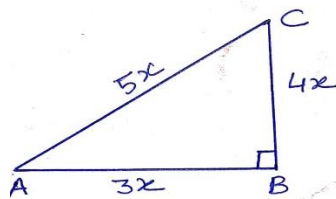
$$(AC)^2 = (4x)^2 + (3x)^2$$

$$(AC)^2 = 16x^2 + 9x^2$$

$$(AC)^2 = 25x^2$$

$$AC = 5x$$

STEP 3



$$\begin{aligned}\text{Now, cosec } A &= \frac{H}{P} = \frac{AC}{BC} \\ &= \frac{5x}{4x} = \frac{5}{4}\end{aligned}$$



Answer is option B.

Yes, you are right.

TRIGNOWIZARD

CHAPTER-3 TRIGONOMETRIC RATIOS OF SOME SPECIFIC ANGLES

3. If $x \tan 45^\circ \sin 30^\circ = \cos 30^\circ \tan 30^\circ$ then find x?

(A) $\sqrt{3}$

(B) $\frac{1}{2}$

(C) $\frac{1}{\sqrt{2}}$

(D) 1

The next question is on your computer screen:

COSTIN ARYA GOES INTO FLASHBACK ...
MS. ALKA DRAWS A PALM ON THE BLACKBOARD



Ma'am, why did you draw this palm?



This is a 'Super Duper Palm' .



'Super Duper Palm'!
Amazing!!!

How does it work,
ma'am?



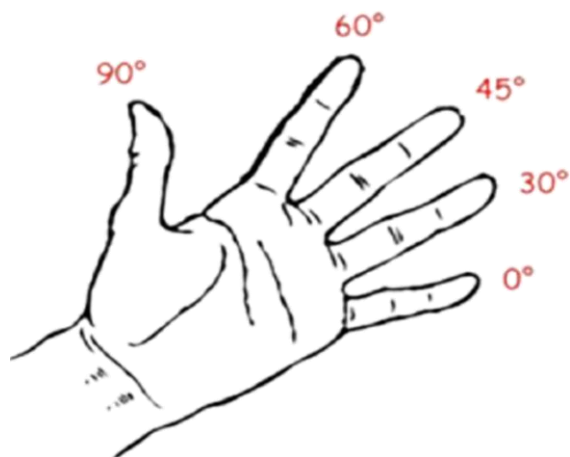
We will use *this* to find the value of trigonometric ratios for some specific angles, particularly 0° , 30° , 45° , 60° and 90° .



OK, Ma'am.



Let's mark each finger with an angle.



$$\sin \theta = \frac{\sqrt{\text{number of fingers below } \theta}}{2}$$

$$\cos \theta = \frac{\sqrt{\text{number of fingers above } \theta}}{2}$$

$$\tan \theta = \frac{\sqrt{\text{number of fingers below } \theta}}{\sqrt{\text{number of fingers above } \theta}}$$

This will help us to find the values of trigonometric ratios for angles!



$$\sin 0^\circ = \frac{\sqrt{0}}{2} = 0$$

$$\cos 0^\circ = \frac{\sqrt{4}}{2} = 1$$

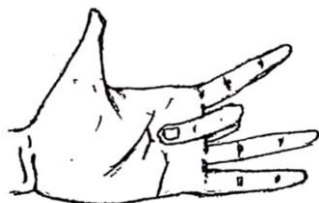
$$\tan 0^\circ = \frac{\sqrt{0}}{\sqrt{4}} = 0$$



$$\sin 30^\circ = \frac{\sqrt{1}}{2} = \frac{1}{2}$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$$

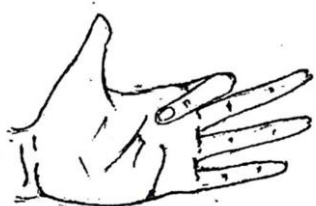
$$\tan 30^\circ = \frac{\sqrt{1}}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$



$$\sin 45^\circ = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$$

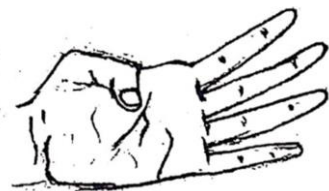
$$\tan 45^\circ = \frac{\sqrt{2}}{\sqrt{2}} = 1$$



$$\sin 60^\circ = \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{\sqrt{1}}{2} = \frac{1}{2}$$

$$\tan 60^\circ = \frac{\sqrt{3}}{\sqrt{1}} = \sqrt{3}$$



$$\sin 90^\circ = \frac{\sqrt{4}}{2} = \frac{2}{2} = 1$$

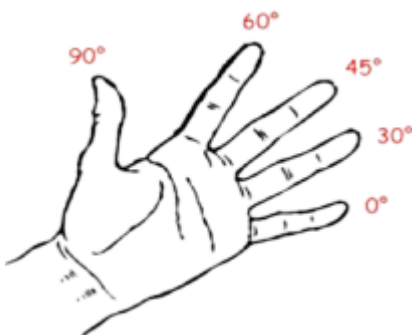
$$\cos 90^\circ = \frac{\sqrt{0}}{2} = 0$$

$$\tan 90^\circ = \frac{\sqrt{4}}{\sqrt{0}} = \text{not defined}$$

Yes! Let's calculate.



θ	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
$\cot \theta$	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
$\sec \theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
$\operatorname{cosec} \theta$	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1



Wow, Ma'am! Finding values using this 'Super Duper Palm' is really easy.

COSTIN ARYA USES THE VALUES IN THE QUESTION AND CALCULATES THE ANSWER

$$Q. x \tan 45^\circ \sin 30^\circ = \cos 30^\circ \tan 30^\circ$$

SOLUTION

Step 1:

Since $\tan 45^\circ = 1$, $\sin 30^\circ = \frac{1}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\tan 30^\circ = \frac{1}{\sqrt{3}}$

Step 2:

$$x \times 1 \times \frac{1}{2} = \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}}$$
$$x = 1$$



The correct option is D.

You win Rs. 5,000! Now get ready for the fourth question.

Yes, I'm ready.

TRIGNOWIZARD

Worksheet-1

1. In a right triangle ABC , right angled at B. Which of the following is true about the other two angles A and C?

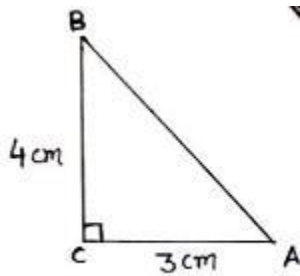
(A) There is no restriction on the measure of the angles.

(B) Both the angles should be obtuse.

(C) Both the angles should be acute.

(D) One of the angle is acute and the other is obtuse.

2. In given figure , ΔABC is right triangle right angled at C. What is the length AB?



(A) 25 cm

(B) 12 cm

(C) 7 cm

(D) 5 cm

3. If $\cos \theta = \frac{2}{3}$, then $\tan \theta$ is equal to :

(A) 5/2

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

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

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

4. $(\sin 30^\circ + \cos 60^\circ) - (\sin 60^\circ + \cos 30^\circ)$ is equal to :

(A) 0

(B) $1 + 2\sqrt{3}$

(C) $1 - \sqrt{3}$

(D) $1 + \sqrt{3}$

5. The value of $\frac{\tan 60^\circ}{\cot 30^\circ}$ is equal to

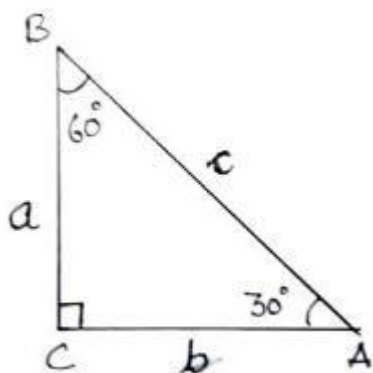
(A) 0

(B) 1

(C) 2

(D) 3

6. In the triangle given below, which of the following is equal to $\frac{a}{c}$.



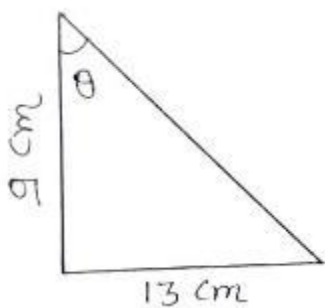
- (A) $\cos 30^\circ$ (B) $\tan 30^\circ$ (C) $\sin 60^\circ$ (D) $\sin 30^\circ$

7. Out of the following options, the two angles that are together classified as complementary angles are:

- (A) 120° and 60° (B) 50° and 30° (C) 65° and 25°

- (D) 70° and 30°

8. In the given right angled triangle what is $\sin \theta$?



- (A) $13/9$ (B) $9/13$ (C) $\frac{13\sqrt{10}}{50}$ (D) $13/24$

State true or false:

1. The value of $\sin \theta$ increases as θ increases.
2. The value of $\cos \theta$ increases as θ increases

3. Is $\operatorname{cosec} \theta = \frac{\text{Hypotenuse}}{\text{perpendicular}}$
4. In a right $\triangle PQR$, right angled at Q, the sum of angles Q and R will be 90° .
5. The value of $\sin \theta$ and $\cos \theta$ never exceeds 1

Match the following :

Column A

- 1) $\sin \theta$
- 2) $\cos 90^\circ$
- 3) $\sec \theta$
- 4) Sum of complementary angles
- 5) $\sec A / \operatorname{cosec} A$

Column B

- a) $\tan A$
- b) $1 / \cos \theta$
- c) 90°
- d) P/H
- e) 0

Answers

MULTIPLE CHOICE QUESTIONS

1. C 2. D 3. C 4. C 5. B 6. D 7. C
8. C

TRUE AND FALSE

1. TRUE 2. FALSE 3. TRUE 4. FALSE 5. TRUE

MATCH THE FOLLOWING

- 1 $\rightarrow$ D 2 $\rightarrow$ E 3. $\rightarrow$ B 4 $\rightarrow$ C 5 $\rightarrow$ A

CHAPTER-4 ANGLE OF ELEVATION AND ANGLE OF DEPRESSION

4. If a man standing on a platform, 3 m above the surface of a lake observes a cloud and its reflection in the lake, then the relation between the angle of elevation θ_1 of the cloud and the angle of depression θ_2 is

(A) $\theta_1 < 90^\circ, \theta_2 > 90^\circ$

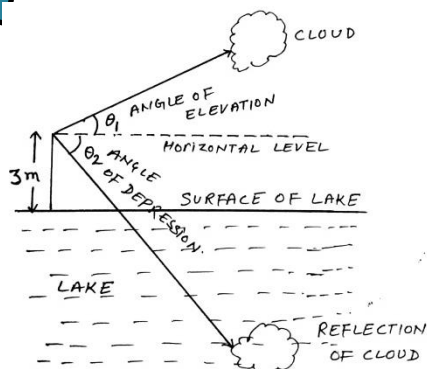
(B) $\theta_1 > 90^\circ, \theta_2 < 90^\circ$

(C) $\theta_1 \neq \theta_2$

(D) $\theta_1 = \theta_2$



COSTIN ARYA IMAGINES THE SITUATION IN HIS MIND



COSTIN ARYA AND MADHURI WERE ONCE AT A PARK WITH SUNIL (COSTIN ARYA'S ELDER BROTHER). WHILE PLAYING IN THE PARK THEY SAW A SPARROW SITTING ON THE TOP MOST BRANCH OF A TREE

Look up there. What a beautiful sparrow! It's perched so high on the tree.



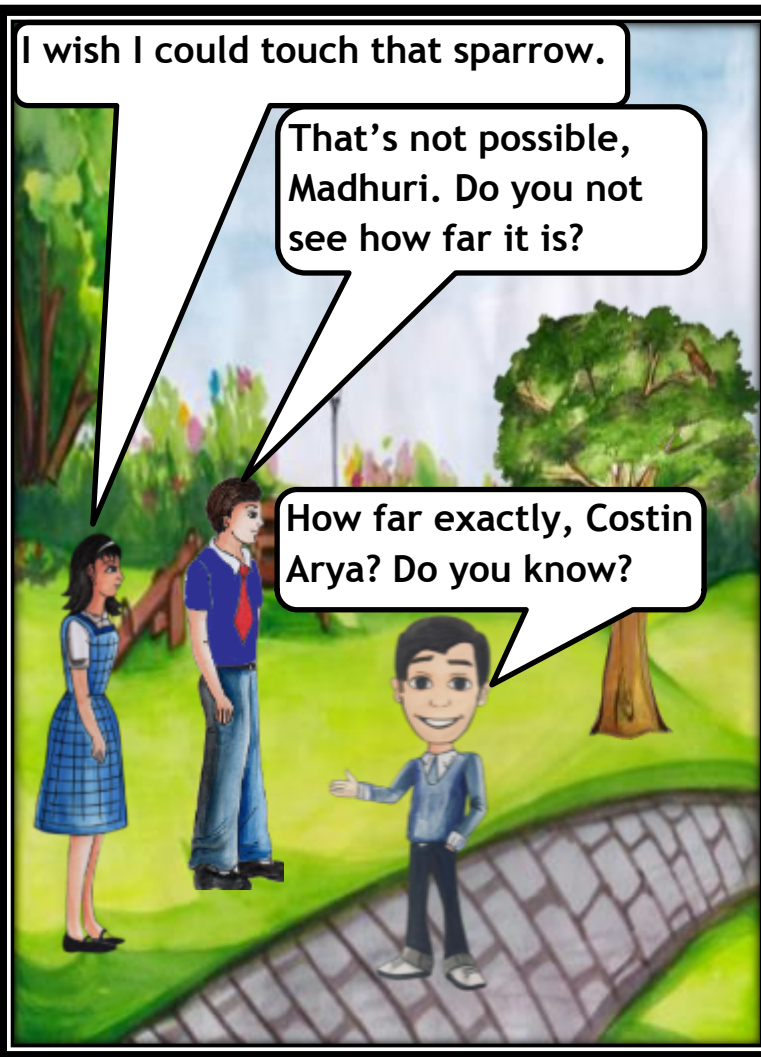
I wish I could touch that sparrow.

That's not possible, Madhuri. Do you not see how far it is?

How far exactly, Costin Arya? Do you know?

No! Standing here, how is it possible for us to know how far the sparrow is?

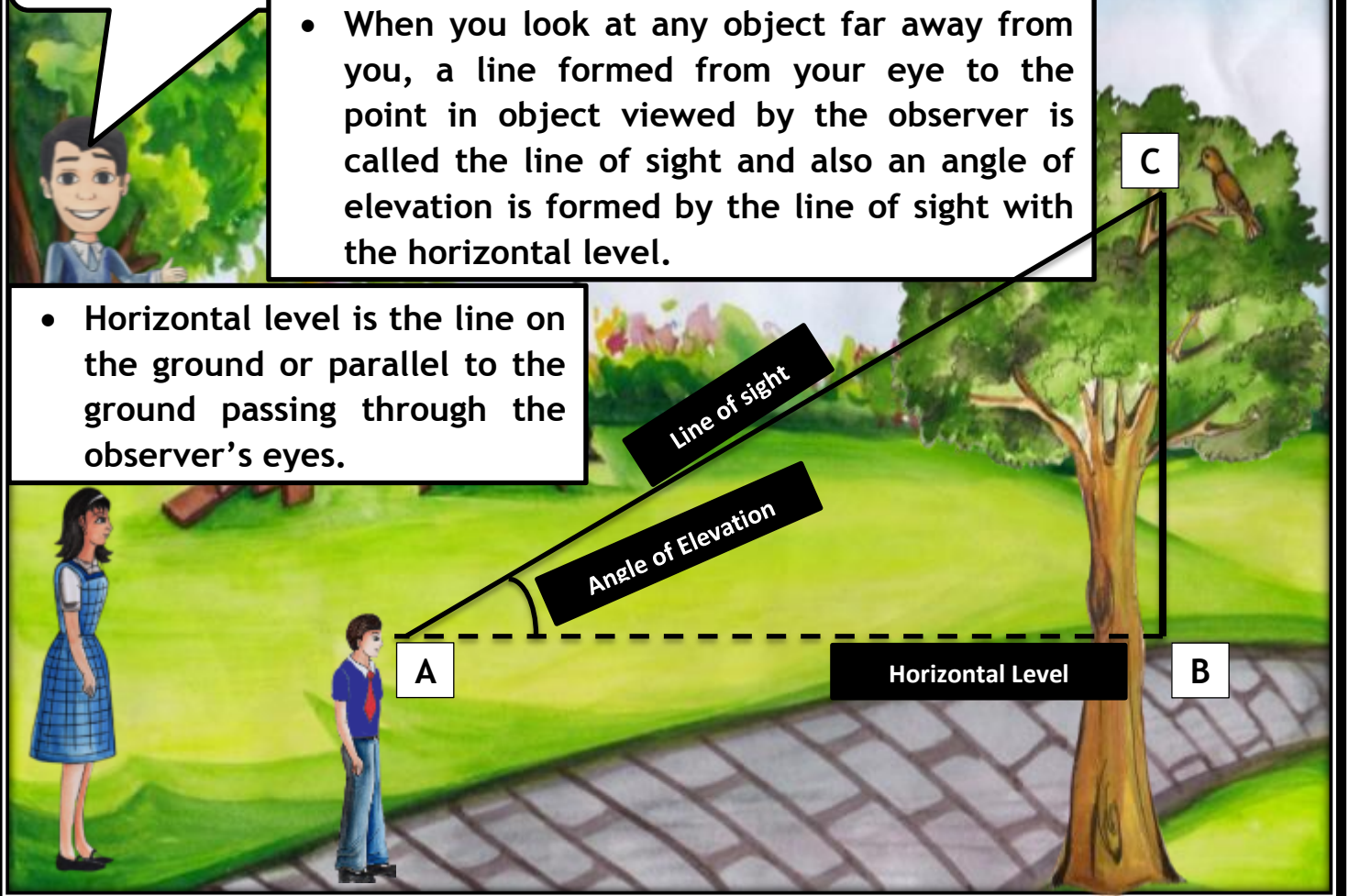
But we would like to know, Sunil.



Good to see your enthusiasm. I'll teach you how to find the distance.

- When you look at any object far away from you, a line formed from your eye to the point in object viewed by the observer is called the line of sight and also an angle of elevation is formed by the line of sight with the horizontal level.

- Horizontal level is the line on the ground or parallel to the ground passing through the observer's eyes.

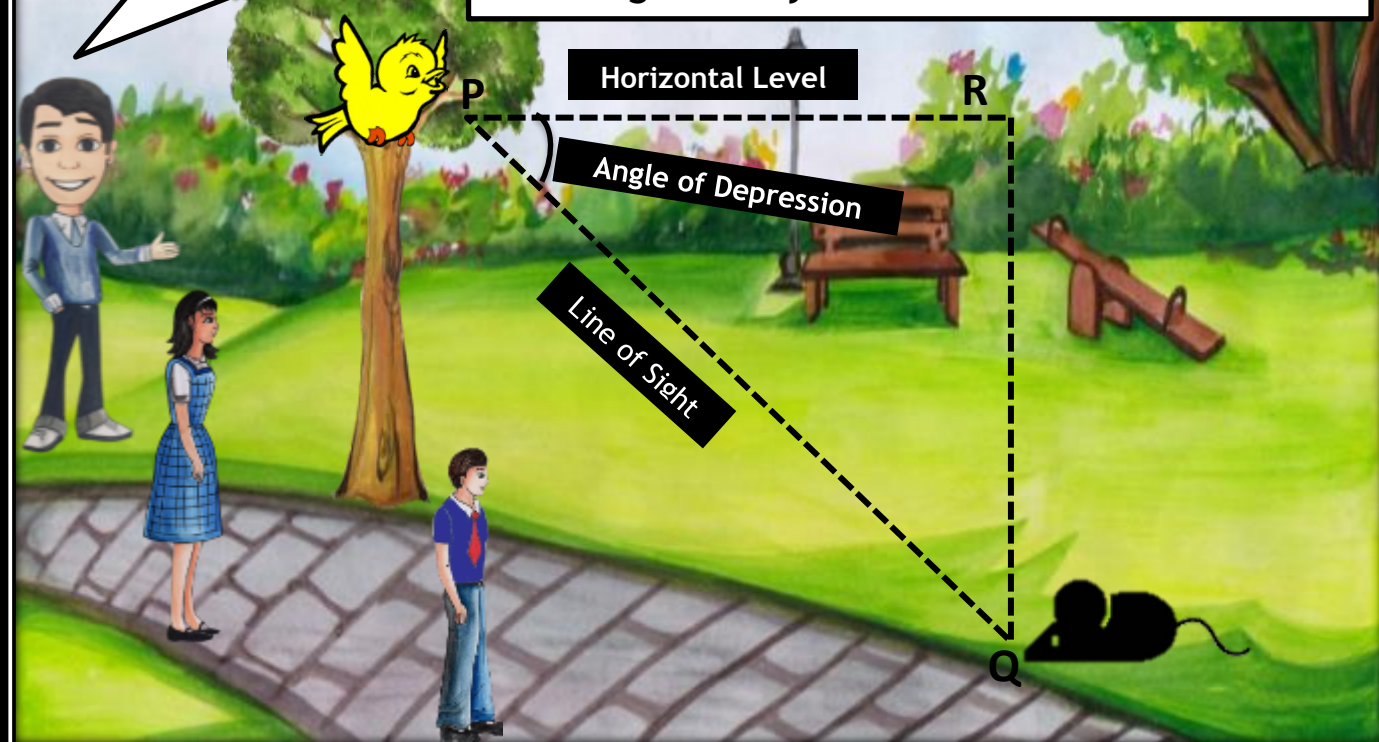


Ok! And what if we are viewing an object from top and want to know the distance of the object lying on the ground?



- In that case, the line of sight is below the horizontal level and the angle formed by the line of sight with the horizontal is called the angle of depression.

- Interestingly, the angle of elevation and the angle of depression are both acute angles always.



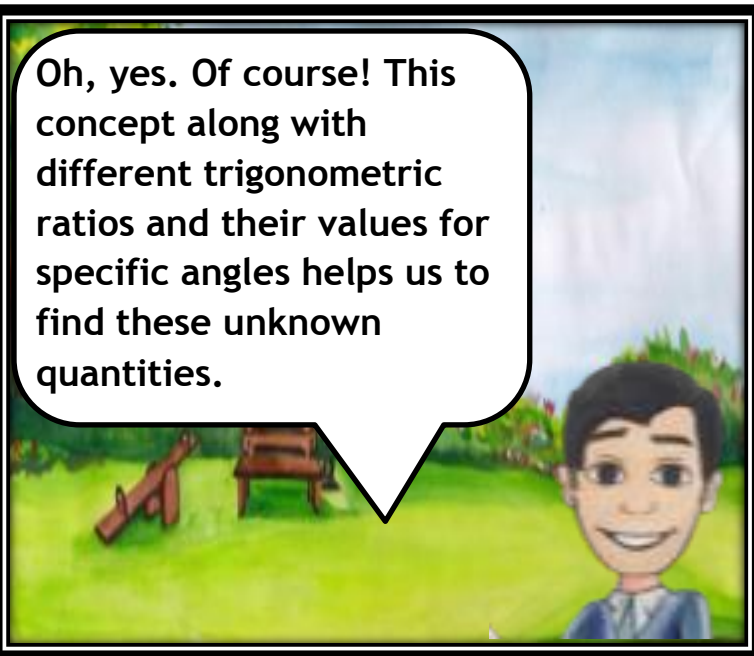
That means this concept can help us to find the height and distance of objects very easily.



Really! Thank you, Sunil. I must say you are good at explaining tricky concepts and I guess that means trigonometry is applicable in a variety of real life situations.

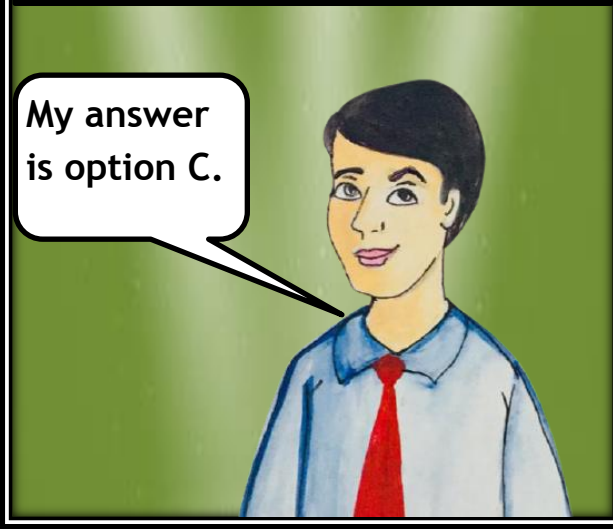


Oh, yes. Of course! This concept along with different trigonometric ratios and their values for specific angles helps us to find these unknown quantities.



COSTIN ARYA RECALLS THE CONCEPT AND ANSWERS THE QUESTION

My answer is option C.



Congratulation!.
You win Rs. 10,000.
You have cleared the first level.



Thank you, Ma'am!



Costin Arya, You are doing very well. Are you now ready for the questions of the next level?



Yes.



Here is the next question.

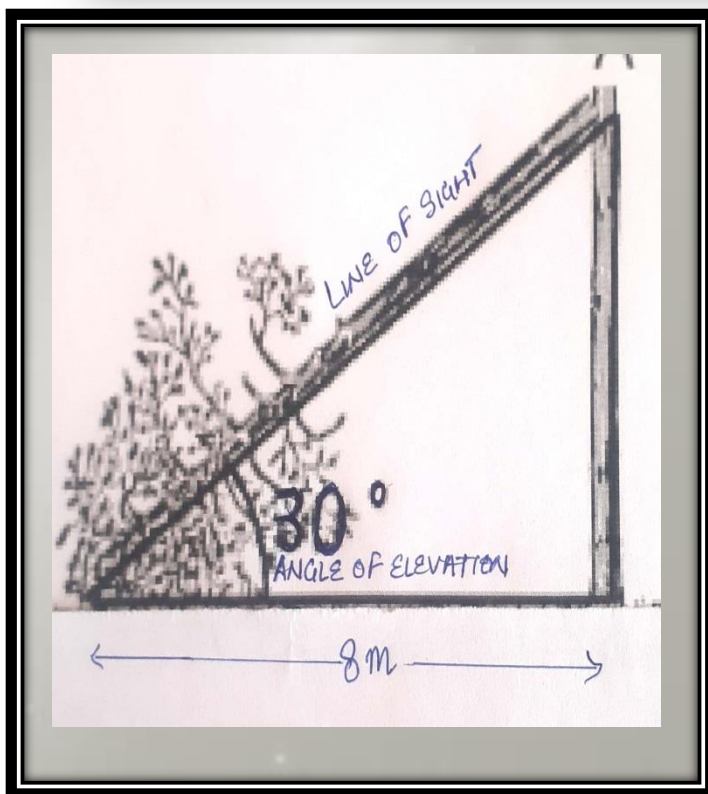
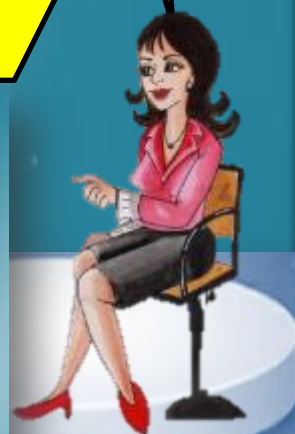
5. A tree breaks due to storm and the broken part bends such that the top of the tree touches the ground making an angle of 30° with the ground. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

(A) $\frac{8}{\sqrt{3}} m$

(B) 8 m

(C) $8\sqrt{3} m$

(D) $\frac{\sqrt{3}}{8} m$

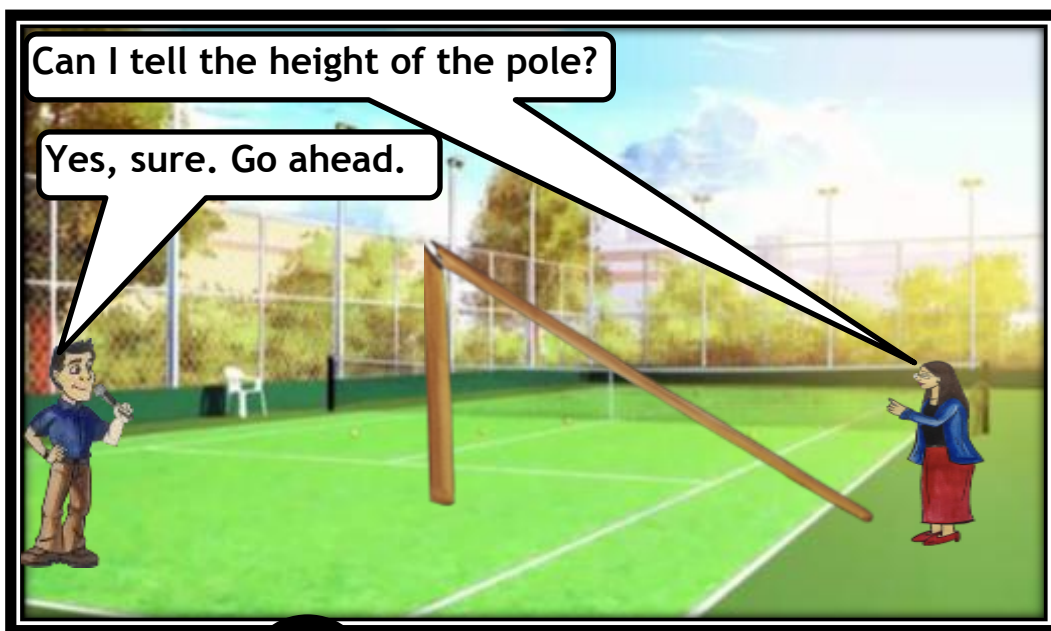
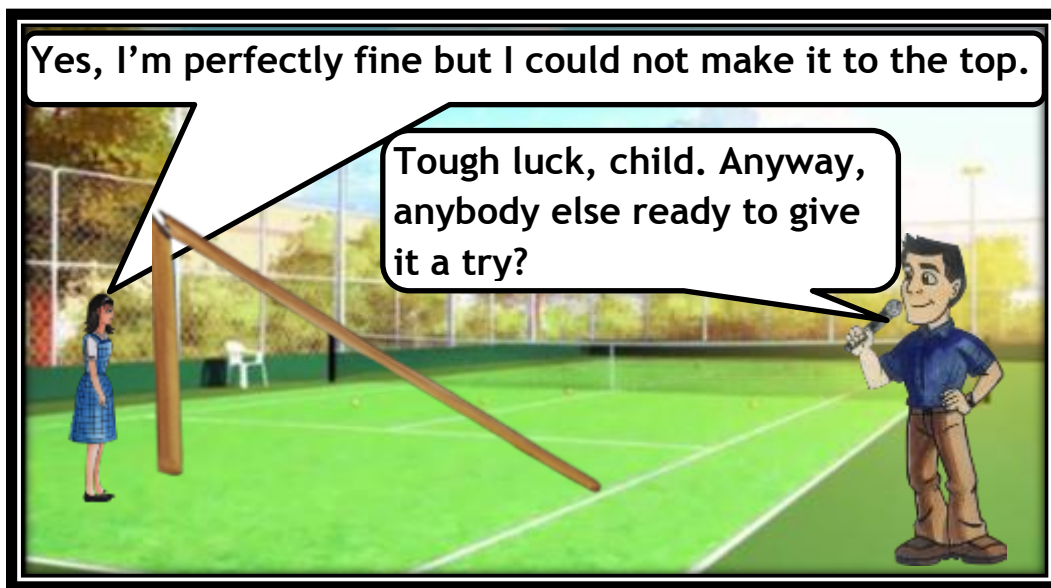
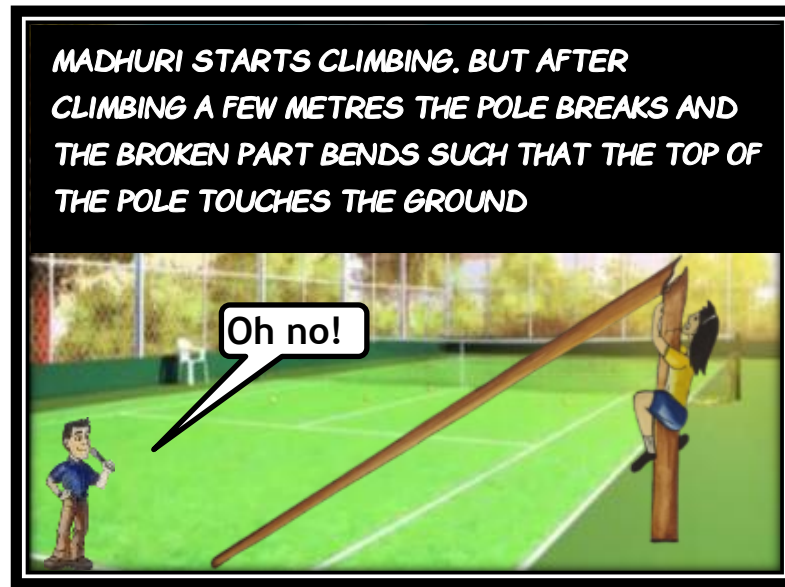
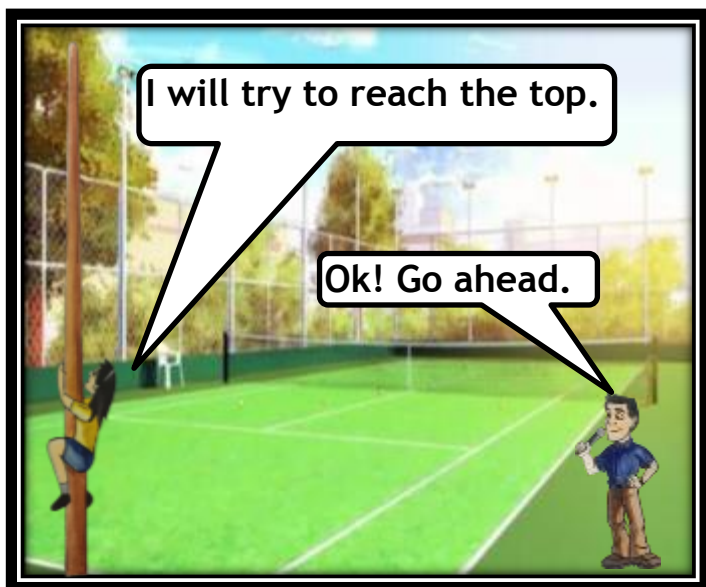


COSTIN ARYA RECALLS A COMPETITION IN WHICH EITHER THEY HAD TO TELL THE HEIGHT OR REACH THE TOP OF THE POLE.

I would love to give it a try

What will you do?
Tell the height or reach the top?

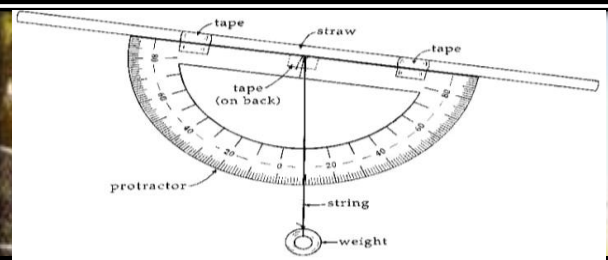




TAKES OUT AN INCLINOMETER FROM HER BAG AND MEASURES THE ANGLE FORMED BY THE BROKEN POLE WITH THE GROUND

It is 30° .

Where is your measuring tape, Ma'am?



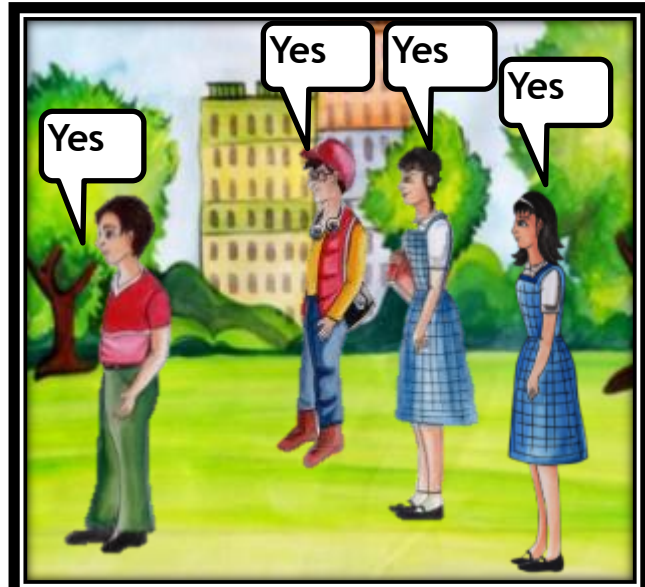
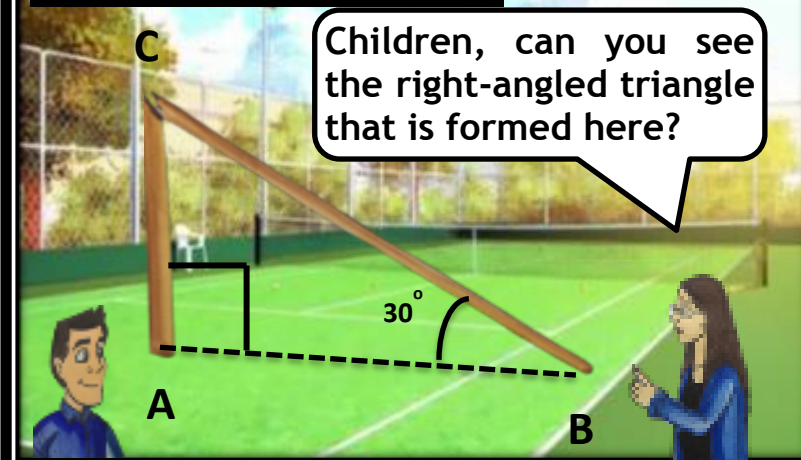
AN INCLINOMETER OR CLINOMETER IS AN INSTRUMENT USED FOR MEASURING ANGLES OF ELEVATION, OR DEPRESSION ESPECIALLY FROM HORIZONTAL LEVEL. IT IS ALSO KNOWN AS A TILT INDICATOR.



I don't need it. I have an inclinometer which I am going to use and apply the concepts of trigonometry to get the answer. I would like to thank you for coming to our school. This event is a great learning opportunity for my students.

APPLIES TRIGONOMETRY

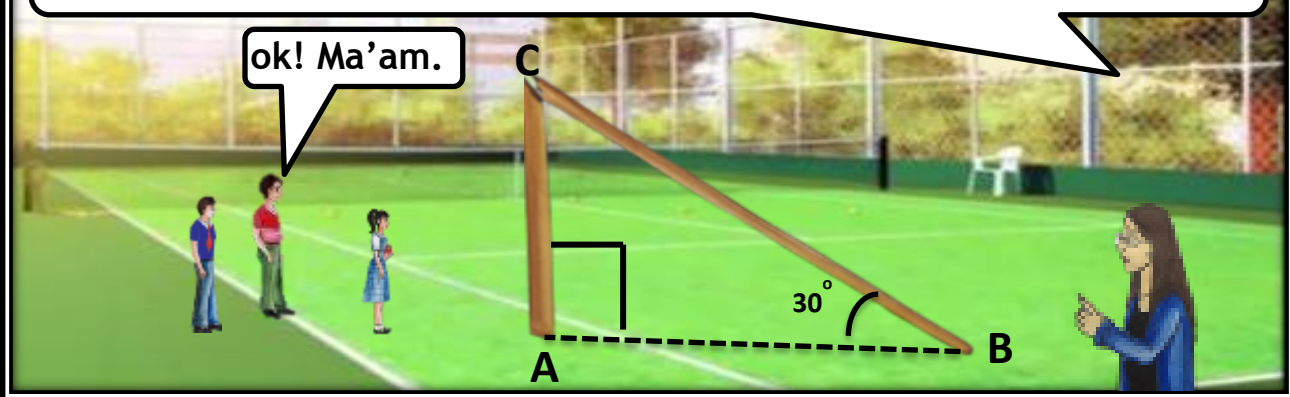
Children, can you see the right-angled triangle that is formed here?



SHOWS THIS BY NAMING THE VERTICES IN THE RIGHT ANGLE TRIANGLE.

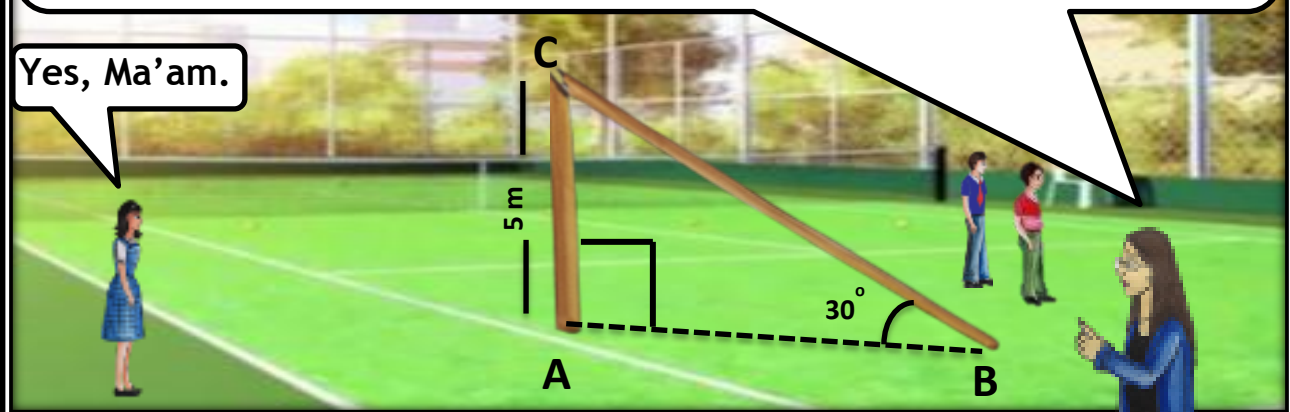
The angle formed with the ground is 30° . I just measured it using the inclinometer.

ok! Ma'am.



Also we know that Madhuri could only climb 5 metres. Therefore, $AC=5\text{m}$ (perpendicular) and now I want to find BC because the total height of the pole according to the figure is $AC + BC$ and the angle of inclination is 30° .

Yes, Ma'am.

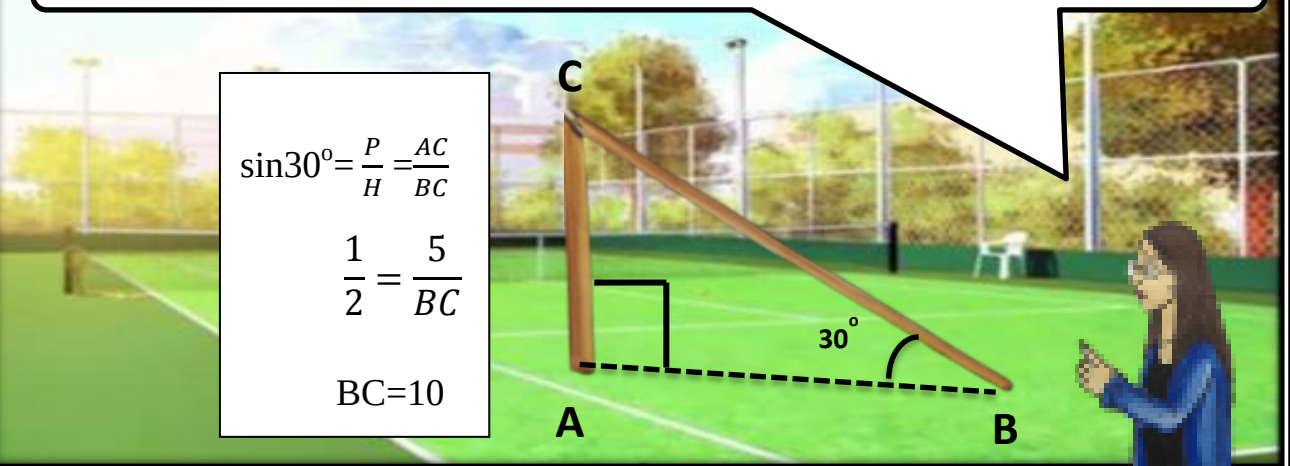


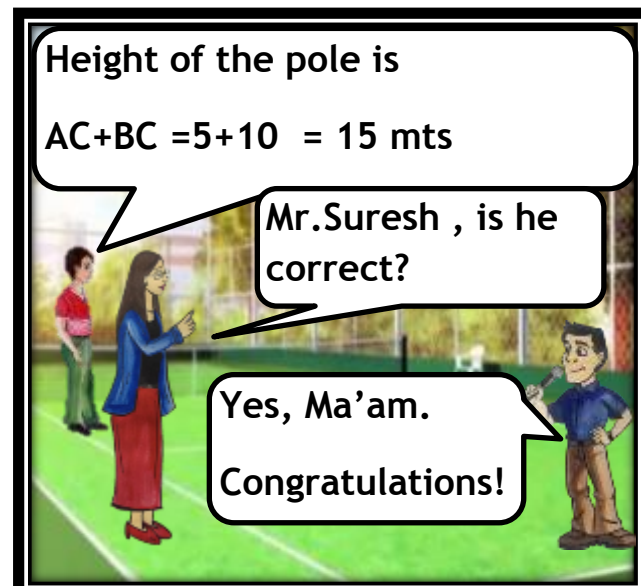
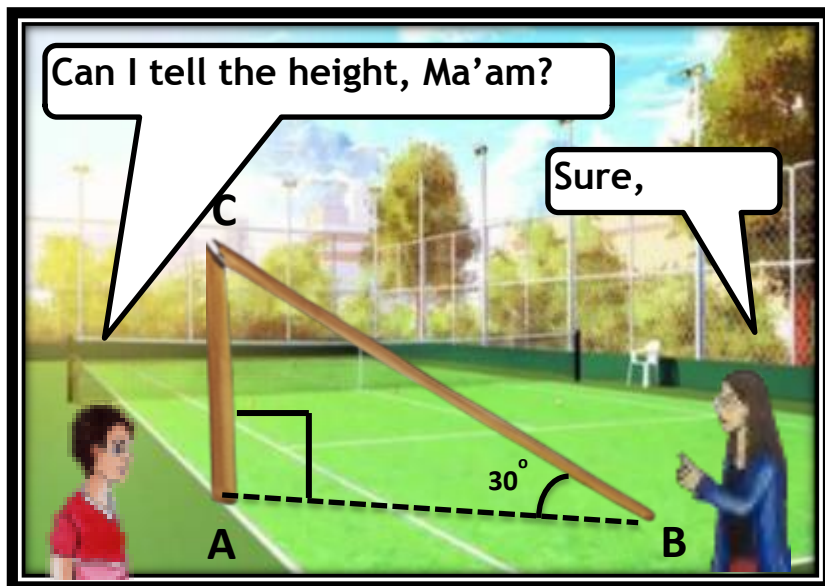
Now all I have to do is apply the trigonometric ratio for 30°

$$\sin 30^\circ = \frac{P}{H} = \frac{AC}{BC}$$

$$\frac{1}{2} = \frac{5}{BC}$$

$$BC = 10$$



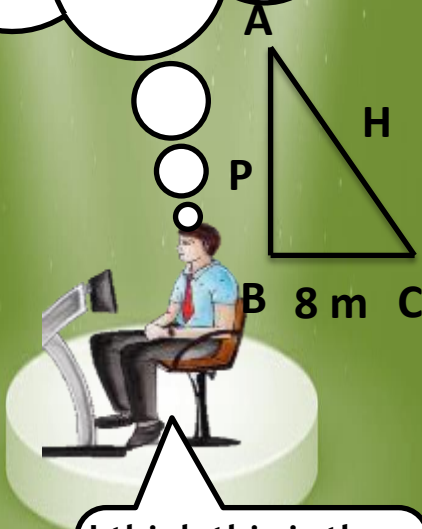


DRAWS A ROUGH SKETCH AND STARTS CALCULATING

$$\tan 30^\circ = \frac{P}{B} = \frac{AB}{BC} = \frac{AB}{8}$$

$$\frac{1}{\sqrt{3}} = \frac{AB}{8}$$

$$\Rightarrow AB = \frac{8}{\sqrt{3}} m$$



I think this is the heightbut no this is only AB.

Costin Arya, all your three lifelines are alive. If you have a doubt, you can avail a lifeline.

Yes, Ma'am. I am doubtful of the answer. I would like to use 50-50 lifeline.



50:50



TRIGNOWIZARD

THE COMPUTER DELETED TWO INCORRECT OPTIONS.

You are now left with two options.

(C) $8\sqrt{3} m$

(D) $\frac{\sqrt{3}}{8} m$



COSTIN ARYA IS STILL CONFUSED.

Oh! I'm not sure...



AGAIN CALCULATES....

AB is not the height ...Yes, I've got it. I have to add length AC with AB to find the total height of the tree.

Now I will calculate AC

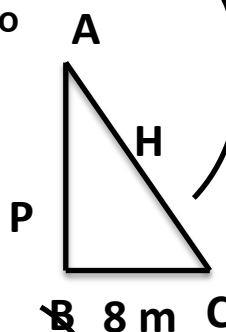
$$\text{In } \triangle ABC, \sin 30^\circ = \frac{P}{H} = \frac{AB}{AC}$$

$$\Rightarrow \frac{1}{2} = \frac{8}{\sqrt{3} \times AC}$$

$$\Rightarrow AC = \frac{16}{\sqrt{3}} m$$

Therefore, the height of the tree =

$$AB + AC = \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 8\sqrt{3} m$$



My answer is option C.

Right answer again.
You win Rs. 20,000.



CHAPTER-6 APPLICATION OF TRIGONOMETRY (II)

6. A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° , as he walks towards the building. Find the distance he walked towards the building.

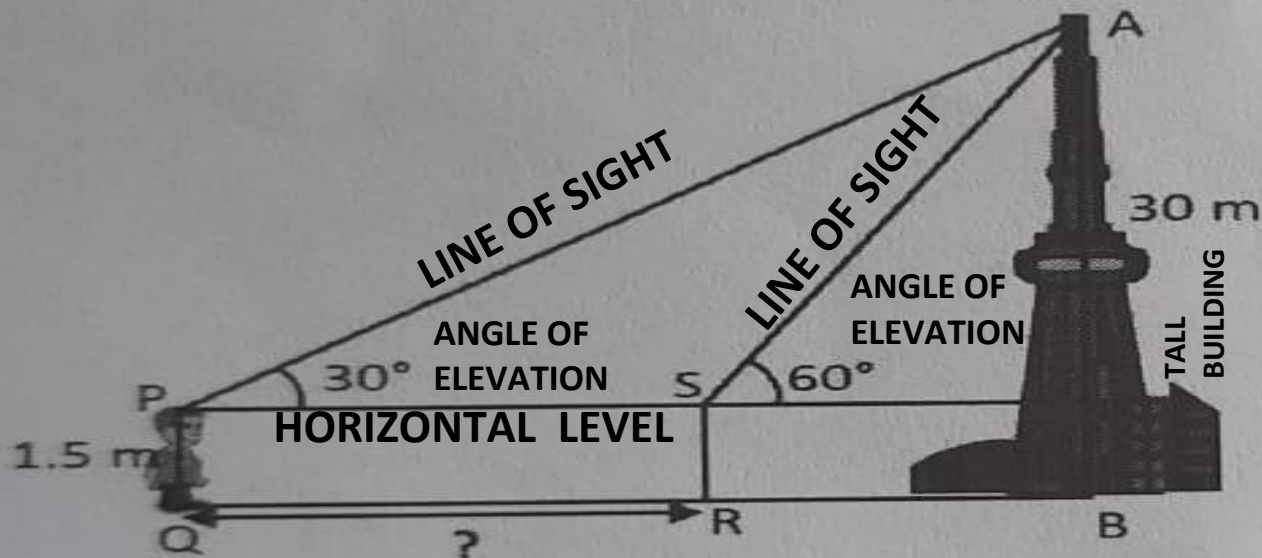
Keep it up, Costin Arya. Now the next question on your screen is for Rs. 50,000.

(A) 23 m

(B) 19 m

(C) $19\sqrt{3}$ m

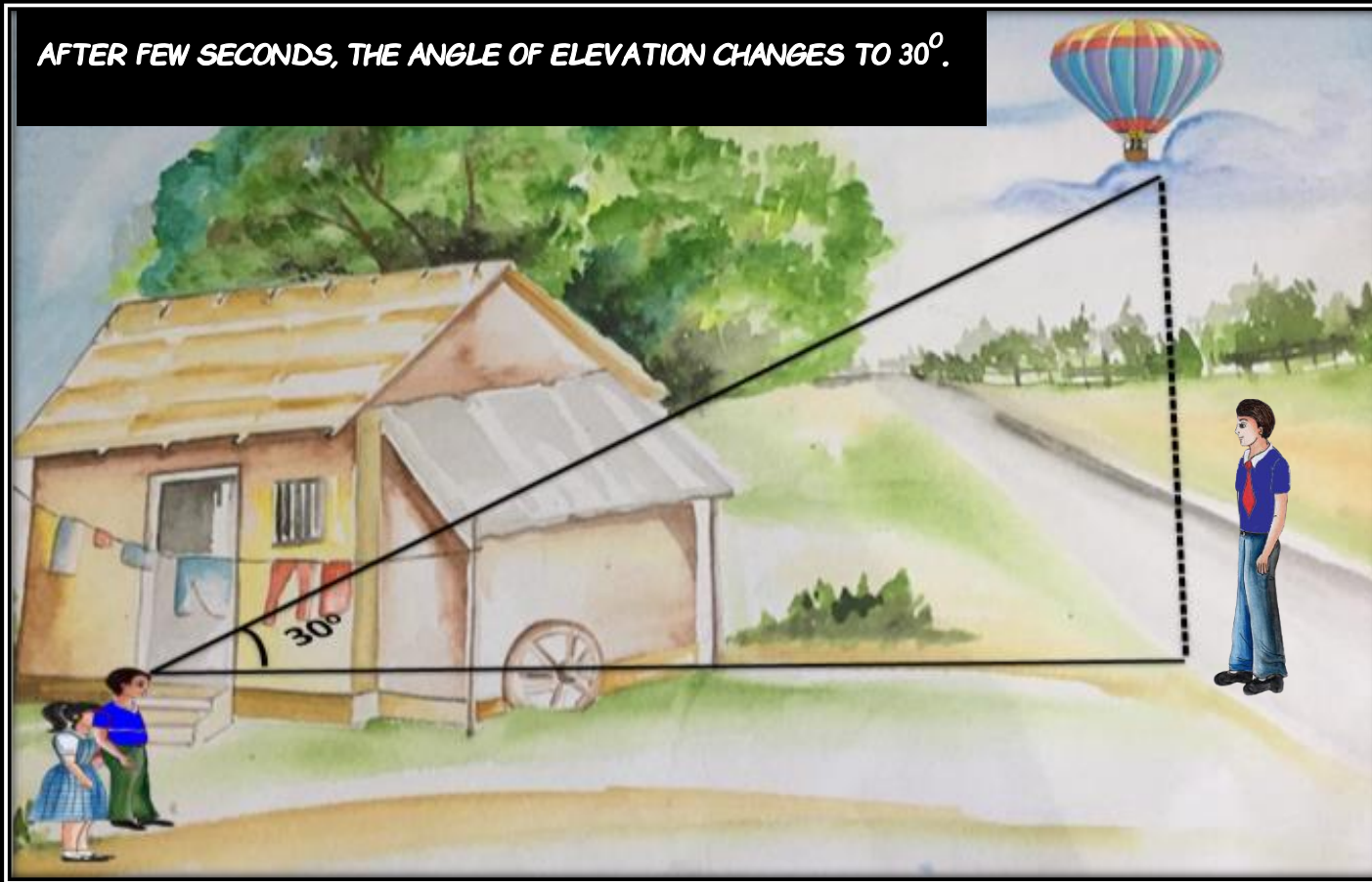
(D) $12\sqrt{2}$ m



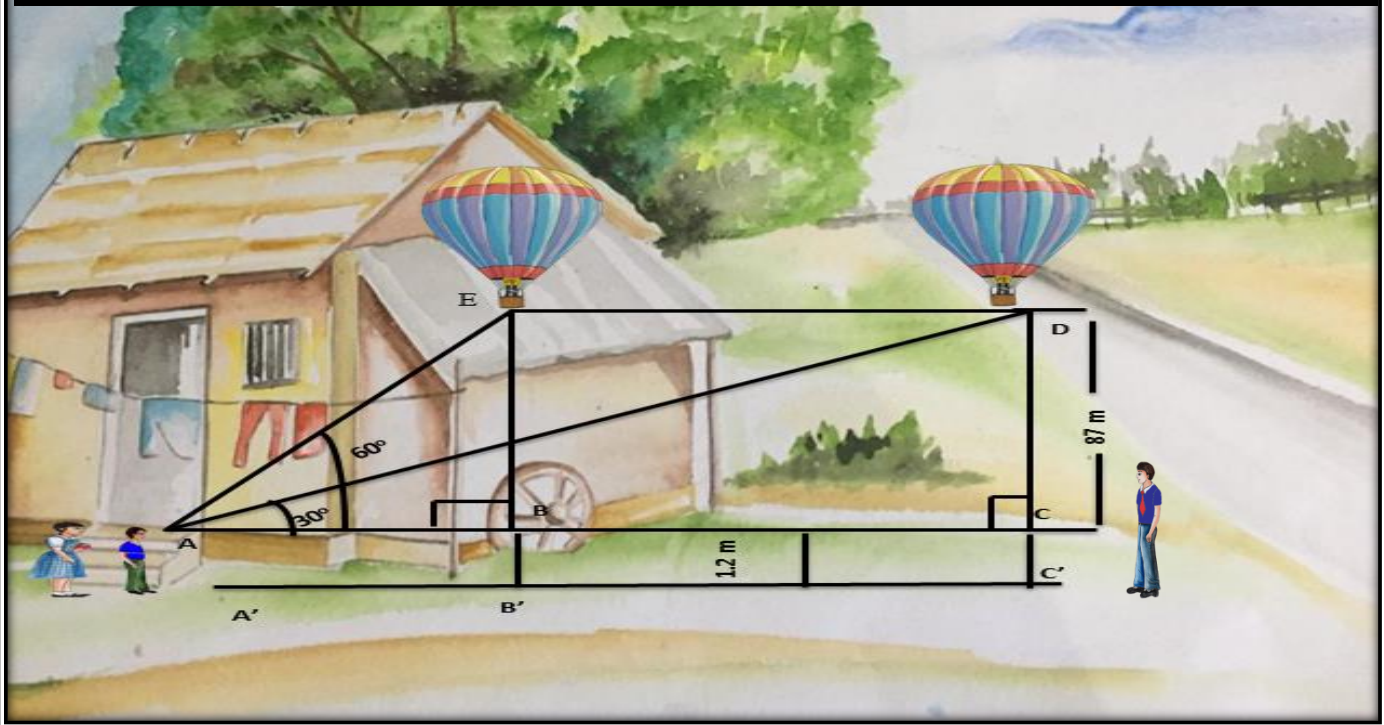
(FLASHBACK)... COSTIN ARYA, SINI AND KAUTILYA ONCE SPOTTED A HORIZONTALLY MOVING HOT AIR BALLOON AT A HEIGHT OF 88.2 M FROM THE GROUND. KAUTILYA'S HEIGHT IS 1.2 M, AND ANGLE OF ELEVATION FROM HIS EYE TO THE BALLOON IS 60° .



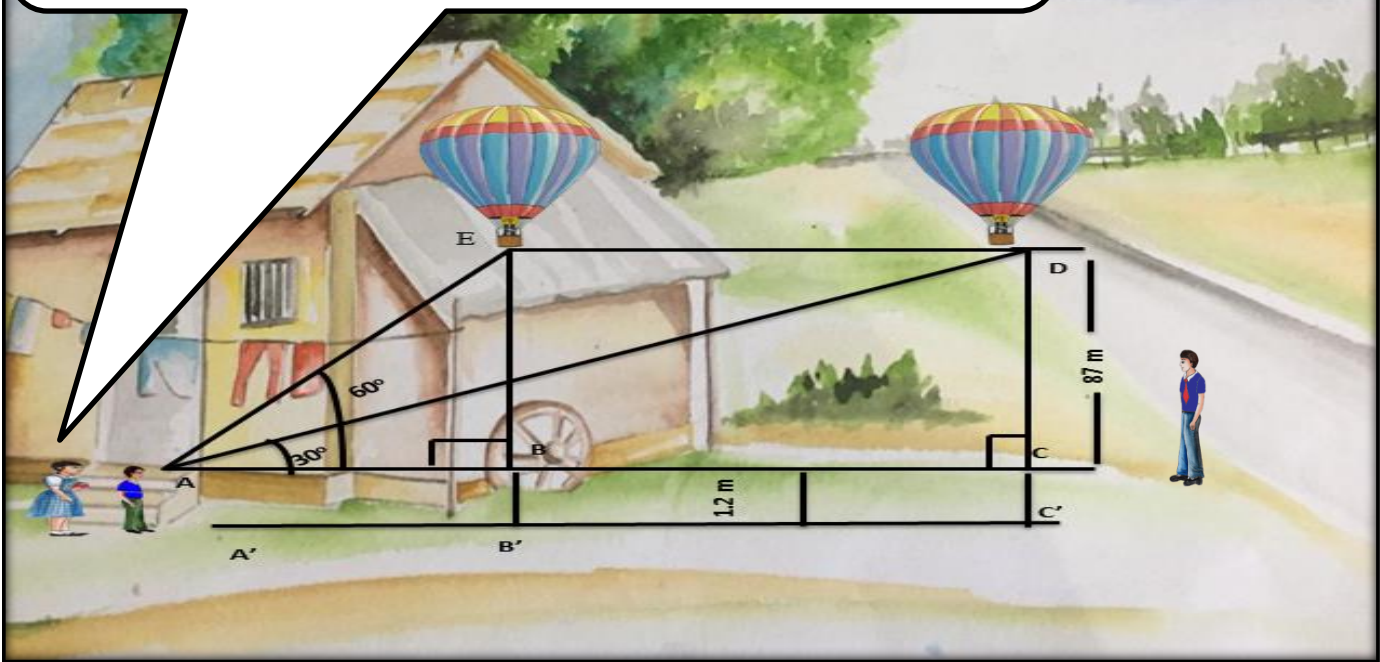
AFTER FEW SECONDS, THE ANGLE OF ELEVATION CHANGES TO 30° .



HE WAS CURIOUS TO KNOW ABOUT THE DISTANCE TRAVELLED BY THE BALLOON DURING THE CHANGE IN ANGLE OF ELEVATION.



Ok! That means the angle of elevation of the object decreases from 60° to 30° as the object moves away from the eye of the observer and it increases as the object comes closer to the eye of the observer.



AFTER RECALLING THE CONCEPT HE DOES THE CALCULATION ON PAPER

Q A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° , as he walks towards the building. Find the distance he walked towards the building.

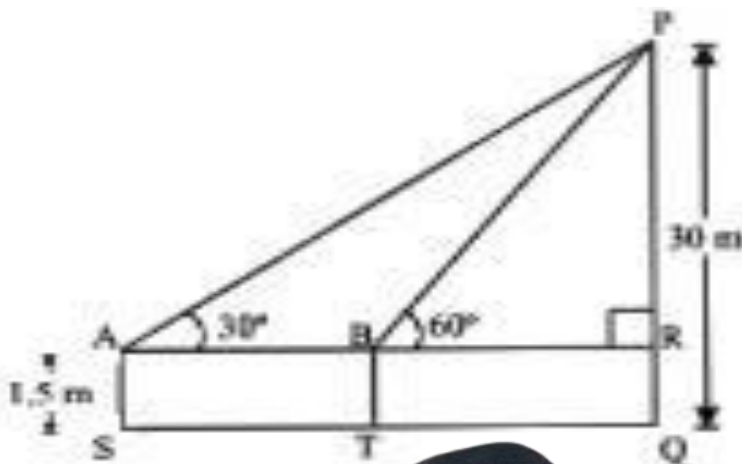
SOLUTION

STEP 1: Let the initial position of the boy be S. He walks towards building and reaches point T.

In the figure, PQ is the building of height 30m.

$$AS=BT=RQ=1.5 \text{ m}$$

$$PR=PQ- RQ = 30 \text{ m} -1.5 \text{ m}=28.5 \text{ m}$$



STEP 2:

$$\text{In } \triangle PAR, \\ \frac{PR}{AR} = \tan 30^\circ$$

STEP 3:

$$\frac{28.5}{AR} = \frac{1}{\sqrt{3}} \\ \mathbf{AR = 28.5\sqrt{3}}$$



STEP 4:

In $\triangle PRB$,
$$\frac{PR}{BR} = \tan 60^\circ$$

STEP 5:

$$\Rightarrow \frac{28.5}{BR} = \sqrt{3}$$

$$\Rightarrow BR = \frac{28.5}{\sqrt{3}} = 9.5\sqrt{3}$$

$$ST = AB = AR - BR = 28.5\sqrt{3} - 9.5\sqrt{3} = 19\sqrt{3}m$$

TRIGNOWIZARD



Please lock option C.

Option C is absolutely right! Costin Arya, you win Rs. 50,000.

TRIGNOWIZARD



Thanks a lot, Ms. Trigger.

Get ready for the question .



Here it is on your computer screen-

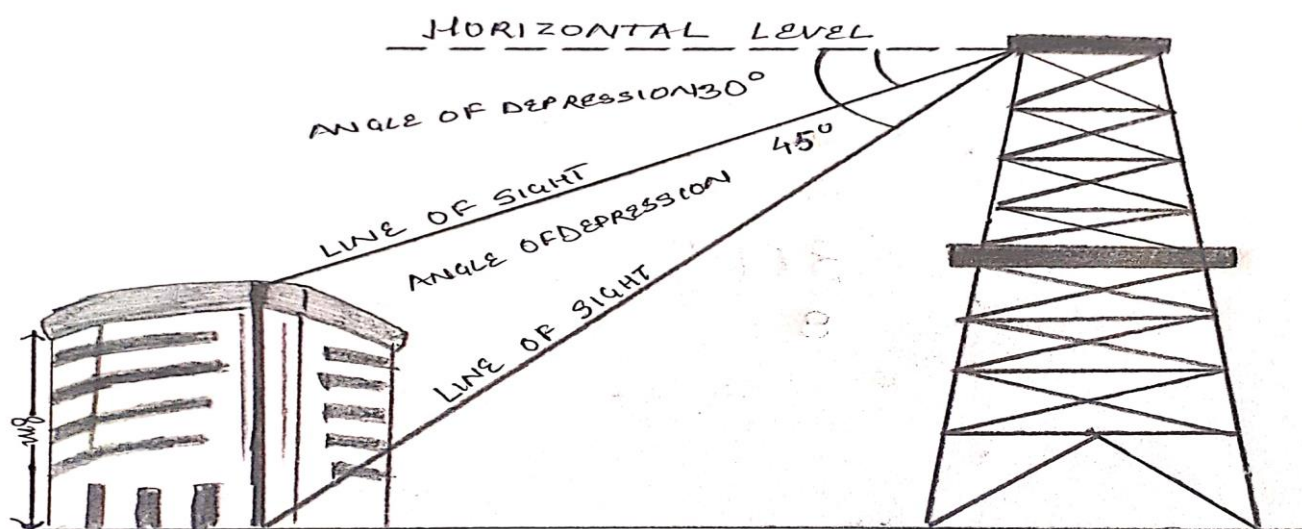
7. The angles of depression of the top and bottom of a 8 m high house from the top of the tower are 30° and 45° respectively. Find the height of the tower.

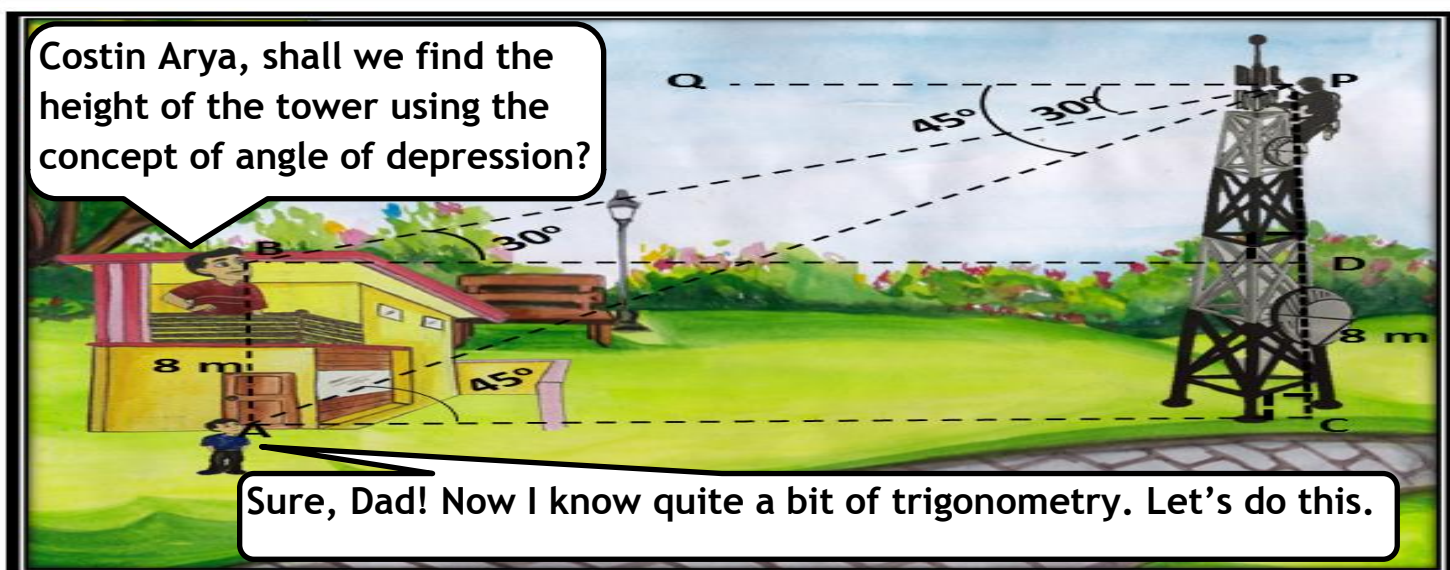
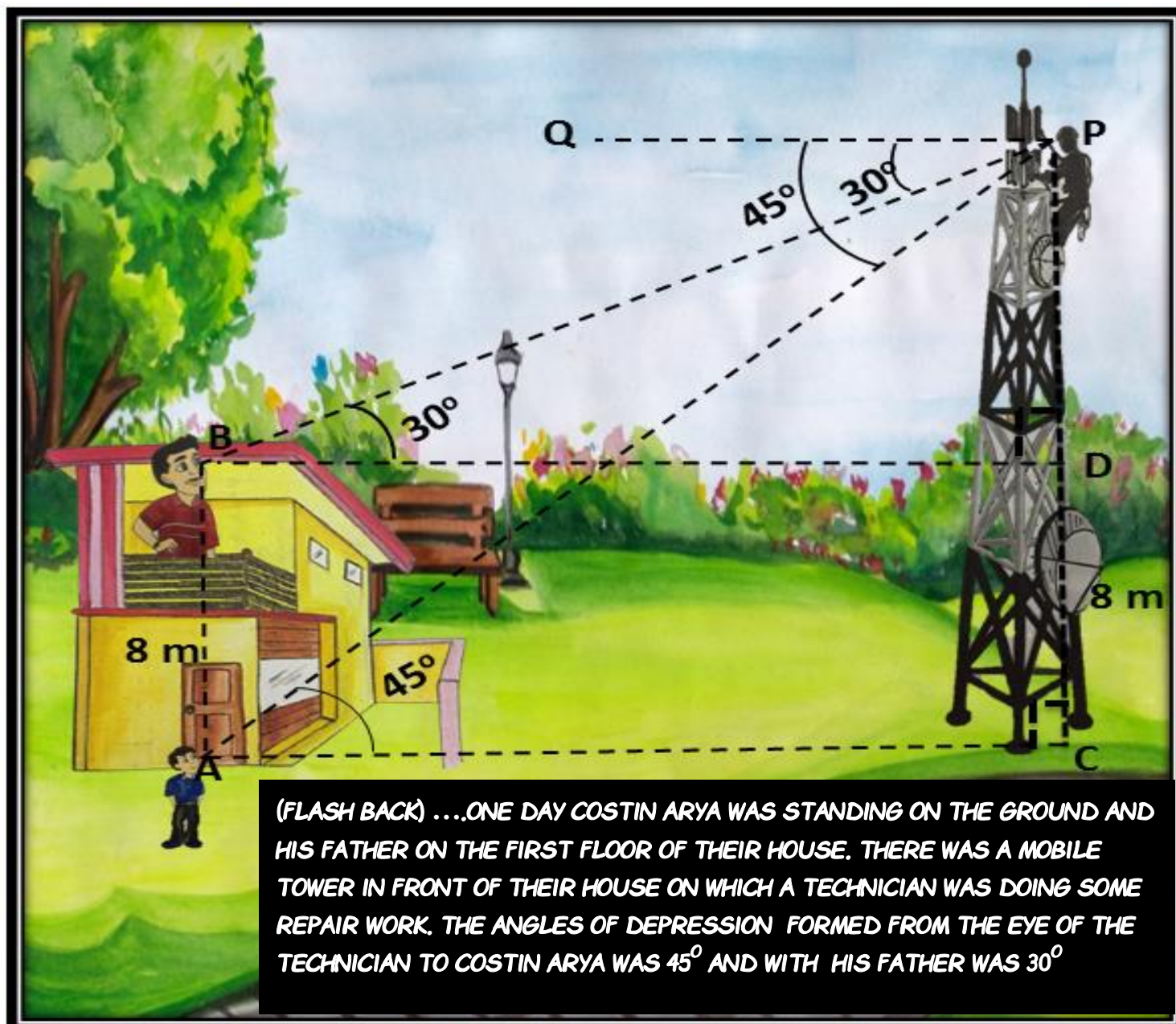
(A) $4(3 + \sqrt{3})$ m

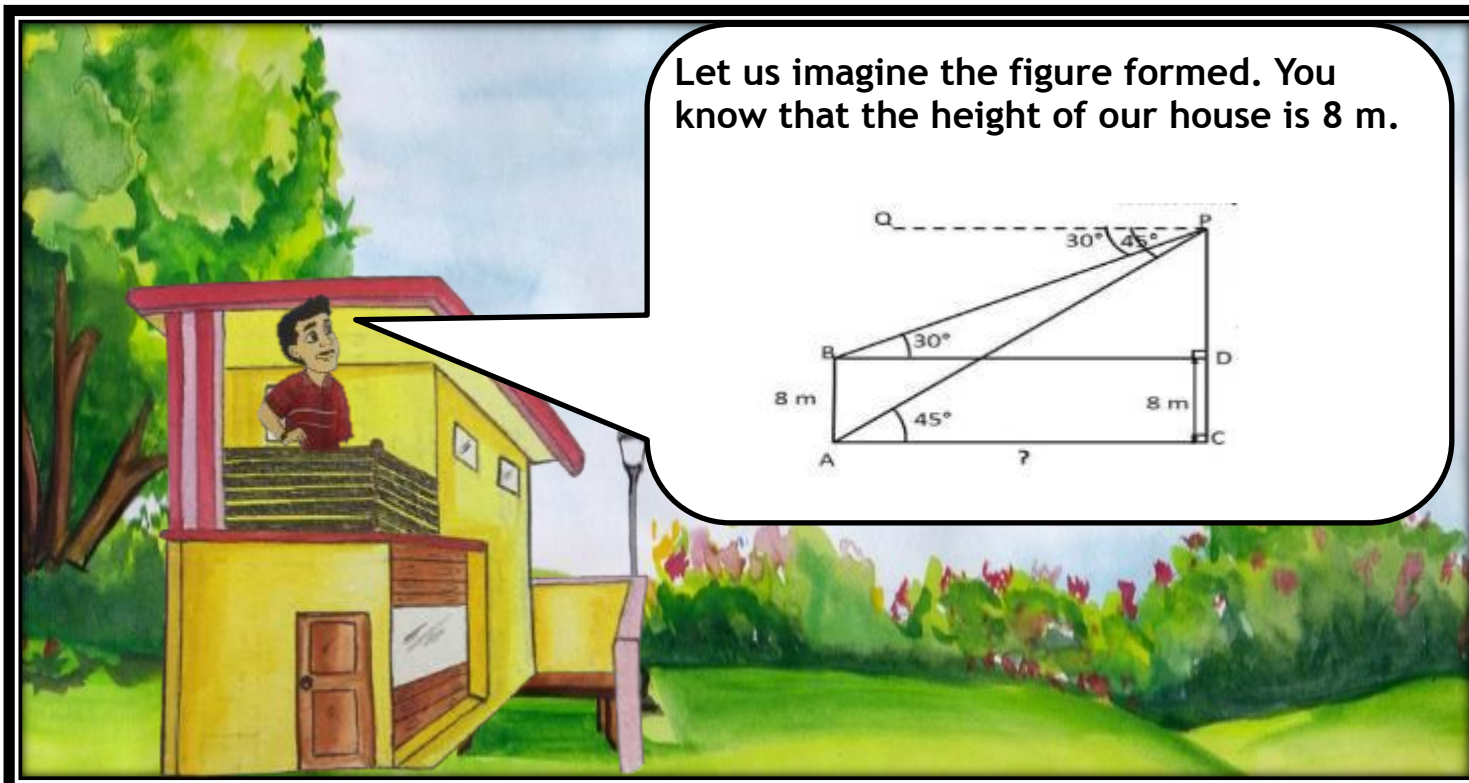
(B) $4(3 - \sqrt{3})$ m

(C) $4(1 + \sqrt{3})$ m

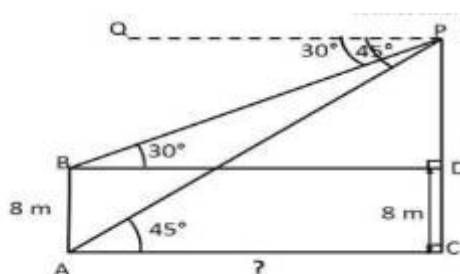
(D) $4(\sqrt{3} - 3)$ m







Let us imagine the figure formed. You know that the height of our house is 8 m.



Now, Dad in right $\triangle PBD$,
we have $\angle PBD = 30^\circ$ as.
 $PQ \parallel BD$.

$$\therefore \tan 30^\circ = \frac{PD}{BD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{PD}{BD} \Rightarrow BD = PD\sqrt{3}m$$

Now apply it in right $\triangle PAC$,

$$\tan 45^\circ = \frac{PC}{AC}$$

$$\Rightarrow PC = AC$$

$$PC = PD + DC$$

here,

$$DC = 8m$$

$$\therefore BD = PD + 8$$

$$\Rightarrow PD\sqrt{3} - PD = 8$$

$$\Rightarrow PD(\sqrt{3} - 1) = 8$$

$$\Rightarrow PD = \frac{8}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1} = \frac{8(\sqrt{3} + 1)}{2}$$

$$= 4(\sqrt{3} + 1)$$

Height of tower is

$$\{4(\sqrt{3} + 1) + 8\}m$$

$$= 4\{\sqrt{3} + 1 + 2\}$$

$$= 4(3 + \sqrt{3})m$$



I have practically solved such a problem before. Lock option A, please.



It is the correct answer. Congratulations, Costin Arya, you have successfully cleared the second level also.

TRIGNOWIZARD

Worksheet- 2

1. The angle formed by the line of sight with the horizontal level when the point is below the horizontal level is called:

- (A) Angle of elevation (B) No angle is formed
(C) Angle of depression (D) None of these

2. The line drawn from the eye of an observer to the point in the object viewed by the observer is said to be

- (A) Angle of elevation (B) Line of sight
(C) Angle of depression (D) Horizontal level

3. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 60° . The height of the tower standing straight is :

- (A) $15\sqrt{3}$ m (B) $10\sqrt{3}$ m (C) $12\sqrt{3}$ m (D) $20\sqrt{3}$ m

4. If a tower 6m high casts a shadow of $2\sqrt{3}$ m long on the ground, then the angle of elevation of sun is :

- (A) 60° (B) 45° (C) 30° (D) 90°

5. As we move closer to the object, the angle of elevation _____ -

- (A) Decreases (B) Increases
(C) Remains unchanged (D) None of these

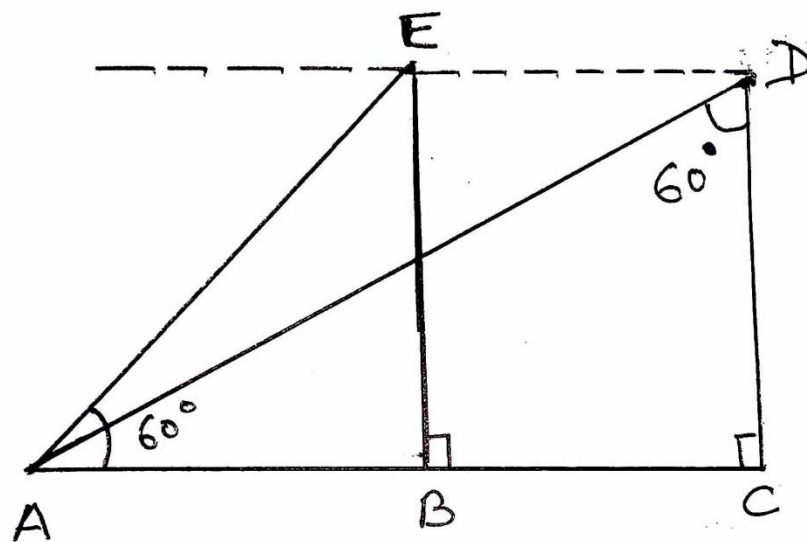
6. A plane is observed to be approaching the airport. It is at a distance of 12 km from the point of observation and makes an angle of elevation of 60° . The height above the ground of the plane is –

- (A) $6\sqrt{3}$ km (B) $4\sqrt{3}$ km (C) $3\sqrt{3}$ km (D) $2\sqrt{3}$ km

7. The shadow of a tower is equal to its height at 10:45 am. The angle of elevation of the top of the tower from the tip of the shadow is –

- (A) 30° (B) 60° (C) 45° (D) 90°

8. In the given figure , the angle of depressions from the observing position D and E of the object at A are



(A) $60^\circ, 60^\circ$

(B) $30^\circ, 30^\circ$

(C) $30^\circ, 60^\circ$

(D) $60^\circ, 30^\circ$

Answers

1. C
7. C

2. B
8. C

3. A

4. A

5. B

6. A

8. If $x = r\sin\theta\cos\phi$,
 $y = r\sin\theta\sin\phi$ and $z = r\cos\theta$ then
find the value of $x^2 + y^2 + z^2$

(A) 1

(B) $2r$ (C) $3r$ (D) r^2

Here's the eighth question.

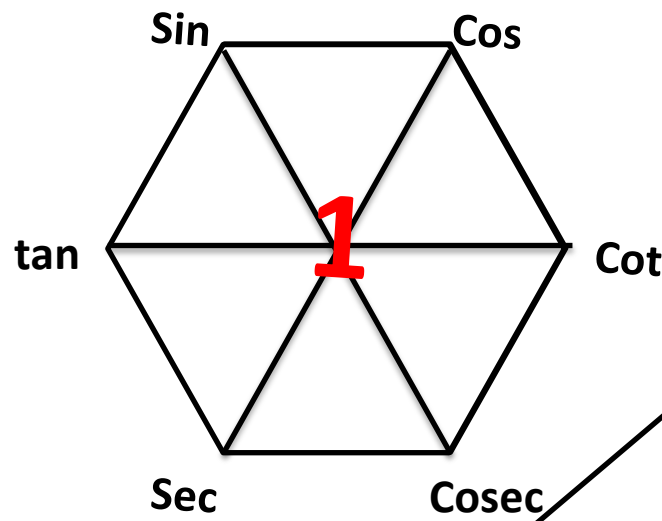


Ma'am, this question, based on trigonometric identities, is from my favourite part in trigonometry. My teacher taught us this concept using a very interesting method.



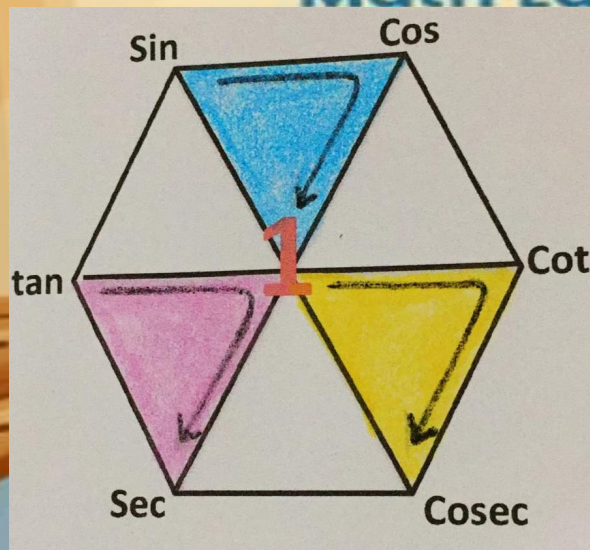
MS. ALKA WITH A HEXAGON KNOWN AS 'SUPER HEXAGON' WITH 3 DIAGONALS AND TRIGONOMETRIC FUNCTIONS WRITTEN IN A PARTICULAR ORDER AND 1 IN THE CENTRE OF THE HEXAGON

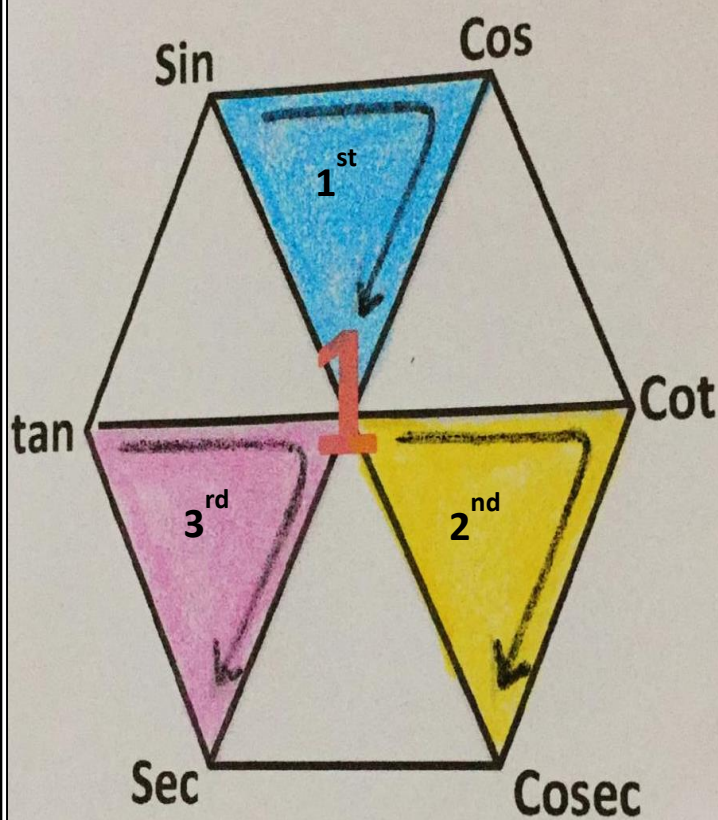
FLASHBACK



All T -ratios starting with 'C' on the right vertices

To get the trigonometric identities, focus on 3 of the shaded triangles.





$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \cot^2\theta = \operatorname{cosec}^2\theta$$

$$\tan^2\theta + 1 = \sec^2\theta$$

Let's move clockwise, starting from the top left position. In the first triangle, see sin, cos and 1, this gives us the first important trigonometric identity i.e. $\sin^2\theta + \cos^2\theta = 1$

Similarly, in the second triangle moving clockwise with 1, cot and cosec we get the second trigonometric identity which is $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

And in the third triangle, moving clockwise with tan, 1 and sec we get the third trigonometric identity i.e. $\tan^2\theta + 1 = \sec^2\theta$



On applying transposition in these three basic identities, we can get (iv) $\sin^2\theta = 1 - \cos^2\theta$

(v) $\cos^2\theta = 1 - \sin^2\theta$

(vi) $1 = \operatorname{cosec}^2\theta - \cot^2\theta$

(vii) $\cot^2\theta = \operatorname{cosec}^2\theta - 1$

$\tan^2\theta = \sec^2\theta - 1$

$1 = \sec^2\theta - \tan^2\theta$

COSTIN ARYA SOLVES THE QUESTION EASILY AND ANSWERS

Q. If $x = r\sin\theta\cos\phi$, $y = r\sin\theta\sin\phi$ and $z = r\cos\theta$ then find the value of $x^2 + y^2 + z^2$

SOLUTION



$$\begin{aligned}x^2 + y^2 + z^2 &= (r\sin\theta\cos\phi)^2 + (r\sin\theta\sin\phi)^2 + (r\cos\theta)^2 \\&= r^2\sin^2\theta\cos^2\phi + r^2\sin^2\theta\sin^2\phi + r^2\cos^2\theta \\&= r^2\sin^2\theta(\cos^2\phi + \sin^2\phi) + r^2\cos^2\theta \\&= r^2\sin^2\theta + r^2\cos^2\theta \quad (\text{applying } \cos^2\phi + \sin^2\phi = 1) \\&= r^2(\sin^2\theta + \cos^2\theta) \\&= r^2\end{aligned}$$

The answer is option D.

Lock D, Mr. Computer.

Another right answer, Costin Arya. Well done! You've won 2 lakh rupees.

Thank you, Ma'am. I am grateful to my teacher who took the pains to explain these tricky concepts of trigonometry.

CHAPTER-9 TRIGONOMETRIC RATIOS OF COMPLEMENTARY ANGLES

Here is the next question.

9. If $2\theta + 45^\circ$ and $30^\circ - \theta$ are acute angles, find the degree measure of θ satisfying $\sin(2\theta + 45^\circ) = \cos(30^\circ - \theta)$.

(A) 20°

(B) 15°

(C) 30°

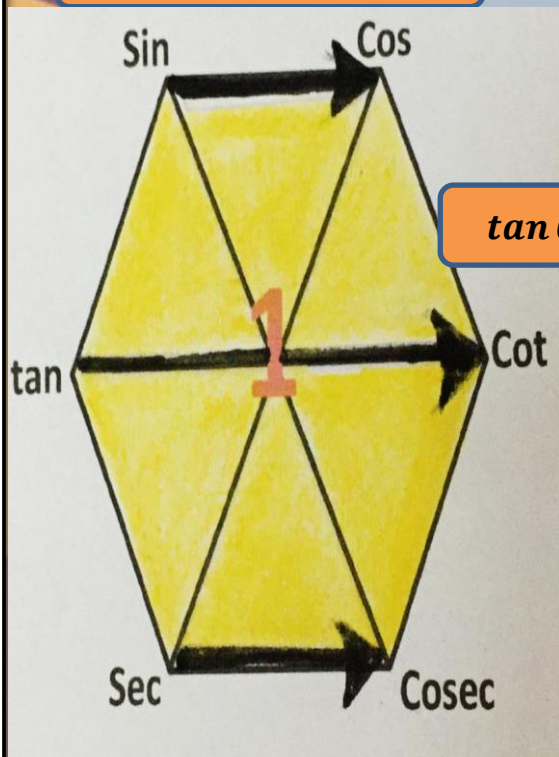
(D) 60°

FLASHBACK

Students, do you remember complementary angles?

Yes, Ma'am! Two angles are said to be complementary if their sum is 90° .

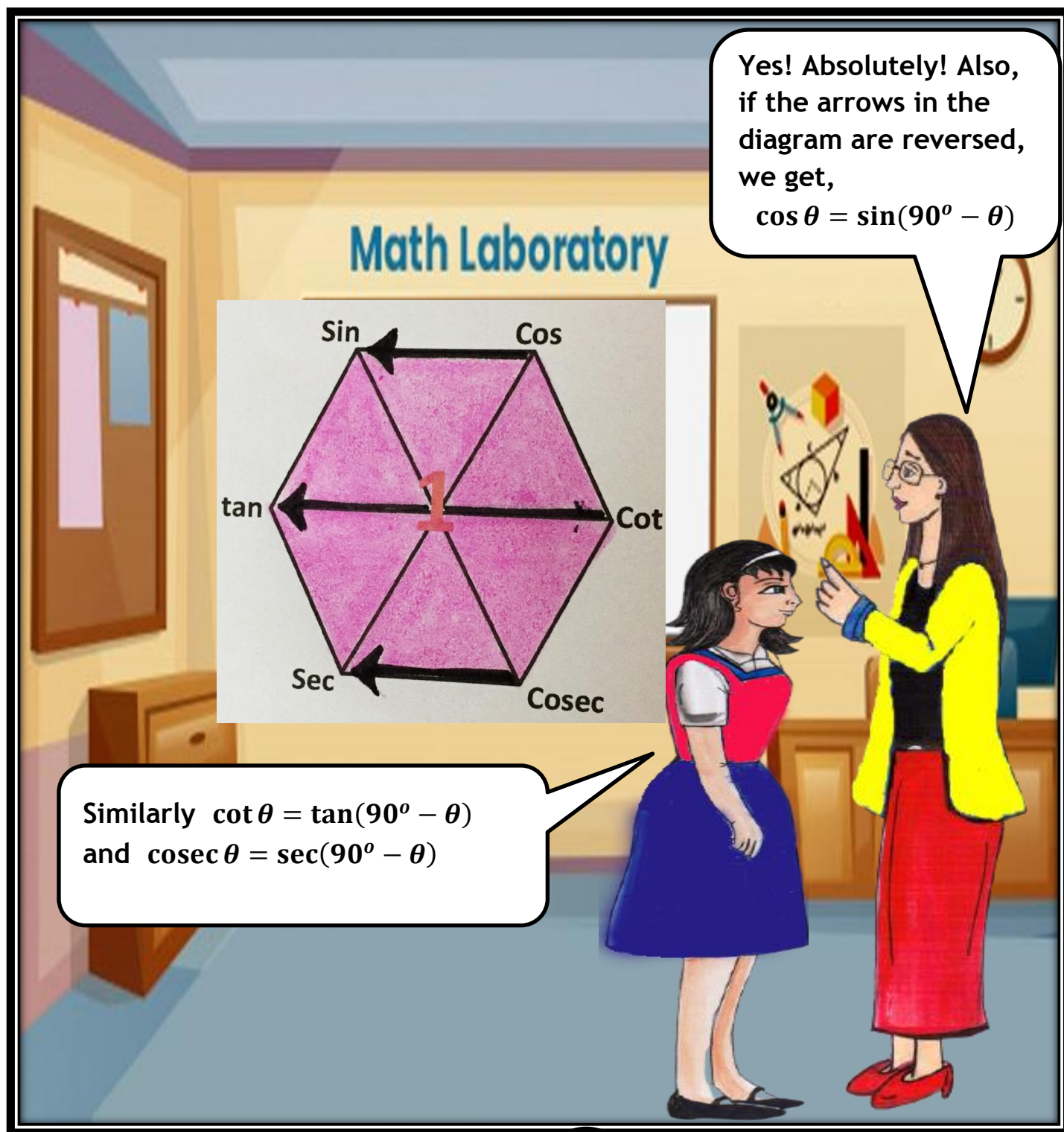
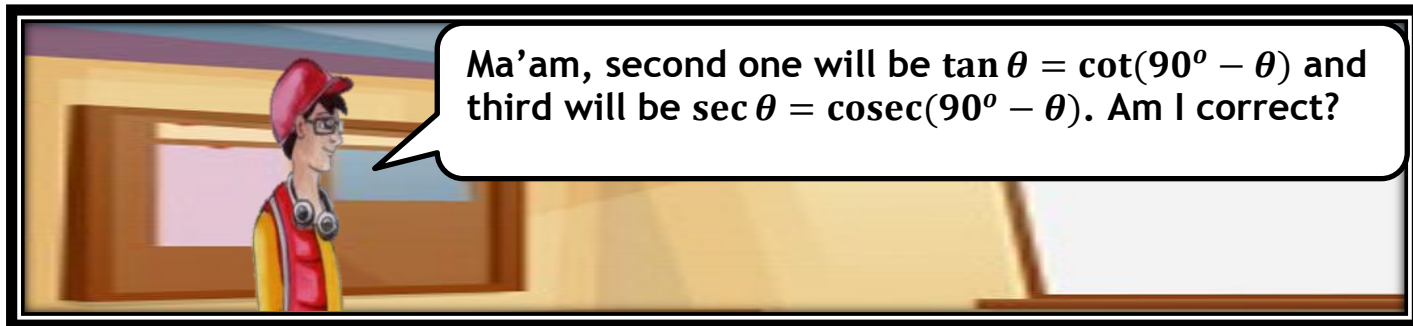
$$\sin \theta = \cos(90^\circ - \theta)$$



$$\tan \theta = \cot(90^\circ - \theta)$$

$$\sec \theta = \csc(90^\circ - \theta)$$

Yes, Mahesh! Trigonometric functions have a special relation with complementary angles. Look at the arrows drawn in the hexagon: they represent $\sin \theta = \cos(90^\circ - \theta)$ i.e. *sine* of an angle is equal to *cosine* of its complementary angle. Similarly, we can calculate others.



COSTIN ARYA APPLIES THE ABOVE CONCEPT AND SOLVES THE QUESTION

Q. If $2\theta + 45^\circ$ and $30^\circ - \theta$ are acute angles, find the degree measure of θ satisfying $\sin(2\theta + 45^\circ) = \cos(30^\circ - \theta)$

SOLUTION

$$\begin{aligned}\sin(2\theta + 45^\circ) &= \sin\{90^\circ - (30^\circ - \theta)\} \\ \Rightarrow \sin(2\theta + 45^\circ) &= \sin\{60^\circ + \theta\} \\ \Rightarrow 2\theta + 45^\circ &= 60^\circ + \theta \\ \Rightarrow \theta &= 15^\circ\end{aligned}$$

The answer is option B.

Costin Arya, you've done it again.
You win Rs. 5,00,000.

Thank you, Ma'am.

You've been playing amazingly well. Are you ready for the final question?

Yes, Ma'am,
I'm ready!

CHAPTER-10 APPLICATION OF TRIGONOMETRY (IV)

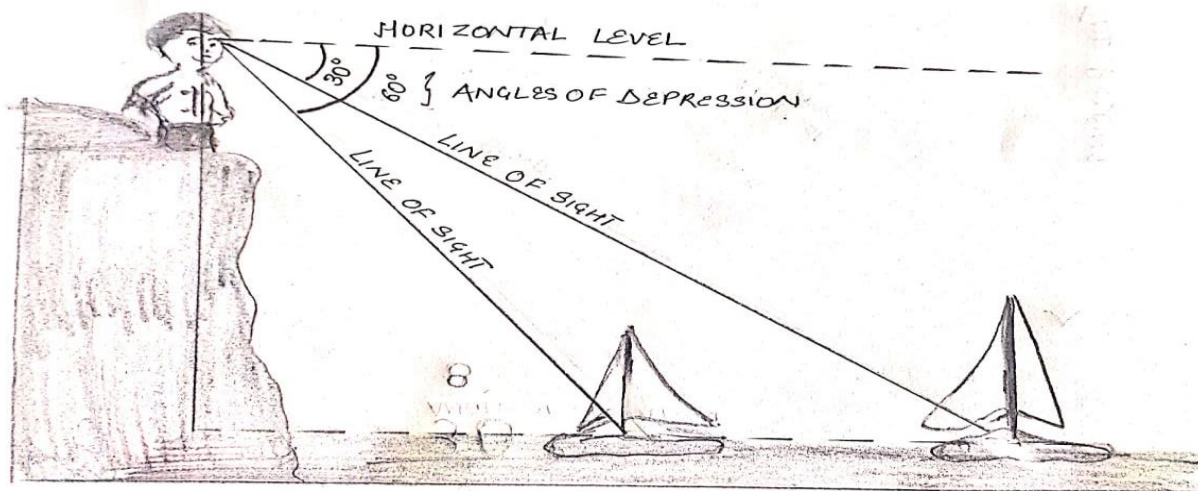
10. A man on a cliff observes a boat at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with a uniform speed. 360 seconds later, the angle of depression of the boat is found to be 60° . Find the total time taken by the boat to reach the shore.

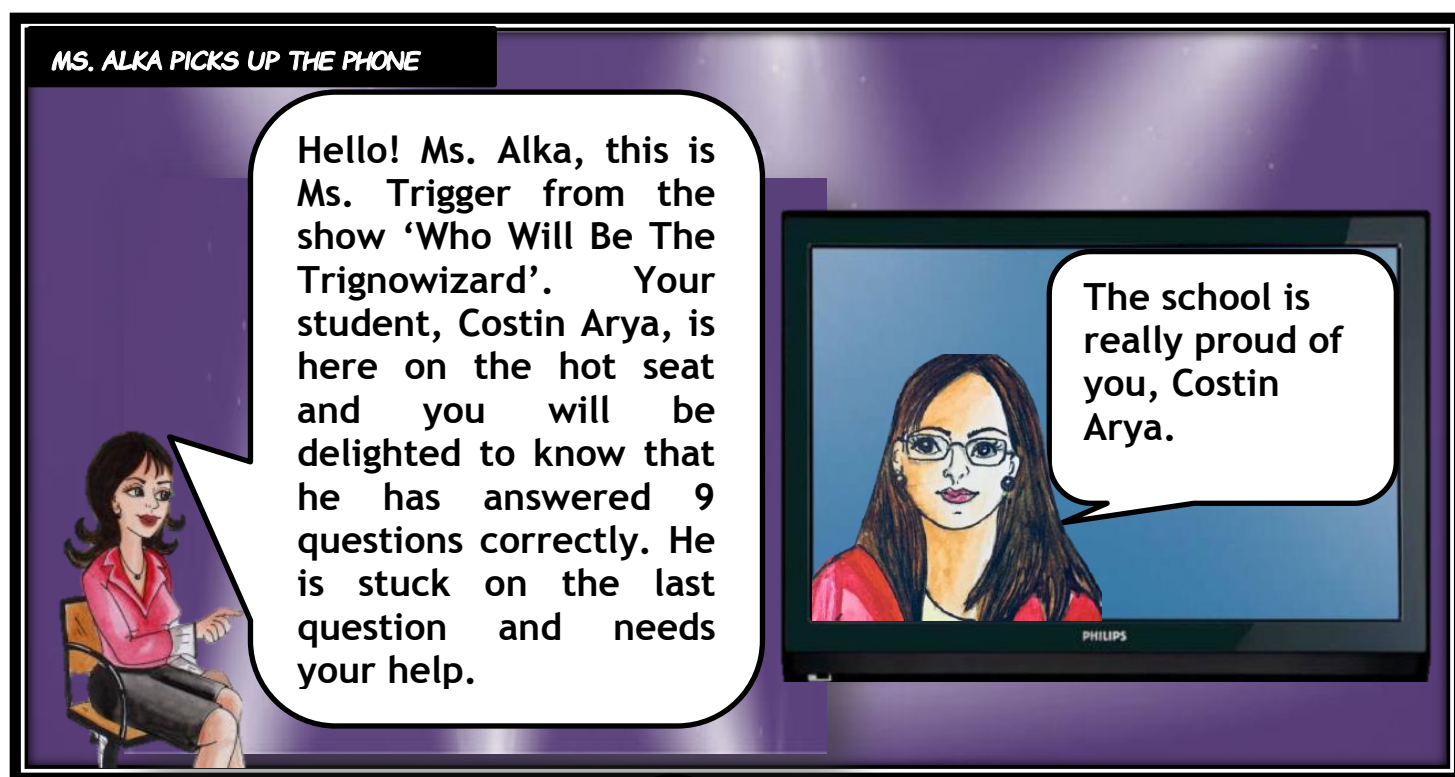
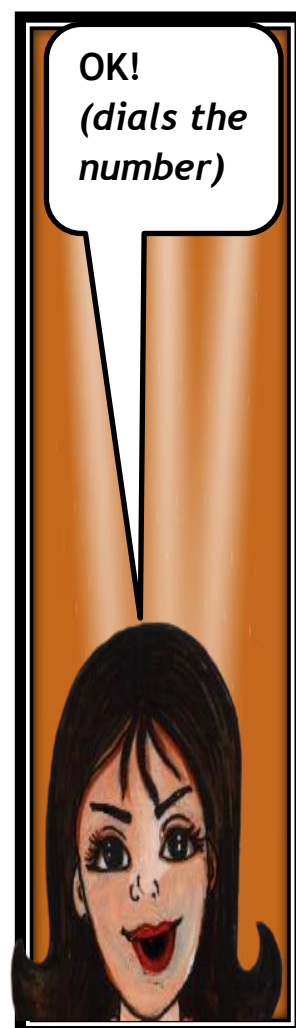
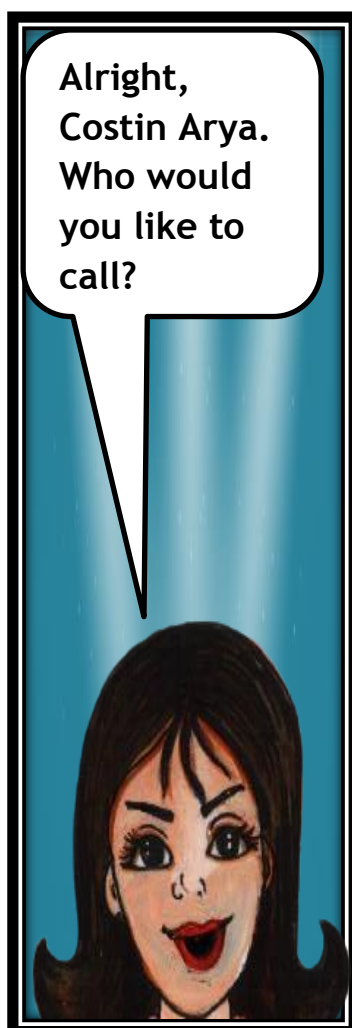
(A) 9 sec

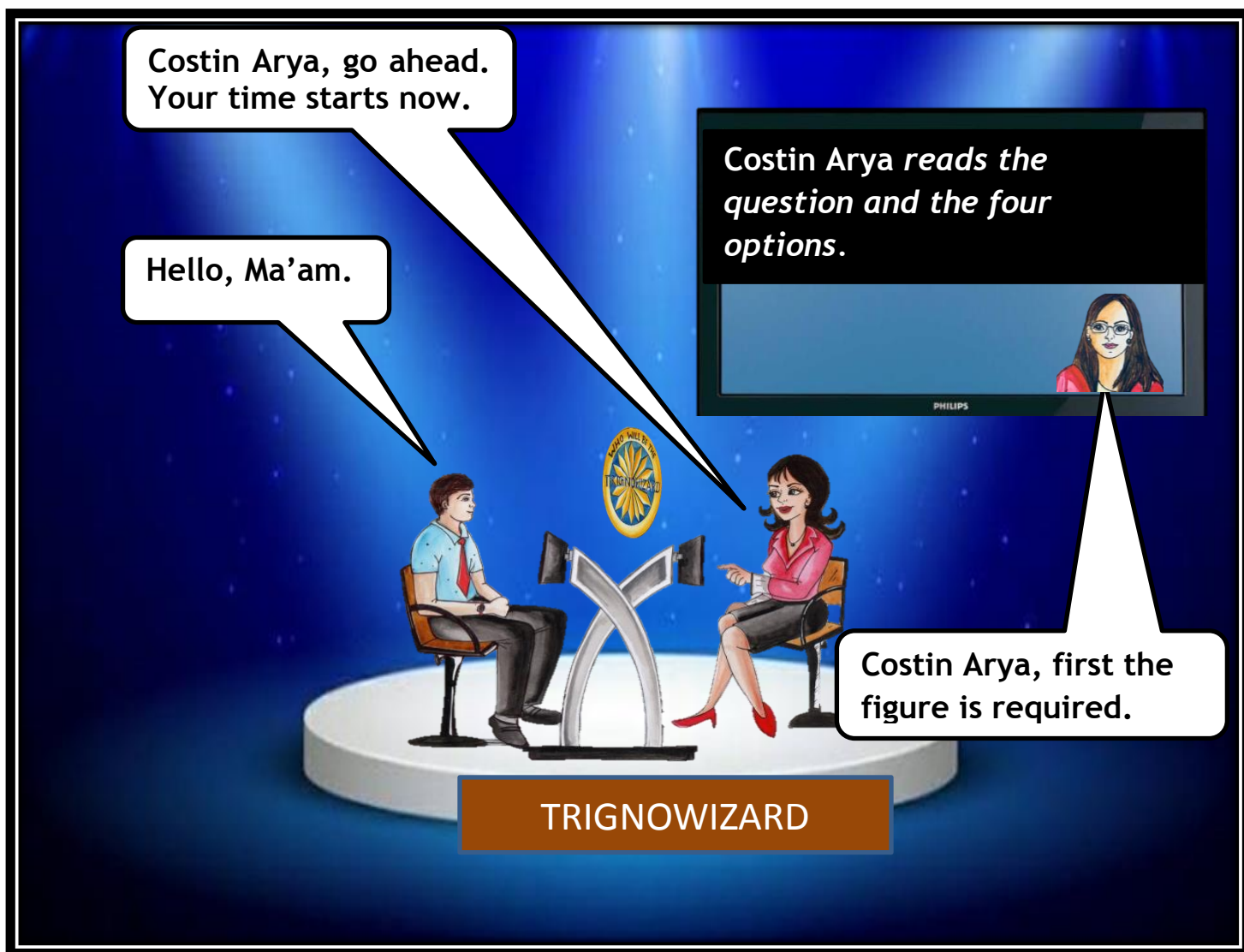
(B) 240 sec

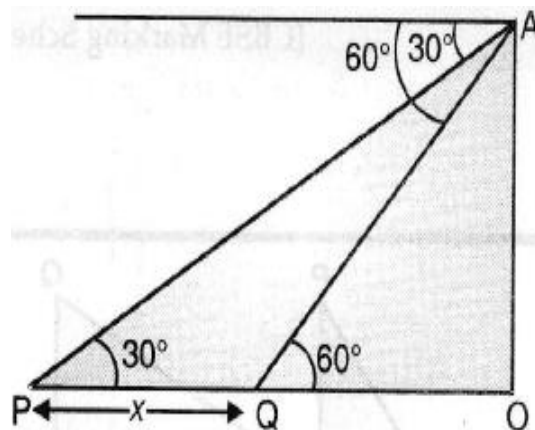
(C) 9 min.

(D) 6 min.









Let OA be the cliff and P is the initial position of the boat where the angle of depression is 30° . After 360 seconds i.e. 6 minutes the boat reaches Q such that the angle of depression changes to 60° . Let the distance travelled by the boat be x mts. And also let us assume the speed of the boat to be v meters per second.

PHILIPS

Ma'am, only few seconds are left. Please explain the method. I'll be able to solve the question.



Oh no! You ran out of time, Costin Arya. Did you get any help from Ms. Alka?

Now I apply $\tan 30^\circ$ and $\tan 60^\circ$ in $\triangle POA$ and $\triangle QOA$ respectively and to find the time apply the concepts of speed ,----



CALL DISCONNECTS

PHILIPS

Yes, a little.
But I'm still not sure of the answer.



You still have audience poll left.



Yes, I would like to take an audience poll.

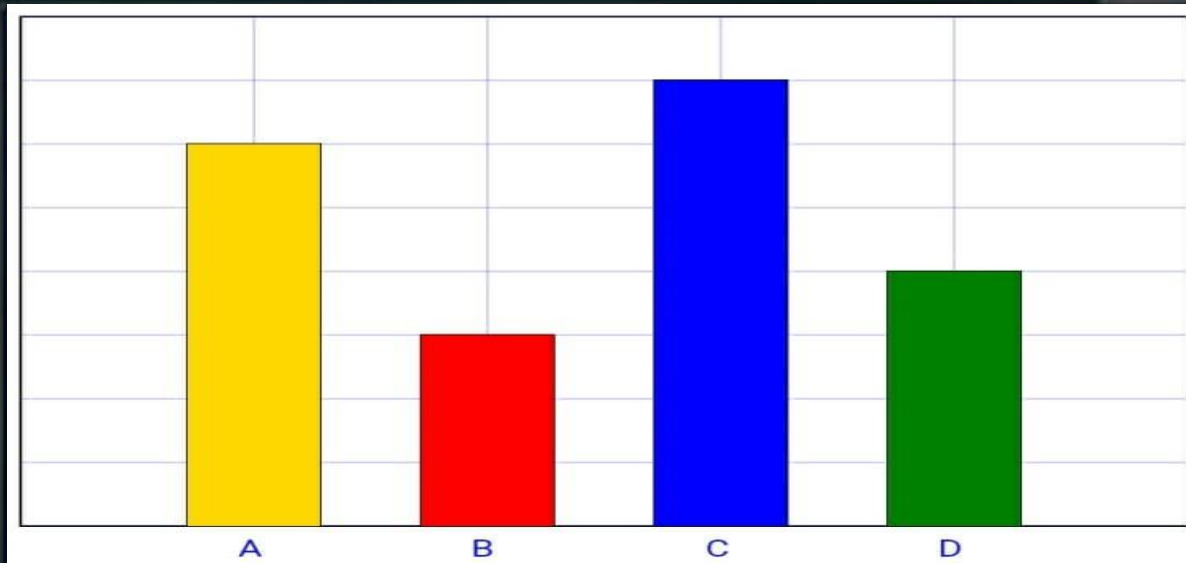
Audience, pick up your voting meters. You have 15 seconds to press the button of the correct option. Your time starts now.



AFTER 15 SECONDS

Let us see the graph to know which option has got the maximum votes.

00:15



PHILIPS

The graph shows option C as the correct answer.

I think I'll go with the audience. Let's hope 'majority wins' proves right today!



Are you sure? If you are confused you can quit and take home the amount you have won up till now.

Ma'am, my mother always says, "When the going gets tough, the tough get going." Victory waits for the one who is ready to take the risk. So, Ma'am, I have decided to go ahead and face whatever is in my destiny. Please lock option 'C'.



*THERE IS A DEEP SILENCE ON THE SET.
EVERYONE WAITS, ONLY THE SOUND OF THE
TICKING OF THE CLOCK CAN BE HEARD..*



Fine, Costin Arya. As you say.
Let's lock option 'C'.

Costin Arya, I had warned you before going ahead. But you have proved your mother's words right. You are the first contestant to win Rs. 10 lakh. Congratulations!



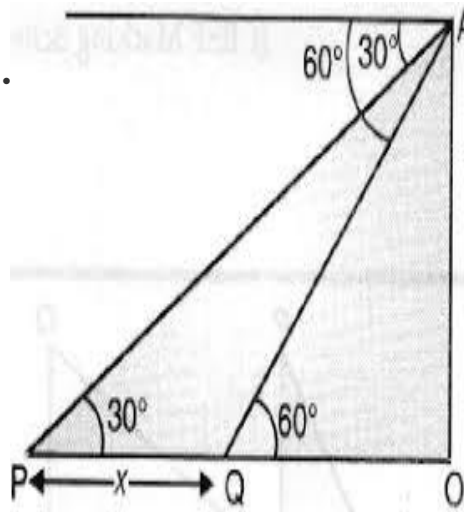
Thanks a lot and a very big
thanks to the audience as well.

But I would like you to know the solution of this question. Here it is.

Let A and D be the positions of the boat at the two instants.

Let the speed of the boat be v m/min.

Therefore, $AD = 6v$ metres



Let the boat takes t minutes to reach from D to B.

Thus, $BD = vt$ metres

In $\triangle DBC$,

$$\frac{BC}{DB} = \tan 60^\circ$$

$$\Rightarrow \frac{h}{vt} = \sqrt{3}$$

$$\Rightarrow h = \sqrt{3}vt \dots (i)$$

In $\triangle ABC$,

$$\frac{BC}{AB} = \tan 30^\circ$$

$$\Rightarrow \frac{h}{6v+vt} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow h = \frac{6v+vt}{\sqrt{3}} \dots (ii)$$

From (i) and (ii),

$$\sqrt{3}vt = \frac{6v+vt}{\sqrt{3}}$$

$$\Rightarrow 3vt = 6v + vt$$

$$\Rightarrow 2vt = 6v$$

$$\Rightarrow t = 3$$

Thus, the total time taken to reach the shore is $3+6 = 9$ minutes.



The application of this concept in trigonometry has always been difficult for me. I owe it all my teachers, parents and above all God Almighty. It is because of them that I have achieved this great success.

Yes, definitely!
Marvellous
performance,
Costin Arya.
Truly
spectacular!



Worksheet 3

1. $1 - \cos^2 A$ is equal to –
(A) $\sin^2 A$ (B) $\tan^2 A$ (C) $1 - \sin^2 A$ (D) $\sec^2 A$
2. $\sin(90^\circ - A)$ and $\cos A$ are:
(A) Different (B) Same (C) Not related (D) None
3. $\operatorname{cosec}^2 \theta - \cot^2 \theta$ is equal to :
(A) -1 (B) 0 (C) $\tan^2 \theta$ (D) 1
4. Which of the following is not an identity?
(A) $\sin^2 A + \cos^2 A = 1$ (B) $\sin A = \tan A \cdot \cos A$ (C) $1 + \cot^2 A = \operatorname{cosec}^2 A$
(D) $1 - \sec^2 A = \tan^2 A$
5. $\frac{\sec^2 \theta - \tan^2 \theta}{\sin \theta} =$
(A) $\sin \theta$ (B) $\operatorname{cosec} \theta$ (C) $\sec \theta$ (D) $\cos \theta$
6. The value of $\cos^2 17^\circ - \sin^2 73^\circ$ is –
(A) 0 (B) 1 (C) -1 (D) 3
7. The value of $\cos \theta \cos(90^\circ - \theta) - \sin \theta \sin(90^\circ - \theta)$ is
(A) 1 (B) 0 (C) -1 (D) 2
8. The value of $\frac{\sin 50^\circ}{\cos 40^\circ} + \frac{\operatorname{cosec} 40^\circ}{\sec 50^\circ} - 4 \cos 50^\circ \operatorname{cosec} 40^\circ$
(A) 2 (B) 0 (C) 4 (D) -2
9. Using the ratio of complementary angles, the value of $\frac{\sin 41^\circ}{\cos 49^\circ}$ is
(A) 2 (B) 3 (C) 1 (D) 0

Answers

- | | | | | | |
|------|------|------|------|------|------|
| 1. A | 2. B | 3. D | 4. D | 5. B | 6. A |
| 7. B | 8. D | 9. C | | | |

Following are some errors that students must avoid:

1. $\sin 45^0 + \sin 30^0 \neq \sin (45^0 + 30^0)$

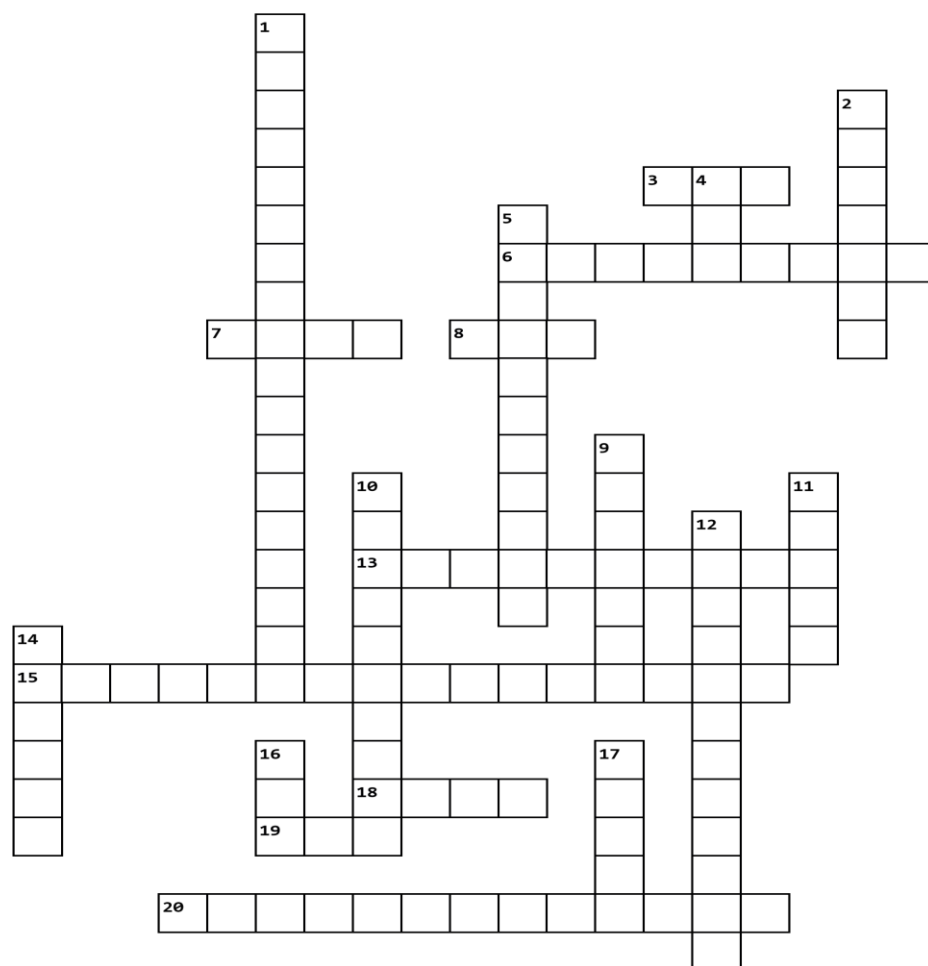
2. $2\sin 45^0 \neq \sin 90^0$

3. $\frac{1}{\cos \emptyset} \neq \cos^{-1} \emptyset$

4. If $\tan 45^0 = 1$, then $45^0 \neq \frac{1}{\tan}$

5. $\tan \emptyset = \frac{p}{b}$, then $\emptyset \neq \frac{p}{\tan b}$

Crossword Puzzle



Across

3. ratio of base to perpendicular
6. the value of $\cos A$ decreases as A _____
7. sine of 0 degree
8. reciprocal of trigonometric ratio of $\cos$
13. the _____ theorem can be used to find the value of a missing side length in a right triangle
15. the angle between the line of sight and the horizontal level when an observer looks upwards.
18. ratio of perpendicular to hypotenuse
19. tangent of 45 degree
20. co-functions of _____ angles are always equal

Down

1. a ratio of the measure of two sides of a right triangle is _____
2. the unit for measuring the angles
4. sin squared plus cos squared
5. a line from an observer's eye to a distant point
9. $\sin / \cos$
10. the longest side of a right triangle
11. abbreviated form of the word cosecant
12. the study of triangles ;their angles,lengths and more is known as _____
14. the six trigonometric _____ are $\sin$, $\cos$, $\tan$, $\cot$, $\sec$ and $\csc$
16. secant of 60 degree
17. triangle with a 90 degree angle is called a _____ angled triangle

Crossword Puzzle Answers

<u>ACROSS</u>	<u>Down</u>
3. cot 6. increases 7. zero 8. sec 13. Pythagoras 15. angle of elevation 18. sine 19. one 20. complementary	1. Trigonometric ratio 2. degrees 4. one 5. line of sight 9. tangent 10. hypotenuse 11. cosec 12. trigonometry 14. ratios 16. two 17. right

Glossary

- **Trigonometry**: (Greek word- trigōnon, "triangle" and metron, "measure") is a branch of mathematics that studies relationships between side lengths and angles of triangles.
- **Trigonometric Ratios**: The *ratios* of sides of a right-angled triangle with respect to any of its acute angles are known as the *trigonometric ratios* of that particular angle.
- There are six trigonometric ratios are sine (sin), cosine (cos), tangent (tan), cotangent (cot), secant (sec), and cosecant (csc).
- **Line of sight**: Line of sight is a straight line from our eye to the object.
- **Horizontal line**: The straight line that does not make any intercept on the X-axis and it can have an intercept on Y-axis is called horizontal line. This means that the line that does not touch any point on the X-axis.
- **Angle of elevation**: The angle formed by the line of sight and the horizontal plane for an object above the horizontal.
- **Angle of depression**: The angle formed by the line of sight and the horizontal plane for an object below the horizontal.
- **Inclinometer**: An inclinometer or clinometer is an instrument used for measuring angles of elevation, or depression especially from horizontal level. It is also known as a tilt indicator.

Bibliography

1. Title of the publication : **Trigonometry**

(Based on Mathematics text book for class X by NCERT)

2. You Tube links used : <https://youtu.be/yzyNVzByew>

<https://youtu.be/TyrM8G1MqiI>

3. Applications used : **crosswordlabs.com**

(for creating crossword)

www.visme.co>[bar-graph-maker](#)

(for making bar graph)

MS-Word, MS -Paint & Photoshop

PRINCIPAL'S DESK

Mathematics is a head-breaking head-ache for some students. Many students score very poor grades in this subject. So, the teachers decided to try a different pedagogy to teach this tough subject to students so that they understand the concepts easily in an unforgettable way.

Trigonometry, an important topic in Class X mathematics, has been made extremely easy through this graphic novel called 'TRIGNOWIZARD' envisaged and executed by a dedicated team of our Maths, Art and Drawing and Computer teachers who blended effectively all their talents and creativity to bring out this beautiful work called a 'THE TRIGNOWIZARD' a graphic novel which makes all the concepts of Trigonometry absolutely clear to students through easy practical steps of daily life events.

I appreciate the creative efforts of the teachers headed by Ms. Priyanka Jain, the chief Co-ordinator of the project, in this Covid-19 lockdown season. They have worked as a team complimenting each other to produce this masterpiece TRIGNOWIZARD working on a storyline of Master Costin Arya, the Trignowizard. The flashback experiences of Master Costin Arya brings the lessons fresh to his mind and he is able to answer even the toughest questions on Trigonometry. The storyline leading to the Jackpot is filled with suspense and excitement. The suspense element of the story is maintained throughout.

I appreciate the efforts of the graphic novel mentor Mr. Sandeep Sethi who guided the teachers in this venture and his persistent perseverance finally brought fruit and now we have a beautiful creation called TRIGNOWIZARD. My hearty Congratulations and best wishes to the entire team of teachers for this great initiative.

Fr. Thomas Maniparambil

Principal

ST. ANSELM'S PINK CITY SCHOOL

Summary

This story is about a fifteen year old boy, Costin Arya who is a contestant on a Mathematics game show. He is asked ten questions which are based on the concepts of trigonometry and their application in real life. His interest in the subject peaked because of his math teacher Ms. Alka who explained tricky concepts to the students using interesting methodologies. He answers the questions recalling the concepts he learnt in school but finds himself stuck at the final question. Will he be able to win the contest?



St. Anselm's Pink City School, Jaipur

Affiliated to C.B.S.E.