PRAGATHI...THE SCHOOL

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GRADE X	***Mathematics***	***Date : 08/12/2022***
Time Allowed: 1 Hrs	UNIT TEST	***Max Marks: 30***

General Instructions :

1. This Question paper contains - **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 4 **MCQ's and 01** Assertion-Reason based questions of 1 mark each.
3. **Section B** has 1 **Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C** has 2 **Short Answer (SA)-type** questions of 3 marks each.
5. **Section D** has 3 **source based/case based/passage based/integrated units of assessment** (4 marks each) with sub parts.

SECTION A

(Multiple Choice Questions) Each question carries 1 mark

1. If x tan 60°cos 60°= sin60°cot 60°, then x =

   (a) cos30° (b) tan30° (c) sin30° (d) cot30

2. If sinθ + cosθ = √2, then tanθ + cot θ

   (a) 1 (b) 2 (c) 3 (d) 4

3. If ΔABC is right angled at C, then the value of cos (A+B) is

   (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

4. $\sqrt{3}\cos^2 A + \sqrt{3}\sin^2 A =$

   a) 1 b) $\frac{1}{\sqrt{3}}$ c) $\sqrt{3}$ d) 0

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of (A)
(b) Both A and R are true but R is not the correct explanation of (A)
(c) A is true but R is false. (d) A is false but R is true.

5. **Assertion (A):** The value of $\sin 60^0 \cos 30^0 + \sin 30^0 \cos 60^0$ is 1
   Reason (R): $\sin 90^0=1$ and $\cos 90^0=0$

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

6. If sin(A+B) =1 and cos(A-B)= √3/2, 0°< A+B ≤ 90° and A> B, then find the measures of angles A and B.

OR

Find an acute angle θ when $\cos\theta - \sin\theta = 1-\sqrt{3}$ & $\cos\theta + \sin\theta = 1+\sqrt{3}$

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

7. Prove that $\dfrac{\tan^3\theta}{1+\tan^2\theta}+\dfrac{\cot^3\theta}{1+\cot^2\theta}=\dfrac{1-2\sin^2\theta\cos^2\theta}{\sin\theta\cos\theta}$

OR

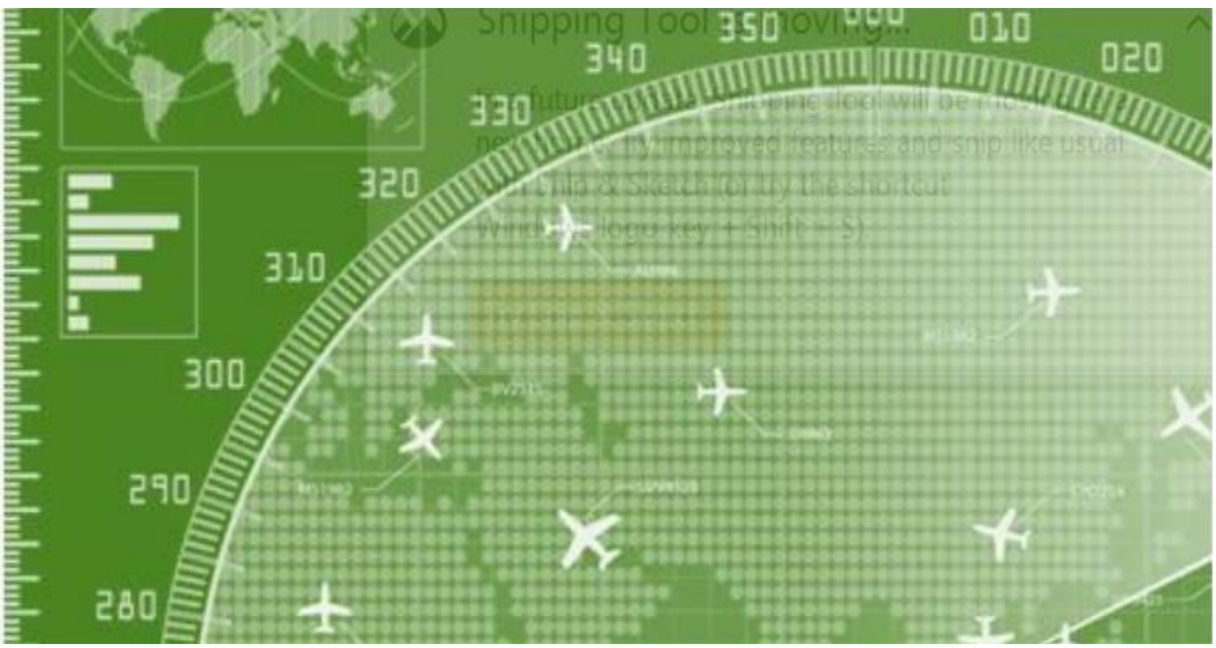
Prove that $\dfrac{\tan\theta}{1-\cot\theta}+\dfrac{\cot\theta}{1-\tan\theta}=1+\sec\theta\operatorname{cosec}\theta$

8. If $\sin\theta+\cos\theta=\sqrt{3}$ then prove that $\tan\theta + \cot\theta = 1$

SECTION D

(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub -parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub-parts of 2 marks each.)

9. **Case Study – 1** We all have seen the airplanes flying in the sky but might have not thought of how they actually reach the correct destination. Air Traffic Control (ATC) is a service provided by ground-based air traffic controllers who direct aircraft on the ground and through a given section of controlled airspace, and can provide advisory services to aircraft in non-controlled airspace. Actually, all this air traffic is managed and regulated by using various concepts based on coordinate geometry and trigonometry



At a given instance, ATC finds that the angle of elevation of an airplane from a point on the ground is 60°. After a flight of 30 seconds, it is observed that the angle of elevation changes to 30°. The height of the plane remains constantly as $3000\sqrt{3}$ m. Use the above information to answer the questions that follow-

(i) Draw a neat labelled figure to show the above situation diagrammatically.

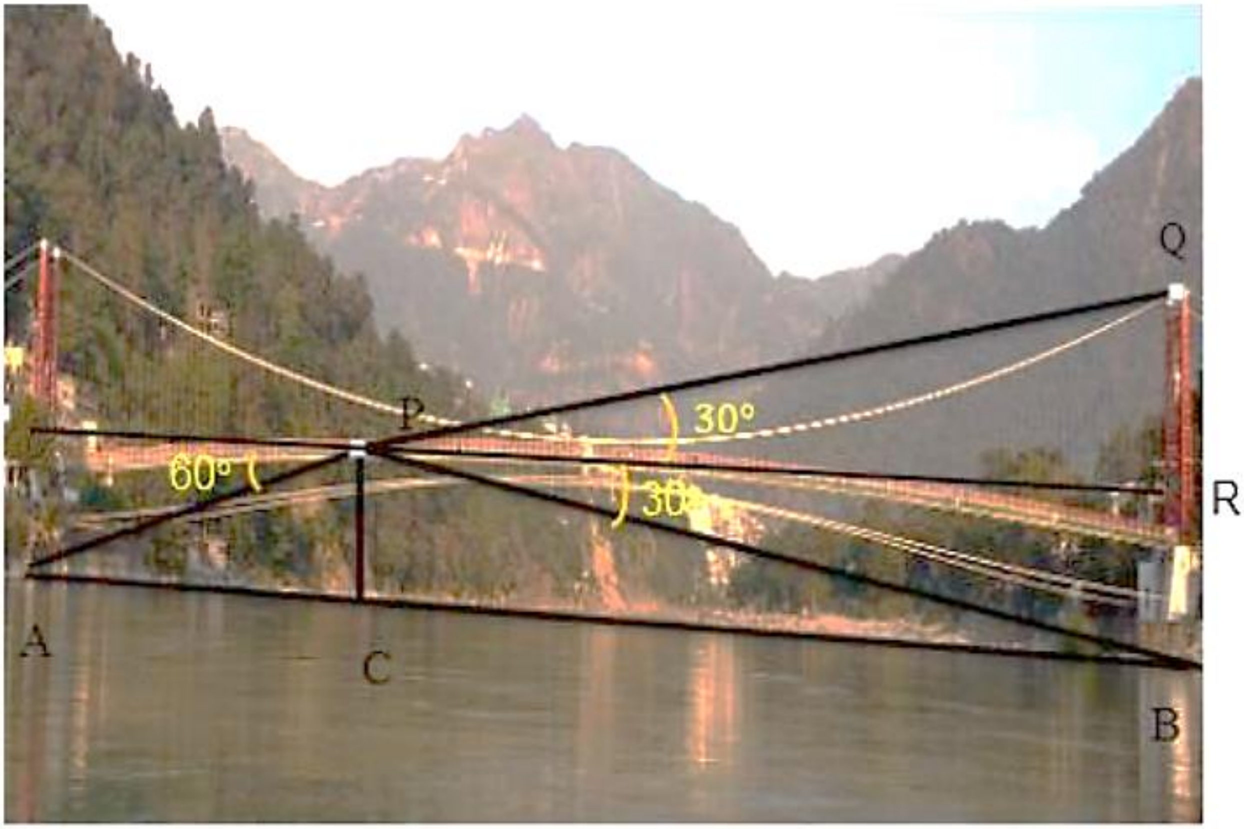
(ii) What is the distance travelled by the plane in 30 seconds?

OR

Keeping the height constant, during the above flight, it was observed that after $15(\sqrt{3}-1)$ seconds, the angle of elevation changed to 45°. How much is the distance travelled in that duration.

(iii) What is the speed of the plane in km/hr.

10. **Case Study – 2** Lakshaman Jhula is located 5 kilometers north-east of the city of Rishikesh in the Indian state of Uttarakhand. The bridge connects the villages of Tapovan to Jonk. Tapovan is in Tehri Garhwal district, on the west bank of the river, while Jonk is in Pauri Garhwal district, on the east bank. Lakshman Jhula is a pedestrian bridge also used by motorbikes. It is a landmark of Rishikesh.



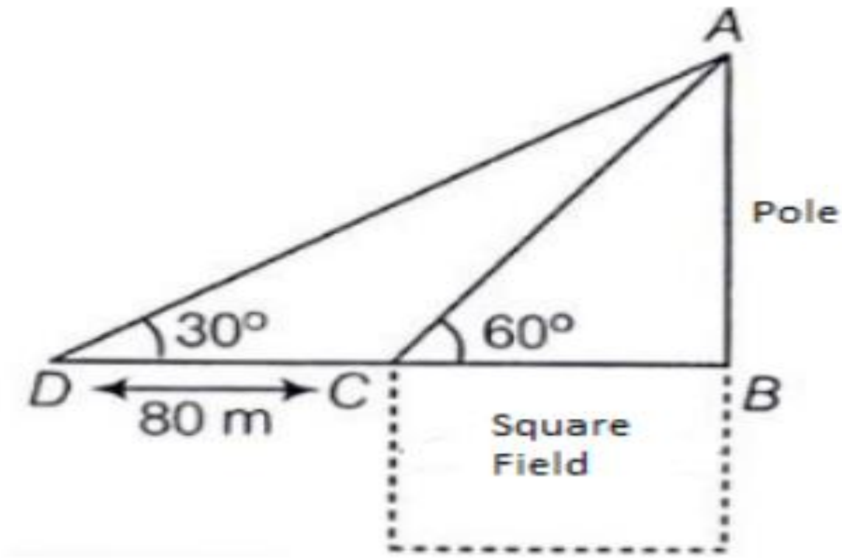
A group of Class X students visited Rishikesh in Uttarakhand on a trip. They observed from a point (P) on a river bridge that the angles of depression of opposite banks of the river are 60° and 30° respectively. The height of the bridge is about 18 meters from the river.

(i) Find the distance PA.
(ii) Find the distance PB.
(iii) Find the width AB of the river.

[OR]

Find the height BQ if the angle of the elevation from P to Q be 30°

11. Case Study – 3: Basant Kumar is a farmer in a remote village of Rajasthan. He has a small square farm land. He wants to do fencing of the land so that stray animals may not enter his farmland. For this, he wants to get the perimeter of the land. There is a pole at one corner of this field. He wants to hang an effigy on the top of it to keep birds away . He standing in one corner of his square field and observes that the angle subtended by the pole in the corner just diagonally opposite to this corner is 60^o. When he retires 80 m from the corner , along the same straight line, he finds the angle to be 30^o



(i) Find the height of the pole too so that he can arrange a ladder accordingly to put an effigy on the pole.

(ii) Find the length of his square field so that he can buy material to do the fencing work accordingly.

(iii) Find the Distance from Farmer at position C and top of the pole?

OR

Find the Distance from Farmer at position D and top of the pole?