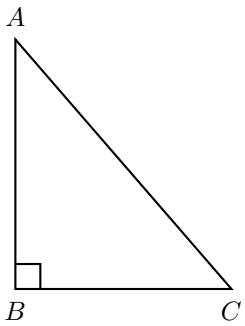
Chapter 4

Trigonometry

Questions 4.1–4.26

Concept : sine and cosine of an angle are numbers to measure the angle

Q.4.1 In the figure, $\angle B = 90°$; also, $AB = 10\,\text{cm}$ and $\angle C = 30°$



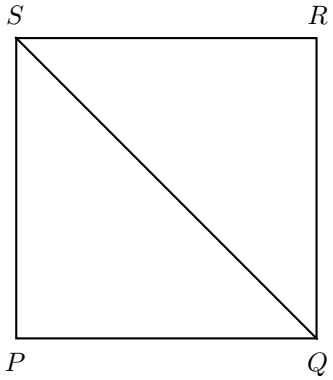
(a) What is the measure of $\angle A$

(b) What are the lengths of AC and BC

Score : 2, Time : 4 minutes

Concept : sine and cosine of an angle are numbers to measure the angle

Q.4.2 In the figure, $PQRS$ is a square:



If $PQ = x$,

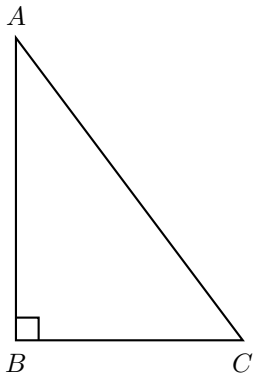
(a) What is the length of SQ?

(b) Calculate $\cos 45°$

Score : 2, Time : 3 minutes

Concept : sine and cosine of an angle are numbers to measure the angle

Q.4.3 In the figure, $\angle B = 90°$, $\angle A = x°$, $AB = 8$, $BC = 6$.



(a) Calculate $\sin x°$ and $\cos x°$

(b) Ammu says $\sin(90 - x)° = \cos x°$. What is your opinion? Justify

Score : 4, Time : 5 minutes

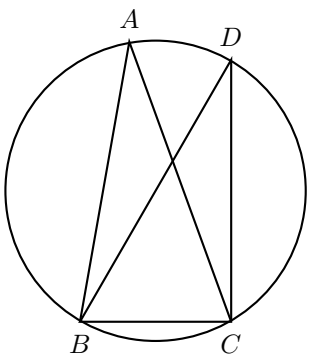
Concept : Solving geometric problems using trigonometry

Q.4.4 The sides of a rhombus are 7 centimetre long and one of its angles is 40°. Calculate its area
($\sin 40° = 0.643$, $\cos 40° = 0.766$, $\tan 40° = 0.839$)

Score : 4, Time : 8 minutes

Concept : Solving geometric problems using trigonometry

Q.4.5 In the figure, BD is a diameter of the circle and $BC = a$; also the radius of the circle is R



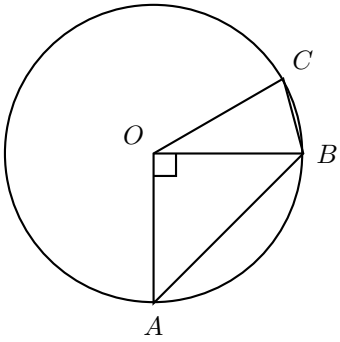
(a) Which angle in the figure is equal to $\angle A$?

(b) Viji says $\dfrac{a}{\sin A} = 2R$. What is your opinion? Justify

Score : 4, Time : 8 minutes

Concept : Solving geometric problems using trigonometry

Q.4.6 In the figure, O is the centre of the circle, $\angle AOB = 90°$, $AB = 6\sqrt{2}\,\text{cm}$, $\angle BOC = 30°$.



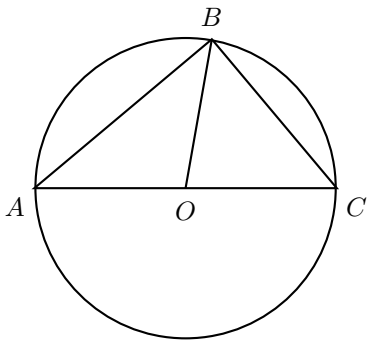
(a) What is the area of the triangle OAB?

(b) Calculate the area of the quadrilateral $OABC$

Score : 5, Time : 8 minutes

Concept : Solving geometric problems using trigonometry

Q.4.7 In the figure, O is the centre of the circle, $AC = 8\,\text{cm}$, $\angle A = 40°$



(a) What is the area of ΔOBC?

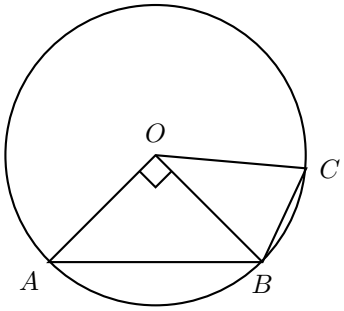
(b) What is the area of ΔOAB?

$\sin 80° = 0.985$, $\cos 80° = 0.174$, $\tan 80° = 5.671$
$\sin 40° = 0.643$, $\cos 40° = 0.766$, $\tan 40° = 0.84$

Score : 4, Time : 8 minutes

Concept : Solving geometric problems using trigonometry

Q.4.8 In the figure, O is the centre of the circle, $\angle AOB = 90°$, $\angle BOC = 40°$, $AB = 5\sqrt{2}$



(a) What are the lengths of OA and OC?

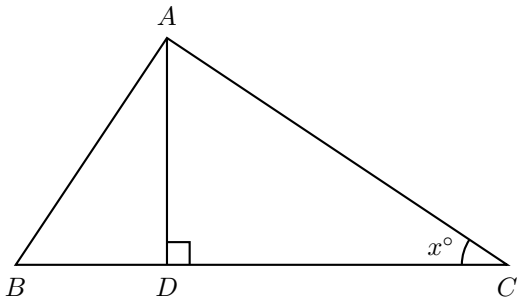
(b) What is the length of BC?

$\sin 40° = 0.643$, $\cos 40° = 0.766$, $\tan 40° = 0.839$

Score : 4, Time : 8 minutes

Concept : Solving geometric problems using trigonometry

Q.4.9 In the figure, $\angle BAC = 90°$, $AD = 6\,\text{cm}$, $CD = 9\,\text{cm}$, $\angle ACD = x$



(a) What is $\tan x$?

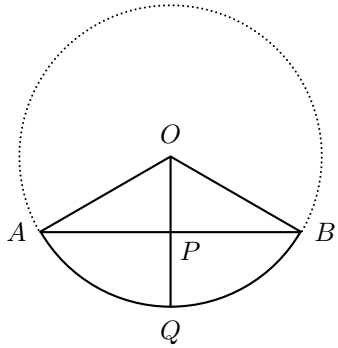
(b) How much is $\angle BAD$?

(c) What is the length of BD?

Score : 3, Time : 5 minutes

Concept : Solving geometric problems using trigonometry

Q.4.10 In the figure, AQB is an arc of a circle centred at O. Also, $\angle AOB = 120°$, $\angle AOQ = 60°$, $PQ = 3\,\text{cm}$



What is the radius of the circle?

Score : 3, Time : 5 minutes

Concept : Solving practical problems using trigonometry

Q.4.11 A boy standing on the ground sees the top of a tree at an angle of elevation of 40°. After walking 20 metres towards the tree, he sees it at an angle of elevation of 80°. Draw a rough sketch and compute the height of the tree

$\sin 40° = 0.643$, $\cos 40° = 0.766$, $\tan 40° = 0.840$
$\sin 80° = 0.985$, $\cos 40° = 0.174$, $\tan 40° = 5.671$

Score : 4, Time : 8 minutes

Concept : Solving practical problems using trigonometry

Q.4.12 Hari standing on the bank of a river, sees the top of a tower, 10 metres away from the opposite bank, at an angle of elevation of 20°. John standing on this bank, on the line joining the feet of the tower and Hari, sees it at an angle of elevation of 40°. Draw a rough sketch and calculate the width of the river
$\sin 40° = 0.643$, $\cos 40° = 0.766$, $\tan 40° = 0.84$

Score : 4, Time : 8 minutes

Concept : Solving practical problems using trigonometry

Q.4.13 Two buildings of different heights stand 16 metres apart. From the foot of the taller building the top of the shorter one is seen at an angle of elevation of 45° and from the foot of the shorter building, the top of the taller building is seen at an angle of elevation of 70°

(a) Draw a rough sketch

(b) What is the height of the shorter building?

(c) What is the height of the taller building?

$\sin 70° = 0.94$, $\cos 70° = 0.342$, $\tan 70° = 2.747$

Score : 4, Time : 8 minutes

Concept : Solving practical problems using trigonometry

Q.4.14 A boy standing atop a lighthouse on the seashore sees a ship at sea at an angle of depression of 20°. A man standing 100 metres away from the light house sees the boy at an angle of elevation of 45°.

(a) Draw a rough sketch based on these pieces of information

(b) What is the height of the light house?

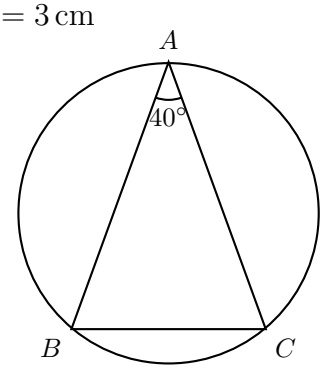
(c) How far from the shore is the ship?

$\tan 20° = 0.342$

Score : 4, Time : 8 minutes

Concept : Geometric problems involving sine and cosine

Q.4.15 In the figure, $\angle A = 40°$, $BC = 3\,\text{cm}$



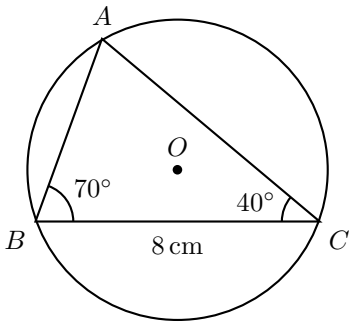
(a) Calculate the circumradius of ΔABC
$\sin 40° = 0.64$, $\cos 40° = 0.766$, $\tan 40° = 0.84$

(b) Haritha says that if one angle of a triangle is 30°, then its circumradius is equal to the side opposite this angle. What is your opinion? Justify

Score : 4, Time : 7 minutes

Concept : Geometric problems involving sine and cosine

Q.4.16 In the figure, O is the circumcentre of ΔABC. Also, $BC = 8\,\text{cm}$, $\angle B = 70°$, $\angle C = 40°$



(a) Find the diameter of the circumcircle

(b) Find the length of AB

$\sin 40^\circ = 0.64$, $\cos 40^\circ = 0.766$, $\tan 40^\circ = 0.84$
$\sin 70^\circ = 0.94$, $\cos 70^\circ = 0.34$, $\tan 40^\circ = 2.75$

Score : 5, Time : 7 minutes

Concept : Geometric problems involving sine and cosine

Q.4.17 In ΔPQR, we have $PQ = 8\,\text{cm}$ and PS perpendicular to QR. Also, $\angle Q = 20^\circ$ and $\angle R = 50^\circ$.

(a) Draw a rough sketch

(b) Find the length of QS

(c) Find the length of RS

$\sin 20^\circ = 0.3420$, $\cos 20^\circ = 0.9397$, $\tan 20^\circ = 0.3640$

Score : 5, Time : 8 minutes

Concept : Trigonometric measures to compute heights and distances

Q.4.18 A man standing on the deck of a ship, 5 metres above the sea level, sees the top of a light house at an angle of elevation of 70° and its foot at an angle of depression of 30°.

(a) Draw a rough sketch

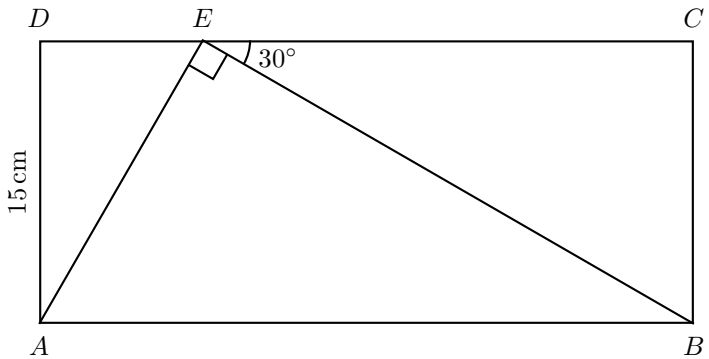
(b) How far is the light house from the ship?

(c) Calculate the height of the light house

Score : 5, Time : 8 minutes

Concept : Problem involving ratios of sides of triangle with angle 30°, 60°, 90°

Q.4.19 The picture shows a still model made for the Math Festival, where $ABCD$ is a rectangle with $AD = 15\,\text{cm}$ and $\angle BEC = 30^\circ$



(a) Find the length of the rectangle

(b) Find the lengths of all sides of ΔAEB

Score : 5, Time : 7 minutes

Concept : Trigonometric measures to compute heights and distances

Q.4.20 When the sun is at an angle of elevation 45°, the length of the shadow of a tree is 6 metres.

(a) Calculate the height of the tree

(b) Calculate the length of the shadow when the sun at an elevation of 30°

(c) What is the difference in the lengths of the shadows?

Score : 5, Time : 8 minutes

Concept : Trigonometric measures to compute heights and distances

Q.4.21 A man on top of a tree sees a car, 30 metres away from the foot of the tree at an angle of depression 30°

(a) How high from the ground is he sitting?

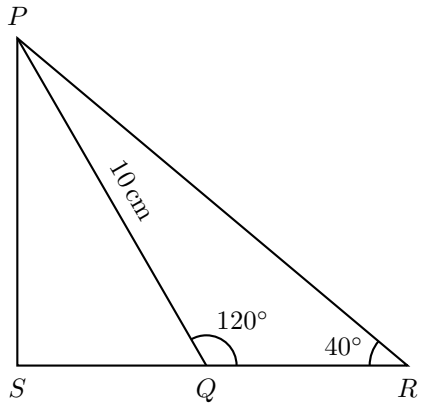
(b) He climbs down a bit and sees the car at an angle of depression of 18°. How high is he now?

$\sin 18° = 0.3090$, $\cos 18° = 0.9511$, $\tan 18° = 0.3249$
$\sin 72° = 0.9511$, $\cos 72° = 0.3090$, $\tan 72° = 3.0777$

Score : 5, Time : 8 minutes

Concept : Solving geometric problems using sine and cosine

Q.4.22 In the figure, $PQ = 10$ cm and PS is perpendicular to RS. Also, $\angle PQR = 120°$ and $\angle PRQ = 40°$



(a) How much is $\angle PQS$?

(b) Find the length of QS

(c) Find the length of PR

$\sin 40^\circ = 0.6428$, $\cos 40^\circ = 0.7660$, $\tan 40^\circ = 0.8391$

Score : 4, Time : 7 minutes

Concept : Solving practical problems using tangent

Q.4.23 A regular pentagon $PQRST$ is drawn within a circle centred at O and OA is drawn perpendicular to PQ. The length of PQ is 10 centimetres.

(a) How much is $\angle OPA$?

(b) What is the length of PA?

(c) What is the length of OA?

$\sin 54^\circ = 0.809$, $\cos 54^\circ = 0.588$, $\tan 54^\circ = 1.376$

Score : 5, Time : 8 minutes

Concept : Trigonometric measures to compute heights and distances

Q.4.24 There are two buildings on either side of a 20 metre high tower, the feet of all three on a line. A 1.6 metre tall man, standing atop the tower, sees the feet of the buildings at angles of depression 20° and 30°.

(a) Draw a rough sketch

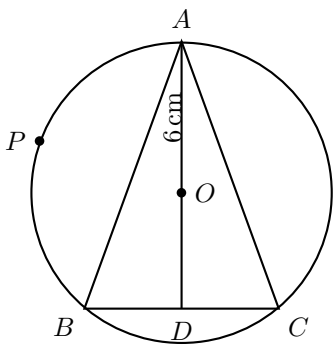
(b) Calculate the distance between the buildings

$\sin 20^\circ = 0.34$, $\cos 20^\circ = 0.94$, $\tan 20^\circ = 0.36$
$\sin 30^\circ = 0.87$, $\cos 30^\circ = 0.50$, $\tan 30^\circ = 0.58$

Score : 4, Time : 6 minutes

Concept : Solving geometric problems using sine and cosine

Q.4.25 In the figure, the circumcentre of the isosceles triangle ABC is O and its circumradius is 6 centimetres. The midpoint of BC is D and the the central angle of the arc APB is 140°



(a) Calculate the length of the chord AB

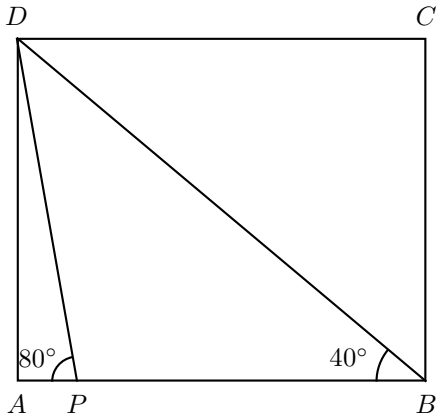
(b) Calculate the perpendicular distance from A to BC

$\sin 20^\circ = 0.34$, $\cos 20^\circ = 0.94$, $\tan 20^\circ = 0.36$, $\tan 70^\circ = 2.75$

Score : 4, Time : 7 minutes

Concept : Solving geometric problems using sine and cosine

Q.4.26 In the figure, $ABCD$ is a rectangle and $PB = 7\,\text{cm}$. Also, $\angle APD = 80^\circ$ and $\angle PBD = 40^\circ$



(a) What is the height of the rectangle?

(b) What is the length of the rectangle?

$\sin 80^\circ = 0.98$, $\cos 80^\circ = 0.17$, $\tan 80^\circ = 5.67$
$\sin 40^\circ = 0.64$, $\cos 40^\circ = 0.77$, $\tan 40^\circ = 0.84$

Score : 4, Time : 6 minutes