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## MATHS

## BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

## MEASURMENT OF TRIGONOMETRICAL

## ANGLES

Example

1. Express $90^{\circ} 20^{\prime} 48$ in right angles.

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2. Express $63^{\circ} 14^{\prime} 51^{\prime \prime}$ in circular measures.

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3. The circular measure of an angle is $\frac{\pi}{8}$, find its value in sexagesimal system.

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4. Find in sexagesimal and circular units of an internal angle of a regular pentagon.

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5. The angles of a triangle are in A.P. If the greatest and the least are in the ratio $3: 2$, find the angles of the triangle in radian .

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6. The sum of two angles is 1 radian and their difference is $1^{\circ}$. Find the angles in degrees.

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7. The angles of a quadrilateral are in A.P . If the ratio of the number of radians in the least angle to the number of degrees in the greatest angle be as $\pi: 1260$, find the angles in radians.
8. The sum of number of degrees, minutes and seconds of an angle is 43932., find the angle in circular system .

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9. Two regular polygons have sides $m$ and $n$ respectively. If the number of degrees in an angle of the first is equal to the number of radians in an angle of the second , show that ,

$$
\frac{n(m-2)}{m(n-2)}=\frac{\pi}{180}
$$

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10. An are of certain length subtends $20^{\circ} 17^{\prime}$
at the centre of a circle of radius 6 cm . Find in
sexagesimal unit the angle subtended by the same arc at the centre of a circle of radius 8 cm .

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11. Assuming the distance of the sun from the observer to be $9,30,00000$ miles and the angle subtended by the diameter of the sun at the eye of the observer to be $32^{\prime}$, find the diameter of the sun.

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12. If $\theta_{1}, \theta_{2}, \theta_{3}$ radians be the angles subtended by the arcs of lengths $l_{1}, l_{2}, l_{3}$ at the centres of the circle whose radii are
$r_{1}, r_{2}, r_{3}$ respectively then show that the angle subtended at the centre by the arc of length $\left(l_{1}+l_{2}+l_{3}\right)$ of a circle whose radius is $\left(r_{1}+r_{2}+r_{3}\right)$ will be $\frac{r_{1} \theta_{1}+r_{2} \theta_{2}+r_{3} \theta_{3}}{r_{1}+r_{2}+r_{3}}$ radian.

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13. At what distance does a man, $5 \frac{1}{2}$ feet in height, subtend an angle of 20" ?
14. A man running along a circular track at the rate of 10 mile per hour traverses in 36 seconds an arc which subtends $56^{\circ}$ at the centre. Find the diameter of the circle.

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Exercise 1

1. A radian is a
A. fundamental unit of angle
B. sexagesimal
C. right angle
D. compound angle

Answer: A

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2. The angle between two hands of a clock at
$3 p . m$. is
A. $\pi^{c}$
B. $\frac{\pi^{c}}{2}$
C. $\frac{\pi^{c}}{4}$
D. $\frac{\pi^{c}}{8}$

## Answer: B

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3. If the angles of a right angled triangle ar in
A.P , then the smallest angle is
A. $\pi^{c}$
B. $\frac{\pi^{c}}{2}$
C. $\frac{\pi^{c}}{3}$
D. $\frac{\pi^{c}}{6}$

## Answer: D

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4. The degree measure of radian measure of angle $(-3)^{c}$ is

$$
\text { A. }-170^{\circ} 49^{\prime} 5^{\prime \prime}
$$

$$
\text { B. }-171^{\circ} 49^{\prime} 5^{\prime \prime}
$$

C. $-171^{\circ} 50^{\prime}$
D. $-171^{\circ} 51^{\prime}$

Answer: B

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5. The angular diameter of the moon 30 ' How far from the eye a coin of diameter 2.2 cm be kept to hide the moon?
A. 250 cm
B. 251 cm
C. 252 cm
D. 253 cm

Answer: C

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6. If the arc of a circle of radius 60 cm subtends and angle $\frac{2}{3}$ radian at its centre, then the length of the arc will be
A. 40 cm
B. 40.1 cm
C. 41 cm
D. 42 cm

Answer: A

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7. Express the following angles in terms of a right angle .
8. Express the following angles in terms of a right angle .
$\left(\frac{2 \pi}{3}\right)^{c}$

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9. Express in sexagesimal system :
$\left(\frac{4 \pi}{9}\right)^{c}$
10. Express in sexagesimal system :
$\left(\frac{7 \pi}{6}\right)^{c}$

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11. Express in sexagesimal system :
$39^{g} 6^{\prime} 25^{\prime \prime}$

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12. Reduce the following angles to circular measure:
$324^{\circ}$

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13. Reduce the following angles to circular measure:
$46^{\circ} 25^{\prime} 36$
14. The circular measure of an angle is 1.5 express it in terms of degree, minutes and seconds.

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15. The sum o9f two angles is $80^{\circ}$ and their difference is $\left(\frac{\pi}{10}\right)^{c}$ find the angle in circular measure.

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16. The sum of the number of degrees and number of grades of a given angle is 152 , find the angle in degree.

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17. The angles of a triangle are in the ratio
$5: 4: 3$. Find the circular measure of the greatest angle .

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18. Find in degree and radian each angle of a regular decagon.

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19. If the difference of two acute angles of a right angled triangle of a right angled triangle is $18^{\circ}$, find in circular measure the angle of the triangle .
20. The angles of a triangle are $\frac{\pi x}{200}$ radian, $3 x^{\circ}$ and $\frac{\pi x}{300}$ radian, find the angles in degrees.

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21. The circular measures of two of the angles
of a triangle are $\frac{1}{2}$ and $\frac{1}{3}$. Express the third angle in sexagesimal measure.
22. If the measurements of an angle in degree minutes and seconds be $D, M$ and $S$ respectively prove that, $\mathrm{S}=60 \mathrm{M}=3600 \mathrm{D}$.

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23. The circular measure of an internal angle
of a regular polygon is $\frac{3 \pi}{4}$, find the number of sides of the polygon.

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24. Express in circular measure an angle of a regular hexagon .

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25. Find in radian an angle of a regular polygon of $n$ sides.

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26. The sum of two angles is $152^{\circ}$. If difference of these two angles is $\frac{2 \pi}{45}$, find the angles in radians.

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27. The angles of a triangle are in A.P. And the number of degrees in the least is to the number of radians in the greatest as 60 to $\pi$.

Find the angles in degrees.
28. The sum of three angles in G.P is $126^{\circ}$, the number of degrees in the greatest is to the number of circular units in the least as 720 is to $\pi$. Find the angles in degrees.

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29. The four angles of a quadrilateral are in A.P , the greatest angles in twice the least angle.

Find circular measure of the least angle.
30. The five angles of a pentagon are in A.P and the greatest angle is three times the least angle . Find the angles in degree and radians.

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31. The greatest angle of a cyclic quadrilateral
is three times the least angle and the other
two angles are in the ratio $4: 5$. Find the angles in circular measure.

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32. If the circumference of a circle be divided into five parts which are in A.P and if the greatest part be six times the least, find in radians the angles subtended by the parts at the centre.

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33. A regular polygon has $n$ times as many sides as another and the number of degrees in
each interior angle of the first is $m$ times the number of radians in that of the second. Find the number of sides of each polygon .

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34. The angles in each of two triangles are in
G.P . The least angle of one of them is three
times the least angle in the other, and the
sum of the greatest angles is $\frac{4 \pi}{3}$. Find the circular measures of the angles.
35. A wire of length 15 cm is bent so as to lie along the circumference of a circle of radius 25 cm . Find in degrees the angle which the wire subtends at the centre of the circle .

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36. A circular wire of radius 3 cm is cut and
then bent so as to lie along the circumference of a hoop of radius 48 cm . Find in degrees the
angle which it subtends at the centre of the hoop.

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37. Two arcs to the same length subtend angles $60^{\circ}$ and $75^{\circ}$ at the centres of two given circles. Find the ratio of their radii.

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38. A railway wheel of diameter 4 ft makes 6
revolutions per second. Find the speed of the train $[\pi=3.14]$.

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39. At what distance does a man whose height
is 2 meters subtend angle of 10 '?

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40. The distance of earth from the moon is
$3,85,000 \mathrm{~km}$ and the moon 's diameter subtends an angle of 31 at the eye of the obsever. Find the diameter of the moon.

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41. A train is moving with a uniform velocity of

66 km per hour along a circular railway line of radius 750 m . Find the angle in degrees which the train subtends at the centre in 10 seconds.
42. The larger hand of a clock is 42 cm long , how many cm does its extremilty move In 20 minutes?

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43. Find the radius of the earth, if an angle of 34 '22" is subtended at its centre by the arc joining two places on it distant 64 km .
44. The perimeter of the sector of a circle is equal to the circumference of the semi-circle of same radius. Find in circular measure the angle subtended at the centre by the bounding radii of the sector .

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45. The radius of the earth 6400 km and moon's distance from the earth is 60 times,
the radius of earth, if the radius of the moon subtends 16 angle at the centre of the earth
,find the diameter of the moon.

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46. If $\alpha_{1}$ and $\alpha_{2}$ be the circular measure of
the angles subtended by the arcs of lengths
$s_{1}, s_{2}$ at the centres of the circles whose radii
are $a_{1}, a_{2}$ respectively, then show that the
angle subtended at the centre by the arc of
length $\left(s_{1}+s_{2}\right)$ of a circle whose radius is
$\frac{1}{n}\left(a_{1} \alpha_{1}+a_{2} \alpha_{2}\right)$ will be n radians.

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47. A horse running along a circular track of radius 27 ft passes over in 3 seconds an arc which subtends $70^{\circ}$ at the centre. Find the distance the horse travels in half a minute.

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48. If the diameter of the sun subtends an angle of 32' at the eye of the observer and the diameter of the moon 30 ' and if the distance of the sun be 360 times that of the moon, find the ratio of the diameter of the sun of that of the moon.

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49. Two -circles of equal radii pass through each other's centre show that the length of
the arc cut off from any circle by the other is equal to one theird the length of its circumference.

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50. Two circles pass through each each other's centre. If an arc of length I of the first circle subtends $\theta$ radian at its centre and an arc of length $m$ of the seconds circle subtends $\varphi$ radian at its centre, then prove that, $l \varphi=m \theta$

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## Sample Questions For Competitive Exams

 Multiple Correct Answers Type1. The angle subtended at the centre of a circle
, by a chord whose length is equal to the radius of the circle will be
A. $\frac{\pi^{c}}{3}$
B. $\frac{\pi^{c}}{4}$
C. $66 \frac{2^{g}}{3}$
D. $50^{g}$

## Answer: A,C

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2. If $\frac{\pi}{6}$ and $150^{g}$ are two angle of a triangle,
then third angle will be
A. $\frac{\pi^{c}}{3}$
B. $16 \frac{2^{g}}{3}$
C. $66 \frac{2^{g}}{3}$
D. $\frac{\pi^{c}}{12}$

Answer: B,D

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3. The angle between the minute hand of a
clock and the hour hand when the time is

7: 20 AM will be
A. $\frac{5 \pi}{9}$
B. $50 g+\frac{5 \pi}{18}$
C. $50 g+\frac{11 \pi}{36}$
D. $111 \frac{1^{g}}{9}$

## Answer: A,C,D

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4. The angles of a quadrilateral are in A.P and
the greatest is twice the smallest angle . Find the value of the smallest angle .
A. $\frac{\pi}{4}$
B. $\frac{\pi}{3}$
C. $66 \frac{2^{g}}{3}$
D. $50^{g}$

## Answer: B,D

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5. A circular ring of radius 3 cm is cut and bent so as to along the circumference of a hoop whose radius is 48 cm . The angle which is
subtended by the arc at the centre of the hoop will be
A. $25^{g}$
B. $\frac{\pi}{8}$
C. $50^{g}$
D. $\frac{\pi}{4}$

Answer: A,B
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## Integer Answer Type

1. The angles of a triangle are in A.P. If the greatest and the least of them be $\frac{n \pi}{4}$ and $\frac{100^{g}}{3}$ respectively, then the value of n will be

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2. The difference of two acute angle of a right angled triangle is $50^{g}$. If the value of the least
acute angle be $\frac{n \pi}{4}$ then the value of n will be

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3. If the arcs of the same length in two circles
of radii $r_{1}$ and $r_{2}$ respectively subtend angle
$\pi$
$\frac{\pi}{3}$ and $120^{\circ}$ at the centre , then the value of $\frac{r_{1}+r_{2}}{r_{1}-r_{2}}$ will be

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4. In case of any angle the relation between the Grade (G) and the Radian ( R ) is $\frac{G}{50 P}=\frac{R}{\pi}$, then find P .

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5. Perimeter of a sector is equal with half of the circumference of a circle. If the angle subtended by the sector at the centre of the circle be $n\left(\frac{\pi}{2}-1\right)$, then find the value of $n$

# Sample Questions For Competitive Exams 

 Comprehension Type1. Let $D$ be the number of degrees, $R$ be the number of radian and $G$ be the number of grades of any angle of the trianlge $A B C$.

Then the required relation among three systems of measurement of an angle is
$\frac{D}{90}=\frac{G}{100}=\frac{2 R}{\pi}$.
If $\angle A=30^{\circ}$ then which one is true?
A. $\frac{\pi}{3}$
B. $\left(\frac{100}{3}\right)^{g}$
C. $\left(\frac{200}{3}\right)^{g}$
D. none of these

Answer: B

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2. Let $D$ be the number of degrees, $R$ be the number of radian and $G$ be the number of grades of any angle of the trianlge $A B C$.

Then the required relation among three
systems of measurement of an angle is
$\frac{D}{90}=\frac{G}{100}=\frac{2 R}{\pi}$.
If $\angle B=100^{g}$ then which one is true ?
A. $\frac{\pi}{3}$
B. $\frac{\pi}{6}$
C. $\frac{\pi}{4}$
D. none of these

Answer: D

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3. Let $D$ be the number of degrees, $R$ be the number of radian and $G$ be the number of grades of any angle of the trianlge $A B C$.

Then the required relation among three systems of measurement of an angle is
$\frac{D}{90}=\frac{G}{100}=\frac{2 R}{\pi}$.
if $\angle A=30^{\circ}$ and $\angle B=100^{g}$ then $\angle C$ will be
A. $\frac{\pi}{3}$
B. $75^{g}$
C. $\frac{\pi}{6}$
D. $50^{g}$

## Answer: A

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4. The sense of an angle is said to be positive or negative according as the initial side rotates in anticlockwise or clockwise direction to get to the terminal side. If a man moves along a circular path after completing 2 rotating he makes a positive angle of $150^{g}$. then

Total angle along anti clockwise direction is
A. $+855^{\circ}$
B. $-855^{\circ}$
C. $585^{\circ}$
D. $-585^{\circ}$

Answer: A

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5. The sense of an angle is said to be positive or negative according as the initial side rotates in anticlockwise or clockwise direction
to get to the terminal side. If a man moves
along a circular path after completing 2 rotating he makes a positive angle of $150^{g}$. then

In which quadrant he is
A. 1st quadrant
B. 2nd quadrant
C. third quadrant
D. fourth quadrant

Answer: B
6. The sense of an angle is said to be positive or negative according as the initial side rotates in anticlockwise or clockwise direction to get to the terminal side. If a man moves along a circular path after completing 2 rotating he makes a positive angle of $150^{g}$. then

At this position how much angle he makes along clockwise direction ?
A. $+225^{\circ}$
B. $+495^{\circ}$
C. $-495^{\circ}$
D. $-225^{\circ}$

## Answer: D

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## Sample Questions For Competitive Exams

 Assertion Reason Type1. Statement -I : The radian measurement of the angle of a regular octagon in radian is $\left(\frac{3 \pi}{4}\right)^{c}$

Statement -II: Angle of an n sided regular polygon $=\frac{(2 n-4)}{n} \times 90^{\circ}$.

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2. Statement -I: The moon's distance from the earth is $36 \times 10^{4} \mathrm{~km}$ and its diameter subtends an anlge of $31^{\prime}$ at the eye of the
observer.

The diameter of moon is 3247.62 km .

Statement -II : Angle subtends at any point $\theta^{c}=\frac{\text { arc length }}{\text { radius }}$

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