BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT: MATHEMATICS-CLASS: X

WEEK - 12th October, 2020 – 16th October, 2020
SUBJECT - MATHEMATICS
CLASS - X
No. OF BLOCKS - 4
TOPIC – SURFACE AREA AND VOLUME (CHAPTER -13) Exercise13.3
Construction – 11.2

GUIDELINES:-

Dear students, kindly refer to the following link of notes/video links from the chapter "**SURFACE AREA AND VOLUME**" and
"**Construction**". Thereafter, do the questions in your Math register.
https://ncert.nic.in/textbook.php?jemh1=13-15

SUBTOPICS:-

- Conversion of 3- D solids from one shape to another.
- Recapitulation of formulae of Volume and surface area of cube, cuboid, cone, cylinder, sphere and hemisphere.
- Application of the above formulae in daily life application questions.
- Construction of tangents to a circle from a point outside the circle.

INSTRUCTIONAL AIDS:-

Presentation by screen sharing, offline whiteboard, online whiteboard, YouTube links, E lesson.

LEARNING OUTCOMES:-

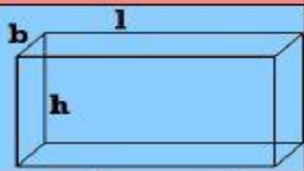
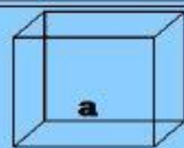
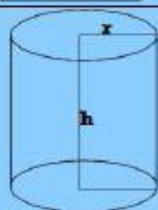
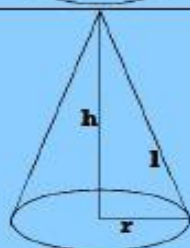
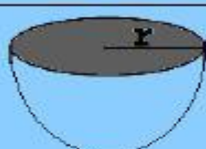
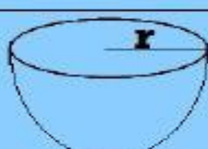
Each student will be able to

- apply the formulae of volumes of these 3- D objects
- apply these formulae to solve questions related to daily life situations
- identify and apply suitable formula
- construct the tangents to a circle from a point outside the circle

Block 1

Introduction Activity -

- Recapitulation of concepts related to volume and surface area of cube, cuboid, cone, cylinder, sphere and hemisphere.
- Let us recall the formulae.

Name	Figure	Curved Surface Area	Total Surface Area	Volume
Cuboid		$2(l+b)h$	$2(lb+bh+hl)$	lbh
Cube		$4a^2$	$6a^2$	a^2
Right Circular Cylinder		$2\pi rh$	$2\pi r(h+r)$	$\pi r^2 h$
Right Circular Cone		πrl	$\pi r(l+r)$	$\frac{1}{3}\pi r^2 h$
Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Solid Hemisphere		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
Hollow Hemisphere		$2\pi r^2$	$2\pi r^2$	$\frac{2}{3}\pi r^3$

Lesson Development:-

Shape Conversion of Solids-

When a solid is converted into another solid of a different shape (by melting or casting), the volume remains constant.

Suppose a metallic sphere of radius 9 cm is melted and recast into the shape of a cylinder of radius 6 cm. Since the volume remains the same after a recast, the volume of the cylinder will be equal to the volume of the sphere.

The radius of the cylinder is known, however the height is not known. Let *h* be the height of the cylinder.
r_1 and r_2 be the radius of the sphere and cylinder respectively. Then,
V(sphere) = V(cylinder)
$\Rightarrow 4/3\pi r_1^3 = \pi r_2^2 h$
$\Rightarrow 4/3\pi(9^3) = \pi(6^2)h$ (On substituting the values)
$\Rightarrow h = 27\text{cm}$

Application of surface area and volume-Refer to the following link to understand few daily life situations-

Exercise13.3 (Refer to the following links)

https://www.youtube.com/watch?v=E_gi6FUr7uE

https://www.youtube.com/watch?v=c4scQqg8QjE

https://www.youtube.com/watch?v=fs3w0wiQo8I

https://www.youtube.com/watch?v=flK23NeAtLs

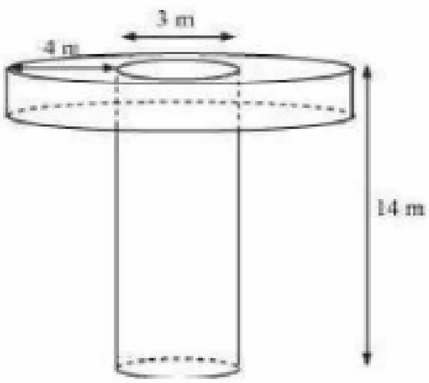
3. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform.

Solution:
It is given that the shape of the well is in the shape of a cylinder with a diameter of 7 m
So, radius = 7/2 m
Also, Depth (h) = 20 m
Volume of the earth dug out will be equal to the volume of the cylinder
$\therefore$ Volume of Cylinder = $\pi \times r^2 \times h$
$= 22 \times 7 \times 5 \text{ m}^3$
Let the height of the platform = H
Volume of soil from well (cylinder) = Volume of soil used to make such platform
$\pi \times r^2 \times h$ = Area of platform × Height of the platform
We know that the dimension of the platform is = 22×14
So, Area of platform = $22 \times 14 \text{ m}^2$
$\therefore \pi \times r^2 \times h = 22 \times 14 \times H$
$\Rightarrow H = 2.5 \text{ m}$

4. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form an embankment. Find the height of the embankment.

Solution:

The shape of the well will be cylindrical as given below.



Given, Depth (h_1) of well = 14 m

Diameter of the circular end of the well =3 m

So, Radius (r_1) = 3/2 m

Width of the embankment = 4 m

From the figure, it can be said that the embankment will be a cylinder having an outer radius (r_2) as 4+(3/2) = 11/2 m and inner radius (r_1) as 3/2m

Now, let the height of embankment be h_2

∴ Volume of soil dug from well = Volume of earth used to form embankment

$\Rightarrow \pi \times r_1^2 \times h = \pi \times (r_2^2 - r_1^2) \times h_2$

Solving this, we get,

The height of the embankment (h_2) as 1.125 m.

8. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?

Solution:

It is given that the canal is the shape of a cuboid with dimensions as:

Breadth (b) = 6 m and Height (h) = 1.5 m

It is also given that

The speed of canal = 10 km/hr

Length of canal covered in 1 hour = 10 km

Length of canal covered in 60 minutes = 10 km

Length of canal covered in 1 min = (1/60)x10 km

Length of canal covered in 30 min (l) = (30/60)x10 = 5km = 5000 m

We know that the canal is cuboidal in shape. So,

Volume of canal = lxbxh

= 5000x6x1.5 m^3

= 45000 m^3

Now,

Volume of water in canal = Volume of area irrigated

= Area irrigated x Height

So, Area irrigated = 56.25 hectares

∴ Volume of canal = lxbxh

45000 = Area irrigatedx8 cm

45000 = Area irrigated x (8/100)m

Or, Area irrigated = 562500 m^2 = 56.25 hectares.

ASSIGNMENT- Questions to be discussed in the class (Exercise-13.3)

2. Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.

6. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm?

9. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in her field, which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 3 km/h, in how much time will the tank be filled?

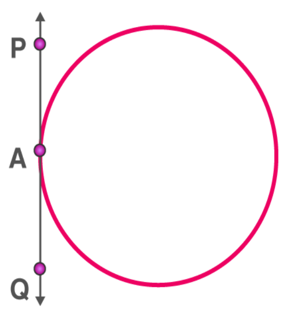
HW- Exercise 13.3 - Q- 1,5,7

Block 2 (CHAPTER 11 – Exercise 11.2)

Activity - Manual activity on length of tangents drawn from an external point to a circle are equal.

Lesson development - We have learnt that

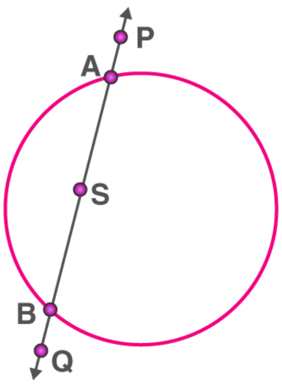
A **tangent** to a circle is a line which **touches the circle at exactly one point**.

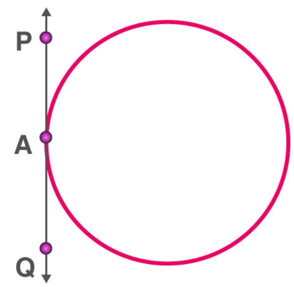


Number of Tangents to a Circle from a Given Point

i) If the point is in an **interior region of the circle**, any line through that point will be a secant. So, in this case, there is no tangent to the circle.

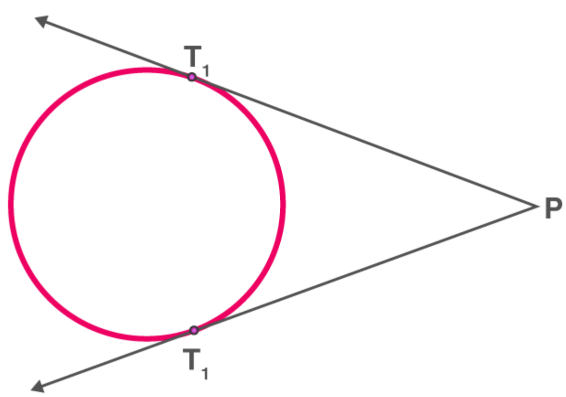
ii) When the point lies on the circle, there is accurately only one tangent to a circle.



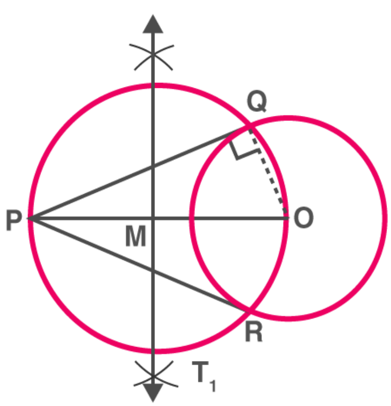


ii) When the point lies outside the circle, there are **exactly two tangents** to a circle

Tangents to a Circle from a Point outside the Circle



Construction of Tangents to a Circle from a Point outside the Circle



To construct the tangents to a circle from a point outside it.

Consider a circle with centre O and let P be the exterior point from which the tangents to be drawn.

Step 1: Join PO and bisect it. Let M be the midpoint of PO.

Step 2: Taking M as the centre and MO (or MP) as radius, draw a circle. Let it intersect the given circle at the points Q and R.

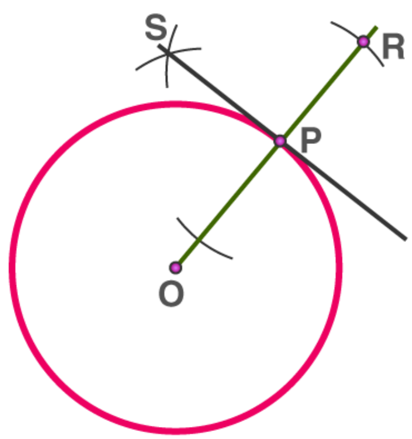
Step 3: Join PQ and PR

Step 3: PQ and PR are the required tangents to the circle.

Construction of Tangents to a Circle from a Point on the Circle

To draw a tangent to a circle through a point on it.

Step 1: Draw the radius of the circle through the required point.
Step 2: Draw a line perpendicular to the radius through this point. This will be tangent to the circle.



ASSIGNMENT- EXERCISE 11.2

In each of the following, give the justification of the construction also:

1. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

2. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm and measure its length. Also verify the measurement by actual calculation.

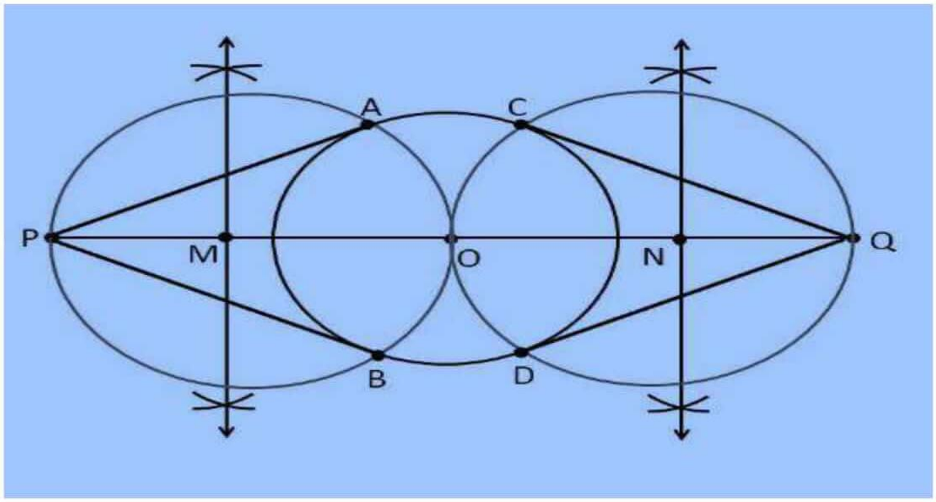
Block 3

Activity- Refer to the following link. https://www.examfear.com/free-video-lesson/Class-10/Maths/Constructions/part-3/Constructions_Part_3_(Draw_tangent_to_a_circle).htm

Lesson Development:-

3. Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q

Solution- PA, PB and QC, QD are the required tangents in the following figure**:**



Justification:

The construction of the given problem can be justified by proving that PQ and PR are the tangents to the circle of radius 3 cm with centre O.

To prove this, join OA and OB.

From the construction,

$\angle PAO$ is an angle in the semi-circle.

We know that angle in a semi-circle is a right angle, so it becomes,

$\therefore \angle PAO = 90°$

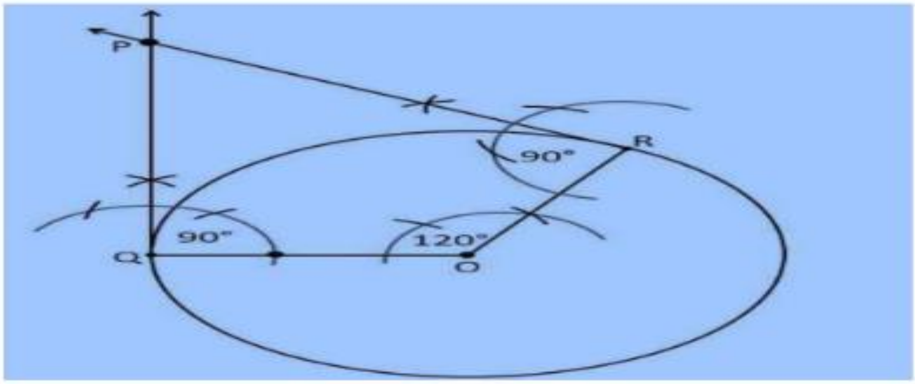
Such that

$\Rightarrow OA \perp PA$

Since OA is the radius of the circle with radius 3 cm, PA must be a tangent of the circle. Similarly, we can prove that PB, QC and QD are the tangent of the circle.

Hence, justified

4. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60°



Justification:

The construction can be justified by proving that

$\angle QPR = 60°$

By our construction

$\angle OQP = 90°$

$\angle ORP = 90°$

And $\angle QOR = 120°$

We know that the sum of all interior angles of a quadrilateral = 360°

$\angle OQP + \angle QOR + \angle ORP + \angle QPR$

$= 360°$

$90° + 120° + 90° + \angle QPR = 360°$

Therefore, $\angle QPR = 60°$

Hence Justified

PQ and PR are required tangents.

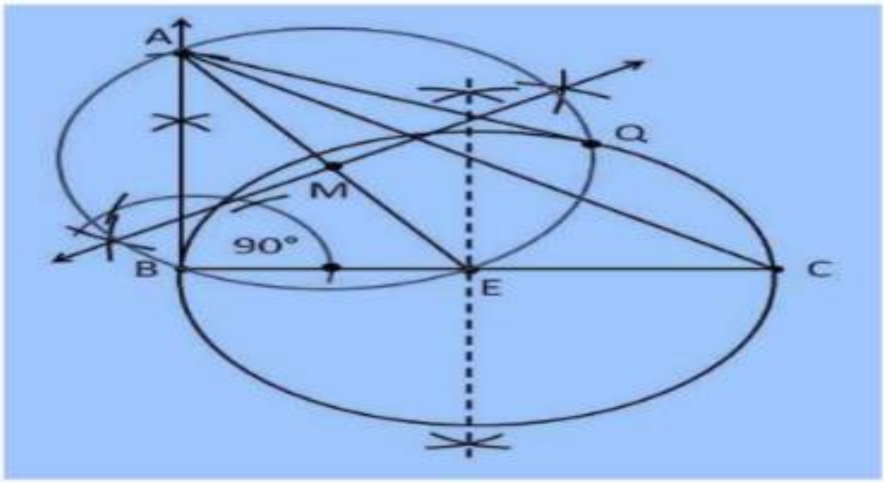
ASSIGNMENT-

5. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle.

Block -4

Q-6.

Let ABC be a right triangle in which AB = 6 cm, BC = 8 cm and ∠B = 90°. BD is the perpendicular Burn B on AC. The circle through B, C, D is drawn. Construct the tangents from A to this circle.



Justification:

The construction can be justified by proving that AG and AB are the tangents to the circle.
From the construction, join EQ.

$\angle AQE$ is an angle in the semi-circle. We know that an angle in a semi-circle is a right angle.

$\therefore \angle AQE = 90^\circ$

$\Rightarrow EQ \perp AQ$

Since EQ is the radius of the circle, AQ has to be a tangent of the circle.

Similarly, $\angle B = 90^\circ$

$\Rightarrow AB \perp BE$

Since BE is the radius of the circle, AB has to be a tangent of the circle.

Hence, justified.

Assignment-

7. Draw a circle with the help of a bangle. Take a point outside the circle. Construct the pair of tangents from this point to the circle.

Summary-

1. From an external point, two tangents can be drawn to a circle which are equal.
2. Every construction has a justification.
3. Note- (Exercises-13.4,11.1 are deleted)

Assignment-

1. O is the centre of the circle. PQ is a chord and PR is the tangent at P which makes an angle of 50^{o} with PQ. Find angle POQ.
2. DE and DF are tangents from an external point D to a circle with centre A. If DE = 5cm and DE is perpendicular to DF, then the radius of the circle is ______
3. A line which intersects a circle in two points is called _______.

4. State true or false: A tangent to the circle can be drawn from a point inside the circle.
5. The point at which a line touches a circle is called __________.
6. **6.** In the given fig. if AC =9, find BD.

1. Refer to the following links to practice more questions.

a) https://diksha.gov.in/play/collection/do_3129243959686676481258?referrer=utm_source%3Ddiksha_mobile%26utm_content%3Ddo_3129243959686676481258%26utm_campaign%3Dshare_content

b) From Khan Academy Assignments

https://www.khanacademy.org/math/in-in-grade-10-ncert

c) www.examfear.com

d) http://www.ei-india.com/mindspark-math (free trial for 60 days)