Participant Handbook

Machining Technician

Qualifications Pack- Machining Technician

- SECTOR: IT-ITES : Automotive
- SUB-SECTOR: Non Formal
- OCCUPATION: Automotive Components Pack
- REFERENCE ID: ASC/Q 3501

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Index

Basic Geometry – 2D

At the end of this session, you will be able to:

- identify the different 2D geometrical shapes.

Line, Line Segment and Ray

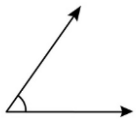
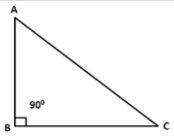
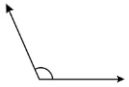
It's Sailesh's second day at the workshop. He walks in to find Mohan studying a component drawing. His interest is further piqued when he sees a number of geometrical shapes printed on the paper. He asks Mohan:
Sailesh: What is this drawing?
Mohan: Oh this… this is a component drawing. You could say it is a blueprint of the desired product. Before we begin, it is very important to define the geometry of the part to be manufactured. These geometrical shapes on the component drawing will provide us with the details of the design – like the exact shape and dimensions.
Sailesh: That's interesting! geometry was always one of my favorite subjects.
Mohan: That's good! Be sure to revisit the basics of geometry before you delve into a component drawing.
Here, you can get started with this simple chart that distinguishes a line, ray and Line segment.
Please

Diagram	Definition
	Line - Infinetly continuous in both directions
	Ray - With one end point and other end extends in one direction
	Line segment - Has two end points

Sailesh always thought a line was a straight stroke, but when he studies the chart in detail he learns that a line in geometry extends in both directions without end. A ray on the other hand, has one end point and extends only in on direction. Whereas, a line segment has two end points.
Next, he goes on to learn about the various angles.

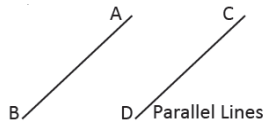
Angle

Sailesh has just begun reading about the different angles in geometry. He starts with the definition of an angle.
The amount of turn between two straight lines that have a common vertex
He understand what lines are, but what is a vertex. Confounded with the jargon, he decides to seek Mohan's help.
Sailesh: Mohan, I have understood all about lines, but what is a vertex and what does it have to with angles. Why can't I simply use a protector to measure angles? It has all the angles marked on it… why do I need to study them?
Mohan: Oh Sailesh do not get so confused. Let me explain you…. An angle is the space between two lines, line segments or rays with a common point. The common end point where both lines meet is called the vertex. The two straight sides are called arms. Simply said, the angle is the amount of turn between each arm. We can measure angles in degrees.
There are 360 degrees in one full rotation i.e. one complete circle around.
Sailesh: Oh I see but, what about these different angles? They are so confusing?
Mohan: Relax Sailesh! Some common angles have been given names. As the angles increase, the names also change. Take a look at this chart. It will help you understand the different types of angles. Here the angle is represented by AOB. The point where the two line segments meet at a common point is called angle vertex. In the above diagram, O is the angle vertex.

Type of Angle	Diagram	Description
Acute Angle		An angle that is less than 90°
Right Angle		An angle that is 90° exactly
Obtuse Angle		An angle that is greater than 90° but less than 180°
Straight Angle		An angle that is 180° exactly
Reflex Angle		An angle that is greater than 180°

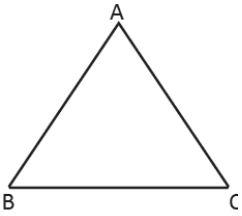
Types of Angles

Sailesh: Now I get it. These are just names of the various kinds of angles. Each angle can be easily distinguished.
Mohan: That's right Sailesh!
Sailesh: Mohan, I still have a slight confusion! You said that an angle is the space between two lines, line segments or rays with a common point but how about when two line segments do not intersect each other…obviously no angle is formed then! Mohan: You're right Sailesh… when two line segments do not intersect each other they are called parallel lines. For instance, take this diagram, AB is parallel to CD. It is represented as AB//CD.

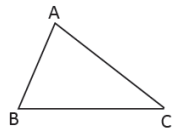
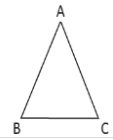
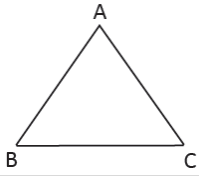
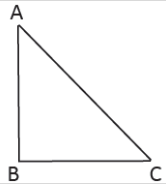


Triangle

Sailesh: Hello everybody, I must say learning about the various types of angles was quite interesting. Next, I'm going to learn about the various types of triangles. As most of us will know, a triangle has three sides and three angles. Take a look at this triangle I have drawn here. It has three sides and angles. A, B and C are the three vertices in the triangle. AB, BC and CA are the sides of the triangle.
Representation△ ABC

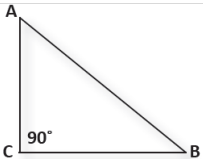
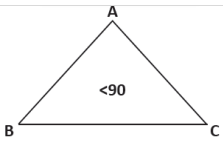
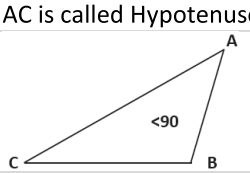


Did you know there are three special names given to triangles that tell how many sides are equal? Here, take a look.

	
Scalene Triangle: All the sides of the triangle are not equal	**Isosceles Triangle:** Two sides of the triangle are equal
	
Equilateral Triangle: All the sides of the triangle are equal	**Right Angle Triangle:** Triangle including a 900. AB is called perpendicular. BC is called base. AC is called Hypotenuse.

Types of Triangles

Triangles can also have names that tell you what type of angle is contained inside. Now that we are acquainted with the classifications of triangles, we can begin our extensive study of the angles of triangles.
I have listed these in the chart below.

	**Right Angle Triangle:** Has a right angle(90°) AB is called perpendicular. BC is called base. AC is called Hypotenuse.
	
Acute Triangle All angles are less than 90°	**Obtuse Triangle** Has an angle more than 90°

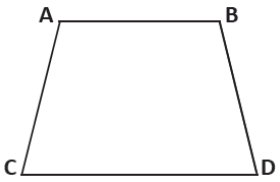
Angles of Triangles

Sometimes a triangle may even have two names. For instance, a triangle that has a right angle (90°) and also two equal angles is called a Right Isosceles Triangle.
Can you guess what the equal angles are?

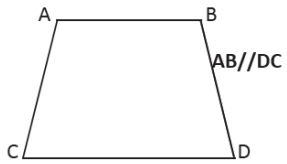
Quadrilaterals

Working with triangles was fairly easy… but what about quadrilaterals. Sailesh is totally flustered –what is a quadrilateral? Is it just a skewed square?

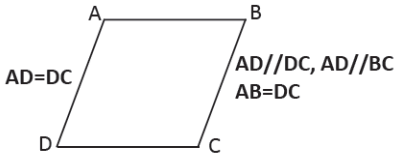
That is when Mohan steps in to help him learn about the quadrilateral shapes.
Mohan: Sailesh, don't look so confused. Quadrilateral just means "four sides", wherein quad means four, lateral means side.
Sailesh: Oh I see…any four-sided shape is a Quadrilateral.
Mohan: Yes, But remember the sides have to be straight, and it has to be 2-dimensional. See this diagram I have drawn below: It can be represented by ⏢ ABCD.



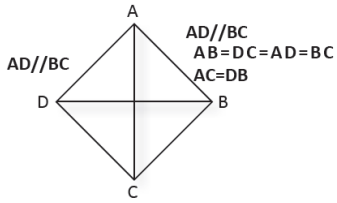
Trapezium:
A trapezium is a quadrilateral with one pair of sides parallel to each other.
The parallel sides that are AB and CD are called bases of the trapezium.
The non-parallel sides are called legs of the trapezium.



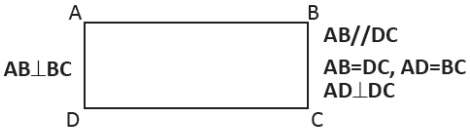
Parallelogram:
The opposite pair of the quadrilateral is parallel and equal to each other.



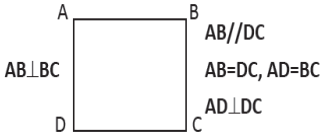
Rhombus:
It is a parallelogram where all the sides are equal to each other. The diagonals are also equal to each other.



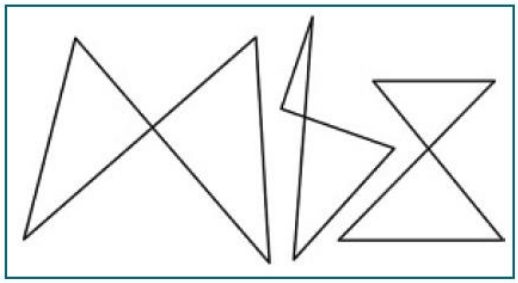
Rectangle:
It is a parallelogram with opposite sides equal and adjacent sides perpendicular to each other



Square:
It is a parallelogram with all sides equal. The adjacent sides are perpendicular to each other.

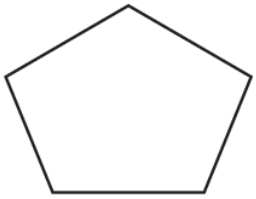
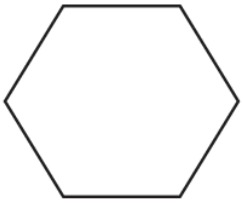
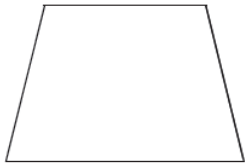
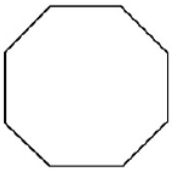
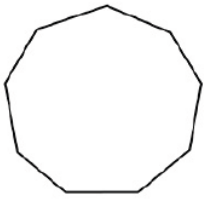
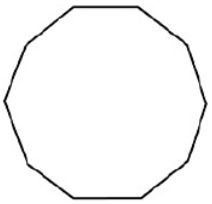


Oh Yes! One other thing you must bear in mind is - When two sides cross over, you call it a "Complex" or "Self-Intersecting" quadrilateral like these:



They still have 4 sides, but two sides cross over.
That's it for quadrilaterals! Next, let's learn about some other polygons.
Sailesh: Polygons? What are those?
Mohan: Polygons are 2-dimensional shapes. They are made of straight lines, and the shape is closed.
Sailesh: closed?
Mohan: It means all the lines connect.

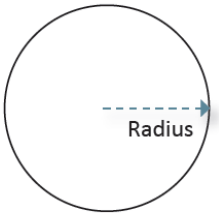
Sailesh: That means that all the shapes we learned about today, like the triangle and the various quadrilaterals are all polygons.
Mohan: That's right Sailesh! Some other polygons you should know about are:

		
Pentagon: Shape with 5 sides	**Hexagon:** Shape with 6 sides	**Heptagon**: Shape with 7 sides
		
Octagon: Shape with 8 sides	**Nonagon**: Shape with 9 sides	**Decagon**: Shape with 10 sides

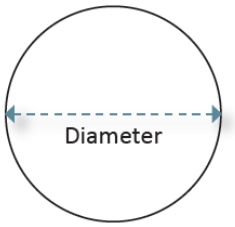
Circles / Elliptical Shapes

Sailesh: So we have learned a great deal about the various 2 dimensional shapes. However there is one more shape I would like to learn about. Most of us already know how to draw a circle, but did you know that in a perfect circle all its points are at the same distance from the center? When I began reading about the circle, there were a lot of confusing terms related to a circle. Mohan then simplified these for me. I have penned these down for you. Here take a peek!

- The Radius is the distance from the center to the edge.



- The Diameter starts at one side of the circle, goes through the center and ends on the other side.



- The Diameter starts at one side of the circle, goes through the center and ends on the other side.

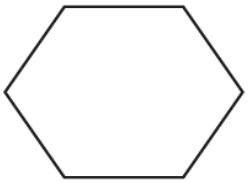
And friends here is the really cool thing: When you divide the circumference by the diameter you get 3.141592654. which is the number π (Pi). Simply put, when the diameter is 1, the circumference is 3.141592654.
With that we come to a close of this interesting session. I will see you soon with more information on shapes. Meanwhile, why don't you practice drawing different shapes? Have Fun!

Worksheet

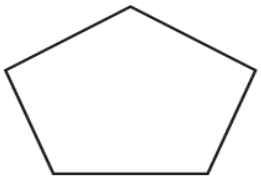
1. Answer these fun riddles for Sailesh and learn more about 2D shapes and their attributes.
a. I am any closed shape with straight sides. Who am I? _____
b. I have three sides and the same amount of angles. What shape am I? _____
c. I am a quadrilateral. All my sides are always the same length. I have all right angles. Who do you think I am? _____
d. Look at my angles! There are three and two of them are equal. Who am I? _____

e. I have more sides than a quadrilateral, but fewer sides than a hexagon. Who could I be? _____

2. Sailesh has muddled all the shapes in haste. Can you match the shape pictures to the correct names?

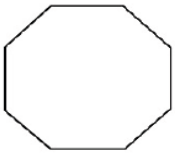


Pentagon

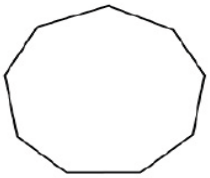


Hexagon

Trapezium



Heptagon



Rhombus

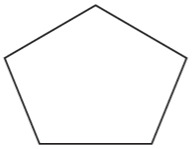
3. 1.If a circle has a diameter of 14 inches, what will its circumference be? Use 22/7 as an approximation for π.

_____

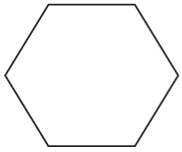
_____

Answers

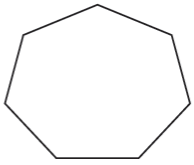
1. a. Polygons b. Equilateral Triangle c. Square d. Isosceles Triangle
e. Pentagon



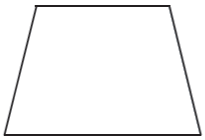
Hexagon



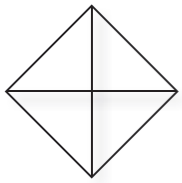
Pentagon



Rhombus



Heptagon



Trapezium

3. 44 inches

Basic Geometry-3D

At the end of this session, you will be able to:

- identify the different 3D geometrical shapes;
- differentiate between 2D and 3D shapes.

2D and 3D

Shailesh has just entered the workshop and finds Mohan working with a cube. Excited to show Mohan how much he has learned about shapes he picks up the cube and says:
Sailesh: This is a square, isn't it?
Mohan: Not quite Sailesh! This is a cube.
Shailesh: Aren't they the same thing?
Mohan: Not really! A square is a 2D (two dimensional) shape, whereas a cube is a 3D (three dimensional) shape.
Sailesh: 3D shape! What is a 3D shape? ... How is it different from a 2D shape? I'm so confused!
Mohan: Relax Shailesh, don't get confused. Let me explain you the difference between 2D and 3D shapes in geometry.

IL&FS | Skills

IL&FS Skills Development Corporation Limited

(A Joint Initiative with National Skill Development Corporation)

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