

# Minor project (Single cutting Tool model)

The shape and angle of tool face & cutting edge is known as Tool geometry.

**Tool Geometry of single point cutting tool :-**

The element which define the shape of a single point cutting tool are as follows :-

- (i) Shank
- (ii) Face
- (iii) Flank
- (iv) Heel
- (v) Nose
- (vi) Base
- (vii) Rake
- (viii) side & back rake angle.
- (ix) side & end cutting edge angle.
- (x) side & end relief angle
- (xi) Lip or cutting angle.

**4th sem Mechanical Engineering**

1. Shank :- Shank is that portion of the tool bit which is not grind to form any cutting edge & is rectangular in cross-section.

2. Face :- Face of the cutting tool is that surface against which the chip slides upward.

3. Flank :- Flank of a cutting tool is that surface which face the work piece.

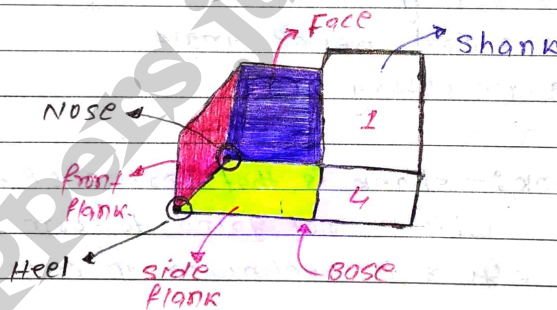
4. Heel :- It is the lowest portion of the bottom of the tool where the base & flank meet.

5. **Nose** :- The point where the side & end cutting edge meet is called the nose of the tool.

6. **Base** :- The base of the tool is the under side of the shank.  
or The under side surface of the tool is known as base.

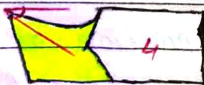
7. **Rake** :- It is the slope of the top towards the shank.

8. **Rake angle** :- It is the angle formed between the face of the tool & a plane parallel to the its base.



→ If the inclination of the angle is towards shank then it is known as back or top rake angle.

→ If its inclination is towards the side of the tool is measured then it is called side rake angle.



Back/Top Rake angle.



Side rake angle.

Rake angle guide the chip away from the cutting edge & reduce chip pressure on the face of the tool & increase the sharpness of tool so that less power is required for cutting.

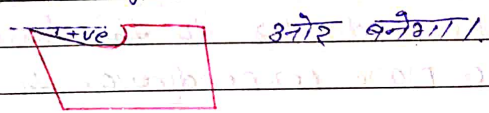
→ Increase in the side rake angle reduces the chip thickness in turning.

### TYPES OF RAKE.

- (i) Positive (+ve) rake
- (ii) Negative (-ve) rake
- (iii) Zero rake

- (i) positive rake :- It increase tool sharpness.
- It make tool weak.
  - It is suitable for ductile material.

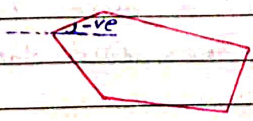
Note:- positive rake angle surface से झेरा नीचे की



- (ii) Negative rake :- • It make tool stronger.

- It direct the chip towards the workpiece.
- It is suitable for Brittle material (C.I) show.

Note:- Negative rake angle surface से झेरा ऊपर की ओर बनेगा।





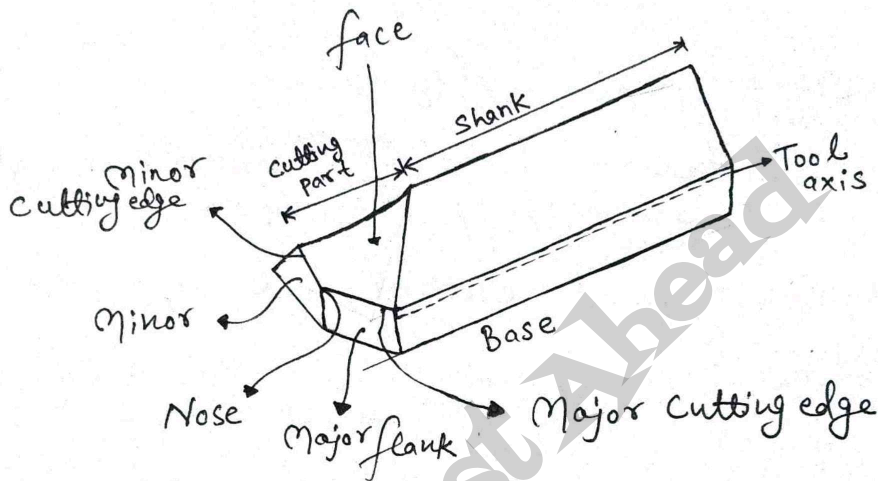


fig: 3D module

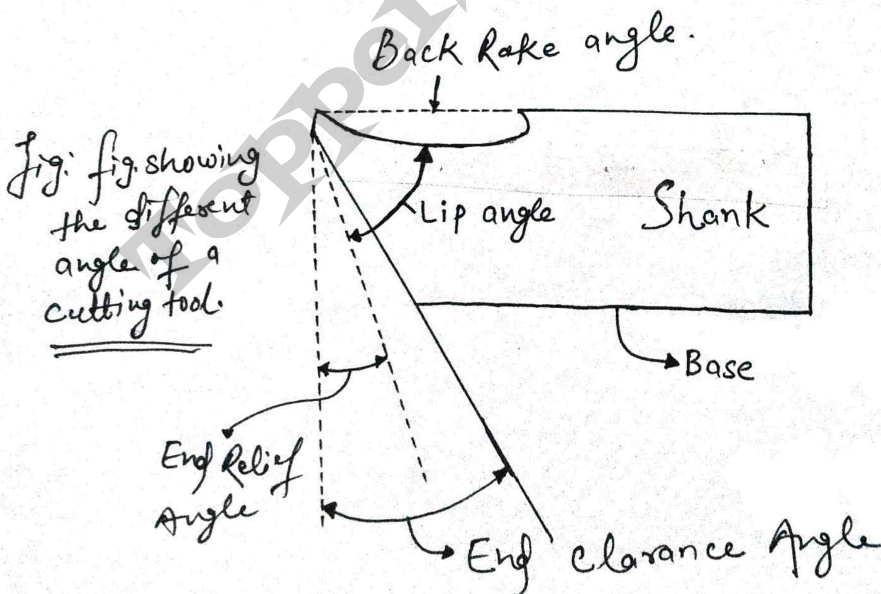


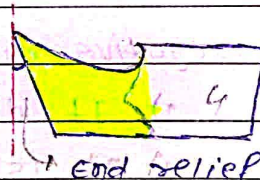
Fig: fig showing the different angle of a cutting tool.

(9) side and end relief angle :- side relief angle is the angle between the portion of the side flank just below the side cutting edge & a line drawn through this cutting edge perpendicular to the base. It is measured in a plane perpendicular to the side flank.

\* end relief angle :- end relief angle is the angle between the portion of the end flank immediately below the end cutting edge & a line drawn through this cutting edge perpendicular to the base. It is measured in a plane perpendicular to the end flank.



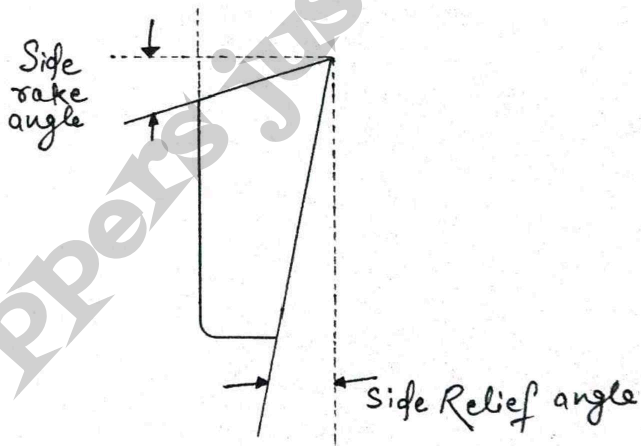
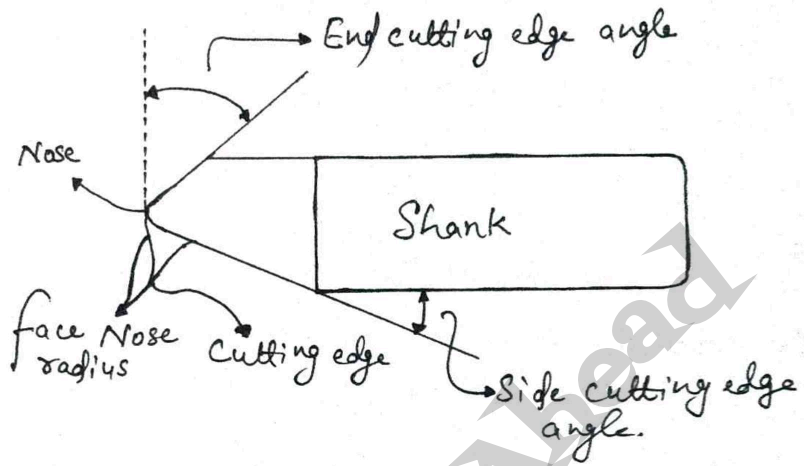
side relief angle.



end relief angle.

(10) side & end cutting edge angle :- side cutting edge angle is the angle between the cutting edge & the line extending the shank. It is measured in a plane parallel to the base. It prevents interference as the tool enters into the work material.

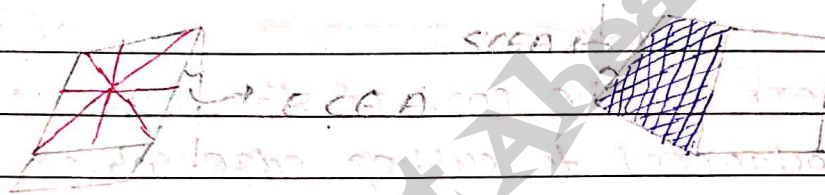
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# TOPPERS JUST AHEAD

- \* End cutting edge angle :- End cutting edge angle is the angle between the end cutting edge & the line passing through the chip perpendicular to the tool axis. It is measured in a plane parallel to base.



- # Tool designation (ANSI or ASA) of single point cutting tool :-

$\alpha_b$	-	$\alpha_s$	-	$\gamma_e$	-	$\gamma_s$	-	$C_e$	-	$C_s$	-	$R$
↓		↓		↓		↓		↓		↓		↓
Back rake angle		Side rake angle		End relief angle		Side relief angle		End cutting edge angle		Side cutting edge angle		Nose Radius

Ex -  $10^\circ - 7^\circ - 8^\circ - 9^\circ - 14^\circ - 15^\circ - 6$

Here  $14^\circ \Rightarrow$  end cutting edge angle

$6 \Rightarrow$  Nose Radius.

$9^\circ \Rightarrow$  side relief angle.

Remember Trick  $\rightarrow$  RAKE - Relief - cutting.

RAKE	RAKE	Relief	Relief	cutting	cutting.
BACK	side	end	side	end	side.

