WELCOME

TO Adda247

"There is nothing impossible to they who will try."

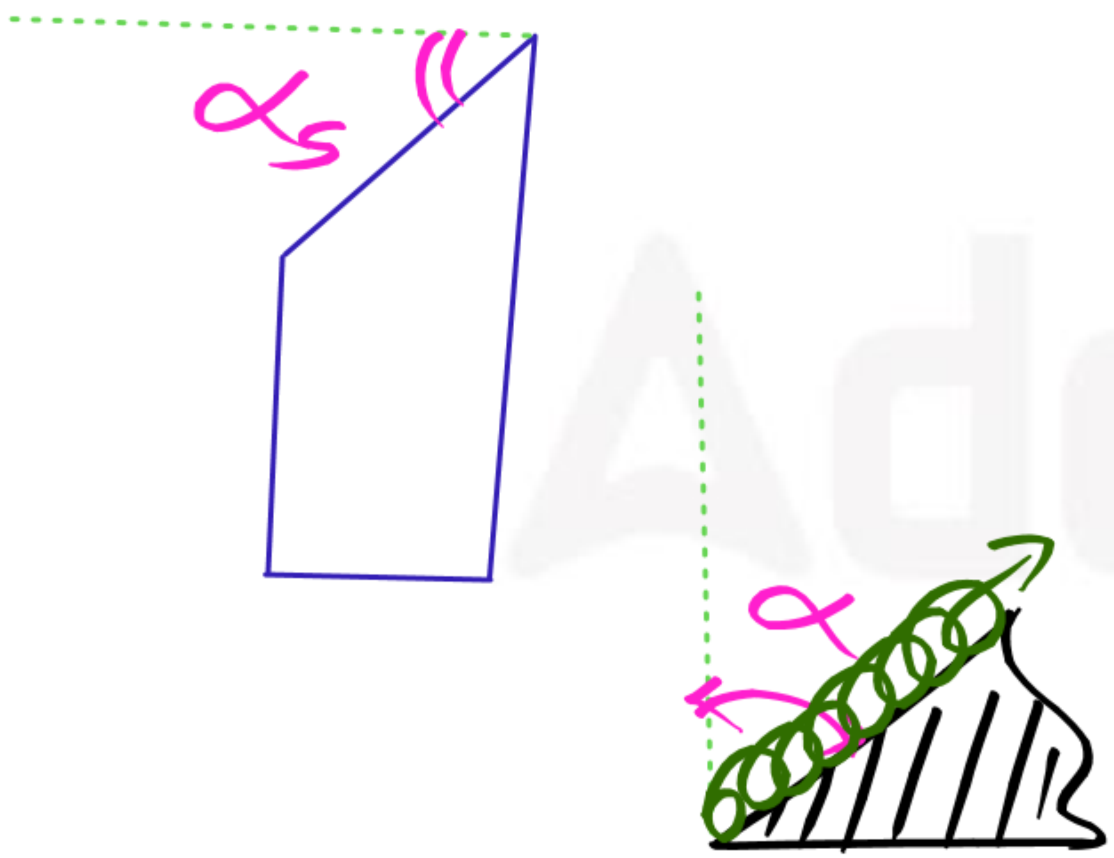
ISRO | BHEL | DRDO & OTHER PSUS

QUESTION SERIES ME

PRODUCTION

Time- 11:30am Date- 10 april 2023

Gaurav sir



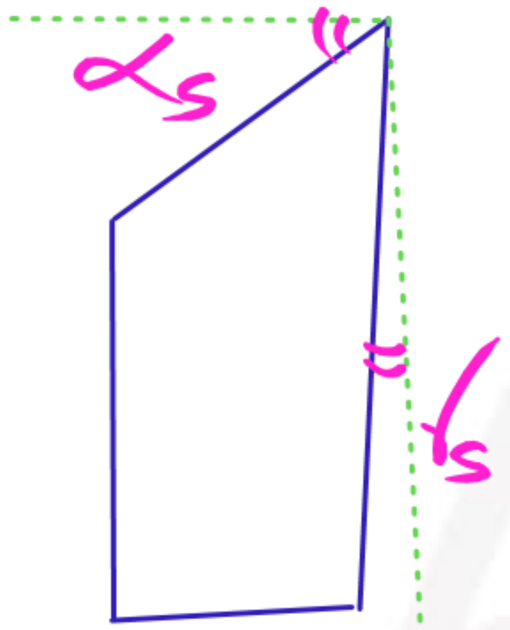
The purpose of providing side rake angle in the cutting tool is

(a) avoid work from rubbing against tool → Relief Angle

(b) Control chip flow

(c) Strengthen tool edge

(d) Break chips



The angle of inclination of the rake face with respect to the tool base measured in a plane perpendicular to the base and parallel to the width of the tool is called

(a) Back rake angle
(b) Side rake angle
(c) Side cutting edge angle
(d) End cutting edge angle

(6)

* Cutting of ⊥ to Base And || to width

⇓

* α_s
* γ_s

* Cutting Along || to Base

⇓

* Nose Radius (R)
* C_e
* C_s

* ⊥ to Base And || to Length

⇓

* γ_e
* α_b

Which of the following is a single point cutting tool?

(a) Hacksaw blade

(b) Milling cutter

(c) Grinding wheel

(d) Parting tool

MPCT

SPCT

* $C_s \uparrow$

* Radial Force → F_y
* Axial or Longitudnal force → F_x
* Tangential or cutting force → F_c

* $F_y = F_t \cdot \sin C_s$
* $F_x = F_t \cdot \cos C_s$

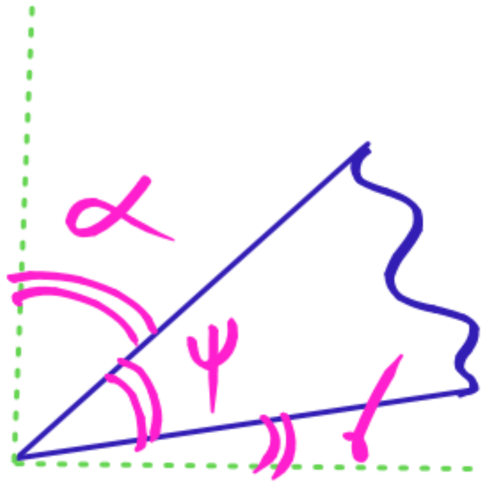
Consider the following statements:

In an orthogonal, single-point metal cutting, as the side-cutting edge angle is increased,

1. The tangential force increases.
2. The longitudinal force drops.
3. The radial force increases.

Which of these statements are correct?

(a) 1 and 3 only (b) 1 and 2 only
(c) 2 and 3 only (d) 1, 2 and 3



Strength of Tool → ψ

$\alpha + \psi + \gamma = 90^\circ = \text{const}$

Consider the following statements:

The strength of a single point cutting tool depends upon

1. Rake angle
2. Clearance angle
3. Lip angle

Which of these statements are correct?

(a) 1 and 3 (b) 2 and 3

(c) 1 and 2 (d) 1, 2 and 3 ✓

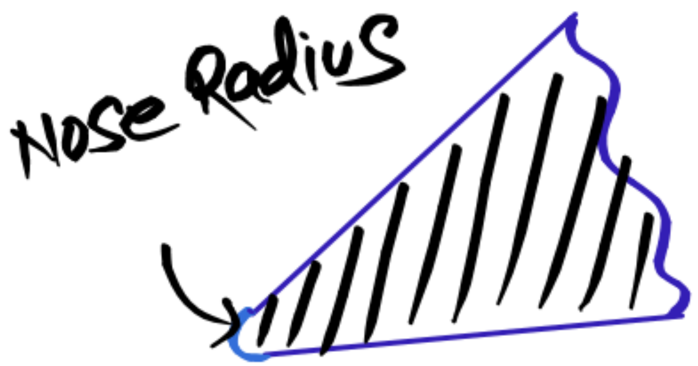
Consider the following statements with respect to the effects of a large nose radius on the tool:

1. It deteriorates surface finish.
2. It increases the possibility of chatter.
3. It improves tool life.

Which of the above statements is/are correct?

(a) 2 only (b) 3 only

(c) 2 and 3 only (d) 1, 2 and 3



Surface Roughness (h)

* $h\downarrow = \dfrac{f^2}{8R\uparrow}$

* $R\uparrow \Rightarrow h\downarrow \Rightarrow$ Excellent Surface Finish

$0.2\,mm < R < 1.2\,mm$

A single – point cutting tool with 12° rake angle is used to machine a steel work – piece. The depth of cut, i.e. uncut thickness is 0.81 mm. The chip thickness under orthogonal machining condition is 1.8 mm. The shear angle is approximately

(a) 22° (b) 26° (c) 56° (d) 76°

Given Data :→ orthogonal Machining

* $\alpha = 12^\circ$
* doc = 0.81 mm = t
* t_c = 1.8 mm
* ϕ = ?

Solution :→

* $\tan\phi = \dfrac{r \cdot \cos\alpha}{1 - r \cdot \sin\alpha}$
* $r = \dfrac{t}{t_c} = \dfrac{0.81}{1.8} = 0.45$
* $\tan\phi = \dfrac{\left(\frac{0.81}{1.8}\right) \cdot \cos 12}{1 - \left(\frac{0.81}{1.8}\right) \cdot \sin 12}$
* $\phi =$

Tool geometry of a single point cutting tool is specified by the following elements:

1. Back rake angle
2. Side rake angle
3. End cutting edge angle
4. Side cutting edge angle
5. Side relief angle
6. End relief angle
7. Nose radius

The correct sequence of these tool elements used for correctly specifying the tool geometry is

(a) 1,2,3,6,5,4,7 (b) 1,2,6,5,3,4,7

(c) 1,2,5,6,3,4,7 (d) 1, 2, 6, 3, 5, 4,7

ASA

α_b α_s γ_e γ_s C_e C_s R

If $C_s \leq 30^\circ$

ORS

i α γ_s γ_e C_e λ R

* $\lambda = 90^\circ - C_s$

(ASA) (ORS)

* $\alpha_s = \alpha$

* $\phi = \lambda = 90^0$

* $\tan\alpha = \tan\alpha_s \cdot \sin\lambda + \tan\alpha_b \cdot \cos\lambda$

* $\tan\alpha = \tan\alpha_s \cdot \sin 90 + \tan\alpha_b \cdot \cos 90$

* $\tan\alpha = \tan\alpha_s$

⇓

$\alpha = \alpha_s$

In a single point turning tool, the side rake angle and orthogonal rake angle are equal. Φ is the principal cutting edge angle and its range is $0° \le \phi \le 90°$. The chip flows in the orthogonal plane. The value of Φ is closest to

(a) 0^0

(b) 45^0

(c) 60^0

(d) 90^0 ✓

Minimum shear strain in orthogonal turning with a cutting tool of zero rake angle is

(a) 0.0 (b) 0.5

(c) 1.0 (d) 2.0 ✓

Shear Strain (ε)

$$\varepsilon = \cot\phi + \tan(\phi - \alpha)$$

$\alpha = 0$

$$* \ \phi = \frac{90 + \alpha}{2}$$

Shear Angle for Minimum Shear Strain

$* \ \phi = \frac{90 + 0}{2} = 45^0$

$* \ \varepsilon = \cot 45 + \tan(45 - 0)$

$* \ \varepsilon = 1 + 1 = 2$

If $\alpha = 0$

$\Downarrow$

$\varepsilon_{Min} = 2A$ at $\phi = 45^\circ$

Given Data :→

* $\alpha = 12^\circ$
* $\phi = ?$ for ε_{min}

A single point cutting tool with 12° rake angle is used for orthogonal machining of a ductile material. The shear plane angle for the theoretically minimum possible shear strain to occur

(a) 51 (b) 45

(c) 30 (d) None of these

Solution :→

* $\varepsilon = \cot\phi + \tan(\phi - \alpha)$
* $\varepsilon = \cot\phi + \tan(\phi - 12)$
* $\frac{d\varepsilon}{d\phi} = 0$

$\phi = ?$

$\phi = \frac{90+\alpha}{2} = \frac{90+12}{2} = 51^\circ$

$\varepsilon_{min} = \cot 51 + \tan(51-12) =$

The rake angle of a cutting tool is 15°, shear angle 45° and cutting velocity 35 m/min. What is the velocity of chip along the tool face?

(a) 28.5 m/min ✓ (b) 27.3 m/min

(c) 25.3 m/min (d) 23.5 m/min

Given Data :→

* $\alpha = 15^\circ$
* $\phi = 45^\circ$
* $V = 35$ m/min
* $V_c = ?$

Solution :→

* $\frac{V_c}{V} = \frac{\sin\phi}{\cos(\phi - \alpha)}$
* $\frac{V_c}{35 \text{ m/min}} = \frac{\sin 45}{\cos(45 - 15)}$
* $V_c = \frac{35 \times \sin 45}{\cos(45 - 15)}$
* $V_c = 28.5$ m/min

* $r = \frac{t}{t_c} = \frac{V_c}{V} = \frac{l_c}{l} = \frac{\sin\phi}{\cos(\phi-\alpha)}$

* $\frac{V_c}{V} = \frac{\sin\phi}{\cos(\phi-\alpha)}$

* $\frac{V_s}{V} = \frac{\cos\alpha}{\cos(\phi-\alpha)}$

Given data :→ orthogonal cutting

* $r = 0.75$
* $V = 60$ m/min
* doc $= 2.4$ mm $= t$
* $V_c = ?$
* $t_c = ?$

Solution :→ * $r = \frac{t}{t_c} = \frac{V_c}{V}$

Consider the following statements:

In an orthogonal cutting the cutting ratio is found to be 0·75. The cutting speed is 60 m/min and depth of cut 2·4 mm. Which of the following are correct?

1. Chip velocity will be 45 m/min.
2. Chip velocity will be 80 m/min.
3. Chip thickness will be 1·8 mm.
4. Chip thickness will be 3·2 mm.

Select the correct answer using the code given below:

(a) 1 and 3 (b) 1 and 4
(c) 2 and 3 (d) 2 and 4

* $r = \frac{t}{t_c}$
* $0.75 = \frac{2.4}{t_c} \Rightarrow t_c = \frac{2.4}{0.75} = 3.2$ mm

☺ * $\frac{V_c}{V} = \frac{\sin\phi}{\cos(\phi-\alpha)}$

* $r = \frac{t}{t_c} = \frac{V_c}{V}$

* $r = \frac{V_c}{V}$

* $0.75 = \frac{V_c}{60\ m/min}$

* $V_c = 0.75 \times 60$

* $V_c = 45\ m/min$

An orthogonal cutting operation is being carried out under the following conditions: cutting speed = 2 m/s, depth of cut = 0.5 mm, chip thickness = 0.6 mm. Then the chip velocity is

(a) 2.0 m/s (b) 2.4 m/s

(c) 1.0 m/s ✓(d) 1.66 m/s

Given Data :→ orthogonal cutting

* $V = 2\,m/s$
* $doc = 0.5\,mm = t$
* $t_c = 0.6\,mm$
* $V_c = ?$

Solution :→ * $r = \frac{t}{t_c} = \frac{V_c}{V}$

* $\frac{t}{t_c} = \frac{V_c}{V}$
* $\frac{0.5}{0.6} = \frac{V_c}{2\,m/s}$
* $V_c = 1.66\,m/s$

In an orthogonal cutting, the depth of cut is halved and the feed rate is double. If the chip thickness ratio is unaffected with the changed cutting conditions, the actual chip thickness will be

(a) Doubled (b) halved ✓

(c) Quadrupled (d) Unchanged.

Given data :→ orthogonal cutting

$t = $ * doc = doc/2

* f = 2f

* r = constant

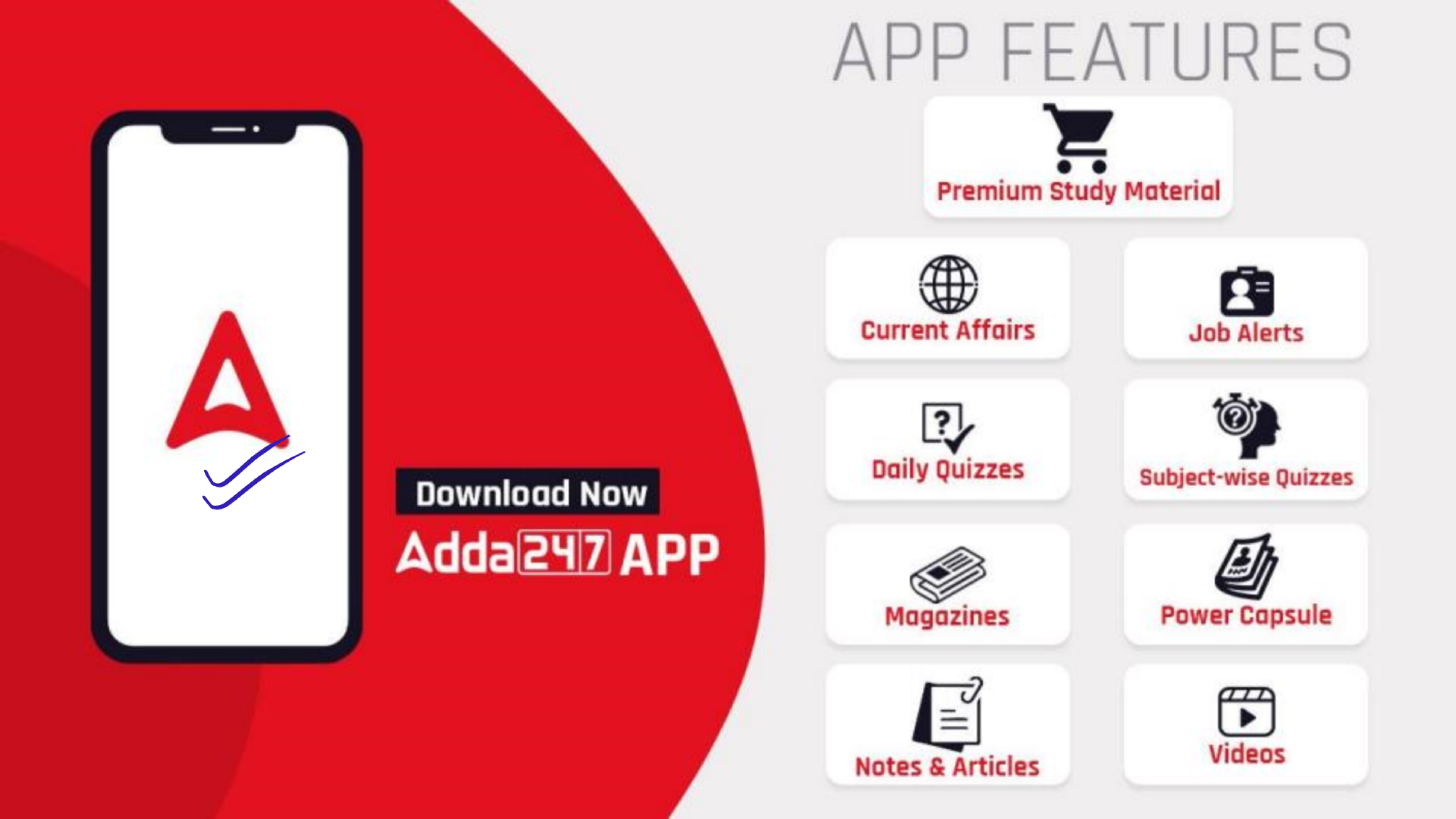
* t_c → Effect

Solution :→ * $r = \frac{t}{t_c} = \frac{doc}{t_c}$

* $r = \frac{(doc/2)}{t_c/2}$

↓

const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