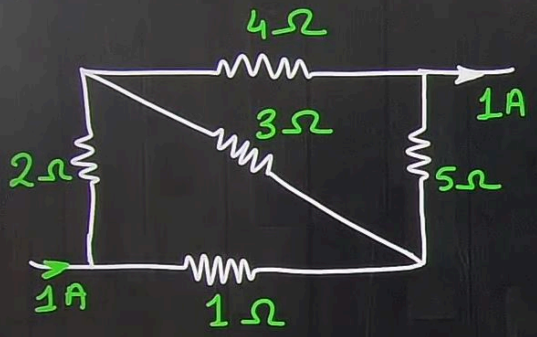
When circuit is complete, use KVL
When circuit is open, use KCL

By using Kirchhoff's laws, calculate branch currents in the circuit.



mesh wise.

① Assume direction to apply KVL.

② V I KVL +V

V KVL −V

③ R −IR

R −(−IR) +IR

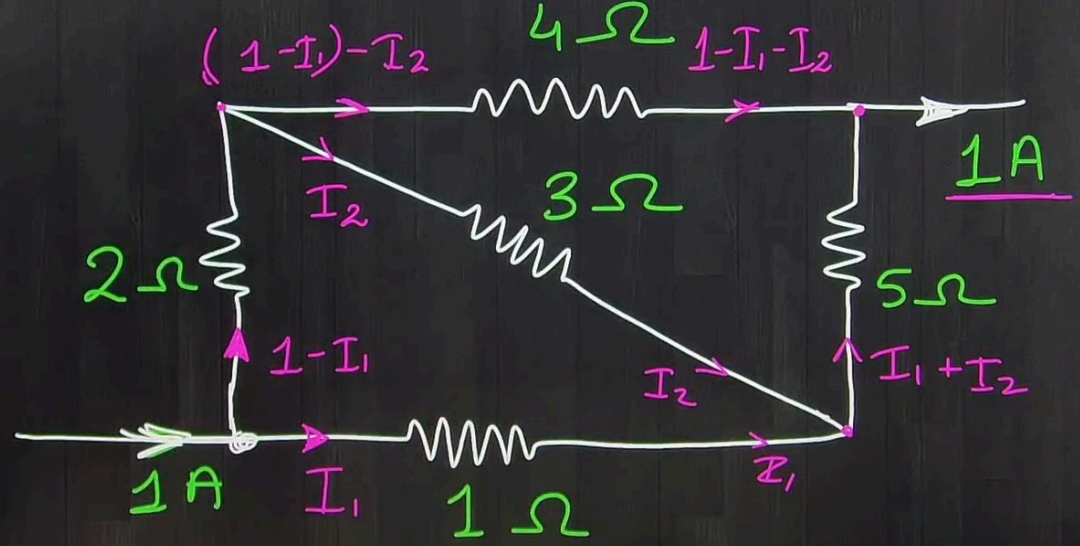
④ Assume proper currents.

08:09

By using Kirchhoff's laws, calculate branch currents in the circuit.

$(1-I_1-I_2)+(I_1+I_2)$

$1-I_1-I_2+I_1+I_2$



08:28

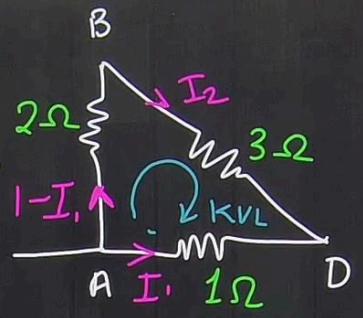
laws, calculate

circuit.

1A

I_2

Apply KVL to ABDA.



$$-[(1-I_1)2] - I_2 3 - (-I_1 1) = 0$$

$$-2(1-I_1) - 3I_2 + I_1 = 0$$

$$-2 + 2I_1 - 3I_2 + I_1 = 0$$

$$\boxed{3I_1 - 3I_2 = +2 \quad — (1)}$$

mesh wise.

① Assume direction to apply KVL.

② V, I. KVL → +V; V, KVL → −V.

③ R: −IR; R: −(−IR) = +IR.

④ Assume proper currents.

lculate

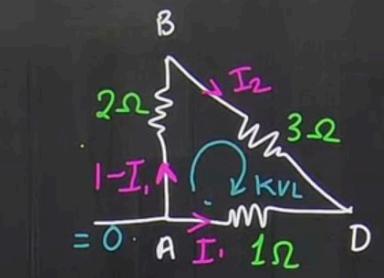
Apply KVL to ABDA

$$-[(1-I_1)2] - I_2 3 - (-I_1 1)$$

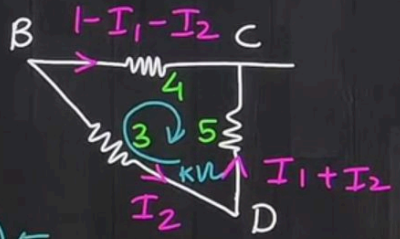
$$-2(1-I_1) - 3I_2 + I_1 = 0$$

$$-2 + 2I_1 - 3I_2 + I_1 = 0$$

$$\boxed{3I_1 - 3I_2 = +2 \quad -(1)}$$



Apply KVL to BCDB



$$-(1-I_1-I_2)4 - (-(I_1+I_2)5 - (-I_2 3) = 0$$

$$-4(1-I_1-I_2) + 5(I_1+I_2) + 3I_2 = 0$$

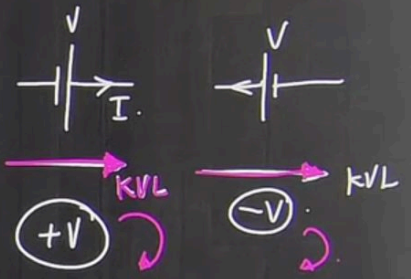
$$-4 + 4I_1 + 4I_2 + 5I_1 + 5I_2 + 3I_2 = 0$$

$$\boxed{9I_1 + 12I_2 = 4 \quad -(2)}$$

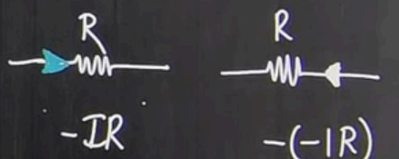
mesh wise.

(I) Assume direction to apply KVL.

(II)



(III)

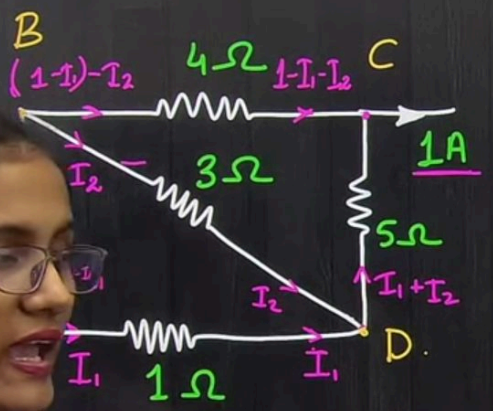


$-IR$ $\quad -(-IR)$

$+IR$

(IV) Assume proper currents.

By using Kirchhoff's laws, calculate branch currents in the circuit



$x = I_1 = 0.571$

$y = I_2 = -0.095$

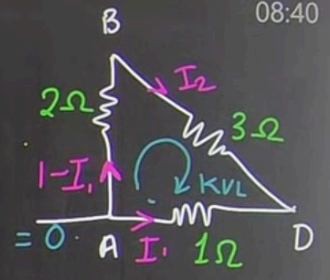
Apply KVL to ABDA

$-[(1-I_1)2] - I_2 3 - (-I_1 1)$

$-2(1-I_1) - 3I_2 + I_1 = 0$

$-2 + 2I_1 - 3I_2 + I_1 = 0$

$3I_1 - 3I_2 = +2 \quad -(1)$



Apply KVL to BCDB

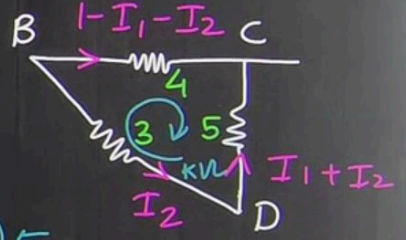
$-(1-I_1-I_2)4 - (-(I_1+I_2)5$

$-(-I_2 3) = 0$

$-4(1-I_1-I_2) + 5(I_1+I_2) + 3I_2 = 0$

$-4 + 4I_1 + 4I_2 + 5I_1 + 5I_2 + 3I_2 = 0$

$9I_1 + 12I_2 = 4 \quad -(2)$



08:40

08:42

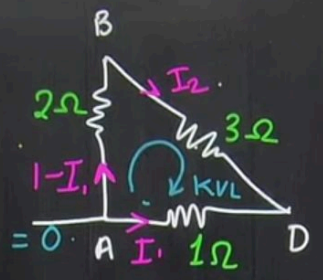
Apply KVL to ABDA

$-[(1-I_1)2] - I_2 3 - (-I_1 1)$

$-2(1-I_1) - 3I_2 + I_1 = 0$

$-2 + 2I_1 - 3I_2 + I_1 = 0$

$3I_1 - 3I_2 = +2 \quad -(1)$



branch AB = $1-I_1$

$= 1 - 0.571$

$=$ _____

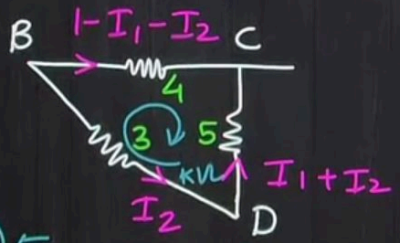
BD = I_2

$=$ _____

AD = I_1

$=$ _____

Apply KVL to BCDB



$-(1-I_1-I_2)4 - (-(I_1+I_2)5 - (-I_2 3) = 0$

$-4(1-I_1-I_2) + 5(I_1+I_2) + 3I_2 = 0$

$-4 + 4I_1 + 4I_2 + 5I_1 + 5I_2 + 3I_2 = 0$

$9I_1 + 12I_2 = 4 \quad -(2)$

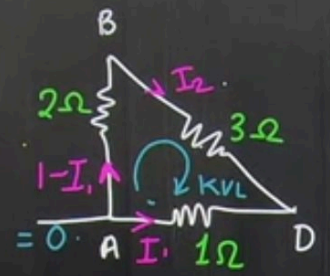
L to ABDA

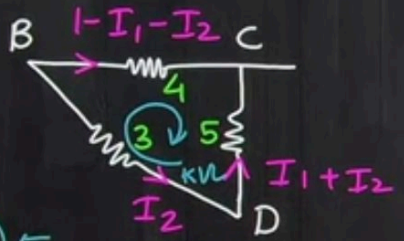
$-I_2 3 - (-I_1 1)$

$-3I_2 + I_1 = 0$

$3I_2 + I_1 = 0$

$-3I_2 = +2$ — ①





KVL to BCDB

$-I_2)4 - (-(I_1+I_2)5 - (-I_2 3) = 0$

$-I_2) + 5(I_1+I_2) + 3I_2 = 0$

$+4I_2 + 5I_1 + 5I_2 + 3I_2 = 0$

$I_1 + 12I_2 = 4$ — ②

branch AB = $1 - I_1$

$= 1 - 0.571$

$= 0.429\ A$

$BD = I_2$

$= -0.0952$

$AD = I_1$

$= 0.571$

$BC = 1 - I_1 - I_2$

$= 1 - 0.571 - (-0.0952)$

$= 1 - 0.571 + 0.0952$

$= 0.5242$

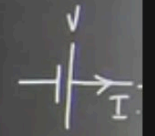
$CD = I_1 + I_2$

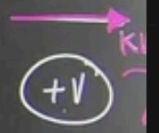
$= 0.571 + (-0.0952)$

08:45

① Assume

II



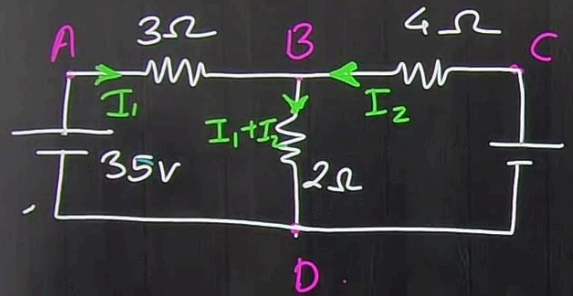


III

$-IR$

IV Assume p

By using kirchhoff's law calculate current in branch.



Apply KVL to mesh ABDA.

$+35 - 3I_1 - 2(I_1+I_2) = 0$

$-3I_1 - 2I_1 - 2I_2 = -35$

$-5I_1 - 2I_2 = -35$ — ①

Apply KVL to mesh BCDB:

$4I_2 - 40 + 2(I_1+I_2) = 0$

$4I_2 - 40 + 2I_1 + 2I_2 = 0$

$2I_1 + 6I_2 = 40$ — ②

$I_1 = 5A$

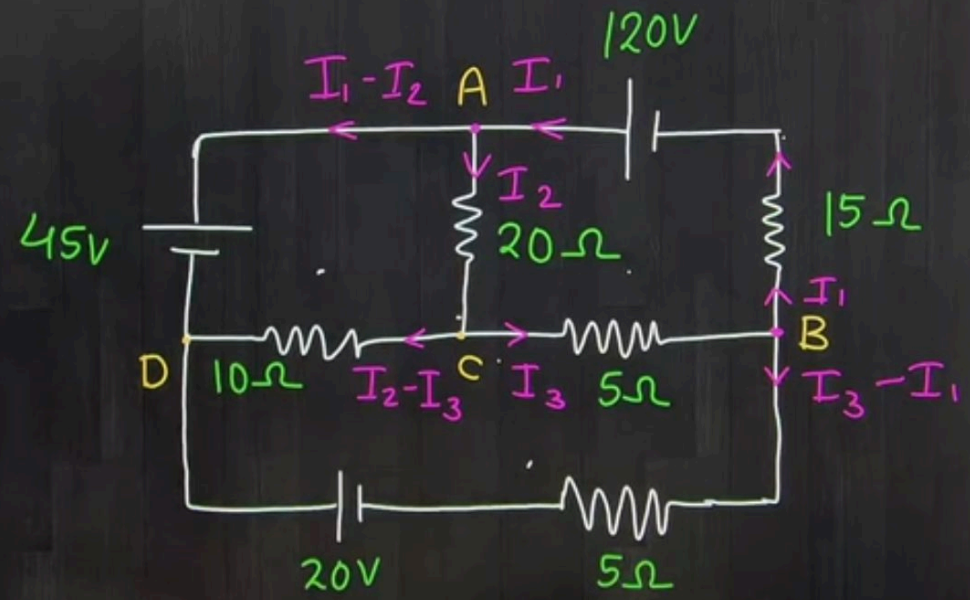
$I_2 = 5A$

Current in 2Ω

$= I_1 + I_2$

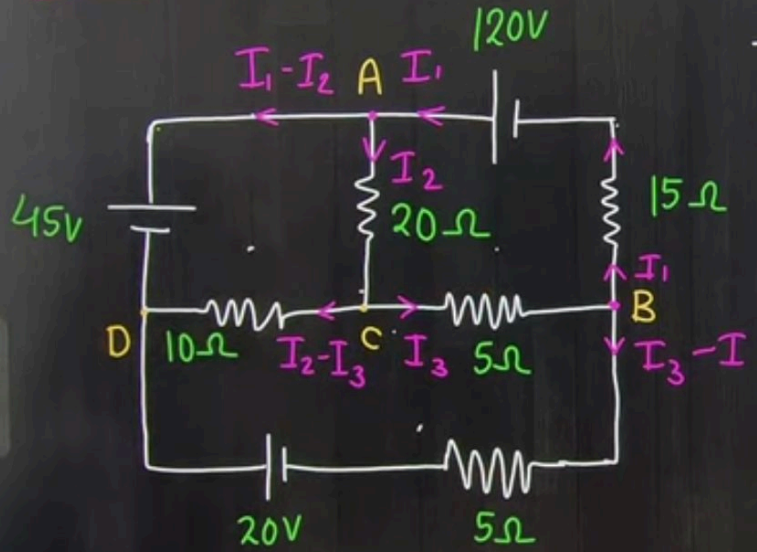
$= 5 + 5 = 10A$ //

Determine the current through 20 Ω resistor in the circuit shown.

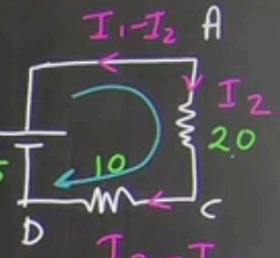


09:27

Determine the current through 20 Ω resistor in the circuit shown.



Apply KVL to ACDA.

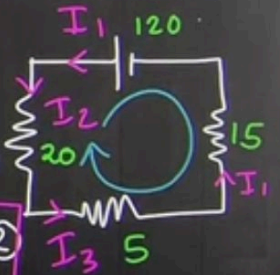


$$-20I_2 - 10(I_2 - I_3) + 45 = 0$$

$$-20I_2 - 10I_2 + 10I_3 = -45$$

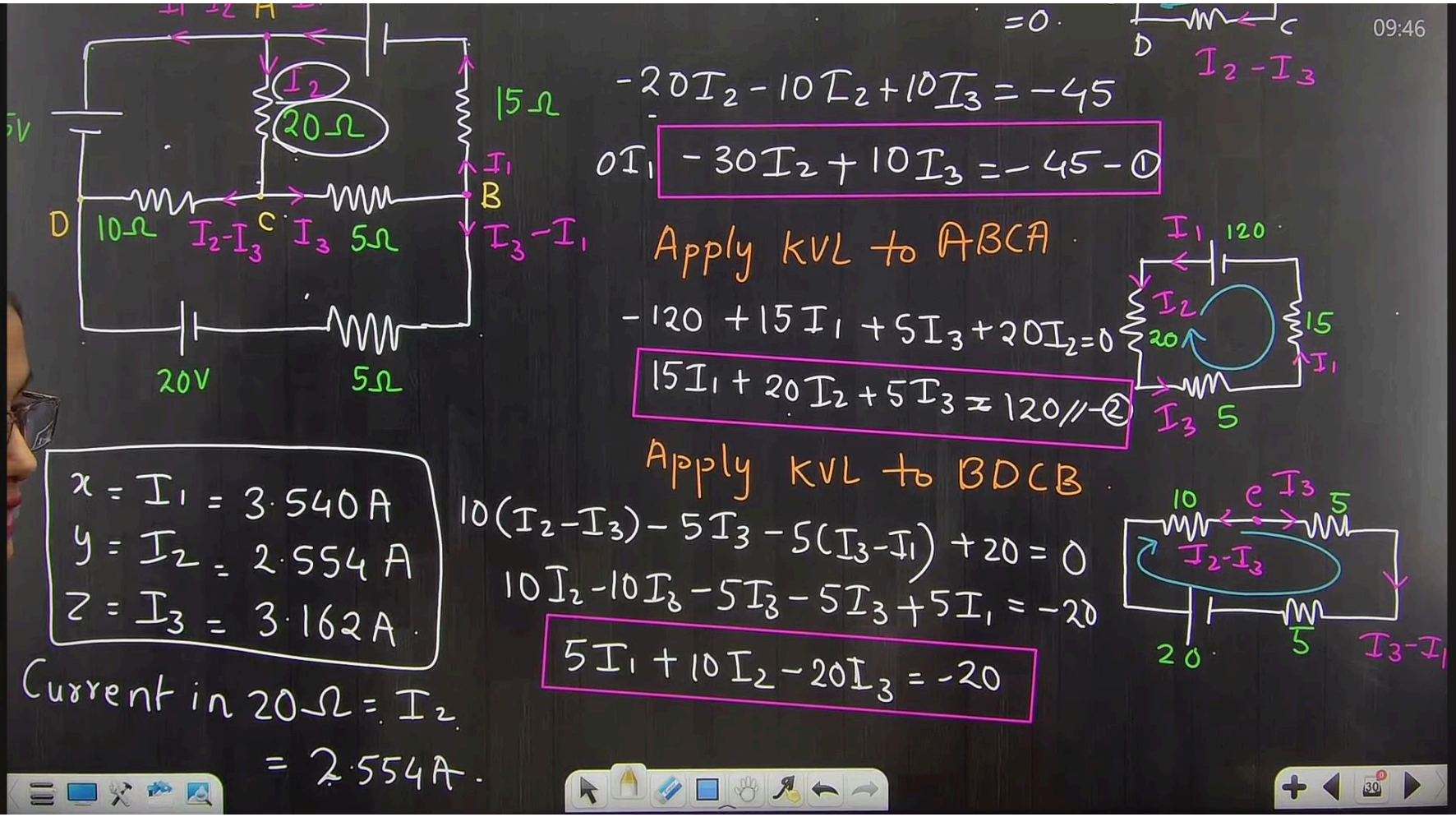
$$\boxed{-30I_2 + 10I_3 = -45 \quad -①}$$

Apply KVL to ABCA.



$$-120 + 15I_1 + 5I_3 + 20I_2 = 0$$

$$\boxed{15I_1 + 20I_2 + 5I_3 = 120 \quad //-②}$$


09:46
A
I_2
20Ω
15Ω
I_1
B
D
10Ω
I_2-I_3
C
I_3
5Ω
I_3-I_1
20V
5Ω
=0
D
C
I_2-I_3
$-20I_2-10I_2+10I_3=-45$
$-30I_2+10I_3=-45-①$
Apply KVL to ABCA
$-120+15I_1+5I_3+20I_2=0$
$15I_1+20I_2+5I_3=120//-②$
I_1 120
I_2
20
15
I_1
I_3 5
Apply KVL to BDCB
$10(I_2-I_3)-5I_3-5(I_3-I_1)+20=0$
$10I_2-10I_3-5I_3-5I_3+5I_1=-20$
$5I_1+10I_2-20I_3=-20$
10
C
I_3
5
I_2-I_3
20
5
I_3-I_1
$x=I_1=3.540A$
$y=I_2=2.554A$
$z=I_3=3.162A$
Current in 20Ω = I_2
= 2.554A.