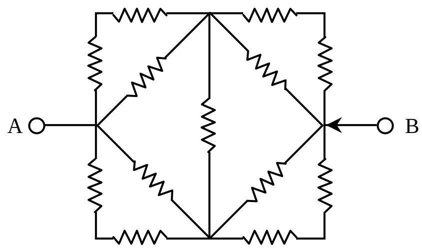
CURRENT ELECTRICITY

1. Thirteen resistor each of resistance R are connected in the circuit as shown in figure. Net shown in figure. Net resistance between A and B is



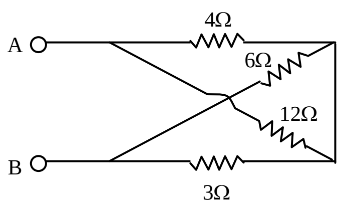
(a) 2R

(b) $\frac{4R}{3}$

(c) $\frac{2R}{3}$

(d) R

2. In the given network, the equivalent resistance between A and B is



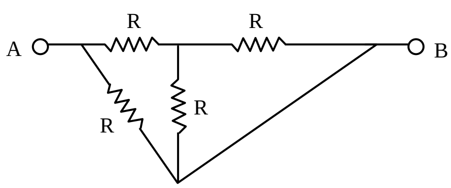
(a) 6 Ω

(b) 16 Ω

(c) 7 Ω

(d) 5 Ω

3. The equivalent resistance between points A and B is



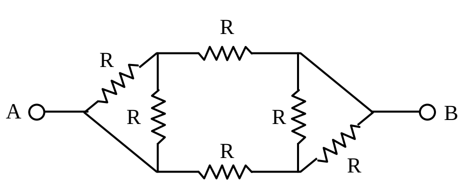
(a) 2R

(b) $\frac{3}{4}$R

(c) $\frac{4}{3}$R

(d) $\frac{3}{5}$R

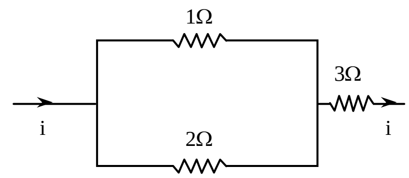
4. Equivalent resistance between A and B is



(a) $\frac{3}{4}$R (b) $\frac{5}{3}$R

(c) $\frac{7}{5}$R (d) R

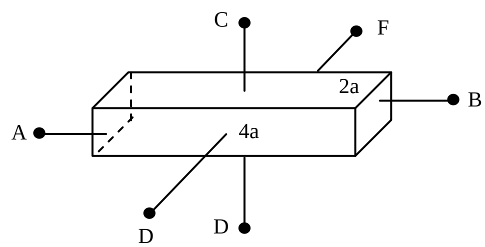
5. In the circuit shown in figure, power developed across 1Ω, 2Ω and 3Ω resistances are in the ratio of



(a) 1 : 2 : 3 (b) 4 : 2 : 27

(c) 6 : 4 : 9 (d) 2 : 1 : 27

6. A conductor with rectangular cross section has dimensions (a × 2a × 4a) as shown in figure. Resistance across AB is x, across CD is y and across EF is z. Then



(a) x = y = z (b) x > y > z

(c) y > z > x (d) x > z > y

7. Which of the following has the maximum resistance?

(a) voltmeter (b) millivoltmeter

(c) ammeter (d) miliammeter

8. A galvanometer of resistance 20 Ω gives a full scale deflection when a current of 0.04 A is passed through it. It is desired to convert it into an ammeter of full scale reading 20 A. The only shunt available is 0.05 Ω resistance. The resistance that must be connected in series with the coil of the galvanometer is

(a) 4.95 Ω (b) 5.94 Ω

(c) 9.45 Ω (d) 12.62 Ω

9. The length of a potentiometer wire is l. A cell of emf E is balanced at a length l/3 from the positive end of the wire. If the length of the wire is increased by l/2. At what distance will the same cell give a balance point?

(a) $\frac{2l}{3}$ (b) $\frac{l}{2}$

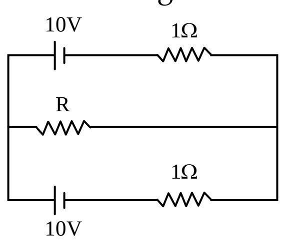
(c) $\frac{l}{6}$ (d) $\frac{4l}{3}$

10. A cell develops the same power across two resistance R_1 and R_2 separately. The internal resistance of the cell is

(a) $R_1 + R_2$ (b) $\frac{R_1 + R_2}{2}$

(c) $\sqrt{R_1 + R_2}$ (d) $\frac{\sqrt{R_1 R_2}}{2}$

11. Maximum power developed across variable resistance R in the circuit shown in figure is



(a) 50 W

(b) 75 W

(c) 25 W

(d) 100 W

12. Resistance of a wire at temperature t^oC is

$$R = R_0 (1 + at + bt^2)$$

Here, R_0 is the temperature at 0^oC. The temperature coefficient of resistance at temperature t is

(a) $\frac{a + 2bt}{1 + at + bt^2}$ (b) $(a + 2bt)$

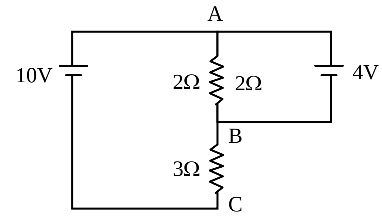
(c) $\frac{1 + at + bt^2}{a + 2bt}$ (d) constant

13. Two wires of same dimension but resistivities ρ_1 and ρ_2 are connected in series. The equivalent resitivity of the combination is

(a) $\rho_1 + \rho_2$ (b) $\frac{1}{2}(\rho_1 + \rho_2)$

(c) $\sqrt{\rho_1 \rho_2}$ (d) $2(\rho_1 + \rho_2)$

14. Current passing through 3 Ω resistance is



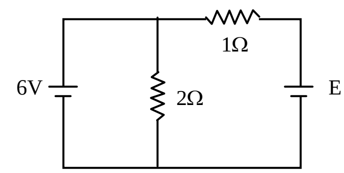
(a) $\frac{14}{3}$ A

(b) 3A

(c) 2A

(d) $\frac{12}{5}$ A

15. Current passing through 1 Ω resistance is zero. Then the



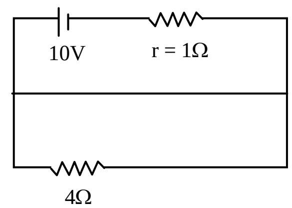
(a) 8 V

(b) 6 V

(c) 4 V

(d) 12 V

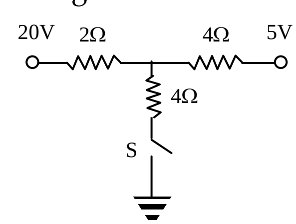
16. Potential difference across the terminals of the battery shown in figure is



(a) 8 V (b) 10 V

(c) 6 V (d) zero

17. As the switch S is closed in the circuit shown in figure, current passed through it is



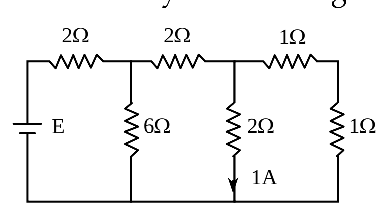
(a) 4.5 A

(b) 6.0 A

(c) 3.0 A

(d) zero

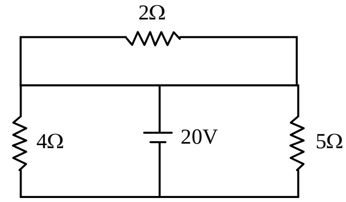
18. The emf of the battery shown in figure is



(a) 12 V (b) 16 V

(c) 18 V (d) 15 V

19. In the circuit shown in figure



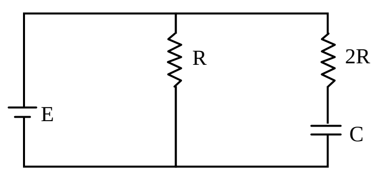
(a) current passing through 2Ω resistance is zero

(b) current passing through 4Ω resistance is 5A

(c) current passing through 5Ω resistance is 4A

(d) all of the above

20. The time constant of charging of the capacitor shown in figure is



(a) $\frac{2}{3}$RC

b) 2 RC

(c) 3 RC

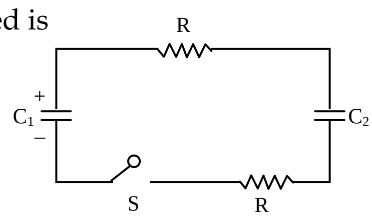
d) $\frac{3}{2}$RC

21. Time constant of a C-R circuit is $\frac{2}{\ln(2)}$ s. Capacitor is discharged at time t = 0. The ratio of charge on the capacitor at time t = 2 s and t = 6 s is

(a) 3 : 1 (b) 8 : 1

(c) 4 : 1 (d) 2 : 1

22. In the circuit shown in figure $C_1 = 2C_2$. Capacitor C_1 is charged to a potential of V. the current in the circuit just after the switch S is closed is



(a) zero (b) $\frac{2V}{R}$

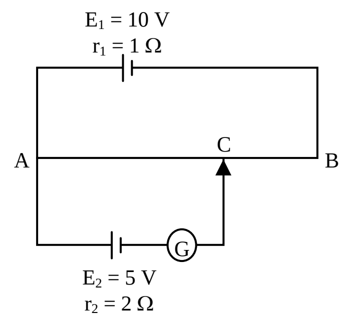
(c) infinite (d) $\frac{V}{2R}$

23. A voltmeter with resistance 500 Ω is used to measure the emf of a cell of internal resistance 4Ω. The percentage error in the reading of the voltmeter will be

(a) 0.2% (b) 0.8%

(c) 1.4% (d) 2.2%

24. In the figure the potentiometer wire of length l = 100 cm and resistance 9Ω is joined to a cell of emf E_1 = 10 V and internal resistance r_1 = 1Ω. Another cell of emf E_2 = 5 V and internal resistance r_2 = 2Ω is connected as shown. The galvanometer G will show no deflection when the length AC is



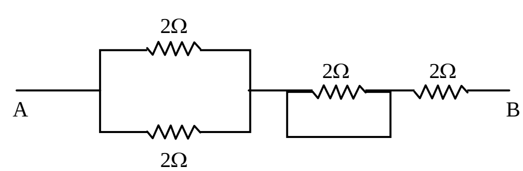
(a) 50 cm

(b) 55.55 cm

(c) 52.67 cm

(d) 54.33 cm

25. Find equivalent resistance between A and B



(a) 5Ω (b) 3Ω

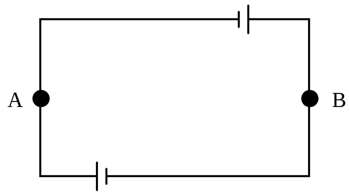
(c) 2Ω (d) 8Ω

26. The potential difference across the terminals of a battery is 10 V when there is a current of 3A in the battery from the negative to the positive terminal. When the current is 2A in the reverse direction, the potential difference becomes 15V. The internal resistance of the battery is

(a) 2.5 Ω (b) 5.0 Ω

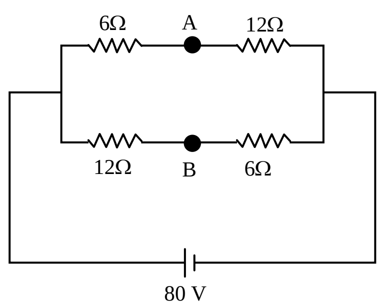
(c) 2.83 Ω (d) 1 Ω

27. Two identical batteries, each having emf of 1.8 V and of equal internal resistances are connected as shown in the figure. potential difference between A and B will be equal to (Ignore the resistance of lead wires)



(a) 3.6 V (b) 1.8 V
(c) zero (d) none of these

28. In the circuit shown, if a wire is connected between points A and B. How much current will flow through that wire?

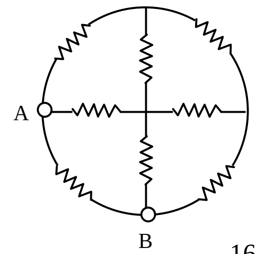


(a) 5A (b) $\frac{10}{3}$ A
(c) $\frac{20}{3}$ A (d) $\frac{5}{3}$ A

29. A 4 μF capacitor, a resistance of 2.5 MΩ is in series with 12 V battery. Find the time after which the potential difference across the capacitor is 3 times the potential difference across the resistor [Given In (2) = 0.693]

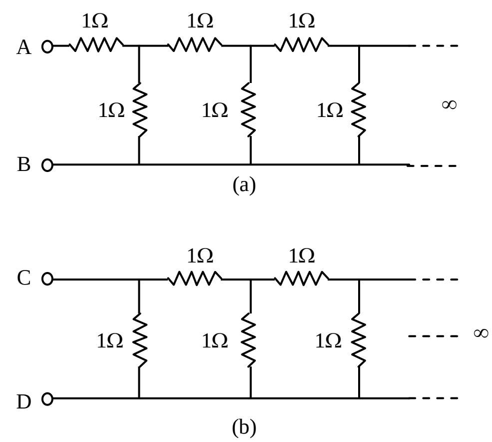
(a) 13.86 s
(b) 6.93 s
(c) 7 s
(d) 14 s

30. Eight resistance each of resistance 5Ω are connected in the circuit as shown in figure. The equivalent resistance between A and B is



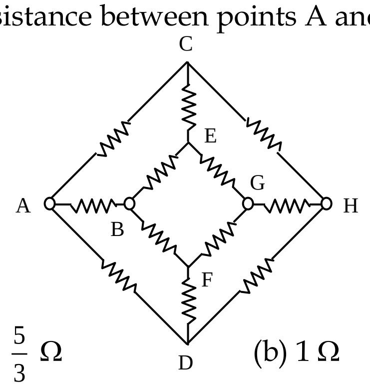
(a) $\frac{8}{3}\Omega$ (b) $\frac{16}{3}\Omega$
(c) $\frac{15}{7}\Omega$ (d) $\frac{19}{2}\Omega$

31. In The two circuits shown in figure



(a) $R_{AB} = R_{CD} = (\sqrt{3}+2)\ \Omega$
(b) $R_{AB} = (\sqrt{3} + 1)\ \Omega$
(c) $R_{CD} = (\sqrt{5} + 1)\ \Omega$
(d) $R_{AB} > R_{CD}$

32. Twelve resistors each of resistance 1 Ω are connected in the circuit shown in figure. Net resistance between points A and H would be

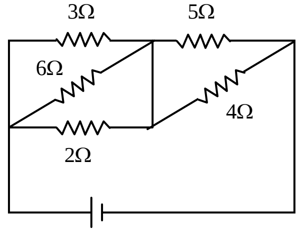


(a) $\frac{5}{3}\ \Omega$ (b) 1 Ω
(c) $\frac{3}{4}\ \Omega$ (d) $\frac{7}{6}\ \Omega$

33. n identical cells are joined in series with two cells A and B with reversed polarities. EMF of each cell is E and internal resistance is r. Potential difference across cell A or B is (n > 4)

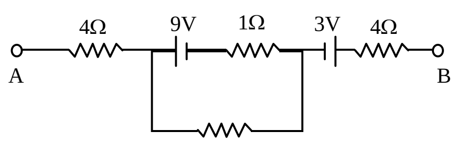
(a) $\frac{2E}{n}$
(b) $2E\left(1-\frac{1}{n}\right)$
(c) $\frac{4E}{n}$
(d) $2E\left(1-\frac{2}{n}\right)$

34. The resistor in which maximum heat will be produced is



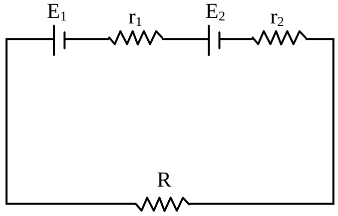
(a) 6 Ω
(b) 2 Ω
(c) 5 Ω
(d) 4 Ω

35. In the circuit shown in figure potential difference between points A and B is 16 V. The current passing through 2 Ω resistance will be



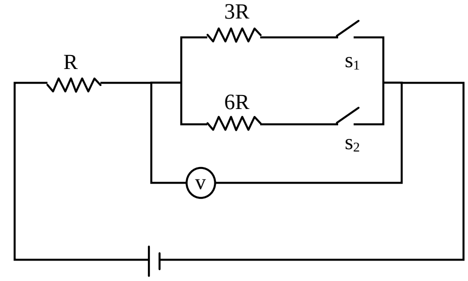
(a) 2.5 A
(b) 3.5 A
(c) 4.0 A
(d) zero

36. Under what conditions current passing through the resistance R can be increased by short circuiting the battery of emf E_2. The internal resistances of the two batteries are r_1 and r_2 respectively



(a) $E_2r_1 > E_1 (R + r_2)$
(b) $E_1r_2 > E_2 (R + r_1)$
(c) $E_2r_2 > E_1 (R + r_2)$
(d) $E_1r_1 > E_2 (R + r_1)$

37. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then



(a) $V_3 > V_2 > V_1$
(b) $V_2 > V_1 > V_3$
(c) $V_3 > V_1 > V_2$
(d) $V_1 > V_2 > V_3$

38. A resistance R carries a current i. The power lost to the surroundings is $\lambda (\theta - \theta_0)$. Here, λ is a constant, θ is temperature of the resistance and θ_0 is the temperature of the atmosphere. If the coefficient of linear expansion is α. The strain in the resistance is

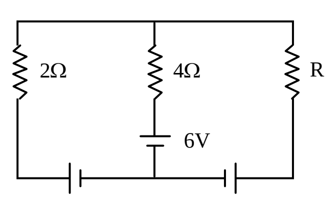
(a) $\frac{\alpha}{\lambda} i^2R$

(b) $\alpha\lambda iR$

(c) $\frac{\alpha i^2 R}{2\lambda}$

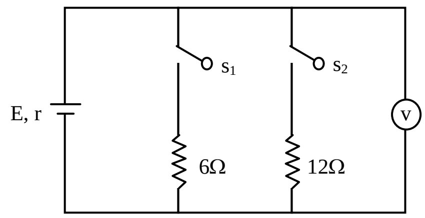
(d) proportional to the length of the resistance wire

39. For what value of R in the circuit as shown current passing through 4 Ω resistance will be zero



(a) 1 Ω
(b) 2 Ω
(c) 3 Ω
(d) 4 Ω

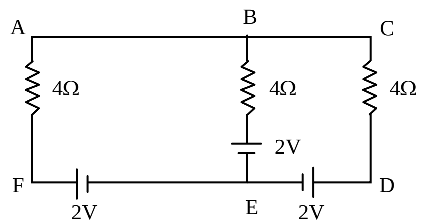
40. In the circuit shown in figure when switch S_1 is closed and S_2 is open, the ideal voltmeter shows a reading 18 V. When switch S_2 is closed and S_1 is open, the reading of the voltmeter is 24 V. When S_1 and S_2 both are closed the voltmeter reading will be



(a) 14.4 V (b) 20.6 V

(c) 24.2 V (d) 10.8 V

41. In the circuit shown in figure



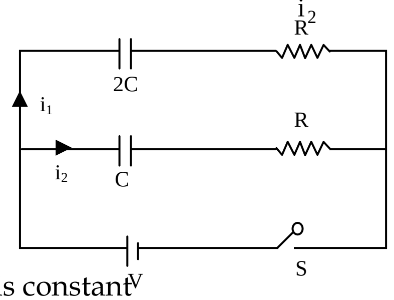
(a) current in wire AF is 1A

(b) current in wire CD is 1A

(c) current in wire BE is 2A

(d) None of the above

42. In the circuit shown in figure switch S is closed at time t = 0, Let i_1 and i_2 be the currents at any finite time t then the ratio $\frac{i_1}{i_2}$



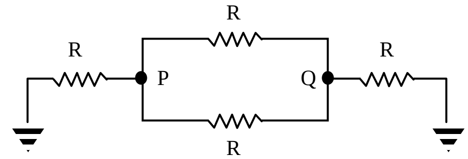
(a) is constant

(b) increases with time

(c) decreases with time

(d) first increase and then decreases

43. The net resistance between points P and q in the circuit shown in figure is



(a) R/2 (b) 2R/5

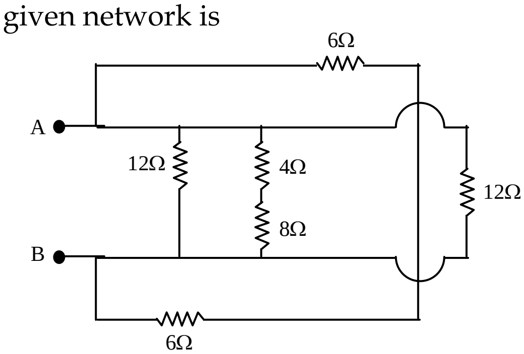
(c) 3R/5 (d) R/3

44. A capacitor of capacitance C is allowed to discharge through a resistance R. The net charge flown through resistance during one time constant is (I_0 is the maximum current)

(a) $CRI_0\left(\frac{1}{e}+1\right)$ (b) $CRI_0\left(1-\frac{1}{e}\right)$

(c) CRI_0 (d) None of the above

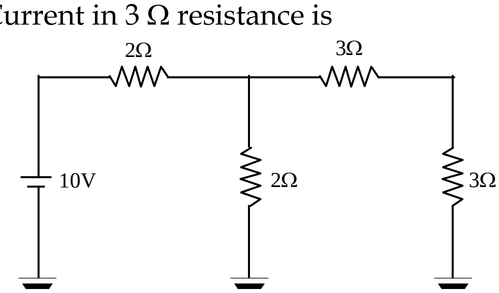
45. The equivalent resistance across AB in the given network is



(a) 4 Ω (b) 3 Ω

(c) 12 Ω (d) $\frac{4}{3}$ Ω

46. Current in 3 Ω resistance is



(a) 1 A (b) $\frac{1}{7}$ A

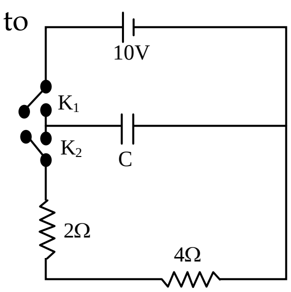
(c) $\frac{5}{7}$ A (d) $\frac{15}{7}$ A

47. A galvanometer of resistance R_G is to be converted into an ammeter, with the help of a shunt of resistance R. If the ratio of the heat dissipated through galvanometer and shunt is 3 : 4, then

(a) $R = \frac{3}{4} R_G$ (b) $\frac{4}{3} R_G = R$

(c) $\frac{9R}{16} = R_G$ (d) $\frac{16R}{9} = R_G$

48. A capacitor of capacitance 3μF is first charged by connecting it across a 10 V battery by closing key K_1. Then it is allowed to get discharged through 2Ω and 4Ω resistors by closing the key K_2. The total energy dissipated in the 4Ω resistor if equal to



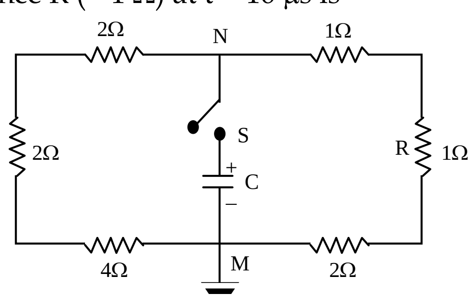
(a) 0.5 mJ

(b) 0.05 mJ

(c) 0.1 mJ

(d) None of these

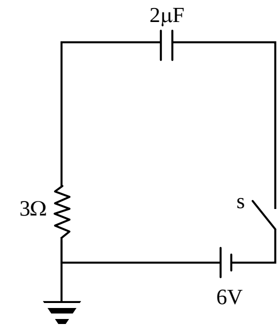
49. A capacitor of capacity 6μF and initial charge 160μC is connected with a key S and resistance as shown in figure. Point M is earthed. If key is closed at t = 0; then the current through resistance R (= 1 Ω) at t = 16 μs is



(a) $\frac{10}{3e}$ A (b) $\frac{10}{e}$ A

(c) $\frac{20}{3e}$ A (d) None of these

50. In the given circuit the quantity of charge that flows to ground long time after the switch is closed is



(a) 12μC (b) 9μC

(c) 13μC (d) zero.

ANSWERS KEY

1	C	**11**	A	**21**	C	**31**	D	**41**	D
2	D	**12**	A	**22**	D	**32**	C	**42**	B
3	D	**13**	B	**23**	B	**33**	D	**43**	B
4	A	**14**	C	**24**	B	**34**	D	**44**	B
5	B	**15**	B	**25**	B	**35**	B	**45**	B
6	D	**16**	D	**26**	D	**36**	B	**46**	C
7	A	**17**	A	**27**	C	**37**	B	**47**	A
8	A	**18**	A	**28**	B	**38**	A	**48**	C
9	B	**19**	D	**29**	A	**39**	A	**49**	C
10	C	**20**	B	**30**	A	**40**	A	**50**	D