

Section – C (Quantitative Reasoning)

43. Tahir and Gagan rode in a 150 km bicycle race. The race was held on a 20 km track. Tahir averaged 30 km/h while Gagan averaged 15 km/h. How many times did Tahir pass Gagan during the race?
- 1) 2
 - 2) 3
 - 3) 4
 - 4) 5

Solution:

75 km = 3.75 laps

Since, the speed of Tahir is half of Gagan, for every one lap covered by Gagan, Tahir completes 2 laps.

Therefore, for every lap covered by Gagan, Tahir crosses Gagan once.

Therefore, during the race Tahir will pass 3 times.

Hence, option (2) is the correct choice.

44. At 8:45 pm Saturday in Bangalore it is 10:15 am Saturday in New York. Ravi wishes to ring his friend in New York at 7 am Saturday New York time. When should Ravi ring from Bangalore?
- 1) 5:30 am Sunday
 - 2) 7:15 am Sunday
 - 3) 5:30 pm Sunday
 - 4) 2:00 am Monday

Solution:

Difference between the time 10: 15 a.m. on Saturday and 7: 00 a.m. on Sunday

= 1 hours 45 minutes + 12 hours + 7 hours = 20 hours 45 minutes

Now, 20 hours 45 minutes = 3 hours 15 minutes + 12 hours + 5 hours 30 minutes

Time 3 hours 15 minutes after 8: 45 p.m. = 00: 00 a.m. (Sunday)

Time 12 hours after 00: 00 a.m. = 12: 00 p.m. (Sunday)

Time 5 hours 30 minutes after 12: 00 p.m. = 5: 30 p.m. (Sunday)

Thus, the time 20 hours 45 minutes after 8: 45 p.m. on Saturday is 5: 30 p.m. on Sunday.

Hence, option (3) is the correct choice.

45. Trout are bred in a tank as fish for restaurants. Twenty trout are caught and each is tagged through the tail then released back into the tank. A week later, thirty trout are caught and it is found that two of them have a tail tag. Based on this evidence along, what estimate can be made of the total number of trout in the tank?
- 1) 100
 - 2) 300
 - 3) 600
 - 4) 1,200

Solution:

Given that out of 30 trouts, 2 are found tail tagged. We know that 20 trouts were tail tagged.

So, estimated number of trouts in the tank will be $30 \times 10 = 300$.

Hence, option (2) is the correct choice

46. The One Rupee coin weights 4.85 g.
Haji has a 2 kg bag of One Rupee coins.
What is the value of this bag of coins?
- 1) Rs 412
 - 2)Rs 2,485
 - 3) Rs 4,850
 - 4) Rs 9,700

Solution:

Weight of the bag of One Rupee coins = 2000 gm

One coin weighs = 4.85 g

Number of coins = $(2000/4.85) = 412$ approximate

Therefore, the value of the bag is Rs 412.

Hence, option (1) is the correct choice.

47. Mrs Ali gave a different number of apples to each of her five children. Any three of her children together received more apples than the remaining two children.
What is the least number of apples that Mrs Ali could have given to one of her children?
- 1) 1
 - 2) 4
 - 3) 5
 - 4) 6

Solution:

Given that the total number of apples with any three children is more than the total number of apples with the remaining two children.

If we can ensure that the sum of the number of apples with the three children that received the least number of apples is more than the number of apples with the two children that received the maximum number of apples, then the condition given in the question will always hold true.

Also, we need to minimise the number of apples with the child that received the least number of apples.

Since, the numbers of apples with the five children are distinct; the number of apples with them should be consecutive.

Assume that the number of apples with the five children are $(n - 2)$, $(n - 1)$, (n) , $(n + 1)$ and $(n + 2)$

Therefore, $(n - 2) + (n - 1) + (n) > (n + 1) + (n + 2)$

Or, $n > 6$. So, minimum value of n is 7. Therefore, the number of apples with the child that received the least number of apples has to be at least $7 - 2 = 5$.

Hence, option (3) is the correct choice.

48. Ravi sold his bicycle for Rs 1,170.
This was 10% less than he paid for it.
How much did he pay for the bicycle?
- 1) Rs 1,053
 - 2) Rs 1,180
 - 3) Rs 1,287
 - 4) Rs 1,300

Solution:

Let the amount paid by Ravi for his bicycle be Rs x .

$$\text{Rs } x - 10\% \text{ of Rs } x = \text{Rs } 1,170$$

$$\text{Or, } 9x/10 = 1170$$

$$\text{Or, } x = (1170 \times 10)/9$$

$$\text{Therefore, } x = 1300$$

Thus, the amount paid by Ravi is Rs 1,300.

Hence, option (4) is the correct choice.

49. Manu pays his rent every 4 weeks.
He made his first payment on Friday February 1st 2013.
When is his 3rd payment due?
- 1) Friday 29th March 2013
 - 2) Friday 1st April 2013
 - 3) Friday 27th April 2013
 - 4) Friday 1st May 2013

Solution:

Given that Manu pays his rent every 4 weeks.

Therefore, his third payment will be due in 12 weeks.

First payment was done on 1st February 2013. In February 2013, 3 complete weeks are completed, In March 2013 5 complete weeks are completed.

Therefore, the third payment will be due after 4 complete weeks in April, i.e. on 27th April.

Hence, option (3) is the correct choice.

50. Four small boys want to know their weights, but the weighing machine only weighs objects more than 40 kg.
As each of the boys knows that his weight is less than this, they weigh themselves two at a time.
The results of all possible paired weighings are: 48 kg, 49 kg, 52 kg, 53 kg, 56 kg and 57 kg.
Mohinda, the tallest of the four boys, weighs the most.
What does he weight?
- 1) 29 kg
 - 2) 30 kg
 - 3) 31 kg
 - 4) 32 kg

Solution:

Let the weights of the four boys be w_1 kg, w_2 kg, w_3 kg and w_4 kg.

Therefore, if we select two different boys from the four, we can do it in ${}^4C_2 = 6$ ways.

We have six different weights given to us.

$w_1 + w_2 = 48$ kg, $w_1 + w_3 = 49$ kg, $w_1 + w_4 = 52$ kg, $w_2 + w_3 = 53$ kg, $w_2 + w_4 = 56$ kg and $w_3 + w_4 = 57$ kg

Therefore, $w_1 + w_2 + w_3 + w_4 = 105$ kg.

Also, $w_1 + w_4 + w_2 + w_4 + w_3 + w_4 = 52 + 56 + 57 = 165$ kg

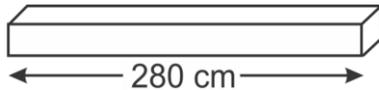
Or, $(w_1 + w_2 + w_3 + w_4) + 2w_4 = 165$ kg

Or, $w_4 = (165 - 105)/2 = 30$ kg, $w_3 = 27$ kg, $w_2 = 22$ kg and $w_1 = 26$ kg

Therefore, weight of Mohinda = 30 kg.

Hence, option (2) is the correct choice.

51. Arni bought a piece of timber that is 280 cm long.



He wants to cut it into two pieces. The shorter piece needs to be 75% of the length of the longer piece.

How long will the shorter piece be?

- 1) 70 cm
- 2) 120 cm
- 3) 160 cm
- 4) 210 cm

Solution:

Let the length of the longer piece be x cm.

So, length of the shorter piece = 75% of x cm = $3x/4$ cm

Length of the longer piece + Length of the shorter piece = 280 cm

Or, $x + 3x/4 = 280$

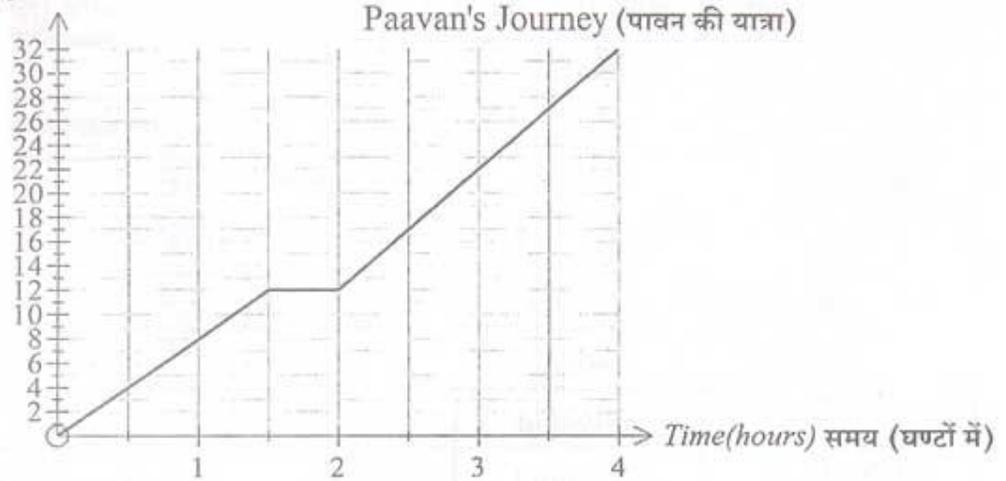
Therefore, $x = (280 \times 4)/7 = 160$

Thus, length of the shorter piece = 280 cm – 160 cm = 120 cm

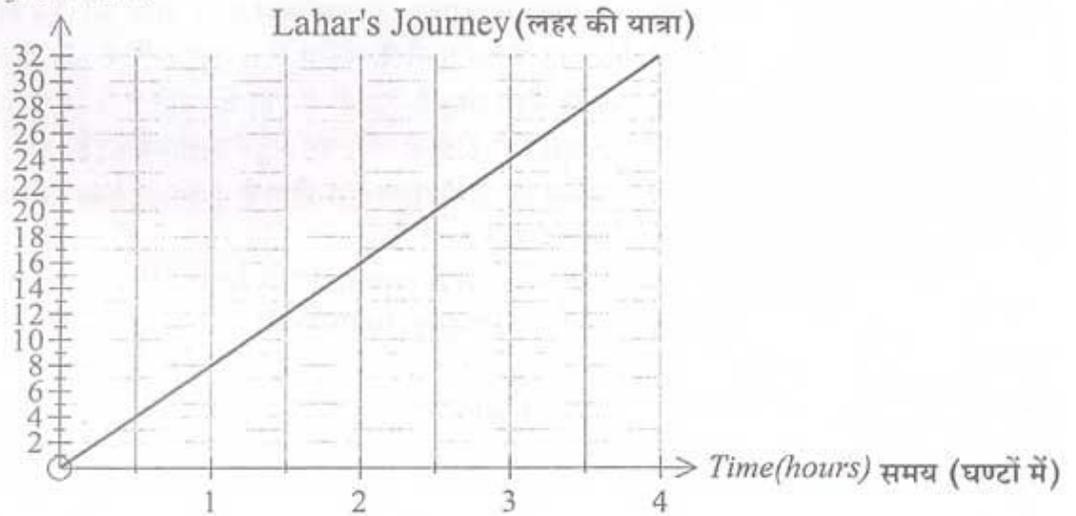
Hence, option (2) is the correct choice.

52. Paavan and Lahar are friends who have decided to travel to each other's cities, 32 km apart. They both left from their own houses at 8 am, and their predicted journeys are sketched below.

(घर से किलो मीटर) *km from home*



(घर से किलो मीटर) *km from home*



At which of following times did Paavan meet Lahar on his journey?

- 1) between 10.00 and 10.30 am
- 2) between 10.30 and 11:00 am
- 3) between 12.00 and 12.30 pm
- 4) between 2.00 and 2.30 pm

Solution:

Time when Lahar and Paavan left their houses = 8:00 a.m.

Distance moved by Lahar in 2 = 16 km

Distance moved by Paavan in 2 hours = 12 km

Total distance covered by Lahar and Paavan in 2 hours = 16 km + 12 km = 28 km

Distance moved by Lahar in 2 and 1/2 hours = 20 km

Distance moved by Paavan in 2 and 1/2 hours = 16 km

Total distance covered by Lahar and Paavan in 2 and 1/2 hours = 20 km + 16 km = 36 km

But, it is given that the distance between their houses is 32 km.

Thus, the two friends meet in between 10:00 and 10: 30 a.m.

Hence, option (1) is the correct choice.

(Questions (53 – 56) : Read the following passage and answer the questions that follow:

All substances, whether they are solids, liquids or gases, are made up of particles. The density of a substance depends upon how close together its particles are. Solid substances usually have high densities because their particles are very close together while gases, which have large spaces between their particles, have very low densities. Density can be calculated by dividing the mass (in grams) by its volume (in cubic centimetres). The table below shows the densities of different substances.

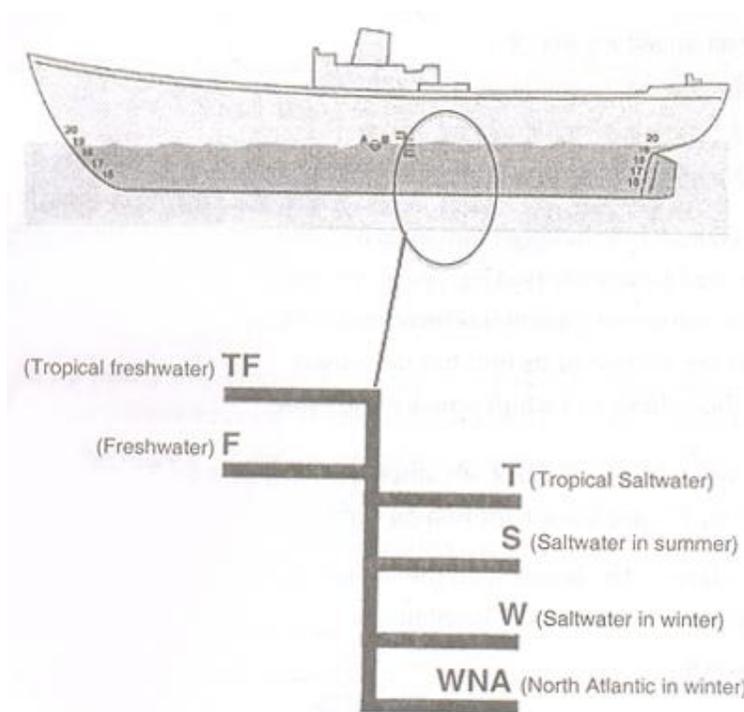
Substance	State	Density (g/cm ³)
Air	Gas	0.0012
Helium	Gas	0.00016
Cork	Solid	0.24
Oil	Liquid	0.92
Water	Liquid	1
Steel	Solid	7.8
Lead	Solid	11.3
Mercury	Liquid	13.6

Objects will float in water if they have a density that is equal to, or lower than, the density of water. A piece of cork floats in water because cork has a lower density than water. A steel nail, which has a density about 8 times that of water, sinks.

Steel ships are able to float because they are not solid pieces of metal like a nail. A ship's hull is actually a steel shell filled mostly with air which is very light. As a result, the total mass of the ship is very low compared to its volume so it has a smaller average density. This average density is lower than that of water and so the ship floats.

Liquids that have different densities form layers. The liquid with the lowest density floats at the top and the densest liquid sinks to the bottom. The diagram below shows 3 containers. Each container holds two different liquids. In total, 4 different liquids are shown.

As cargo is added to a ship, it sinks lower down into the water. Ships also float at different levels depending on the temperature of the water and whether it is fresh water or seawater. This is because the densities of warm water and cold water are different. The density of salt water is also different to the density of freshwater. The Plimsoll line shown below is a marking that can be found on the hulls of ships to indicate the safe level to which the ship can be loaded in different types of water.



53. Which of the following statements is true?
- 1) Salt water is less dense than fresh water.
 - 2) Warm water is denser than cool water
 - 3) A ship will sit lower in the water in winter than in summer.
 - 4) A ship that is loaded in fresh water will rise when it enters an ocean.

Solution:

Density of sea water is more than that of fresh water. Hence, when ship displaces less volume in sea as compared to that in fresh water which results in rise in the level of ship in sea water.

Hence, option (4) is the correct choice

54. What is the mass of 1 litre of air?
- 1) 1.2 g
 - 2) 0.12 g
 - 3) 0.0012 g
 - 4) 0.012 kg

Solution:

Density of air = 0.0012 g/cm^3
 $= 0.0012 \times 10^6 \text{ g/m}^3$
 $= 0.0012 \times 10^3 \text{ g/L}$ (since there are 1000 litres in one cubic metre)
 $= 0.012 \text{ kg/L} = 1.2 \text{ g/L}$

Hence mass of 1 litre of air is 1.2 g.

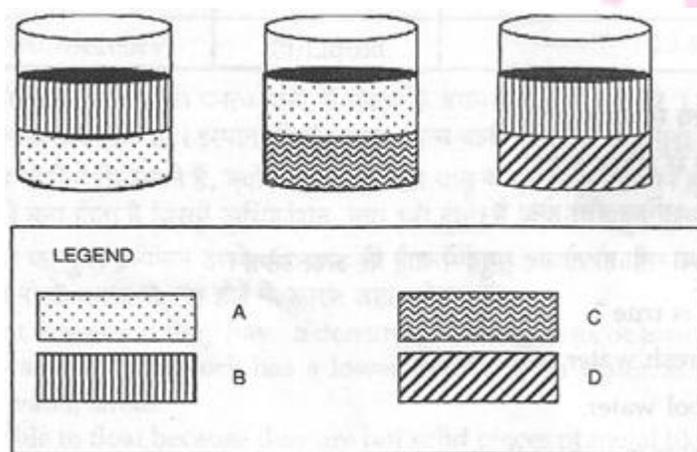
Hence, option (1) is the correct choice.

55. Why does a ship sink when a large enough hole has been torn in its hull and water enters the ship?
- 1) Its mass and the volume of its hull have increased.
 - 2) Its mass has decreased and the volume of its hull as increased.
 - 3) Its mass remains the same but the volume of its hull has decreased.
 - 4) Its mass has increased while the volume of its hull remains the same.

Solution:

When a large hole is made in the hull of the ship, water enters in to the ship which results in increase in mass of the ship but it occupies the same volume as it was occupying earlier. Gradually there comes a time when weight of the ship becomes more than that of water it has displaced, at that instant ship sinks in to the water.

Hence, option (4) is the correct choice.



56. This diagram proves that
- 1) Liquid B has the highest density.
 - 2) Liquid D has the lowest density.
 - 3) Liquid C has a higher density than B.
 - 4) Liquid B is more dense than either liquid A or liquid C.

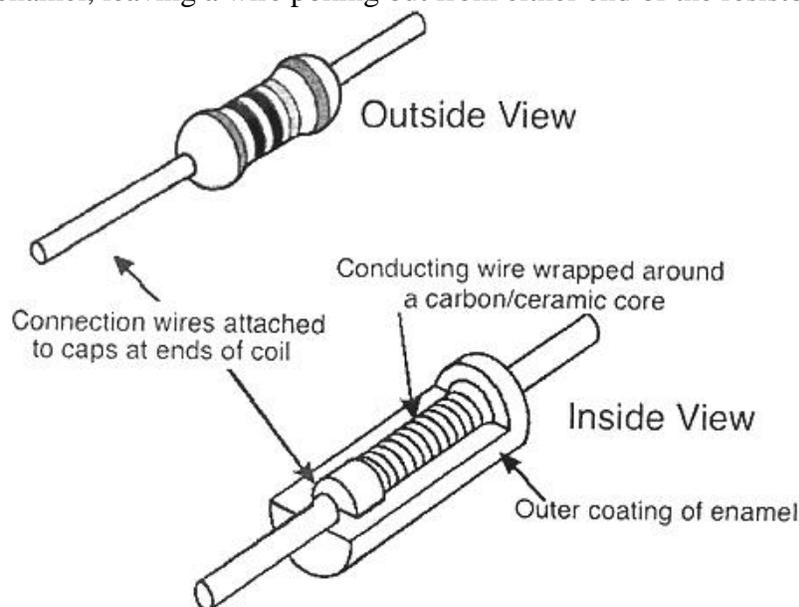
Solution:

From the 1st container we can say that, density of A > density of B
 From the 2nd container we can say that, density of C > density of A
 From the 3rd container we can say that, density of D > density of B
 Hence, density of C > density of A > density of B and density of D > density of B.
 This proves density of C > density of B

Hence, option (3) is the correct choice.

(Questions (57 – 60) : Read the following passage and answer the questions that follow:

If you open up nearly any electronic device, you will see many small bead-like components with coloured stripes on them. These components are called resistors and they are used to control the amount of electrical current that flows through different circuit sections in the device. Most resistors have a central core made of a mixture of carbon and ceramic. A wire made of a material such as copper or nichrome is then wrapped around this core. Finally, the resistor is coated in enamel, leaving a wire poking out from either end of the resistor.



The degree to which a resistor reduces the size of the current flowing through its branch of the circuit is called its resistance. The resistance value is measured in ohms (written as Ω).

When the resistance is increased, the current that flows through the resistor is proportionally decreased. So a resistor that has a low value of resistance allows a large amount of current to flow through it.

Where two resistors are made of the same material, a long wire will have a higher resistance than a short wire of the same diameter. A very long wire will need to be wrapped around the core many more times than a short wire. This means that the resistance is also directly proportional to the number of coils.

The cross-sectional area of the wire also affects the resistance. The larger the cross-section of the wire, the more easily an electric current can flow through it. In other words, the resistance of the wire is inversely proportional to the area of its cross-section.

Nichrome wire with a 1 mm diameter is coiled around a 5 cm long carbon core to form a resistor. The diameter of the core is 1 cm and the wire is coiled in such a way that the entire length of the core is covered with only one layer of wire.

57. If the resistance of the nichrome wire is 2 per metre, the wire wrapped around the core will have a total resistance that is closest to
- 1) 0.3 Ω
 - 2) 3 Ω
 - 3) 30 Ω
 - 4) 300 Ω

Solution:

Cross sectional area of the nichrome wire, $A = \pi r^2 = \pi \times (0.5 \times 10^{-3})^2 = 0.785 \times 10^{-6} \text{ m}^2$

Number of the coils, $n = (5 \times 10^{-2}) / (1 \times 10^{-3}) = 50$

Length of nichrome wire, $l = 2\pi R \times n = 2\pi(0.5 \times 10^{-2}) \times 50 = 1.57 \text{ m}$

Hence resistance of the wire = $1.57 \times (2 \Omega \text{ m}^{-1}) = 3.14 \Omega$, which is nearer to 3 Ω .

Hence, option (2) is the correct choice.

Four resistors are made using carbon cores. The core of each resistor has been wrapped with copper wire, but the wires have differing lengths and cross-sections as shown in the table below.

Resistor	Length (cm)	Cross-sectional Area (mm^2)
A	10	2
B	20	4
C	30	3
D	40	5

58. Which pair of resistors has the same resistance?
- 1) A and D
 - 2) B and C
 - 3) A and B
 - 4) B and D

Solution:

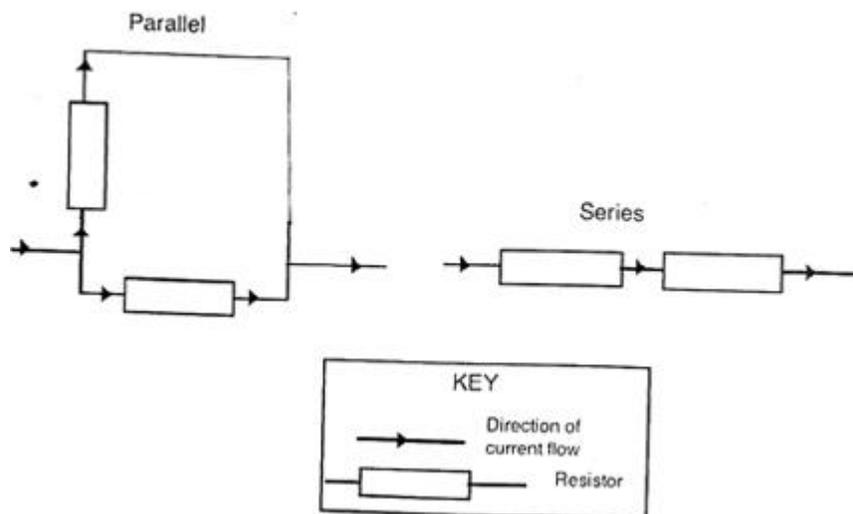
Since, $R \propto l/A$

Hence, $R_A/R_B = (10/2) \times (4/20) = 1$

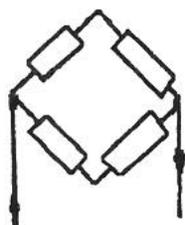
Hence, $R_A = R_B$

Hence, option (3) is the correct choice.

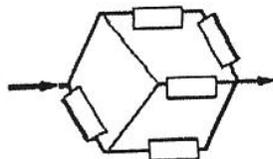
When resistors are connected in series, the electrical current passes through them one after another. When they are connected in parallel, the current splits to travel through them at the same time.



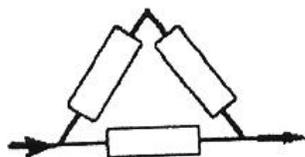
59. Which one of the diagrams below shows ALL of the resistors in parallel with each other?
1)



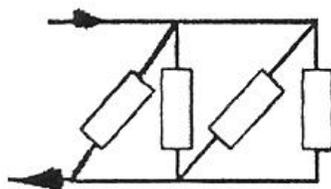
2)



3)



4)

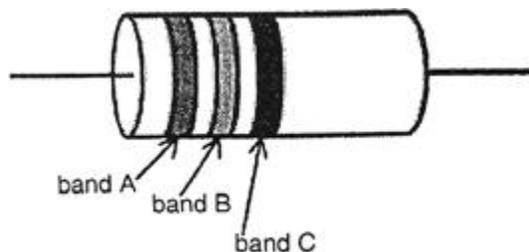


Solution:

Since in option (4), the current splits to travel through them at the same time, thus the resistors are parallel with each other.

Hence, option (4) is the correct choice.

Some resistors are too small to have their value printed on them numerically. Instead, they have their resistance value coded as a series of coloured bands painted around their ends. Each colour stands for a different number or multiplier as shown in the table below.



Band colour	Band A Value	Band B Value	Band C Multiplier
Black	0	0	1
Brown	10	1	10
Red	20	2	100
Orange	30	3	1 000
Yellow	40	4	10 000
Green	50	5	100 000
Blue	60	6	1 000 000
Violet	70	7	10 000 000
Gray	80	8	100 000 000
White	90	9	1 000 000 000
Gold			0.1
Silver			0.01

For example, a resistor marked with brown, blue and yellow bands would have a value of $(10 + 6) \times 10\,000 = 160\,000\ \Omega$.

An electrician needs to replace a resistor that is marked with violet, green and gold bands with a new resistor that has twice the resistance value of the old one.

60. In order, what are the colours of the bands for the new resistor?

- 1) black, yellow and gold
- 2) brown, green and black
- 3) orange, violet and green
- 4) brown, yellow and black

Solution:

Resistance with the resistors marked with violet, green and gold, $R = (70 + 5) \times 0.1 = 7.5\ \Omega$

Hence, $2R = 2 \times 7.5 = 15\ \Omega$

Resistance with the resistors marked with brown, green and black = $(10+5) \times 1 = 15 \Omega$
Hence, option (2) is the correct choice

