



Rao IIT Academy

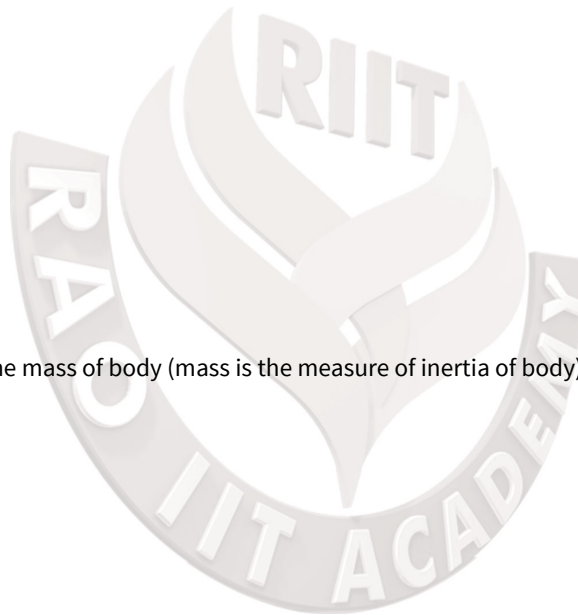
Symbol of Excellence and Perfection

JEE | MEDICAL-UG | BOARDS | KVPY | NTSE | OLYMPIADS

NTSE Official Test Paper - 2018 / SAT Solutions

Date: 04.11.2018

1. Difficulty : Easy
- Topics :
- FORCE AND LAWS OF MOTION,**
- Inertia of body depends upon the mass of body (mass is the measure of inertia of body)



2.

Difficulty : Easy

Topics :

Motion,

Area under $v - t$ graph

$$S = \frac{1}{2} \times (30 - 0) \times (3 - 0)$$

$$= 45 \text{ m}$$

3.

Difficulty : Easy

Topics :

Gravitation,

$$F = \frac{Gm_1m_2}{r^2}$$

$$r' = \frac{r}{2} \quad F' = \frac{Gm_1m_2}{(r')^2} = \frac{Gm_1m_2}{\left(\frac{r}{2}\right)^2} = \frac{4Gm_1m_2}{r^2} = 4F$$

4.

Difficulty : Easy

Topics :

Gravitation,

As radius of the Earth at equator is greater than that at the poles

$$r_{\text{pole}} < r_{\text{equator}}$$

$$\therefore g \propto \frac{1}{r^2} \Rightarrow g_{\text{pole}} > g_{\text{equator}}$$

5.

Difficulty : Easy

Topics :

**Wave Motion,
SOUND,**

Due to the property of ultrasound waves that it can travel large distance in a particular direction in solids and liquids without much loss of intensity as well as, as they carry large power hence are used in the device 'SONAR'

6.

Difficulty : Easy

Topics :

**Wave Motion,
SOUND,**

As the speed of a wave (V), can be given by

$[V = f\lambda]$ where $f \rightarrow$ Frequency of the wave

$$f = \frac{v}{\lambda} = \frac{350m/s}{0.7m} \quad \lambda \rightarrow \text{wavelength of the wave}$$

$$f = \frac{3500}{7} = 500Hz$$

7.

Difficulty : Medium

Topics :

LIGHT,

Due to the irregularities in spherical shape of cornea, image formed on retina gets stretched along horizontal and vertical. This defect in vision is called Astigmatism

8.

Difficulty : Easy

Topics :

LIGHT,

As power of a lens is given by

$$P = \frac{1}{\text{focal length in metre}}$$

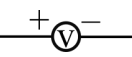
$$P = \frac{1}{0.4m} = +2.5D$$


9.

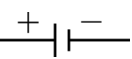
Difficulty : Easy

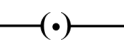
Topics :

ELECTRICITY,

(a) Voltmeter — (iii) 

(b) Rheostat — (iv) 

(c) Electric Cell — (i) 

(d) Plug key — (ii) 

10. Difficulty : Medium

Topics :

MAGNETISM,

A split - ring (commutator) makes the current to change its direction every half of the rotation, whereas a slip-ring merely maintains a connection between moving rotor between the moving rotor and load in case of A.C generator

11. Difficulty : Easy

Topics :

Current electricity,

equivalent resistance between A & B is

$$\frac{1}{R_{AB}} = \frac{1}{20} + \frac{1}{10} + \frac{1}{20}$$

$$\frac{1}{R_{AB}} = \frac{1+2+1}{20} \Rightarrow \frac{4}{20}$$

$$R_{AB} = 5\Omega$$

12. Difficulty : Difficult

Topics :

Work, Energy and power,

Displacement $x = 4cm = 4 \times 10^{-2}m$

Work done $W = 4$ Joule

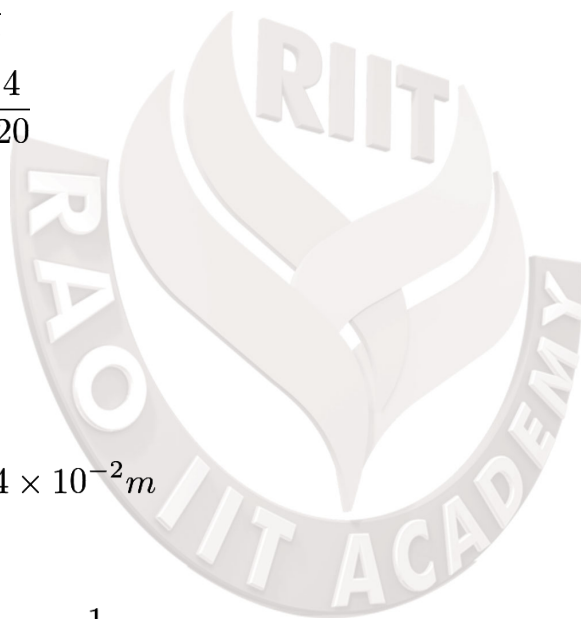
Spring constant $K = ?$

Work done = energy stored in spring = $\frac{1}{2}Kx^2$

$$4 = \frac{1}{2}K(4 \times 10^{-2})^2$$

$$8 = K \times 16 \times 10^{-4}$$

$$K = \frac{8}{16 \times 10^{-4}} = 5000N - m^{-1}$$



13. Difficulty : Easy

Topics :

SOURCE OF ENERGY,

LED has lowest power consumption

LED consumes least power as compared to CFL or incandescent bulb for same light requirement because it uses most energy efficient semiconductor electronic technology to produce light

14. Difficulty : Medium

Topics :

Is matter around us pure,

Air is a homogenous mixture of gaseous substances like nitrogen, oxygen and other gases.

15. Difficulty : Medium

Topics :

Is matter around us pure,

Camphor show sublimation property

16. Difficulty : Medium

Topics :

Atoms & Molecules,

Molar mass of $O_2 = 32g$

Given mass = $32g$

Number of molecules $\frac{\text{given mass}}{\text{molar mass}} \times 6.022 \times 10^{23}$

Number of molecules = 6.022×10^{23}

17. Difficulty : Medium

Topics :

Atoms & Molecules,

${}^3_1H \rightarrow$ Tritium

Number of Neutron = mass number — atomic number.

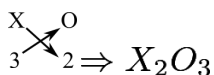
= $3 - 1 = 2$



18.

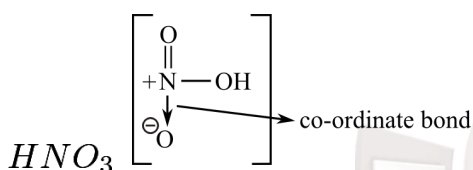
Difficulty : Medium

Topics :
STRUCTURE OF ATOM,

 So valency of X is = 3


19.

Difficulty : Medium

Topics :
STRUCTURE OF ATOM,


20.

Difficulty : Medium

Topics :
ACID BASES AND SALTS & CHANGES AROUND US,

$$[H^+] = [OH^-] = 10^{-7}$$

21.

Difficulty : Medium

Topics :
ACID BASES AND SALTS & CHANGES AROUND US,

 Acidity is removed using a base $Mg(OH)_2$

22.

Difficulty : Medium

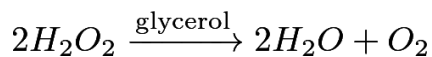
Topics :
ACID BASES AND SALTS & CHANGES AROUND US,


when plaster of Paris $\left(CaSO_4 \cdot \frac{1}{2} H_2O \right)$ is heated its water of crystallization is lost and anhydrous $CaSO_4$ is left. That is known as dead burnt plaster.

23. Difficulty : Medium

Topics :

Chemical Reaction & Equation,



Glycerol retard the decomposition of H_2O_2 .

24. Difficulty : Medium

Topics :

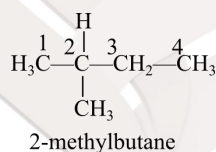
PERIODIC PROPERTIES,

In periodic table on going from left to right size of atom decreases

25. Difficulty : Medium

Topics :

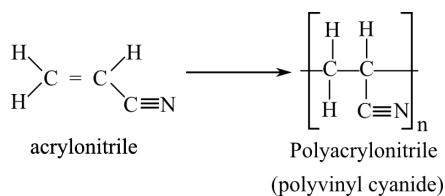
Carbon & Its Compound,



26. Difficulty : Medium

Topics :

Polymers,



27. Difficulty : Medium

Topics :

Unit cell,

Christian de duve discovered lysosomes.

28.

Difficulty : Medium

Topics :

Biodiversity,

Trapa = free floating hydrophyte

Segetaria = Amphibious hydrophytes

29.

Difficulty : Medium

Topics :

REPRODUCTION,

The generative cell undergoes mitosis in pollen tube to form two male gamete.

30.

Difficulty : Medium

Topics :

REPRODUCTION,

Budding is an asexual mode of reproduction found in Yeast.

31.

Difficulty : Medium

Topics :

CONSERVATION OF PLANTS AND ANIMALS,

The number of biosphere reserve in India is 18.

32.

Difficulty : Medium

Topics :

Health and Disease,

The bark of terminalia arjuna tree is use as medicine in ischemic cardiac disease.

33.

Difficulty : Medium

Topics :

UNIVERSE,

Indian Space Research Committee changed into Indian Space Research Organisation in 1969.

34.

Difficulty : Medium

Topics :

Health and Disease,

Tuberculosis is a bacterial disease.

35.

Difficulty : Medium

Topics :

IMPROVEMENT IN FOOD,

Honeybee culture is known as apiculture

For forest = silviculture

for silk worm = sericulture

for fish = pisciculture

36.

Difficulty : Medium

Topics :

Health and Disease,

Rickets disease is caused by the deficiency of vitamin D

37.

Difficulty : Medium

Topics :

Blood,

O blood group do not have any antigen so they are universal donor.

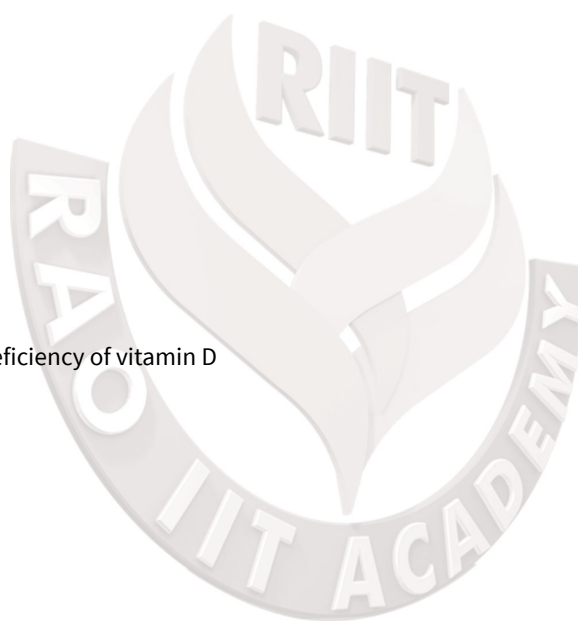
38.

Difficulty : Medium

Topics :

The Tissues,

Skeletal muscles are striated and voluntary.



39. Difficulty : Medium

Topics :

Biodiversity,

Water vascular system is present in phylum echinodermata.

40. Difficulty : Medium

Topics :

The Female Reproductive System,

ovary is a primary reproductive organ because it produce female gamete or ovum.

41. Difficulty : Medium

Topics :

Number Systems,

$$\frac{2\sqrt{11}}{7\sqrt{11}} = \frac{2}{7}$$

42. Difficulty : Medium

Topics :

Polynomial Function,

$$\text{Let } x^4 - 4x^2 + x^3 + 2x + 1$$

$$\text{put } x = 1$$

$$p(1) = (1)^4 - 4(1)^2 + (1)^3 + 2(1) + 1$$

$$p(1) = 1 - 4 + 1 + 2 + 1$$

$$p(1) = 1$$



43.

Difficulty : Medium

Topics :

LINEAR EQUATIONS IN TWO VARIABLES,

Let the unit digit be ' x '

tens digit be ' y '

Number = $x + 10y$

According to question

$$x + y = 14 \quad \dots(1)$$

$$(x + 10y) - 18 = y + 10x$$

$$\Rightarrow -9x + 9y = 18$$

$$\Rightarrow -x + y = 2 \quad \dots(2)$$

BY (1), (2) solving

we get

$$x + y = 14$$

$$-x + y = 2$$

$$2y = 16$$

$$y = 8$$

put equation (1)

$$x + y = 14$$

$$x + 8 = 14$$

$$x = 6$$

$$\text{Number} = x + 10y$$

$$= 6 + 10 \times 8$$

$$= 6 + 80$$

$$\text{Number} = 86$$

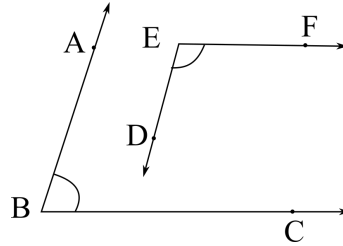


44.

Difficulty : Medium

Topics :

LINES AND ANGLES,



Since $AB \parallel ED$, $BC \parallel EF$

$$\angle ABC + \angle DEF = 180^\circ$$

45.

Difficulty : Medium

Topics :

MENSURATION,

$$100 \text{ kilolitre} = 10^8 \text{ cubic cm.}$$

46.

Difficulty : Medium

Topics :

Arithmetic Progression,

$$a_5 = 10 + a_3$$

$$a + 4d = 10 + a + 2d$$

$$2d = 10$$

$$d = 5$$

$$a_9 - a_6 = (a + 8d) - (a + 5d)$$

$$= 3d$$

$$= 3 \times 5 = 15$$

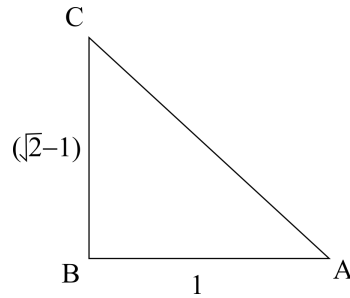


47.

Difficulty : Medium

Topics :

Trigonometric Function,



$$\tan A = \frac{\sqrt{2} - 1}{1} = \frac{P}{B}$$

$$(AC)^2 = (AB)^2 + (BC)^2$$

$$(AC)^2 = 1 + 2 + 1 - 2\sqrt{2}$$

$$(AC)^2 = 4 - 2\sqrt{2}$$

$$AC = \sqrt{4 - 2\sqrt{2}}$$

$$\sin A = \frac{(\sqrt{2} - 1)}{\sqrt{4 - 2\sqrt{2}}}, \cos A = \frac{1}{\sqrt{4 - 2\sqrt{2}}}$$

$$\sin A \cdot \cos A = \frac{(\sqrt{2} - 1)}{4 - 2\sqrt{2}} = \frac{\sqrt{2} - 1}{2\sqrt{2}(\sqrt{2} - 1)}$$

$$= \frac{1}{2\sqrt{2}}$$

48.

Difficulty : Medium

Topics :

Number Systems,

2, 3, 5, 7

multiplication of prime no

$$= 2 \times 3 \times 5 \times 7$$

$$= 210$$

49.

Difficulty : Medium

Topics :

Quadratic Equations,

$$(b - c)x^2 + (c - a)x + (a - b) = 0$$

roots are equal than

$$D = 0$$

$$b^2 - 4ac = 0$$

$$\Rightarrow (c - a)^2 - 4(b - c)(a - b) = 0$$

$$\Rightarrow [c^2 + a^2 - 2ac] - 4[ab - ac - b^2 + bc] = 0$$

$$\Rightarrow c^2 + a^2 - 2ac - 4ab + 4ac + 4b^2 - 4bc = 0$$

$$\Rightarrow c^2 + a^2 + 4b^2 + 2ac - 4ab - 4bc = 0$$

$$\Rightarrow c^2 + a^2 + (-2b)^2 + 2(a)(c) + 2(a)(-2b) + 2(-2b)(c) = 0$$

$$\Rightarrow (c + a - 2b)^2 = 0$$

$$\Rightarrow c + a - 2b = 0$$

$$\Rightarrow c + a = 2b$$

50.

Difficulty : Medium

Topics :

LINEAR EQUATIONS IN TWO VARIABLES,

$$x + y - 4 = 0$$

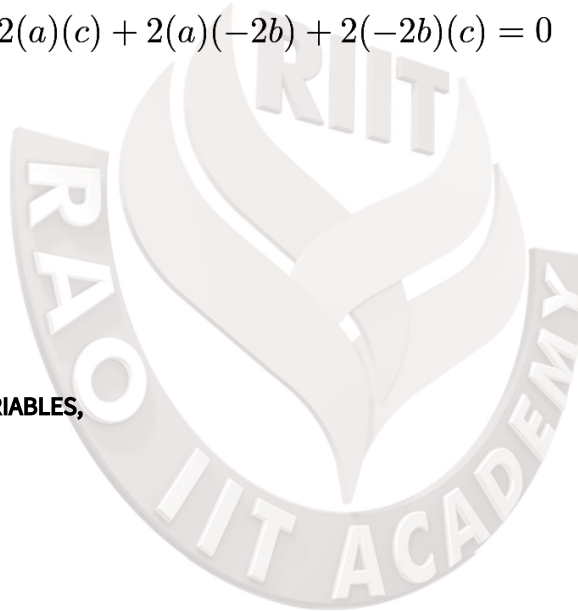
$$2x + ky - 3 = 0$$

If give no solution

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\frac{1}{2} = \frac{1}{k}$$

$$k = 2$$

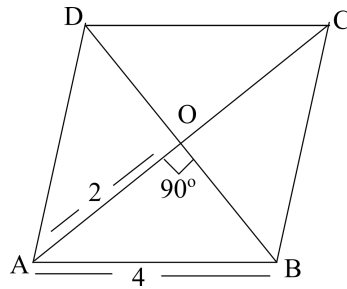


51

Difficulty : Medium

Topics :

GEOMETRY,



IN $\triangle OAB$

$$(AB)^2 = (OA)^2 + (OB)^2$$

$$(4)^2 = (2)^2 + (OB)^2$$

$$16 - 4 = (OB)^2$$

$$12 = (OB)^2$$

$$OB = \sqrt{12}$$

$$OB = 2\sqrt{3}$$

length of the other diagonal

$$= 2\sqrt{3} + 2\sqrt{3}$$

$$= 4\sqrt{3}$$



52.

Difficulty : Medium

Topics :

STATISTICS,

$$\text{Mean} = \frac{0 + 1 + 2 + 3 + 4 + 5 + \dots + 16}{17}$$

$$= \frac{16 \times 17}{2 \times 17} = 8$$

53.

Difficulty : Medium

Topics :

MENSURATION,

$$\text{TSA of cube} = 6 \times 5^2 = 150$$

If cube of edge 1cm is cut from corner of solid cube then no any change will be in TSA.

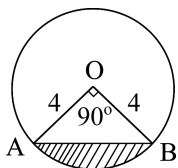
$$\text{So TSA of remaining same} = 150\text{cm}^2$$

54.

Difficulty : Medium

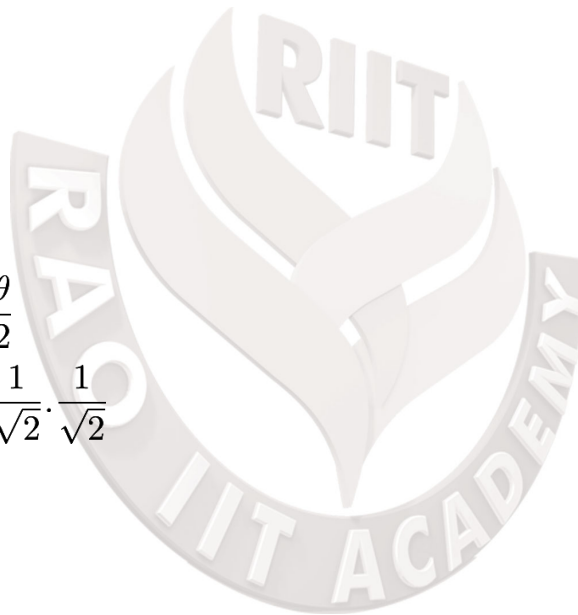
Topics :

GEOMETRY,



Area of shaded region

$$\begin{aligned} &= \frac{\pi r^2 \theta}{360^\circ} - r^2 \sin \frac{\theta}{2} \cdot \cos \frac{\theta}{2} \\ &= \frac{\pi \times 16 \times 90^\circ}{360^\circ} - 16 \cdot \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} \\ &= 4\pi - 8 \\ &\Rightarrow 4(\pi - 2)\text{cm}^2 \end{aligned}$$

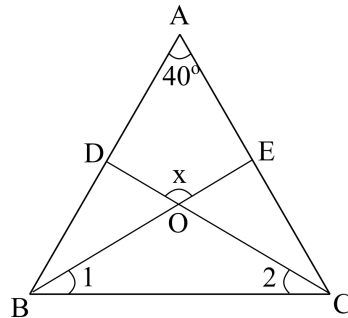


55.

Difficulty : Medium

Topics :

Triangle,



given $AB = AC$

$$\Rightarrow \angle B = \angle C = \angle P$$

$$40^\circ + \angle P + \angle P = 180^\circ$$

$$2\angle P = 140^\circ$$

$$\angle P = 70^\circ$$

$$\angle 1 = \frac{1}{2}\angle P = 35^\circ$$

$$\angle 2 = \frac{1}{2}\angle P = 35^\circ$$

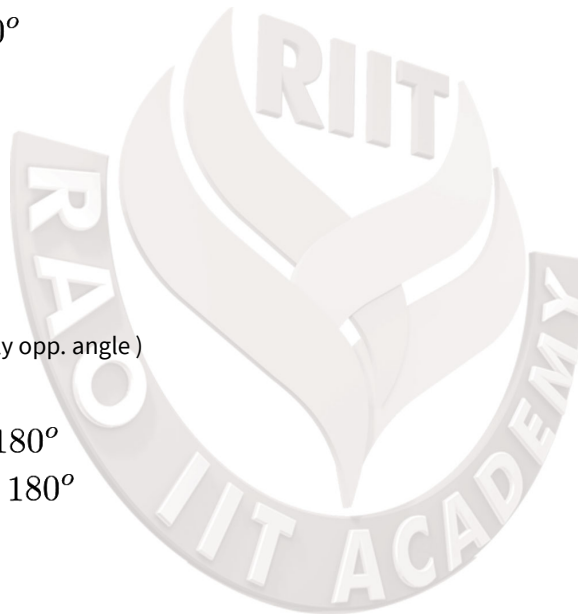
$$\angle BOC = \angle x \quad (\text{vertically opp. angle})$$

In $\triangle BOC$

$$\angle 1 + \angle 2 + \angle BOC = 180^\circ$$

$$35^\circ + 35^\circ + \angle BOC = 180^\circ$$

$$\angle BOC = 110^\circ$$

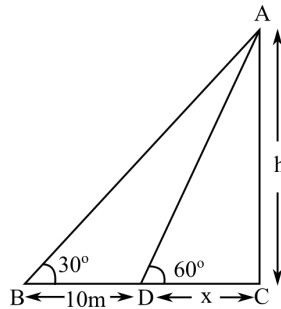


56.

Difficulty : Medium

Topics :

TRIGONOMETRY,


 In $\triangle ACD$ we have

$$\sqrt{3} = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}} \dots (1)$$

 In $\triangle ACB$

$$\tan 30^\circ = \frac{h}{10 + x}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{10 + x}$$

$$10 + x = \sqrt{3} h$$

$$10 + \frac{h}{\sqrt{3}} = \sqrt{3} h$$

$$10 = \sqrt{3} h - \frac{h}{\sqrt{3}}$$

$$10 = h \left(\sqrt{3} - \frac{1}{\sqrt{3}} \right)$$

$$10 = h \left(\frac{3 - 1}{\sqrt{3}} \right)$$

$$10 = \frac{h \times 2}{\sqrt{3}}$$

$$h = \frac{10 \times \sqrt{3}}{2}$$

$$h = 5\sqrt{3} \text{ m} \text{ option 'A' is correct.}$$



57.

Difficulty : Medium

Topics :

Probability,

$$x = p(\text{getting less than 4}) = \frac{3}{6} = \frac{1}{2}$$

$$y = p(\text{getting a number greater than 4}) = \frac{2}{6} = \frac{1}{3}$$

$$x - y = \frac{1}{2} - \frac{1}{3}$$

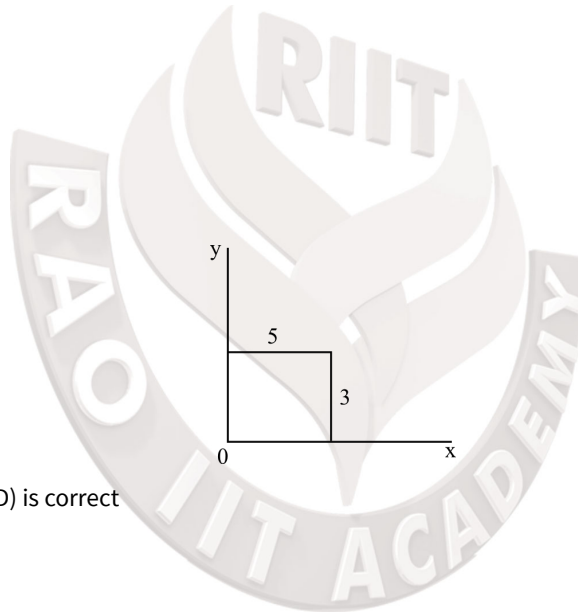
$$\frac{3 - 2}{6} = \frac{1}{6} \rightarrow \text{option (B) is correct.}$$

58.

Difficulty : Medium

Topics :

CO-ORDINATE GEOMETRY,



$$\text{sum} = 5 + 3 = 8, \text{Option (D) is correct}$$

59.

Difficulty : Medium

Topics :

Polynomial Function,

$$x^2 + 4y^2 + 9z^2 - 4xy - 12yz + 6xz$$

$$\Rightarrow (x)^2 + (2y)^2 + (3z)^2 + 2(x)(-2y) + 2(-2y)(3z) + 2(3z)(x)$$

$$\Rightarrow (x - 2y + 3z)^2 = 0$$

$$\Rightarrow x - 2y + 3z = 0$$

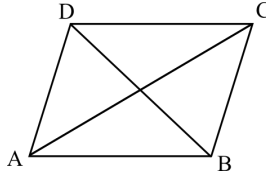
$$\Rightarrow \mathbf{x = 2y - 3z}, \text{option 'A' is correct.}$$

60.

Difficulty : Medium

Topics :

Triangle,



The sum of two sides of a triangle is greater than the third side so option (A), (B), (C) are correct options, option (D) is incorrect.

In $\triangle ABC$

$$AB + BC > AC \quad \dots(1)$$

In $\triangle ADC$

$$AD + DC > AC \quad \dots(2)$$

$$AB + BC + CD + AD > 2AC$$

Option (1) is correct

$$AB + AD > BD \quad \dots(3)$$

$$BC + CD > BD \quad \dots(4)$$

Adding (1), (2), (3), (4)

$$AB + BC + CD + DA > AC + BD$$

Option (C) is correct.

Option (B) is correct.

So option (D) is false statement.

