



GENERAL INSTRUCTIONS :

1. All questions are compulsory.
2. The question paper consists of 34 questions divided into four sections A,B,C and D. Section – A comprises of 10 question of 1 mark each. Section – B comprises of 8 questions of 2 marks each. Section – C comprises of 10 questions of 3 marks each and Section – D comprises of 6 questions of 4 marks each.
3. Question numbers 1 to 10 in Sections – A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four mark each. You have to attempt only one If the alternatives in all such questions.
5. Use of calculator is not permitted.

MATHEMATICS

CLASS X

(SA-2)

Time : 3 Hours 15 Minutes

Maximum Marks : 80

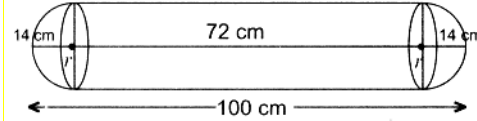
VOLUME & SURFACE AREA OF SOLID FIGURE AND PROBABILITY

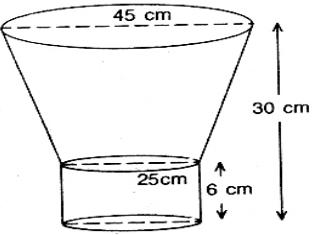
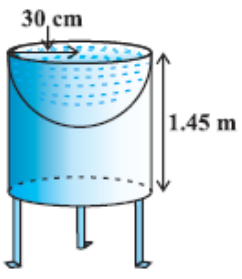
SECTION A

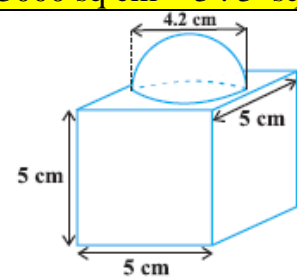
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| Q.1 | A sphere and a cube have equal surface areas. The ratio of the volume of the sphere to that of cube is (a) $\sqrt{\pi} : \sqrt{6}$ (b) $\sqrt{6} : \sqrt{\pi}$ (c) $\sqrt{\pi} : \sqrt{3}$ (d) $\sqrt{3} : \sqrt{\pi}$ Ans B |
| Q.2 | The height of a cone is 60 cm. A small cone is cut off at the top by a plane parallel to the base and its volume is $\frac{1}{64}$ the volume of original cone. The height from the base at which the section is made is
(a) 15 cm (b) 30 cm (c) 45 cm (d) 20 cm. Ans (c) |
| Q.3 | A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of the cone is 2 cm and diameter of base is 4 cm. if a right circular cylinder circumscribes the solid, find how much more space it will cover.
(a) $4\pi cm^3$ (b) $6\pi cm^3$ (c) $8\pi cm^3$ (d) $\frac{16}{3}\pi cm^3$ Ans c |
| Q.4 | If a solid sphere of radius 10 cm is moulded into 8 spherical solid balls of equal radius, then the surface area of each ball is
(a) $60\pi cm^2$ (b) $65\pi cm^2$ (c) $75\pi cm^2$ (d) $100\pi cm^2$ Ans.(d) |
| Q.5 | If h, C and V are height, curved surface area and volume of a cone |

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|------------------|--|
| | respectively , then $3v\pi h^3 - c^2 h^2 + 9v^2$ is equal to
(a) 1 (b)0 (c) -1 (d) 2 Ans.(b) |
| Q.6 | Two dice are thrown simultaneously. What is the probability of obtaining a multiple of 2 on one of them and a multiple of 3 on the other
(a) $\frac{5}{36}$ (b) $\frac{11}{36}$ (c) $\frac{1}{6}$ (d) $\frac{1}{3}$ Ans (b) |
| Q.7 | The probability that leap year has 53 sunday, is
(a) $\frac{2}{7}$ (b) $\frac{5}{7}$ (c) 1 (d)None of these Ans (a) |
| Q.8 | From a book containing 100 pages, one page is selected randomly. The probability that the sum of the digits of the page number of the selected page is 11, is (a) $\frac{2}{25}$ (b) $\frac{9}{100}$ (c) $\frac{11}{100}$ (d) None of these Ans (a) |
| Q.9 | There are two children in a family. The probability that both of them are boys is (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d)None of these Ans c |
| Q.10 | The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume become $\frac{1}{27}$ o the volume of the given cone, then the height above the base at which the section has been made is (a)10 cm (b)15 cm (c)20 cm (d)25 cm Ans.(c) |
| SECTION B | |
| Q.11 | If odds in favour of an event be 2 : 3 . Find the probability of non – occurrence of this event . Ans 3 / 5 |
| Q.12 | Solid cylinder of brass 8 m high and 4 m diameter is melted and recast into a cone of diameter 3 m. Find the height of the cone. Ans 42.66 m |
| Q.13 | A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random, from the jar, the probability that it is green is $\frac{2}{3}$,find the number of blue marbles in the jar. Ans : 8 |
| Q.14 | The radius of the internal and external surfaces of a hollow spherical shell are 3 cm and 5 cm respectively. If it is melted and recast into a solid cylinder of height $2\frac{2}{3}$ cm. Find the diameter of the cylinder. Ans : 14 cm |

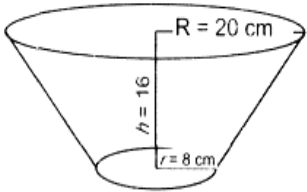
Q.15	Cards marked with numbers 6 to 101 are placed in a box and mixed thoroughly. One card is drawn at random from this box. Find the probability that the number on the card is (i) a number which is a perfect square (ii) a prime number less than 30. Ans : n (s) = 96 (i) $8 / 96 = 1 / 12$ (ii) $7 / 96$
Q.16	Two cubes, each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboids . ans : 160 cm^2
Q.17	A sphere of diameter 5 cm is dropped into a cylindrical vessel partly filled with water. The diameter of the base of the vessel is 10 cm. If sphere is completely submerged, by how much will the level of water rise? (Ans. $5/6 \text{ cm}$)
Q.18	A rectangular strip $25 \text{ cm} \times 7 \text{ cm}$ is rotated about the longer side. Find the volume of the solid, thus generated. ans : $r = 7$ & $h = 25$; Volume = 3850 cm^3 OR The rain water from a roof $22\text{m} \times 20 \text{ m}$ drains into a cylindrical vessel having diameter of base 2m and height 3.5 m . If the vessel is just full, find the rainfall in cm. 2.5cm
SECTION C	
Q.19	Two customers KRITIKA and JYOTSNA are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day so on another day . What is the probability that both will visit the shop on (i) same day ?(ii) consecutive days? (iii) different days ? Ans : Same day = $5 / 25 = 1 / 5$ (ii) consecutive days = $8 / 25$ (iii) different days = $20 / 25 = 4 / 5$ OR One card is drawn from a well – shuffled deck of 52 cards. Find the probability of getting (i) a king of red colour (ii) a red face card (iii) the jack of hearts. (iv) the queen of diamonds. Ans : i) a king of red colour = $2 / 52 = 1 / 26$ (ii) a red face card $12 / 52 = 3 / 13$ (iii) the jack of hearts = $1 / 52$ (iv) the queen of diamonds = $1 / 52$.
Q.20	The diameter of a roller 120 cm long is 84 cm. If it takes 500 complete revolutions to level a playground, determine the cost of levelling it at the rate of

	30 paise per square meter. Ans. Total area in 500 revolution = 1584 sq m & total cost = $475 .20$
Q.21	A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 100 cm and the diameter of the hemispherical ends is 28 cm, find the cost of polishing the surface of the solid at the rate of 5 paise per sq cm. Sol.  Radius of hemisphere, $r = 14 \text{ cm}$ Length of cylindrical part (h) = $[100 - 2 (14)] = 72 \text{ cm}$ Radius of cylindrical part = Radius of hemispherical ends, $r = 14 \text{ cm}$ Total area to be polished = 2 (C.S.A. of hemispherical end) + C.S.A. of cylinder = $2 (2\pi r^2) + 2\pi r h = 2\pi r (2r + h) = 2\pi \times \frac{22}{7} \times 14 (2 \times 14 + 72) = 88 (28 + 72) = 8800 \text{ cm}^2$ Cost of polishing the surface = $8800 \times 0.05 = \text{Rs. } 440$
Q.22	A metallic bucket is in the shape of a frustum of a cone mounted on a hollow Cylindrical base given in the figure. If the diameters of two circular ends of the bucket are 45cm and 25 cm, total vertical height is 30 cm and that of the cylindrical portion is 6 cm, find the area of the metallic sheet used to make the bucket. $\left(\pi = \frac{22}{7} \right)$ Ans: Height of frustum = $30 - 6 = 24 \text{ cm}$; Radi of circular end = 22.5 & 12.5 ; Slant height = 26 cm ; Area of metallic sheet used = curve surface area of frustum of cone + area of circular base end + curve surface area of cylinder = $1216.25\pi \text{ cm}^2 = 3822.\text{cm}^2$ OR A metallic bucket is in the shape of a frustum of a cone mounted on a hollow cylindrical base given in the figure. If the diameters of two circular ends of the bucket are 45cm and 25 cm, total vertical height is 30 cm and that of the cylindrical portion is 6 cm . Also find the volume of water it can hold. $\left(\pi = \frac{22}{7} \right)$ Ans: Height of frustum = $30 - 6 = 24 \text{ cm}$ Radi of circular end 22.5 & 12.5 ; Volume of bucket it can hold = volume of frustum =

	
	$\frac{\pi h}{3}(r_1^2 + r_2^2 + r_1 r_2) = 772.388 \text{ cm}^3$
Q.23	<p>All cards of king, jack and queen of club are removed from a deck of playing cards. One card is drawn at random from the remaining cards. Find the probability that the card drawn is (a) a heart (b) a king (c) a club (d) the 10 of diamond. Ans : (i) 13 / 49 (ii) 3 / 49 (iii) 10 / 49 (iv) 1 / 49 .</p>
Q.24	<p>A bucket of height 8 cm and made up of copper sheet is in the form of frustum of a right circular cone with radii of its lower and upper ends as 3 cm and 9 cm respectively. .(Leave the answer in terms of π) Calculate: (a) the height of the cone of which the bucket is a part. (b) the volume of water which can be filled in the bucket. (c) the area of copper sheet required to make the bucket Ans (a) 12 cm (b) $312\alpha\pi\text{cm}^3$ (c) $129\pi\text{cm}^2$</p>
Q.25	<p>A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel. Ans. 100</p>
Q.26	<p>Mayank made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end (see Fig.). The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of</p> 

	<p>the bird-bath. (Take $\pi = 22/7$) Ans : Total surface area of the bird bath = CSA of cylinder + CSA of hemi sphere = 33000 sq cm = 3.3 sq m</p>
Q.27	 <p>The decorative block shown in Fig. is made of two solids — a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm. Find the total surface area of the block. ($\pi = 22/7$) . ans ; Surface area of the block = total surface area of cube – base area of hemisphere + curved surface area of hemisphere = $6 \times 5^2 - \pi r^2 + 2\pi r^2 = 163.86$ sq cm</p> <p style="text-align: center;">OR</p> <p>Water in a canal, 30 dm wide and 12 dm deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed? Ans. Speed of water in the canal = 10 km. h = 10000 m. 60 min = $\frac{500}{3}$ m/min. \therefore The volume of the water flowing out of the canal in 1 minute = $(\frac{500}{3} \times \frac{30}{10} \times \frac{12}{10}) \text{ m}^3 = 600 \text{ m}^3$ \therefore In 30 min, the amount of water flowing out of the canal = $(600 \times 30) \text{ m}^3 = 600 \text{ m}^3$. If the required area of the irrigated land is $x \text{ m}^2$, then the volume of water to be needed to irrigate the land = $(x \times \frac{8}{100}) \text{ m}^3 = \frac{2x}{25} \text{ m}^3$ Hence, $\frac{2x}{25} = 18000 \Rightarrow x = 18000 \times \frac{25}{2} = 225000$. Hence, the required area is 225000 m².</p>
Q.28	<p>The differences between inside and outside surfaces of a cylindrical tube 14cm long is 44 sq.cm. If ht volume of the tube is 99 cubic cm, find the inner and outer radii of the tube. Ans : 2.5 & 2 cm</p>
SECTION D	
Q.29	<p>Water is being pumped out through a circular pipe whose internal</p>

	<p>diameter is 7 cm. If the flow of water is 72cm per second, how many litres of water are being pumped out in one hour ? Ans volume of water flow out per hour = 9979200 cubic cm = 9979.2 liters</p> <p style="text-align: center;">OR</p> <p>A hemispherical tank of radius $1\frac{3}{4}$ m is full of water. It is connected with a pipe which empties it at the rate of 7 litres per second. How much time will it take to empty the tank completely? Ans Radius of the hemisphere = $\frac{7}{4}$ m = $\frac{7}{4} \times 100$ cm = 175 cm \therefore Volume of the hemisphere = $\frac{2}{3} \times \pi \times 175 \times 175 \times 175$ cm³ . The cylindrical pipe empties it at the rate of 7 liters i.e., 7000 cm³ of water per second. Hence, the required time to empty the tank = $\left(\frac{2}{3} \times \frac{22}{7} \times 175 \times 175 \times 175 \div 7000\right)$s = $\frac{2}{3} \times \frac{22}{7} \times \frac{175 \times 175 \times 175}{7000 \times 60}$ min = $\frac{11 \times 25 \times 7}{3 \times 2 \times 12}$ min = $\frac{1925}{72}$ min \cong 26.75 min, nearly.</p>
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Q.30	<p>A container (open at the top) made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. (Take $\pi = 3.14$) Find :</p> <p>(i) the cost of milk when it is completely Filled with milk at the rate of Rs. 15 per litre.</p> <p>(ii) the cost of metal sheet used, if it costs Rs. 5 per 100 cm² Sol. The container is in the shape of a frustum of a cone ; $h = 16$ cm, $r = 8$ cm, $R = 20$ cm</p> <div style="text-align: center;">  </div> <p>Volume of the container = $\frac{1}{3} \times \pi h (R^2 + Rr + r^2) = \frac{1}{3} \times 3.14 \times 16 [(20)^2 + 20(8) + (8)^2]$ cm³ = $\frac{1}{3} \times 3.14 \times 16 (400 + 160 + 64)$</p>
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	<p>= $\left(\frac{1}{3} \times 3.14 \times 16 \times 624\right)$ cm³</p> <p>= (3.14×3328) cm³</p> <p>= 10449.92 cm³</p> <p>= $\frac{10449.92}{1000}$ litres</p> <p>= 10.45 litres (approx.) (i) Cost of milk = 10.45 x Rs. 15 = Rs. 156.75 Now, slant height of the frustum of cone</p> <p>$l = \sqrt{h^2 + (R - r)^2} = \sqrt{16^2 + (20 - 8)^2} = \sqrt{256 + 144} = \sqrt{400} = 20$ cm.</p> <p>Total surface area of the container = $[\pi l (R + r) + \pi r^2]$</p> <p>= $[3.14 \times 20 (20 + 8) + 3.14 (8)^2]$ cm² = $3.14 [20 \times 28 + 64]$ cm² = 3.14×624 cm² = 1959.36 cm²</p> <p>(ii) Cost of metal sheet used = Rs. $\left[1959.36 \times \frac{5}{100}\right] = \frac{9796.8}{100}$ = Rs. 97.968 = Rs. 98 (approx.)</p>
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Q.31	<p>A toy is in the shape of a right circular cylinder with a hemisphere on one end and a cone on the other. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical part. Find the surface area of the toy, if the total height of the toy is 30 cm. Ans. S.A. = 770 cm²</p>
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Q.32	<p>An agriculture field is in the form of a rectangle of length 20m width 14m . A 10m deep well of diameter 7m is dug in a corner of the field and the earth taken out of the well is spread evenly over the remaining part of the field. Find the rise in its level. Ans $h = \frac{2 \times 385}{483} = \frac{770}{483} = 1.594$ m</p>
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Q.33	<p>A right triangle , whose sides are 15 cm and 20 cm, is made to revolve about its hypotenuse. Find the volume and the surface area of the double cones so formed . (Use $\pi = 3.14$). (Ans. Volume of double cone 3768 cubic cm & Surface area of double cone = 1318.8 sq cm)</p>
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Q.34	<p>A <i>gulab jamun</i>, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 <i>gulab jamuns</i>, each shaped like a cylinder with two hemispherical ends with length 5 cm and</p>
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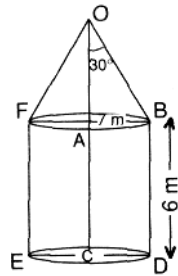
diameter 2.8 cm . (Ans. Volume of one gulab gamun = 75.152 / 3 Volume of 45 gulab gamun = 1127.28 cubic cm & volume of syrup = 338 . 184 cubic

OR

The interior of a building is in the form of a right circular cylinder of radius 7 m and height 6m, surmounted by a right circular cone of same radius and of vertical angle 60° . Find the cost of painting the building from inside at the rate of Rs. 30/m². **Sol.** Internal curved surface area of cylinder = $2\pi rh = (2\pi \times 7$

$$\times 6)m^2 = \left(2 \times \frac{22}{7} \times 7 \times 6\right)m^2$$

$$= 264 \text{ m}^2 \text{ In right } \triangle OAB, \frac{AB}{OB} = \sin 30^\circ = \frac{7}{OB} = \frac{1}{2} \text{ Slant height of cone (OB) = 14 m}$$



Internal curved surface area of cone = $\pi rl = \frac{22}{7} \times 7 \times 14 = 308m^2$ Total area to be painted = $(264 + 308) = 572 \text{ m}^2$ Cost of painting @ Rs. 30 per m² = Rs. $(30 \times 572) = \text{Rs. } 17,160$

**TO FOLLOW, WITHOUT HALT, ONE AIM :
THERE'S THE SECRET OF SUCCESS .**