

MATHEMATICS
SAMPLE QUESTION PAPER
CLASS IX
(SUMMATIVE ASSESSMENT - II)

TIME : 3 hours - 3½ hours

Maximum Marks : 80

General Instructions :

1. All questions are compulsory.
2. The question paper consists of 34 questions divided into 4 sections, section A, B, C, and D.
3. Section A contains 12 multiple choice type questions, first 8 of which carry 1 mark each and the next 4 carry two marks each. Section B contains 7 questions of 2 marks each, section C contains 10 questions of 3 marks each and section D contains 5 questions of 4 marks each.
4. Use of calculators is not permitted.

SECTION-A

Question numbers 1 to 8 are of 1 marks each and from 9 to 12 are of 2 marks each. Each question is provided with 4 choices out of which only one is correct. Choose the correct one.

Q 1. Between two rational numbers, there is/ are

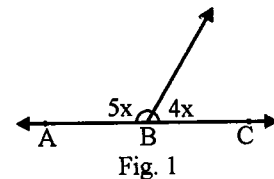
- (A) infinite number of rational numbers
- (B) one and only one rational number
- (C) no rational number
- (D) no irrational number

Q2. Which of the following is a polynomial in one variable?

- (A) $\sqrt{2} - x^2 + 3x$
- (B) $\sqrt{2x} + 9$
- (C) $x^2 + x^{-2}$
- (D) $x^5 + y^8 + 9$

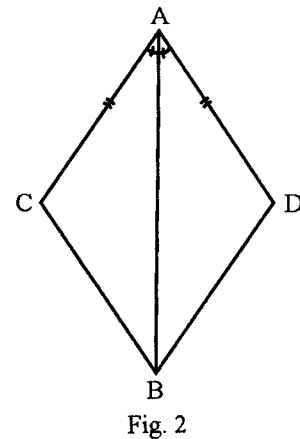
Q3. In Fig. 1, the value of x is

- (A) 80°
- (B) 20°
- (C) 40°
- (D) 60°



Q4. In Fig. 2, the congruence rule used in proving $\triangle ACB \cong \triangle ADB$ is

- (A) ASA
- (B) SAS
- (C) SSS
- (D) RHS



Q5. The sides of a quadrilateral are extended in order to form exterior angles. The sum of these exterior angles is

- (A) 180°
- (B) 270°
- (C) 90°
- (D) 360°

- Q6. ABCD is a rhombus with $\angle ABC=40^\circ$. The measure of $\angle ACD$ is
 (A) 90° (B) 20°
 (C) 40° (D) 70°
- Q7. The distance of a chord of length 16cm from the centre of the circle of radius 10cm is
 (A) 6cm (B) 8cm
 (C) 10cm (D) 12cm
- Q8. If the diameter of base of a cone is 8cm and its height is 3cm, the slant height of cone is
 (A) 5 cm (B) 6 cm
 (C) 7.5 cm (D) 6.25 cm

Q9. $\frac{1}{\sqrt{18}-\sqrt{32}}$ is equal to

- (A) $\sqrt{2}$ (B) $-\sqrt{2}$
 (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{-1}{\sqrt{2}}$

Q10. The value of $p\left(\frac{1}{2}\right)$ for $p(z) = z^4 - z^2 + z$ is

- (A) $\frac{7}{16}$ (B) $\frac{5}{16}$
 (C) $\frac{3}{16}$ (D) $\frac{1}{16}$

Q11. In Fig. 3, if $AB \parallel CF$, $CD \parallel FE$, then the value of x is

- (A) 40°
 (B) 65°
 (C) 75°
 (D) 105°

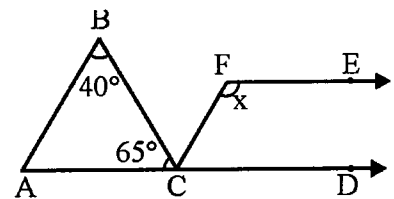


Fig. 3

Q12. In Fig. 4, BCPQ and BCDA are two parallelograms on the same base BC.

The value of $(x+y)$ is

- (A) 130°
- (B) 140°
- (C) 115°
- (D) 120°

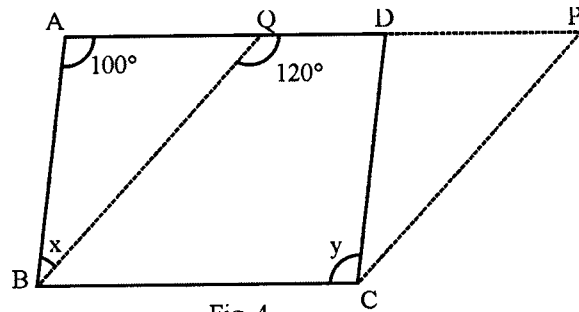


Fig. 4

SECTION-B

Question numbers 13 to 19 carry 2 marks each.

Q13. Without actually calculating the cubes, find the value of $55^3 - 25^3 - 30^3$

Q.14. In Fig. 5, $OA \perp OD$, $OC \perp OB$,

$OD=OA$ and $OC=OB$

Prove that $AB=CD$

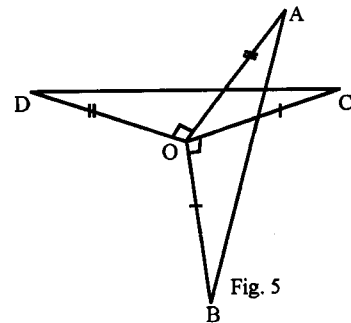


Fig. 5

Q15. In Fig. 6, ABCD is a parallelogram in which X and Y are the mid-points of the sides DC and AB respectively.

Prove that AXCY is a parallelogram.

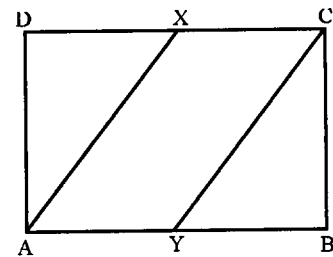


Fig. 6

Q16. In Fig.7, RS is a diameter of the circle with centre O.

NM is parallel to RS and

$\angle MRS=29^\circ$. Find $\angle RNM$.

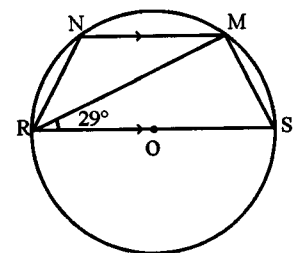


Fig. 7

- Q17. The total surface area of a cube is 486cm^2 . Find its volume.
- Q18. The mean of 100 observations is 50. If the observation 50 is replaced by 150, what will be the resulting mean?
- Q19. The median of the following observations arranged in ascending order is 24. Find the value of x .
11, 12, 14, 18, $x+2$, $x+4$, 30, 32, 35, 41

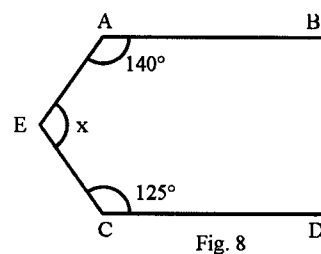
SECTION C

Question numbers 20 to 29 carry 3 marks each.

Q20. If $a=1-\sqrt{2}$, find the value of $\left(a-\frac{1}{2}\right)^3$

Q21. Factorise $3-12(a-b)^2$

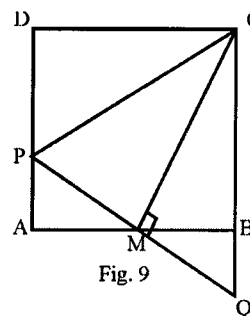
Q22. In Fig.8, $AB\parallel CD$. Find x .



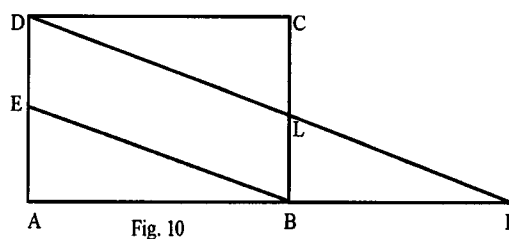
Q23. In Fig.9, ABCD is a square. M is the mid-point of AB and $PQ \perp CM$ meets AD at P and CB produced at Q.

Prove that

- (i) $\Delta PAM \cong \Delta QBM$
- (ii) $CP=CQ$



Q24. In Fig.10, ABCD is a parallelogram in which E is the mid-point of AD. $DF\parallel EB$, meeting AB produced in F and BC at L. Prove that $DF=2DL$



- Q25. In Fig. 11, there are two concentric circles with centre O. AD is a chord of larger circle intersecting the smaller circle at B and C. Prove that $AB=CD$.

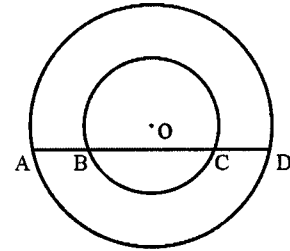


Fig. 11

- Q26. In Fig. 12, C and D are two points on the semicircle described on AB as diameter. If $\angle BAD=70^\circ$ and $\angle DBC=30^\circ$, find $\angle BCD$ and $\angle BDC$.

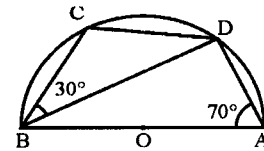
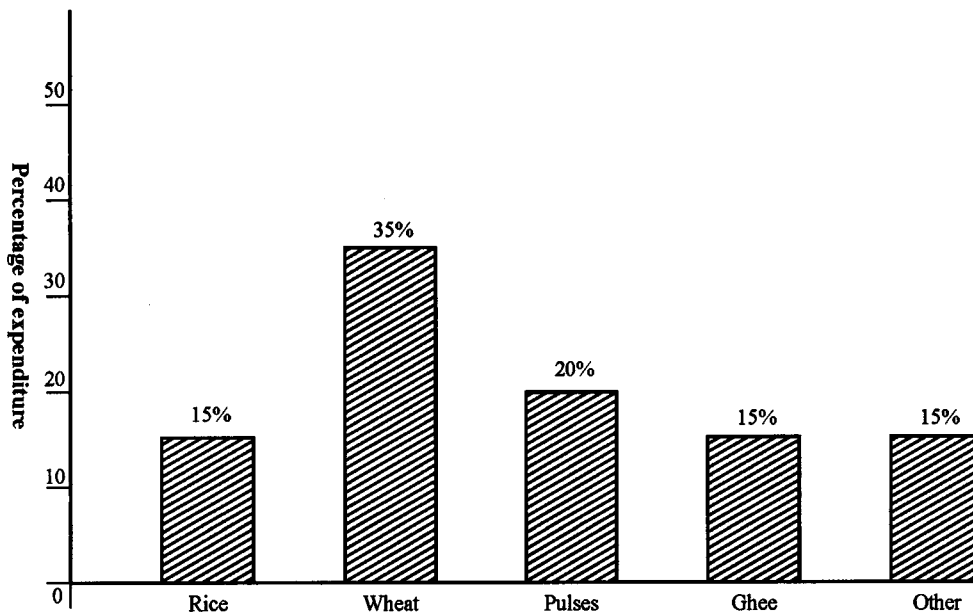


Fig. 12

- Q27. The difference between the outside and inside surfaces of a cylindrical pipe 14cm in length is 44cm^2 . Find the thickness of the pipe.
- Q28. A sphere, a cylinder and a cone have the same radii. The height of the cylinder and the cone is equal to the diameter of the sphere. Find ratio of their respective volumes.
- Q29. The distribution of expenditure of a family on food items is given in the following bar chart. Read the bar chart and answer the following questions:
- Q1. What is the percentage of excess expenditure on wheat than that on pulses?
- Q2. What is the total percentage expenditure on pulses and ghee?



Food Items

Fig. 13

Section D

Question numbers 30 to 34 carry 4 marks each.

30. Prove that a diagonal of a parallelogram divides it into two congruent triangles.

31. Following table gives the distribution of the marks obtained by the students of a class.

Marks	0-15	15-30	30-45	45-60	60-75	75-90
Number of students	5	12	28	30	35	13

Represent the data by a frequency polygon.

32. Factorise $(a^2-2a)^2 - 23(a^2-2a) + 120$

33. In Fig 14, two circles with centres at A and B intersect each other at points P and Q. Prove that the line joining the centres (AB) bisects the common chord (PQ) at right angles.

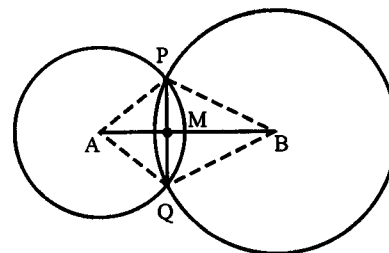
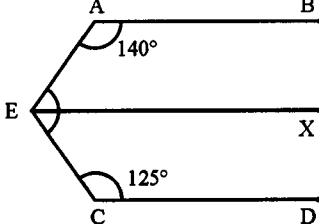


Fig. 14

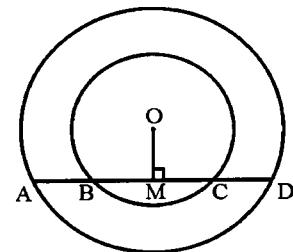
34. The radius and height of a cylinder are in the ratio 2:3. If the volume of the cylinder is 1617 cm^3 , find the radius of base of the cylinder.

No.	Answers	Marks
	$\Rightarrow \frac{1}{2}AB \parallel \frac{1}{2}CD \text{ and } \frac{1}{2}AB = \frac{1}{2}CD$ $\Rightarrow XC \parallel AY \text{ and } XC = AY \text{ (} \because X \text{ and } Y \text{ are mid point of } DC \text{ and } AB \text{ respectively)}$ $\Rightarrow AXCY \text{ is a parallelogram.}$	<p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p>
16.	<p>In the given figure</p> $\angle RMS = 90^\circ \text{ (angle in a semicircle as } RS \text{ is diameter)}$ $\therefore \angle RSM = 180^\circ - (29^\circ + 90^\circ) \text{ (angle sum property of triangle)}$ $= 180^\circ - 119^\circ$ $= 61^\circ$ $\angle RNM = 180^\circ - 61^\circ \text{ (opposite angles of a cyclic quadrilateral are supplementary)}$ $= 119^\circ$	<p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">1</p> <p style="text-align: center;">$\frac{1}{2}$</p>
17.	<p>Let each side of cube be a cm.</p> <p>It is given that $6a^2 = 486$</p> $\therefore a^2 = 81$ $a = 9 \text{ cm}$ <p>\therefore volume of cube = a^3</p> $= 9^3$ $= 729 \text{ cm}^3$	<p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p>
18.	$\text{Mean} = \frac{\text{Sum of 100 observations}}{100}$ $\text{Sum of 100 observations} = 50 \times 100$ $= 5000$ $\text{New sum} = 5000 - 50 + 150$ $= 5100$ $\therefore \text{New mean} = \frac{5100}{100} = 51$	<p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">$\frac{1}{2}$</p>

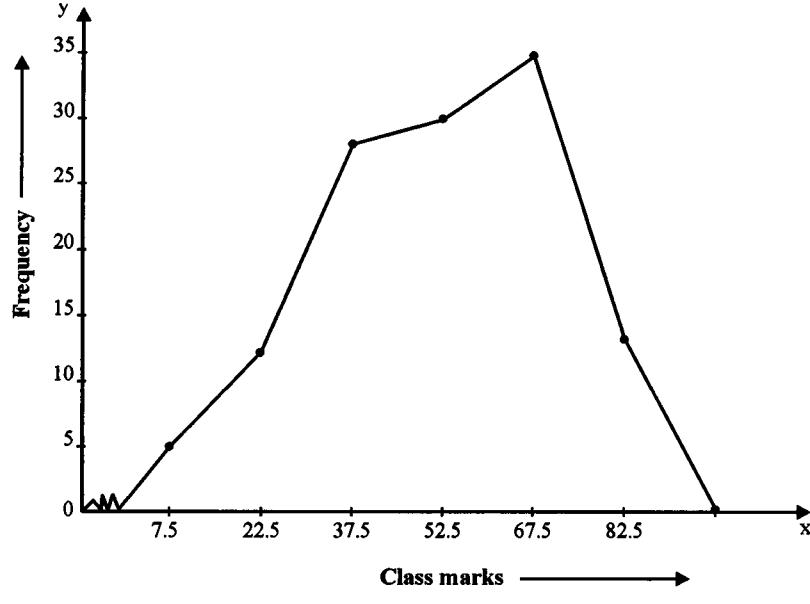
No.	Answers	Marks
19.	<p>Total observations $n = 10$ (even)</p> <p>\therefore median = mean of $\left(\frac{n}{2}\right)^{\text{th}}$ and $\left(\frac{n}{2}+1\right)^{\text{th}}$ observations</p> <p>median = mean of 5th & 6th observations</p> $24 = \frac{(x+2)+(x+4)}{2}$ $= \frac{2x+6}{2} = x+3$ <p>$\therefore x = 21$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
SECTION-C		
20.	<p>$a = 1 - \sqrt{2}$</p> $\frac{1}{a} = \frac{1}{1 - \sqrt{2}}$ $= \frac{1}{1 - \sqrt{2}} \times \frac{1 + \sqrt{2}}{1 + \sqrt{2}}$ $= \frac{1 + \sqrt{2}}{1 - 2}$ $= -(1 + \sqrt{2})$ $a - \frac{1}{a} = (1 - \sqrt{2}) - \{-(1 + \sqrt{2})\}$ $= 1 - \sqrt{2} + 1 + \sqrt{2}$ $= 2$ <p>$\therefore \left(a - \frac{1}{a}\right)^3 = 2^3$</p> $= 8$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

No.	Answers	Marks
21.	$3-12(a-b)^2$ $= 3\{1-4(a-b)^2\}$ $= 3\left[(1)^2 - \{2(a-b)\}^2\right]$ $= 3\left[\{1+2(a-b)\}\{1-2(a-b)\}\right]$ $= 3\left[(1+2a-2b)(1-2a+2b)\right]$	<p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p>
22.	<p>Draw $EX \parallel CD$</p> <p>$EX \parallel CD$</p> <p>$\therefore \angle XEC + \angle ECD = 180^\circ$ (interior angles on same side of transversal)</p> <p>$\therefore \angle XEC = 180^\circ - 125^\circ$</p> <p style="padding-left: 2em;">$= 55^\circ$</p> <p>$EX \parallel AB$ ($\because AB \parallel CD$)</p> <p>$\therefore \angle XEA + \angle EAB = 180^\circ$ (same reason)</p> <p>$\therefore \angle XEA = 180^\circ - 140^\circ$</p> <p style="padding-left: 2em;">$= 40^\circ$</p> <p>$x = \angle XEC + \angle XEA$</p> <p style="padding-left: 2em;">$= 55^\circ + 40^\circ$</p> <p style="padding-left: 2em;">$= 95^\circ$</p>	 <p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p>
23.	<p>In $\triangle PAM$ and $\triangle QBM$</p> <p>$\angle PAM = \angle QBM = 90^\circ$ each</p> <p>$AM = BM$ (M is the mid-point of AB)</p> <p>$\angle AMP = \angle BMQ$ (vertically opposite angles)</p> <p>$\therefore \triangle PAM \cong \triangle QBM$ (A.S.A.)</p> <p>$\therefore PM = MQ$ (c.p.c.t.)</p> <p>In $\triangle CPM$ and $\triangle CQM$</p>	<p>1</p> <p>1/2</p>

No.	Answers	Marks
24.	<p>PM = MQ (proved above)</p> <p>$\angle PMC = \angle QMC = 90^\circ$ each</p> <p>CM = CM (common)</p> <p>$\therefore \triangle CPM \cong \triangle CQM$ (S.A.S. axiom)</p> <p>$\therefore CP = CQ$ (c.p.c.t.)</p> <p>In $\triangle ADF$</p> <p>E is the mid-point of AD (given)</p> <p>BE DF (given)</p> <p>\therefore By converse of mid-point theorem B is the mid-point of AF</p> <p>$\therefore AB = BF$ (i)</p> <p>ABCD is a parallelogram</p> <p>$\therefore AB = CD$ (ii)</p> <p>from (i) and (ii)</p> <p>CD = BF</p> <p>Consider $\triangle DLC$ and $\triangle FLB$</p> <p>DC = FB (proved above)</p> <p>$\angle DCL = \angle FBL$ (alternate angles)</p> <p>$\angle DLC = \angle FLB$ (vertically opposite angles)</p> <p>$\therefore \triangle DLC \cong \triangle FLB$ (A.A.S.)</p> <p>$\therefore DL = LF$</p> <p>$\therefore DF = 2DL$</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>
25.	<p>Draw $OM \perp AB$</p> <p>Perpendicular drawn from centre to a chord bisects the chord</p> <p>$\therefore AM = MD$ (i)</p> <p>$OM \perp BC, BM = MC$ (ii)</p> <p>(i) - (ii) $\Rightarrow AM - BM = MD - MC$</p> <p>$\Rightarrow AB = CD$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>



No.	Answers	Marks
26.	<p>AB is diameter</p> <p>$\therefore \angle BDA = 90^\circ$ (angle in a semicircle)</p> <p>In $\triangle BDA$</p> <p>$\angle ABD = 180^\circ - (90^\circ + 70^\circ)$ (angle sum property of triangle)</p> <p>$= 180^\circ - 160^\circ$</p> <p>$= 20^\circ$</p> <p>$\angle CBA + \angle ADC = 180^\circ$ (ABCD is a cyclic quadrilateral)</p> <p>$\therefore (30^\circ + 20^\circ) + 90^\circ + \angle BDC = 180^\circ$</p> <p>$\therefore \angle BDC = 180^\circ - 140^\circ$</p> <p>$= 40^\circ$</p> <p>In $\triangle BCD$</p> <p>$\angle BCD = 180^\circ - (30^\circ + 40^\circ)$ (angle sum property of triangle)</p> <p>$= 180^\circ - 70^\circ$</p> <p>$= 110^\circ$</p>	<p>1</p> <p>1</p> <p>1</p>
27.	<p>$2\pi h(r_1 - r_2) = 44$</p> <p>$2 \times \frac{22}{7} \times 14 (r_1 - r_2) = 44$</p> <p>$r_1 - r_2 = \frac{1}{2}$</p> <p>$\therefore$ Thickness of the pipe is $\frac{1}{2}$ cm</p>	<p>1</p> <p>1</p> <p>1</p>
28.	<p>Let radius of sphere = radius of cylinder = radius of cone = r (say)</p> <p>Height of cylinder = height of cone = 2r</p> <p>\therefore Vol. of sphere : Vol. of cylinder : Vol of cone</p> <p>$= \frac{4}{3}\pi r^3 : \pi r^2(2r) : \frac{1}{3}\pi(r^2)(2r)$</p> <p>$= \frac{4}{3} : 2 : \frac{2}{3}$</p> <p>$= 2 : 3 : 1$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>.</p> <p>1</p> <p>1</p>

No.	Answers	Marks																					
29.	(i) Percentage of excess expenditure on wheat than that on pulses = $(35-20)\%$ $= 15\%$ (ii) Total percentage expenditure on pulses and Ghee = $(20+15)\%$ $= 35\%$	1 $\frac{1}{2}$ 1 $\frac{1}{2}$																					
SECTION-D																							
30.	Given, To prove, Figure, construction (if any). Proof	2 2																					
31.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Classes</th> <th style="text-align: left;">Class - marks</th> <th style="text-align: left;">Frequency</th> </tr> </thead> <tbody> <tr> <td>0-15</td> <td>7.5</td> <td>5</td> </tr> <tr> <td>15-30</td> <td>22.5</td> <td>12</td> </tr> <tr> <td>30-45</td> <td>37.5</td> <td>28</td> </tr> <tr> <td>45-60</td> <td>52.5</td> <td>30</td> </tr> <tr> <td>60-75</td> <td>67.5</td> <td>35</td> </tr> <tr> <td>75-90</td> <td>82.5</td> <td>13</td> </tr> </tbody> </table>	Classes	Class - marks	Frequency	0-15	7.5	5	15-30	22.5	12	30-45	37.5	28	45-60	52.5	30	60-75	67.5	35	75-90	82.5	13	2
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No.	Answers	Marks
	$1617 = \frac{22}{7} \times 12x^3$ $\Rightarrow x^3 = \frac{539 \times 7}{22 \times 4}$ $= \frac{49 \times 7}{2 \times 4} = \frac{7 \times 7 \times 7}{2 \times 2 \times 2}$ $x = \frac{7}{2}$ <p>\therefore radius of base of the cylinder = 7cm</p>	$\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$