CBSE Sample Paper-02
SUMMATIVE ASSESSMENT –II
MATHEMATICS
Class – IX

Time allowed: 3 hours | Maximum Marks: 90

General Instructions:

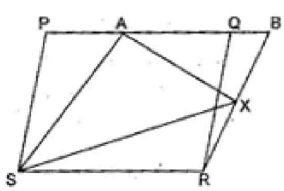
a) All questions are compulsory.
b) The question paper consists of 31 questions divided into five sections – A, B, C, D and E.
c) Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 8 questions of 3 marks each, Section D contains 10 questions of 4 marks each and Section E contains three OTBA questions of 3 mark, 3 mark and 4 mark.
d) Use of calculator is not permitted.

Section A

1. If the perimeter of one of the faces of a cube is 40 cm , them its volume is
2. What is the upper limit of the interval: 20 – 23?
3. Out of 35 students Participating in a debate 10 are girls. The Probability that winner is a boy is
4. A triangle has an area of 45 square foot. Base of the triangle is 9 foot. What is corresponding height of triangle.

Section B

5. A plastic box 1.5 m long, 1.25 m wide and 65 cm deep is to be made. It is to be open at the top. Ignoring the thickness of the plastic sheet, determine:
   (i) The area of the sheet required for making the box.
   (ii) The cost of sheet for it, if a sheet measuring $1m^2$ cost Rs.20.
6. The length, breadth and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of Rs. 7.50 per m2.
7. In figure, $\angle PQR = 100°$, where P, Q, R are points on a circle with centre O. Find $\angle OPR$.
8. In figure, PQRS and ABRS are parallelograms and X is any point on the side BR. Show that:



   (i) ar (PQRS) = ar (ABRS)
   (ii) ar (AXS) = $\frac{1}{2}$ ar (PQRS)

9. The class marks of the observations are 17, 21, 25, 29, 33, 37, 41, 45. Find the class intervals.
10. The average mark of boys in an examination is 68 & that of girls in 89. If the average mark of all candidates in that examination is 80, find the ratio of the no. of boys to the number of girls that appeared in the examinations.

Section C

11. ABCD is a rhombus and P, Q, R, S are mid-points of AB, BC, CD and DA respectively. Prove that quadrilateral PQRS is a rectangle.
12. ABCD is a rectangle and P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rhombus.
13. Recall that two circles are congruent if they have the same radii. Prove that equal chords of congruent circles subtend equal angles at their centres.
14. A conical tent is 10 m high and the radius of its base is 24 m. Find:
    (i) slant height of the tent.
    (ii) cost of the canvas required to make the tent, if the cost of a m^2 canvas is Rs. 70.
15. What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. $\left(\text{Use } \pi = 3.14\right)$
16. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40 cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m^2, what will be the cost of painting all these cones? $\left(\text{Use } \pi = 3.14 \text{ and take } \sqrt{1.04} = 1.02\right)$
17. The following is the monthly expenditure (Rs.) of ten families of the particular area:
    145, 115, 129, 135, 139, 158, 170, 175, 188, 163
    (a) Make a frequency distribution table by using the following class interval:
    100 – 120, 120 – 140, 140 – 160, 160 – 180, 180 – 200.
    (b) Construct a frequency polygon for the above frequency distribution.
18. The marks obtained by 30 students is given in the following table:

Marks	70	58	60	52	65	75	68
No. of Students	3	5	4	7	6	2	3

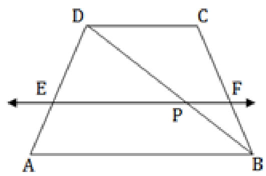
Find the Probability that a student secures

(i) 60 marks (ii) 75 marks (iii) Less than 60 marks

Section D

19. Construct a triangle ABC in which BC = 7cm $\angle B = 75°$ and AB+AC=9cm
20. Construct a triangle XYZ in which $\angle y = 30°$ $\angle Z = 90°$ and $XY + YZ + ZX = 11cm$

21. A circular park of radius 20 m is situated in a colony. Three boys Ankur, Syed and David are sitting at equal distance on its boundary each having a toy telephone in his hands to talk each other. Find the length of the string of each phone.
22. Prove that the parallelogram which is a rectangle has the greatest area.
23. ABCD is a trapezium, in which AB || DC, BD is a diagonal and E is the mid-point of AD. A line is drawn through E, parallel to AB intersecting BC at F (See figure). Show that F is the mid-point of BC.



24. D, E and F are respectively the mid-points of the sides BC, CA and AB of a Δ ABC. Show that:
    (i) BDEF is a parallelogram.
    (ii) ar (DEF) = $\frac{1}{4}$ ar (ABC)
    (iii) ar (BDEF) = $\frac{1}{2}$ ar (ABC)
25. Shanti Sweets Stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25 cm by 20 cm by 5 cm and the smaller of dimensions 15 cm by 12 cm by 5 cm. 5% of the total surface area is required extra, for all the overlaps. If the cost of the card board is Rs. 4 for 1000 cm^2, find the cost of cardboard required for supplying 250 boxes of each kind.
26. Find:
    (i) the lateral or curved surface area of a petrol storage tank that is 4.2 m in diameter and 4.5 m high.
    (ii) how much steel was actually used if $\frac{1}{12}$ of the steel actually used was wasted in making the tank?
27. Draw a histogram with frequency polygon for the following data:

Class Interval	25-29	30-34	35-39	40-44	45-49	50-54
Frequency	5	15	23	20	10	7

28. An insurance company selected 2000 drivers at random in a particular city to find a relationship between age and accidents. The data obtained are given below:

Age of drivers	Accident in one year.				
(in yrs)	0	1	2	3	Over 3
18-29	440	160	110	61	35

30-50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probability of the following events for a driver chosen at random from a city :
(i) Being 18-29 years of age and having exactly 3 accidents in a year.
(ii) Being 30-50 years of age and having one or more accidents in a year.
(iii) Having no. accidents in a year.

29. OTBA Question for 3 marks from Algebra. Material will be supplied later.
30. OTBA Question for 3 marks from Algebra. Material will be supplied later.
31. OTBA Question for 4 marks from Algebra. Material will be supplied later.

(Solutions)

Section A

Ans1. 1000 cu cm

Ans2. 20

Ans3. $\frac{5}{7}$

Ans4. 10 foot

Section B

Ans5. (i) Given: Length (l) = 1.5 m, Breadth (b) = 1.25 m and Depth (h) = 65 cm = 0.65 m

Area of the sheet required for making the box open at the top = $2(bh+hl)+lb$

$= 2(1.25\times0.65+0.65\times1.5)+1.5\times1.25$

$= 2(0.8125+0.975)+1.875$

$= 2\times1.7875+1.875$

= 3.575 + 1.875

= 5.45 m^2

(ii) Since, Cost of 1 m^2 sheet = Rs. 20

$\therefore$ Cost of 5.45 m^2 sheet = 20 x 5.45 = Rs. 109

Ans6. Length (l) = 5 m, Breadth (b) = 4 m and Height (h) = 3 m

$\because$ Area of the four walls = Lateral surface area = $2(bh+hl) = 2h(b+l)$

= 2 x 3 (4 + 5)

= 2 x 9 x 3 = 54 m^2

Area of ceiling = $l\times b$ = 5 x 4 = 20 m^2

$\therefore$ Total area of walls and ceiling of the room = 54 + 20 = 74 m^2

Now Cost of white washing for 1 m^2 = Rs. 7.50

$\therefore$ Cost of white washing for 74 m^2 = 74 x 7.50 = Rs. 555

Ans7. In the figure, Q is a point in the minor arc $\widehat{PQR}$.

$\therefore \quad m\widehat{RP} = 2\angle PQR \quad \Rightarrow \quad \angle ROP = 2\angle PQR$

$\Rightarrow \quad \angle ROP = 2 \times 100° = 200°$

Now $\quad m\widehat{PR} + m\widehat{RP} = 360° \quad \Rightarrow \quad \angle POR + \angle ROP = 360°$

$\Rightarrow \quad \angle POR + 200° = 360° \quad \Rightarrow \quad \angle POR = 360° - 200° = 160°$ .....(i)

Now $\quad \Delta$ OPR is an isosceles triangle.

$\therefore \quad OP = OR$ [radii of the circle]

$\Rightarrow \quad \angle OPR = \angle ORP$ [angles opposite to equal sides are equal] .....(ii)

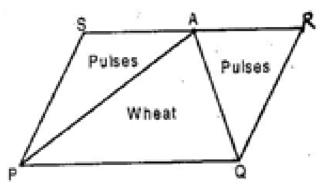
Now in isosceles triangle OPR,

$\angle OPR + \angle ORP + \angle POR = 180°$

$\Rightarrow \quad \angle OPR + \angle ORP + 160° = 180° \quad \Rightarrow \quad 2\angle OPR = 180° - 160°$ [Using (i) & (ii)]

$\Rightarrow \quad 2\angle OPR = 20° \quad \Rightarrow \quad \angle OPR = 10°$

Ans8. (i) Parallelogram PQRS and ABRS are on the same base SR and between the same parallels SR and PB.



$\therefore$ ar (|| gm PQRS) = $\frac{1}{2}$ ar (|| gm ABRS) ....(i)

[$\because$ parallelograms on the same base and between the same parallels are equal in area]

(ii) Δ AXS and || gm ABRS are on the same base AS and between the same parallels AS and BR.

$\therefore$ ar (Δ AXS) = $\frac{1}{2}$ ar (|| gm ABRS) ....(ii)

Using eq. (i) and (ii),

ar (Δ AXS) = $\frac{1}{2}$ ar (|| gm PQRS)

Ans9. Class marks are 17, 21, 25, 29, 33, 37, 41 and 45

Class size = 21 – 17 = 25 – 21 = 4 and Half of class size = $\frac{4}{2} = 2$

So, Class intervals are:

17 – 2 = 15	&	17 + 2 = 19	i. e.	15 – 19
21 – 2 = 19	&	21 + 2 = 23	i. e.	19 – 23

25 – 2 = 23	&	25 + 2 = 27	i. e.	23 – 27
29 – 2 = 27	&	29 + 2 = 31	i. e.	27 – 31
33 – 2 = 31	&	33 + 2 = 35	i. e.	31 – 35
37 – 2 = 35	&	37 + 2 = 39	i. e.	35 – 39
41 – 2 = 39	&	41 + 2 = 43	i. e.	39 – 43
45 – 2 = 43	&	45 + 2 = 47	i. e.	43 – 47

Ans10. Let number of boys be x & that of girls be 4.

$\therefore$ Total marks of boys = $68 \times x$ = 68x

& Total marks of girls = $89 \times y$ = 89y

Hence total marks for boys & girls = 68x + 89y ----------- (1)

Also, total of boys & girls = x + y & average for all the candidates = 80

$\therefore$ Total marks for boys & girls, = 80 (x + y) ------------- (2)

From (1) & (2)

80 (x + y) = 68x + 89y

80x + 80y = 68x – 89y

80x – 68x = 89y – 80y

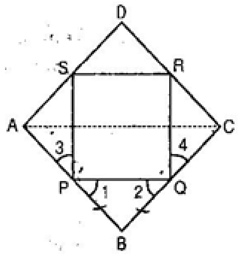
12x = 9y

$\frac{x}{y} = \frac{9}{12} = \frac{3}{4} \therefore$

$\therefore$ Ratio of boys & girls = 3: 4

Section C

Ans11. Given: P, Q, R and S are the mid-points of respective sides AB, BC, CD and DA of rhombus. PQ, QR, RS and SP are joined.



To prove: PQRS is a rectangle.

Construction: Join A and C.

Proof: In ΔABC, P is the mid-point of AB and Q is the mid-point of BC.

$\therefore$ $PQ \parallel AC$ and $PQ = \frac{1}{2} AC$ ……….(i)

In ΔADC, R is the mid-point of CD and S is the mid-point of AD.

$\therefore$ $SR \parallel AC$ and $SR = \frac{1}{2} AC$ ……….(ii)

From eq. (i) and (ii), $PQ \parallel SR$ and PQ = SR

$\therefore$ PQRS is a parallelogram.

Now ABCD is a rhombus. [Given]

$\therefore$ AB = BC

$\Rightarrow$ $\frac{1}{2} AB = \frac{1}{2} BC$ $\Rightarrow$ PB = BQ

$\therefore$ $\angle 1 = \angle 2$ [Angles opposite to equal sides are equal]

Now in triangles APS and CQR, we have,

AP = CQ [P and Q are the mid-points of AB and BC and AB = BC]

Similarly AS = CR and PS = QR [Opposite sides of a parallelogram]

$\therefore$ $\Delta APS \cong \Delta CQR$ [By SSS congruency]

$\Rightarrow$ $\angle 3 = \angle 4$ [By C.P.C.T.]

Now we have $\angle 1 + \angle SPQ + \angle 3 = 180^\circ$

And $\angle 2 + \angle PQR + \angle 4 = 180^\circ$ [Linear pairs]

$\therefore$ $\angle 1 + \angle SPQ + \angle 3 = \angle 2 + \angle PQR + \angle 4$

Since $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$ [Proved above]

$\therefore$ $\angle SPQ = \angle PQR$ ……….(iii)

Now PQRS is a parallelogram [Proved above]

$\therefore$ $\angle SPQ + \angle PQR = 180^\circ$ ……….(iv) [Interior angles]

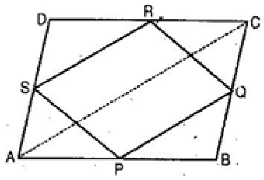
Using eq. (iii) and (iv),

$\angle SPQ + \angle SPQ = 180^\circ$ $\Rightarrow$ $2\angle SPQ = 180^\circ$

$\Rightarrow$ $\angle SPQ = 90^\circ$

HencePQRS is a rectangle.

An12. Given: A rectangle ABCD in which P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. PQ, QR, RS and SP are joined.



To prove: PQRS is a rhombus.

Construction: Join AC.

Proof: In ΔABC, P and Q are the mid-points of sides AB, BC respectively.

$\therefore$ PQ $\parallel$ AC and PQ = $\frac{1}{2}$ AC ....(i)

In ΔADC, R and S are the mid-points of sides CD, AD respectively.

$\therefore$ SR $\parallel$ AC and SR = $\frac{1}{2}$ AC ....(ii)

From eq. (i) and (ii), PQ $\parallel$ SR and PQ = SR ....(iii)

$\therefore$ PQRS is a parallelogram.

Now ABCD is a rectangle. [Given]

$\therefore$ AD = BC

$\Rightarrow$ $\frac{1}{2}$AD = $\frac{1}{2}$BC $\Rightarrow$ AS = BQ ....(iv)

In triangles APS and BPQ,

AP = BP [P is the mid-point of AB]

$\angle$PAS = $\angle$PBQ [Each 90°]

And AS = BQ [From eq. (iv)]

$\therefore$ Δ APS $\cong \Delta$ BPQ [By SAS congruency]

$\Rightarrow$ PS = PQ [By C.P.C.T.] ....(v)

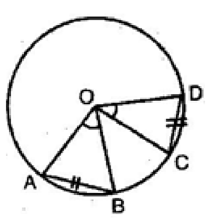
From eq. (iii) and (v), we get that PQRS is a parallelogram.

$\Rightarrow$ PS = PQ

$\Rightarrow$ Two adjacent sides are equal.

Hence, PQRS is a rhombus.

Ans13. I Part: Two circles are said to be congruent if and only if one of them can be superposed on the other so as to cover it exactly.



Let C (O, r) and C (O', s) be two circles. Let us imagine that the circle C (O', s) is superposed on C (O, r) so that O' coincide with O. Then it can easily be seen that C (O', s) will cover C (O, r) completely if and only if

Hence we can say that two circles are congruent, if and only if they have equal radii.

II Part: Given: In a circle (O, r), AB and CD are two equal chords, subtend $\angle$AOB and $\angle$COB at the centre.

To Prove: $\angle$AOB = $\angle$COD

Proof: In ΔAOB and ΔCOD,

	AB = CD	[Given]
	AO = CO	[Radii of the same circle]
	BO = DO	[Radii of the same circle]
$\therefore$	ΔAOB $\cong$ Δ COD	[By SSS axiom]
$\Rightarrow$	$\angle$AOB = $\angle$COD	[By CPCT]

Hence Proved.

Ans14. Height of the conical tent (h) = 10 m

Radius of the conical tent (r) = 24 m

(i) Slant height of the tent $(l)=\sqrt{r^2+h^2} = \sqrt{(24)^2+(10)^2}$

$= \sqrt{576+100} = \sqrt{676} = 26$ m

(ii) Canvas required to make the tent = Curved surface area of the tent

$= \pi rl = \frac{22}{7}\times 24\times 26 = \frac{13728}{7}$ m^2

$\because$ Cost of 1 m^2 canvas = Rs. 70

$\therefore$ Cost of $\frac{13728}{7}$ m^2 canvas = 70 x $\frac{13728}{7}$ = Rs. 137280

Ans15. Height of the conical tent (h) = 8 m and Radius of the conical tent (r) = 6 m

Slant height of the tent $(l)=\sqrt{r^2+h^2} = \sqrt{(6)^2+(8)^2} = \sqrt{36+64} = \sqrt{100} = 10$ m

Area of tarpaulin = Curved surface area of tent = πrl = 3.14 x 6 x 10 = 188.4 m^2

Width of tarpaulin = 3 m

Let Length of tarpaulin = L

$\therefore$ Area of tarpaulin = Length x Breadth = L x 3 = 3L

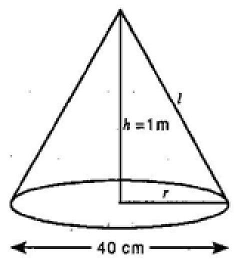
Now According to question, 3L = 188.4

$\Rightarrow$ L = $\frac{1884.4}{3}$ = 62.8 m

The extra length of the material required for stitching margins and cutting is 20 cm = 0.2 m.

So the total length of tarpaulin bought is (62.8 + 0.2) m = 63 m

Ans16. Diameter of cone = 40 cm



$\Rightarrow$ Radius of cone $(r) = \frac{40}{2}$ = 20 cm = $\frac{20}{100}$ m = 0.2 m

Height of cone (h) = 1 m

Slant height of cone $(l) = \sqrt{r^2 + h^2}$ = $\sqrt{(0.2)^2 + (1)^2}$ = $\sqrt{1.04}$ m

Curved surface area of cone = πrl = 3.14 x 0.2 x $\sqrt{1.04}$

= 0.64056 m^2

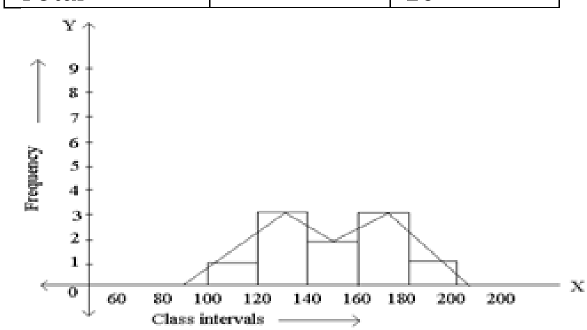
$\because$ Cost of painting 1 m^2 of a cone = Rs. 12

$\therefore$ Cost of painting 0.64056 m^2 of a cone = 12 x 0.64056= Rs. 7.68672

$\therefore$ Cost of painting of 50 such cones = 50 x 7.68672 = Rs. 384.34 (approx.)

Ans17.

Frequency Distribution		
Class Interval	Tally marks	Frequency
100-120	I	1
120-140	III	3
140-160	II	2
160-180	III	3
180-200	I	1
Total		10



Ans18. Total no. of students = 30

No. of students securing 60 marks = 4

(i) $\therefore$ P (Students securing 60 marks) = $\frac{4}{30} = \frac{2}{15}$

(ii) No. of students securing 75 marks = 2

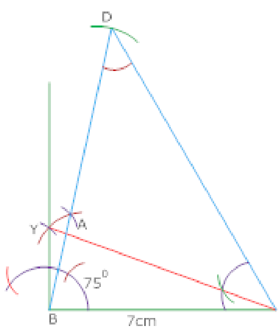
$\therefore$ P (Students securing 75 marks) = $\frac{2}{30} = \frac{1}{15}$

(iii) No. of students securing less than 60 marks = 5+7 = 12

P (Students securing less than 60 marks) = $\frac{12}{30} = \frac{2}{5}$

Section D

Ans19. Steps of construction



(1) Draw BC = 7cm

(2) Draw $\angle DBC = 75°$

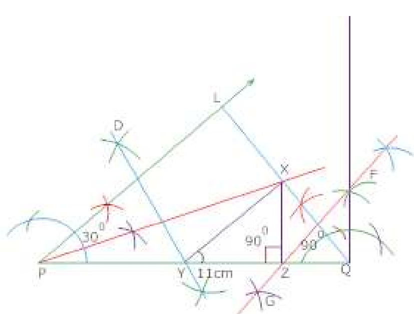
(3) Cut a line segment BD = 9cm

(4) Join DC and make $\angle DCY = \angle BDC$

(5) Let CY intersect BX at A

(6) Triangle ABC is required triangle

Ans20. Steps of construction



(1) Draw line segment PQ = 11cm

(2) At P construct an angle 30° and at Q an angle 90°

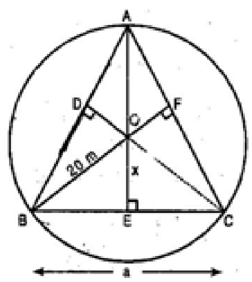
(3) Bisect these angles. Let the bisectors of these angles intersect each other at point X.

(4) Draw perpendicular bisector DE of PX and FG of XQ intersect PQ at point Y and Z respectively.

(5) Join XY and XZ

(6) XYZ is required triangle.

Ans21. Let position of three boys Ankur, Syed and David are denoted by the points A, B and C respectively.



A = B = C = a [say]

Since equal sides of equilateral triangle are as equal chords and perpendicular distances of equal chords of a circle are equidistant from the centre.

$\therefore$ OD = OE = OF = x cm [say]

Join OA, OB and OC.

$\Rightarrow$ Area of ΔAOB = Area of ΔBOC = Area of ΔAOC

And Area of ΔABC

= Area of ΔAOB + Area of ΔBOC + Area of ΔAOC

$\Rightarrow$ And Area of ΔABC = 3 x Area of ΔBOC

$\Rightarrow \frac{\sqrt{3}}{4}a^2 = 3\left(\frac{1}{2}\text{ BC x OE}\right)$ $\Rightarrow \frac{\sqrt{3}}{4}a^2 = 3\left(\frac{1}{2}\times a\times x\right)$

$\Rightarrow \frac{a^2}{a} = 3\times\frac{1}{2}\times\frac{4}{\sqrt{3}}\times x$ $\Rightarrow a = 2\sqrt{3}x$ ……….(i)

Now, CE $\perp$ BC

$\therefore$ BE = EC = $\frac{1}{2}$ BC [$\because$ Perpendicular drawn from the centre bisects the chord]

$\Rightarrow$ BE = EC = $\frac{1}{2}a$ $\Rightarrow$ BE = EC = $\frac{1}{2}\left(2\sqrt{3}x\right)$ [Using eq. (i)]

$\Rightarrow$ BE = EC = $\sqrt{3}x$

Now in right angled triangle BEO,

$OE^2 + BE^2 = OB^2$ [Using Pythagoras theorem]

$\Rightarrow \quad x^2 + \left(\sqrt{3}x\right)^2 = (20)^2 \qquad \Rightarrow \quad x^2 + 3x^2 = 400$

$\Rightarrow \quad 4x^2 = 400 \qquad \Rightarrow \quad x^2 = 100$

$\Rightarrow \quad x = 10$ m

And $\quad a = 2\sqrt{3}x = 2\sqrt{3}\times 10 = 20\sqrt{3}$ m

Thus distance between any two boys is $20\sqrt{3}$ m.

Ans22. Let PQRS be a parallelogram in which PQ = a and PS = b and h be the altitude corresponding to base PQ

Area of parallelogram PQRS = Base $\times$corresponding Altitude = ah

ΔPSK is a right angled triangle $b(PS)$ being its hypotenuse.

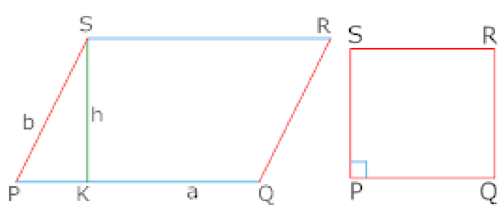
But hypotenuse is the greatest side of Δ

Area of (ah) of ||gram PQRS will be greatest when h is greatest

H = b, then PS$\perp$PQ

The ||gram PQRS will be a rectangle.

Hence, the area of ||gram is greatest when it is a rectangle



Ans23. Let diagonal BD intersect line EF at point P.

In Δ DAB,

E is the mid-point of AD and EP || AB [$\because$ EF|| AB (given) P is the part of EF]

$\therefore$ P is the mid-point of other side, BD of Δ DAB.

[A line drawn through the mid-point of one side of a triangle, parallel to another side intersects the third side at the mid-point]

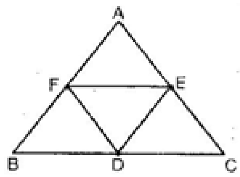
Now in Δ BCD,

P is the mid-point of BD and PF || DC [$\because$ EF|| AB (given) and AB || DC (given)]

$\therefore$ EF|| DC and PF is a part of EF.

$\therefore$ F is the mid-point of other side, BC of Δ BCD. [Converse of mid-point of theorem]

Ans24. (i) F is the mid-point of AB and E is the mid-point of AC.



$\therefore$ FE || BC and FE = $\frac{1}{2}$ BD

[$\because$ Line joining the mid-points of two sides of a triangle is parallel to the third and half of it]

$\Rightarrow$ FE || BD [BD is the part of BC]

And FE = BD

Also, D is the mid-point of BC.

$\therefore$ BD = $\frac{1}{2}$ BC

And FE || BC and FE = BD

Again E is the mid-point of AC and D is the mid-point of BC.

$\therefore$ DE || AB and DE = $\frac{1}{2}$ AB

$\Rightarrow$ DE || AB [BF is the part of AB]

And DE = BF

Again F is the mid-point of AB.

$\therefore$ BF = $\frac{1}{2}$ AB

But DE = $\frac{1}{2}$ AB

$\therefore$ DE = BF

Now we have FE || BD and DE || BF

And FE = BD and DE = BF

Therefore, BDEF is a parallelogram.

(ii) BDEF is a parallelogram.

$\therefore$ ar (Δ BDF) = ar (Δ DEF) ……….(i) [diagonals of parallelogram divides it in two triangles of equal area]

DCEF is also parallelogram.

$\therefore$ ar (Δ DEF) = ar (Δ DEC) ……….(ii)

Also, AEDF is also parallelogram.

$\therefore$ ar (Δ AFE) = ar (Δ DEF) ……….(iii)

From eq. (i), (ii) and (iii),

ar (Δ DEF) = ar (Δ BDF) = ar (Δ DEC) = ar (Δ AFE) ……….(iv)

Now, ar (Δ ABC) = ar (Δ DEF) + ar (Δ BDF) + ar (Δ DEC) + ar (Δ AFE) ……….(v)

$\Rightarrow$ ar (ΔABC) = ar (ΔDEF) + ar (ΔDEF) + ar (ΔDEF) + ar (ΔDEF) [Using (iv) & (v)]

$\Rightarrow$ ar (ΔABC) = 4 x ar (ΔDEF)

$\Rightarrow$ ar (ΔDEF) = $\frac{1}{4}$ ar (ΔABC)

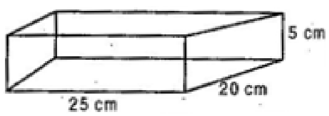
(iii) ar (|| gm BDEF) = ar (ΔBDF) + ar (ΔDEF) = ar (ΔDEF) + ar (ΔDEF) [Using (iv)]

$\Rightarrow$ ar (|| gm BDEF) = 2 ar (ΔDEF)

$\Rightarrow$ ar (|| gm BDEF) = 2 x $\frac{1}{4}$ ar (ΔABC)

$\Rightarrow$ ar (|| gm BDEF) = $\frac{1}{2}$ ar (ΔABC)

Ans25. Given: Length of bigger cardboard box (L) = 25 cm



Breadth (B) = 20 cm and Height (H) = 5 cm

Total surface area of bigger cardboard box

= 2 (LB + BH + HL)

= 2 (25 x 20 + 20 x 5 + 5 x 25)

= 2 (500 + 100 + 125)

= 1450 cm^2

5% extra surface of total surface area is required for all the overlaps.

$\Rightarrow$ 5% of 1450 = $\frac{5}{100}\times 1450$ = 72.5 cm^2

Now, total surface area of bigger cardboard box with extra overlaps

= 1450 + 72.5 = 1522.5 cm^2

$\Rightarrow$ Total surface area with extra overlaps of 250 such boxes

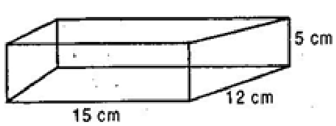
= 250 x 1522.5 = 380625 cm^2

Since, Cost of the cardboard for 1000 cm^2 = Rs. 4

$\therefore$ Cost of the cardboard for 1cm^2 = Rs. $\frac{4}{1000}$

$\therefore$ Cost of the cardboard for 380625 cm^2 = Rs. $\frac{4}{1000}\times 380625$ = Rs. 1522.50

Now length of the smaller box (l) = 15 cm,



Breadth (b) = 12 cm and Height (h) = 5 cm

Total surface area of the smaller cardboard box

$= 2(lb + bh + hl)$

$= 2\ (15 \times 12 + 12 \times 5 + 5 \times 15) = 2\ (180 + 60 + 75) = 2 \times 315 = 630\ cm^2$

5% of extra surface of total surface area is required for all the overlaps.

$\therefore$ 5% of 630 = $\frac{5}{100} \times 630 = 31.5\ cm^2$

Total surface area with extra overlaps = 630 + 31.5 = 661.5 cm^2

Now Total surface area with extra overlaps of 250 such smaller boxes

$= 661.5 \times 250 = 165375\ cm^2$

Cost of the cardboard for 1000 cm^2 = Rs. 4

Cost of the cardboard for 1cm^2 = Rs. $\frac{4}{1000}$

Cost of the cardboard for 165375 cm^2 = Rs. $\frac{4}{1000} \times 165375$ = Rs. 661.50

$\therefore$ Total cost of the cardboard required for supplying 250 boxes of each kind

= Total cost of bigger boxes + Total cost of smaller boxes

= Rs. 1522.50 + Rs. 661.50

= Rs. 2184

Ans26. (i) Diameter of cylindrical petrol tank = 4.2 m

$\therefore$ Radius of the cylindrical petrol tank = $\frac{4.2}{2}$ = 2.1 m

And Height of the tank = 4.5 m

$\therefore$ Curved surface area of the cylindrical tank = $2\pi rh = 2 \times \frac{22}{7} \times 2.1 \times 1.45 = 59.4\ m^2$

(ii) Let the actual area of steel used be x meters

Since $\frac{1}{12}$ of the actual steel used was wasted, the area of steel which has gone into the tank.

$$= x - \frac{1}{12}x = \frac{11}{12}x$$

$\therefore$ $\frac{11}{12}x = 59.4$ $\Rightarrow$ $x = 59.4 \times \frac{12}{11} = 64.8\ m^2$

Hence steel actually used is 64.8 m^2.

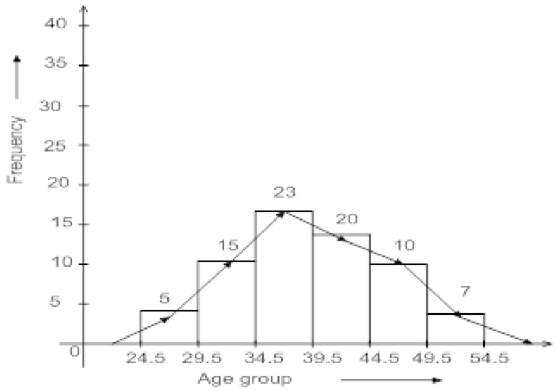
Ans27. Ascertainment of lower and upper class limits: since the difference between the second and first mid-points is 25-29

Let h=1

Then for continuous frequency distribution, we subtract $\frac{h}{2}$ from lower limit and Add $\frac{h}{2}$ to upper limit.

$\therefore \ \dfrac{h}{2} = 0.5$

Class Interval	24.5-29.5	29.5-34.5	34.5-39.5	39.5-44.5	44.5-49.5	49.5-54.5
Frequency	5	15	23	20	10	7



Ans28. (i) Total number of drivers = 2000

No. of drivers being 18 – 29 years of age and having exactly 3 accidents in a year = 61

P(E) = $\dfrac{61}{2000}$

(ii) No. of drivers being 30 – 50 years of age and having one or more accidents in a year

= 125+60+22+18

=225

P (E) = $\dfrac{225}{2000} = \dfrac{45}{400} = \dfrac{9}{80}$

(iii) No. of drivers having no accidents in a

Year = 440+505+360

= 1305

P (E)=$\dfrac{1305}{2000} = \dfrac{261}{400}$