CBSE Class 09

Mathematics

Sample Paper 13 (2019-20)

Maximum Marks: 80

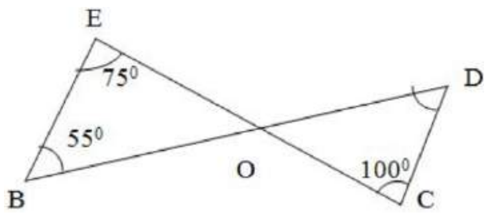
Time Allowed: 3 hours

General Instructions:

i. All the questions are compulsory.
ii. The question paper consists of 40 questions divided into 4 sections A, B, C, and D.
iii. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
iv. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
v. Use of calculators is not permitted.

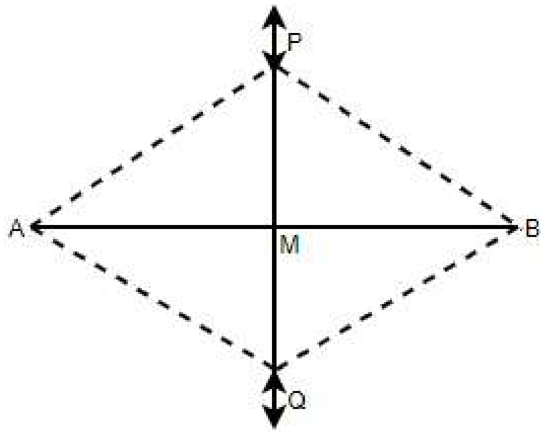
Section A

1. If $3^x + 64 = 2^6 + (\sqrt{3})^8$, then the value of ‘x’ is
   a. 4
   b. 2
   c. 3
   d. 1
2. If $x + y = 8$ and $xy = 15$, then $x^2 + y^2$
   a. 34
   b. 1
   c. 32
   d. 36
3. In the given figure, ∠OEB = 75°, ∠OBE = 55° and ∠OCD = 100°. Then ∠ODC = ?



a. 30°
b. 25°
c. 35°
d. 20°

4. In the construction of the perpendicular bisector of a given line segment, as shown in the figure below △PBM ≅ △PMB by which congruence criterion?



a. SSS
b. AAS
c. SAS
d. RHS

5. If both (x + 2) and (2x + 1) are factors of $ax^2 + 2x + b$, then the value of $a - b$ is
a. -1
b. 2
c. 1
d. 0

6. The figure obtained by joining the mid-points of the adjacent sides of a rectangle of sides 8 cm and 6 cm is
a. a rectangle of area $24\ cm^2$
b. a trapezium of area $14\ cm^2$.
c. a square of area $26\ cm^2$.
d. a rhombus of area $24\ cm^2$.

7. If $x^2 + 3mx + 6$, then the value of 'm' is

a. 0
b. $\sqrt{3}$
c. 3
d. 1

8. The perimeter of a rhombus is 20 cm. One of its diagonals is 8 cm. Then area of the rhombus is
   a. 24 cm^2
   b. 18 cm^2
   c. 14 cm^2
   d. 36 cm^2
9. The curved surface area of a right circular cylinder which just encloses a sphere of radius r is
   a. $2\pi r^2$.
   b. $4\pi r^2$.
   c. $8\pi r^2$.
   d. $6\pi r^2$.
10. The probability of a sure event is
    a. 1
    b. more than 1
    c. less than 1
    d. between 0 and 1
11. Fill in the blanks:

    $(27)^{-2/3}$ is equal to ________.

12. Fill in the blanks:

    x – 4 is the equation of a line parallel to _________ .

OR

Fill in the blanks:

y + 7 is the equation of a line parallel to _________

13. Fill in the blanks:

    The y-coordinate is also called the ________.

14. Fill in the blanks:

    The region between a chord and either of the arc is called a ________.

15. Fill in the blanks:

    The surface area of a sphere is 676π cm^2, then its radius is ________.

16. If x = 2 + $\sqrt{3}$, find the value of $x^2 + \frac{1}{x^2}$.

17. Factorize: $x^4 + 4$

18. The radius of sphere is 2r, then find its volume.

OR

    The volume of a cuboid is 440 cm^3 and the area of its base is 88 cm^2. Find its height.

19. Can the angles 110°, 80°, 70° and 95° be the angles of a quadrilateral? Why or why not?

20. Find the co-ordinate where the equation 2x + 3y = 6 intersects x-axis.

21. Prove that: $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{6}} + \frac{1}{\sqrt{6}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{8}} + \frac{1}{\sqrt{8}+\sqrt{9}} = 2$

22. Find the value of the following equation for x = l, y =Mas a solution. 5x + 3y = a

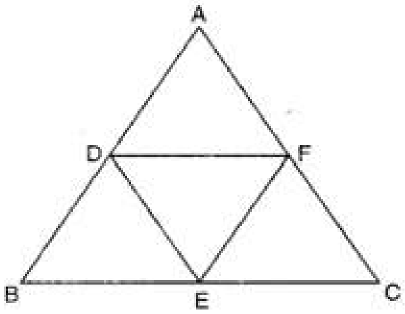
23. Evaluate the following using suitable identities : $(998)^3$

OR

    Factorize: $2(x + y)^2 - 9(x + y) - 5$

24. Mr Sharma explains his four children two boys and two girls about distribution of his

property among them by a picture of triangle ABC such that D, E, F are mid-points of sides AB, BC, CA respectively are joined to divide triangle ABC in four triangles as shown in figure.



If total property is equal to area of $\triangle$ABC and share of each child is equal to area of each of four triangles, what does each child has share?

25. The class marks of a distribution are 47, 52, 57, 62, 67, 72, 77, 82 Determine the
(i) class size
(ii) class limits
(iii) true class limits.

OR

A random survey of the number of children of various age group playing in the park was found:

Age [in years]	1 - 2	2 - 3	3 - 5	5 - 7	7 - 10
No. of children	3	5	7	10	13

Draw a histogram to represent the data above?

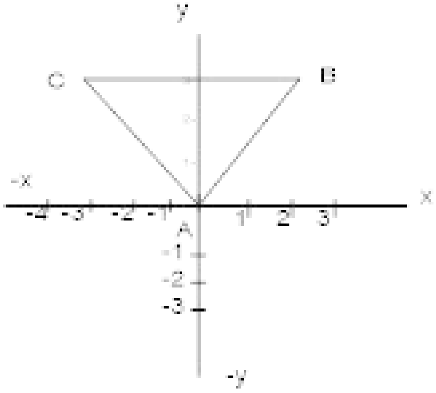
26. The students of a Vidyalaya were asked to participate in a competition, for making and decorating penholders in the shape of a cylinder with a base, using cardboard. Each penholder was to be of radius 3cm and height 10.5cm. The Vidyalaya was to supply competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?

27. Rationalize the denominator of the following : $\frac{3+\sqrt{2}}{3-\sqrt{2}}$

OR

Simplify the following: $\frac{1}{2+\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} + \frac{1}{2-\sqrt{5}}$

28. In fig find the vertices' coordinates of $\triangle$ABC



29. Write two solutions for the following equation: 3x + 4y = 7

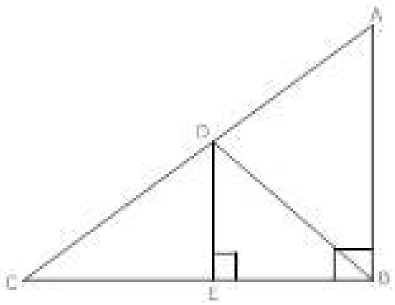
OR

Draw the graph of y = |x|.

30. Draw a circle with centre at point O. Draw its two chords AB and CD such that AB is not parallel to CD. Draw the perpendicular bisectors of AB and CD. At what point do they intersect?

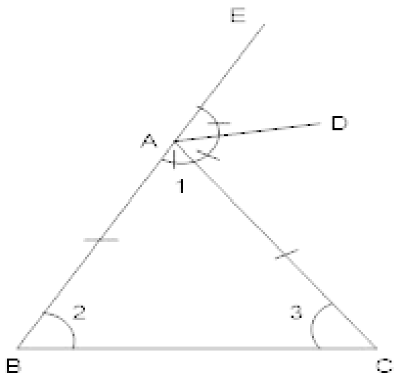
31. In fig $\angle$B is a right angle in $\triangle$ABC and D is the mid-point of AC. Also, DE $\parallel$ AB and DE intersects BC at E. show that

   i. E is the mid-point of BC
   ii. DE $\perp$ BC
   iii. BD = AD



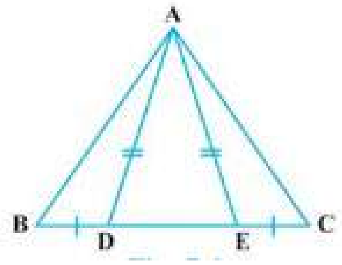
32. $\triangle$ABC is an isosceles triangle with AB = AC. AD bisects the exterior $\angle$A. prove that AD

|| BC.



OR

In the given figure, D and E are points on side BC of a $\triangle ABC$ such that BD = CE and AD = AE. Show that $\triangle ABD \cong \triangle ACE$.



33. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 13 m, 14 m and 15 m. The advertisements yield an earning of Rs2000 per m^2 a year. A company hired one of its walls for 6 months. How much rent did it pay?

34. 1500 families with 2 children were selected randomly and the following data were recorded:

No. of girls in a family	No. of families
2	475
1	814
0	211

Compute the probability of a family, chosen at random, having:

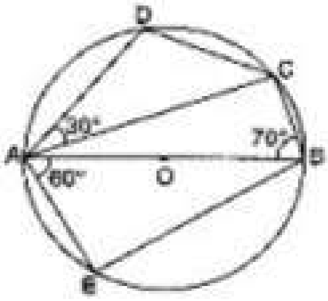
(i) 2 girls

(ii) 1 girl

(iii) No girl

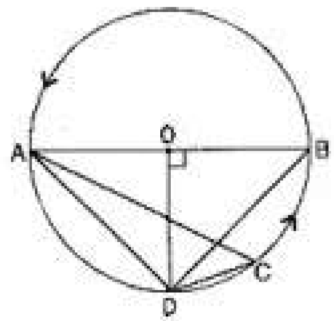
Also, check whether the sum of these probabilities is 1

35. In figure, AB is a diameter of a circle with centre O. If $\angle ABC = 70^\circ, \angle CAD = 30^\circ$ and $\angle BAE = 60^\circ$, find $\angle BAC, \angle ACD$ and $\angle ABE$

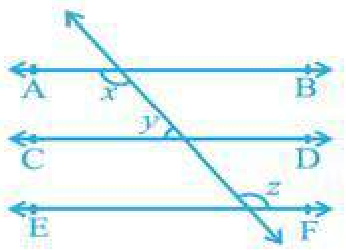


OR

In the given figure, AB is a diameter of the circle C(O, r) and radius OD is perpendicular to AB. If C is any point on DB, find $\angle BAD$ and $\angle ACD$.



36. In the given figure, if AB || CD, CD || EF and y: z = 3: 7, find x.



37. Check whether p(x) is a multiple of g(x) or not:

i. $p(x) = x^3 - 5x^2 + 4x - 3, g(x) = x - 2$
ii. $p(x) = 2x^3 - 11x^2 - 4x + 5, g(x) = 2x + 1$

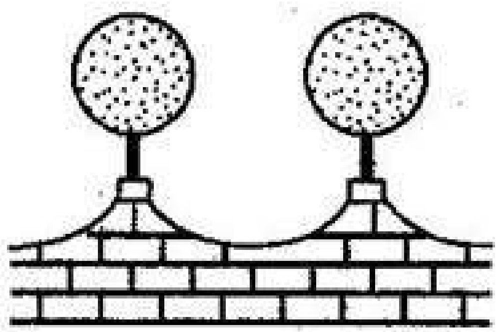
OR

Prove that $(a+b+c)^3 - a^3 - b^3 - c^3 = 3(a+b)(b+c)(c+a)$

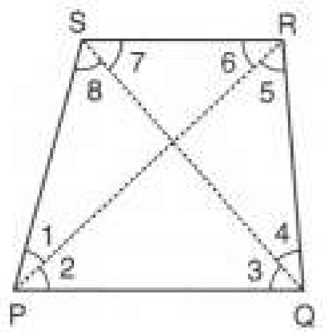
38. What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. $(\text{Use } \pi = 3.14)$

OR

The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in figure. Eight such spheres are used for this purpose and are to be painted silver. Each support is a cylinder of radius 1.5 cm and height 7 cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per cm^2 and black paint costs 5 paise per cm^2



39. In Fig., PQRS is a quadrilateral. PQ is its longest side and RS is its shortest side. Prove that ∠R > ∠P and ∠S > ∠Q.



40. The following table gives the distribution of students of two sections according to the marks obtained by them:

Section A	**Section B**

Marks	Frequency	Marks	Frequency
0-10	3	0-10	5
10-20	9	10-20	19
20-30	17	20-30	15
30-40	12	30-40	10
40-50	9	40-50	1

Represent the marks of the students of both the sections on the same graph by frequency polygons.

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Solution

Section A

1. (a) 4

   Explanation: $3^x + 64 = 2^6 + (\sqrt{3})^8$

   but we know that,

   $2^6 = 64$ so,

   $2^6 + 3^x = 2^6 + (\sqrt{3})^{2\times4}$

   $\Rightarrow 2^6 + 3^x = 2^6 + (3)^4$

   now by equating both|

   we get,

   x = 4

2. (a) 34

   Explanation:

   $x^2 + y^2 = (x+y)^2 - 2xy$

   $\Rightarrow x^2 + y^2 = (8)^2 - 2 \times 15$

   $\Rightarrow x^2 + y^2 = 64 - 30$

   $\Rightarrow x^2 + y^2 = 34$

3. (a) 30°

   Explanation:

   In $\triangle$OEB

   $\angle$OEB + $\angle$EBO + $\angle$BOE = 180° (Angle sum property)

   75° + 55° + $\angle$BOE = 180°

   $\angle$BOE = 50°

   $\angle$BOE = $\angle$COD = 50° (Vertically opposite angle)

   In $\triangle$ODC

   $\angle$ODC + $\angle$DOC + $\angle$DCO = 180°

$\angle$ODC = 180° - 100° - 50°

$\angle$ODC = 30°

4. (c) SAS

   Explanation:

   In $\triangle$PMA and $\triangle$PMB,

   PM = PM (common)

   $\angle$PMA = $\angle$PMB (each 90°)

   MA = MB (perpendicular bisector PM bisects the side AB in two equal parts)

   $\implies \triangle PMA \cong \triangle PMB$ (By SAS criteria)

5. (d) 0

   Explanation:

   p(x) = $ax^2 + 2x + b$

   If both (x + 2) and (2x + 1) are factors of $ax^2 + 2x + b$, then

   p(-2) = 0

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

   $\Rightarrow 4a - 4 + b = 0$ ....(i)

   Also,

   $p\left(\frac{-1}{2}\right) = 0$

   $\Rightarrow\ a\left(\frac{-1}{2}\right)^2 + 2\left(\frac{-1}{2}\right) + b = 0$

   $\Rightarrow\ \frac{a}{4} - 1 + b = 0$

   $\Rightarrow a - 4 + 4b = 0$ ....(ii)

   Subtracting eq.(ii) from eq.(i), we get

   3a + 0 - 3b = 0

$\Rightarrow$ 3(a - b) = 0

$\Rightarrow$ a - b = 0

6. (d) a rhombus of area $24\ cm^2$.
   Explanation: Since figure obtained by joining the mid-points of the adjacent sides of a rectange is a rhombus.

   Then diagonals of the rhombus PQRS are QS and PR i.e., sides of rectangle ABCD.

   Therefore, QS = 8 cm and PR = 6 cm

   Now, Area of rhombus PQRS = $\frac{1}{2} \times$ QS $\times$ PR = $\frac{1}{2} \times 8 \times 6$ = 24 cm^2

   The figure obtained by joining the mid-points of the adjacent sides of a rectangle of sides 8 cm and 6 cm is a rhombus with area 24 sq. cm.

7. (b) $\sqrt{3}$
   Explanation:

   To find the value of m, we will put one of the given options, $\sqrt{3}$ in the given polynomial to check whether it would be a polynomial.

   Putting $\sqrt{3}$ in the given polynomial $x^2 + 3mx + 6$, we get

   $x^2 + 3\sqrt{3}x + 6$

   = $x^2 + 2\sqrt{3}x + \sqrt{3}x + 6$

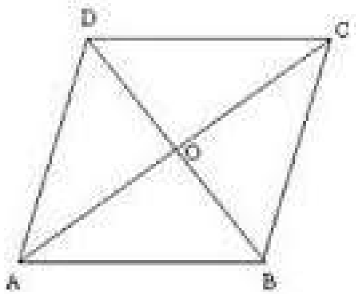
   = $x\left(x + 2\sqrt{3}\right) + \sqrt{3}\left(x + 2\sqrt{3}\right)$

   = $\left(x + \sqrt{3}\right)\left(x + 2\sqrt{3}\right)$

   Since after putting $\sqrt{3}$, we get two factors, therefore, the value of m is $\sqrt{3}$.

8. (a) 24 cm^2
   Explanation:

   Perimeter of Rhombus = 20 cm



$\Rightarrow 4 \times$ side = 20 cm $\Rightarrow$ Side = 5 cm

Since diagonals of rhombus bisect each other at perpendicular, therefore

OC = $\frac{8}{2}$ = 4 cm

In triangle OBC,

OB = $\sqrt{5^2 - 4^2} = \sqrt{25 - 16}$ = 3 cm

AC = 2 $\times$ 3 = 6 cm

Area of rhombus = $\frac{1}{2}$ $\times$ Product of diagonal

= $\frac{1}{2} \times 8 \times 6$ = 24 sq cm

9. (b) $4\pi r^2$.

Explanation:

Here, height of cylinder would be equal to diameter of spherei.e. 2r

So, CSA of cylinder is $2\pi rh$

$=2\pi r(2r)$

$= 4\pi r^2$

10. (a) 1

Explanation: A sure event is an event, which always happens. For example, it's a sure event to obtain a number between “1” and “6” when rolling an ordinary die. The probability of a sure event has the value of 1.

11. $\frac{1}{9}$

12. y-axis

OR

x-axis

13. ordinate

14. segment

15. 13

16. It is given that , x = 2 + $\sqrt{3}$

$\therefore\ \frac{1}{x} = \frac{1}{2+\sqrt{3}} = \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = \frac{2-\sqrt{3}}{2^2-(\sqrt{3})^2} = \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$

Now, $x^2 + \frac{1}{x^2} = (x + \frac{1}{x})^2 - 2$

$\Rightarrow x^2 + \frac{1}{x^2} = (2 + \sqrt{3} + 2 - \sqrt{3})^2 - 2 = 4^2 - 2 = 16 - 2 = 14.$

17. We have,

$x^4 + 4$

$= (x^4 + 4x^2 + 4) - 4x^2$

$= (x^2 + 2)^2 - (2x)^2 = (x^2 + 2 - 2x)(x^2 + 2 + 2x) = (x^2 - 2x + 2)(x^2 + 2x + 2)$

18. The radius of sphere = 2r

Volume of the sphere = $\frac{4}{3}\pi(\text{radius})^3$

$= \frac{4}{3}\pi(2r)^3 = \frac{4}{3}\pi 8r^3$

$= \frac{32}{3}\pi r^3$

OR

We have,

Volume = 440 cm^3 and Area of the base = 88 cm^2

$\therefore$ Height = $\frac{Volume}{Area\ of\ the base} \Rightarrow$ Height = $\frac{440}{88}$ cm = 5 cm

19. Sum of these angles 110° + 80° + 70° + 95° = 355°

But, sum of the angles of a quadrilateral is always 360°. Hence, 110°, 80°, 70° and 95° cannot be the angles of a quadrilateral.

20. The y-coordinate is 0.

$\therefore\ 2x + 3(0) = 6$

$\Rightarrow x = 3$

$\therefore$ the co-ordinate of the point is $(3, 0)$.

21. LHS = $\frac{1}{1+\sqrt{2}}$ + $\frac{1}{\sqrt{2}+\sqrt{3}}$ + $\frac{1}{\sqrt{3}+\sqrt{4}}$ + $\frac{1}{\sqrt{4}+\sqrt{5}}$ + $\frac{1}{\sqrt{5}+\sqrt{6}}$ + $\frac{1}{\sqrt{6}+\sqrt{7}}$ + $\frac{1}{\sqrt{7}+\sqrt{8}}$ + $\frac{1}{\sqrt{8}+\sqrt{9}}$

Rationalising the denominator of each term on LHS, we have

= $\frac{1-\sqrt{2}}{1-2}$ + $\frac{\sqrt{2}-\sqrt{3}}{2-3}$ + $\frac{\sqrt{3}-\sqrt{4}}{3-4}$ + $\frac{\sqrt{4}-\sqrt{5}}{4-5}$ + $\frac{\sqrt{5}-\sqrt{6}}{5-6}$ + $\frac{\sqrt{6}-\sqrt{7}}{6-7}$ + $\frac{\sqrt{7}-\sqrt{8}}{7-8}$ + $\frac{\sqrt{8}-\sqrt{9}}{8-9}$

= -1+$\sqrt{2}$ - $\sqrt{2}$ +$\sqrt{3}$ - $\sqrt{3}$ +$\sqrt{4}$ - $\sqrt{4}$ +$\sqrt{5}$ - $\sqrt{5}$ + $\sqrt{6}$ - $\sqrt{6}$ + $\sqrt{7}$ - $\sqrt{7}$ + $\sqrt{8}$ - $\sqrt{8}$ + $\sqrt{9}$

= -1 + $\sqrt{9}$ = -1 + 3 = 2 = RHS

22. 5x + 3y = a

If x = l, y = l[illegible]s a solution, then

5l + 2al = 3a

⇒ 3a – 2al = 5l

⇒ a (3 – 2l) = 5l

⇒ $a = \frac{5l}{3-2l}$

23. $(998)^3$

= $(1000 - 2)^3$ = $(1000)^3$ - $(2)^2$ - 3(1000)(2)(1000 - 2)

(Using Identity $(a – b)^3 = a^3 – b^3 – 3ab (a – b)$)

= 1000000000 - 8 - 6000(1000 - 2)

= 1000000000 - 8 - 6000000 + 12000

= 994011992

OR

We have,

$2(x + y)^2$ - 9(x + y) - 5

put x+y=a

= $2a^2$ - 9a - 5

= ($2a^2$ - 10a + a - 5)

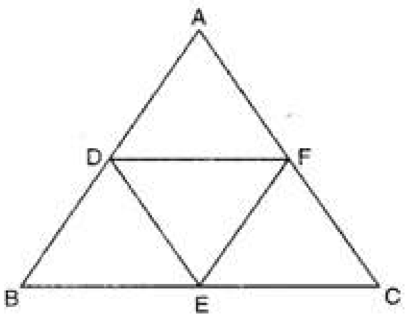
= ($2a^2$ - 10a) + (a - 5)

= 2a (a - 5) + (a - 5)

= (2a + 1)(a-5)

Now substitute a=x+y we get

= {2(x + y) + 1}(x+y-5) = (2x + 2y + 1)(x+y-5)

24. 

D, E and F are mid-points of AB, BC and CA respectively.

By mid-point theorem, we have DF||BC and EF||AB

$\Rightarrow$ DF||BE and EF||BD

$\Rightarrow$ BEFD is a parallelogram.

$\because$ The diagonal of a parallelogram divide it into two congruent triangles,

$\therefore \quad \triangle \mathrm{DEF} \cong \triangle \mathrm{BED}$

Similarly, $\triangle \mathrm{DEF} \cong \triangle \mathrm{ADF}$

And $\triangle \mathrm{DEF} \cong \triangle \mathrm{CEF}$

$\therefore \triangle \mathrm{DEF} \cong \triangle \mathrm{BED} \cong \triangle \mathrm{ADF} \cong \triangle \mathrm{CEF}$

$\Rightarrow \quad \operatorname{ar}(\triangle \mathrm{DEF})=\operatorname{ar}(\triangle \mathrm{BED})=\operatorname{ar}(\triangle \mathrm{ADF})=\operatorname{ar}(\triangle \mathrm{CEF})$

$\because \quad \operatorname{ar}(\triangle \mathrm{DEF})+\operatorname{ar}(\triangle \mathrm{BED})+\operatorname{ar}(\triangle \mathrm{ADF})+\operatorname{ar}(\triangle \mathrm{CEF})=\operatorname{ar}(\triangle \mathrm{ABC})$

Hence, $\operatorname{ar}(\triangle \mathrm{DEF})=\operatorname{ar}(\triangle \mathrm{BED})=\operatorname{ar}(\triangle \mathrm{ADF})=\operatorname{ar}(\triangle \mathrm{CEF})=\frac{1}{4}\operatorname{ar}(\triangle \mathrm{ABC})$

Each child will get equal share of property.

25. (i) Class size = 52 – 47 = 5

(ii) Class limits are

44.5-49.5, 49.5-54.5, 54.5-59.5, 59.5-64.5,

64.5-69.5, 69.5-74.5, 74.5-79.5, 79.5-84.5.

(iii) True class limits are

45-49, 50-54, 55-59, 60-64, 65-69,70-74, 75-79, 80-84

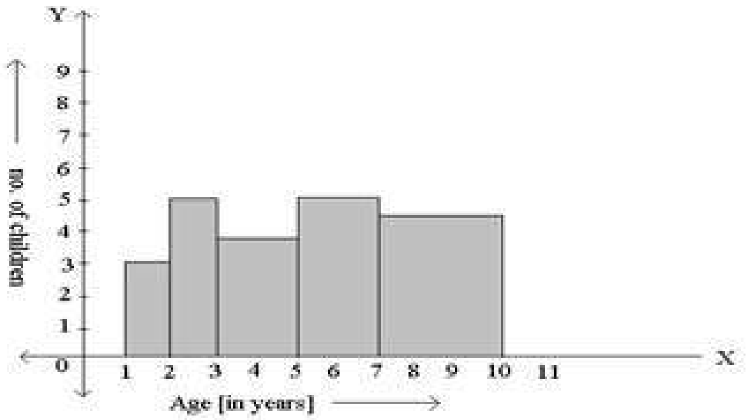
OR

Since the class intervals are not of equal width; we calculate the adjusted frequencies [AF] for histogram. Minimum class size [CS] = 1

Age [in years	**Frequency**	**Class Size [CS]**	**AF** $=\frac{\text{minimum CS}}{\text{CS of this class}} \times Its$ **frequency**
1 - 2	3	1	$\frac{1}{1}\times$ 3 = 3

2 - 3	5	1	$\frac{1}{1} \times$ 5 = 5
3 - 5	7	2	$\frac{1}{2} \times$ 7 = 3.5
5 - 7	10	2	$\frac{1}{2} \times$ 10 = 5
7 - 10	13	3	$\frac{1}{3} \times$ 13 = 4.3

Now we draw rectangles with heights equal to the corresponding adjusted frequencies & bases equal to the given class intervals, to get the required histogram, as shown below.



26. r = 3 cm, h = 10.5 cm

∴ Cardboard required for 1 competitor = $2\pi rh + \pi r^2$

$= 2 \times \frac{22}{7} \times 3 \times 10.5 + \frac{22}{7} \times (3)^2$

= $198 + \frac{198}{7}$

= $\frac{198 \times 8}{7}$ cm^2

∴ Cardboard required for 35 competitors = $\frac{198 \times 8}{7} \times 35\ cm^2$ = 7920 cm^2

∴ 7920 cm^2 of cardboard was required to be bought for the competition.

27. $\frac{3+\sqrt{2}}{3-\sqrt{2}} = \frac{3+\sqrt{2}}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}}$

(Multiplying the numerator and denominator by 3 + $\sqrt{2}$)

$\frac{(3+\sqrt{2})^2}{(3)^2 - (\sqrt{2})^2} = \frac{(3)^2 + 2(3)(\sqrt{2}) + (\sqrt{2})^2}{9-2}$

$= \frac{9+6\sqrt{2}+2}{7} = \frac{11+6\sqrt{2}}{7}$

OR

We have,

$\frac{1}{2+\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} + \frac{1}{2-\sqrt{5}}$

$= \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} + \frac{1}{2-\sqrt{5}} \times \frac{2+\sqrt{5}}{2+\sqrt{5}}$

$= \frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})} + \frac{2\sqrt{5}+2\sqrt{3}}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})} + \frac{2+\sqrt{5}}{(2-\sqrt{5})(2+\sqrt{5})}$

$= \frac{2-\sqrt{3}}{(2)^2-(\sqrt{3})^2} + \frac{2\sqrt{5}+2\sqrt{3}}{(\sqrt{5})^2-(\sqrt{3})^2} + \frac{2+\sqrt{5}}{(2)^2-(\sqrt{5})^2}$

$= \frac{2-\sqrt{3}}{1} + \frac{2\sqrt{5}+2\sqrt{3}}{2} + \frac{2+\sqrt{5}}{-1}$

$= 2 - \sqrt{3} + \sqrt{5} + \sqrt{3} - 2 - \sqrt{5}$

$= 0$

$\therefore \frac{1}{2+\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} + \frac{1}{2-\sqrt{5}} = 0$

28. (A) (0, 0) (B) (2, 3) (c) (-2, 3)

29. We can pick two arbitrary values for x and put them into the equation to find the corresponding y:

We have $3x + 4y = 7$ ....(i)

Let $x = 0$

$3(0) + 4y = 7$

$0 + 4y = 7$

$4y = 7$

$y = \frac{7}{4}$

So, $(0, \frac{7}{4})$ is a solution of the given equation.

Again put $y = 0$ in (i),

$3x + 4(0) = 7$

$3x = 7$

$x = \frac{7}{3}$

So, $(\frac{7}{3}, 0)$ is a solution of the given equation.

$\therefore$ We obtain $(0, \frac{7}{4})$ and $(\frac{7}{3}, 0)$ as two solutions to the given equation.

OR

Given eq. is

$y = |x|$ .....(i)

Putting $x = 0$ in eq.(i), we get $y = 0$

Putting x = 2 in eq.(i), we get y = 2

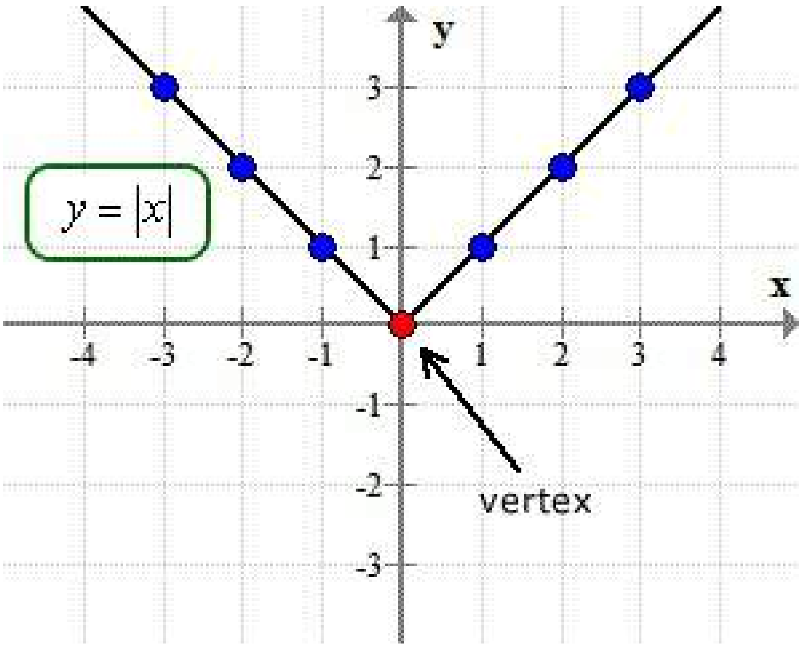
Putting x = -2 in eq.(i), we get y = 2

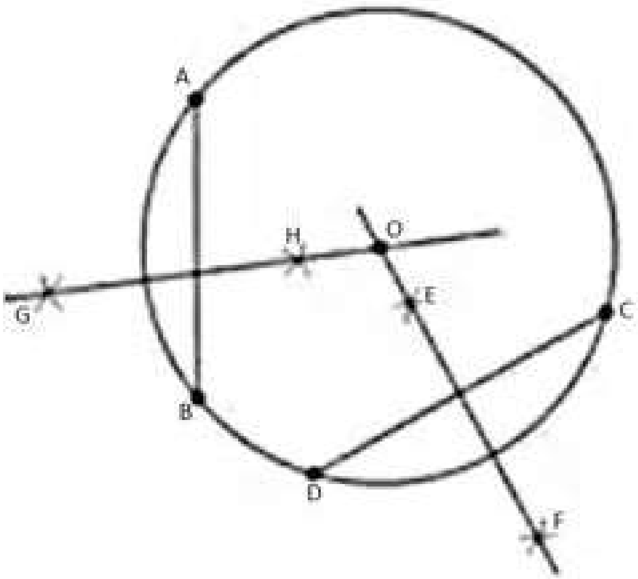
Putting x = -3 in eq. (i), we get y = 3

Thus, we have the following table for the points on graph of |x|.

x	0	2	-2	-3
y	0	2	2	3

The graph of the equation y = |x|



30. 

Steps of construction:-

i. With centre O and any radius, draw a circle.
ii. Draw two chords AB and CD.
iii. With centre B and radius more than $\frac{1}{2}$ AB, draw arcs, one on each side of AB.
iv. With centre A and same radius, draw arcs cutting previous arcs at E and F respectively.
v. Join EF.
vi. With centre C and radius more than $\frac{1}{2}$ DC, draw arcs, one on each side of DC.
vii. With centre D and same radius, draw arcs cutting previous arcs at G and H respectively.
viii. Join GH.
Both perpendicular bisectors EF and GH intersect each other at the centre O of the circle.

31. Proof: $\because$ DE $\parallel$ AB: and D is midpoints of AC
In $\triangle$DCE and $\triangle$DBE
CE = BE
DE = DE (Common side)
And $\angle$DEC = $\angle$ DEB = 90°
$\therefore$ $\triangle$DCE $\cong$ $\triangle$DBE
$\therefore$ CD = BD
Therefore, we can easily say that E is the midpoint of BC.(Proof of (i))
Also, DE is perpendicular to BC. (Proof of (ii))
Since triangle ABD is an equilateral triangle then all sides are equal.
So, BD = AD (Proof of (iii))
Hence proved.

32. SOLUTION: Since AD bisects the exterior A,
$\angle$EAD = $\angle$DAC ...(1)
$\angle$2 = $\angle$3 [OPPOSITE ANGLE OF EQUAL SIDE] ...(2)
$\angle$EAC = $\angle$EAD + $\angle$DAC ...(3)
$\angle$EAC = $\angle$2 + $\angle$3 [EXTERIOR ANGLE THEOREM FOR A TRIANGLE] ...(4)
From equation (3) & (4)
$\angle$EAD + $\angle$DAC = $\angle$2 + $\angle$3
From equation (1) & (2)

$\angle$DAC + $\angle$DAC = $\angle$3 + $\angle$3

2$\angle$DAC = 2$\angle$3

$\angle$DAC = $\angle$3

alternate angle are equal so - AD $\parallel$ BC

OR

Given: $\triangle$ABC in which BD = CE and AD = AE.

To Prove: $\triangle$ABD ≅ $\triangle$ACE

Proof: In $\triangle$ADE, we have

AD = AE [Given]

$\Rightarrow \angle 2 = 1$

[∵ Angle opposite to equal sides of a triangle are equal]

Now, $\angle 1 + \angle 3 = 180^\circ$ ...(1) [Linear pair axiom]

$\angle 2 + \angle 4 = 180^\circ$ ...(2) [Linear pair axiom]

From equations (1) and (2), we get

$\angle 1 + \angle 3 = \angle 2 + \angle 4$

$\Rightarrow \angle 3 = \angle 4 \ [\because \angle 1 = \angle 2]$

Now, in $\triangle$ABD and $\triangle$ACE, we have

AD = AE [Given]

$\angle 3 = \angle 4$ [Proved above]

BD = CE [Given]

So, by SAS criterion of congruence, we have

$\triangle$ABD ≅ $\triangle$ACE

Hence, proved

33. The sides of triangular side walls of flyover which have been used for advertisements are 13 m, 14 m, 15 m.

$s = \frac{13+14+15}{2} = \frac{42}{2} = 21m$

$= \sqrt{21(21-13)(21-14)(21-15)}$

$= \sqrt{21 \times 8 \times 7 \times 6}$

$= \sqrt{7 \times 3 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2}$

$= 7 \times 3 \times 2 \times 2 = 84m^2$

It is given that the advertisement yield an earning of Rs. 2,000 per m^2 a year.

$\therefore$ Rent for 1 m^2 for 1 year = Rs. 2000

So, rent for 1 m^2 for 6 months or $\frac{1}{2} year = Rs(\frac{1}{2} \times 2000)$ = Rs. 1,000.

$\therefore$ Rent for 84 m^2 for 6 months = Rs. (1000 × 84) = Rs. 84,000.

34. (i) Total number of families = 1500

No. of families having 2 girls = 475

$\therefore$ P (Family having 2 girls) = $\frac{475}{1500} = \frac{19}{60}$

(ii) No of families having 1 girl = 814

$\therefore$P(Family having 1 girl) = $\frac{814}{1500} = \frac{407}{750}$

(iii) No. of families having no girl = 211

$\therefore$ P (Family having no girl) = $\frac{211}{1500}$

Checking: Sum of all probabilities = $\frac{19}{60} + \frac{407}{750} + \frac{211}{1500}$

= $\frac{475+814+211}{1500} = \frac{1500}{1500}$ = 1

Yes, the sum of all three probabilities is 1.

35. i. $\angle BAC$

$\because$ AB is a diameter

$\therefore \angle ACB = 90^\circ$ |$\because$ Angle in a semi-circle is 90^o

In $\triangle ABC$

$\angle ABC + \angle ACB + \angle BAC = 180^\circ$ |angle sum property of a triangle

$\Rightarrow 70^\circ + 90^\circ + \angle BAC = 180^\circ$

$\Rightarrow 160^\circ + \angle BAC = 180^\circ$

$\Rightarrow \angle BAC = 180^\circ - 160^\circ$

$\Rightarrow \angle BAC = 20^\circ$

ii. $\angle ACD$

$\because$ ABCD is a cyclic quadrilateral

$\therefore \angle ADC + \angle ABC = 180^\circ$

|$\because$ Opposite angles of a cyclic quadrilateral are supplementary

$\Rightarrow \angle ADC + 70^\circ = 180^\circ$

$\Rightarrow \angle ADC = 180^\circ - 70^\circ$

$\Rightarrow \angle ADC = 110^\circ$

In $\triangle ADC$

$\angle ADC + \angle CAD + \angle ACD = 180^\circ$ |Angles sum property of a triangle

$\Rightarrow 110^\circ + 30^\circ + \angle ACD = 180^\circ$
$\Rightarrow 140^\circ + \angle ACD = 180^\circ$
$\Rightarrow \angle ACD = 180^\circ - 140^\circ$
$\Rightarrow \angle ACD = 40^\circ$

iii. $\angle ABE$

$\because$ AB is a diameter
$\therefore \angle AEB = 90^\circ$
In $\triangle AEB$
$\angle AEB + \angle BAE + \angle ABE = 180^\circ$ |Angle sum property of a triangle
$\Rightarrow 90^\circ + 60^\circ + \angle ABE = 180^\circ$
$\Rightarrow 150^\circ + \angle ABE = 180^\circ$
$\Rightarrow \angle ABE = 180^\circ - 150^\circ$
$\Rightarrow \angle ABE = 30^\circ$

OR

Given. AB is a diameter of the circle C(O, r) and radius OD is perpendicular to AB. C is any point on DB.

Required: To find $\angle BAD$ and $\angle ACD$

Determination: In right triangle OAD,

$AD^2 = OA^2 + OD^2$ .... (1) |Pythagoras Theorem

In right triangle OBD,

$BD^2 = OB^2 + OD^2$ |Pythagoras Theorem

$= OA^2 + OD^2$ .... (2) |$\because$ OA = OB (radii of the same circle)

From (1) and (2),

$AD_2 = BD^2$

$\Rightarrow$ AD = BD

$\therefore \angle ABD = \angle BAD$ |Angle opposite to equal sides of a triangle are equal

But $\angle ABD + \angle BAD = 90^\circ$.

|$\because$ In $\triangle ABD, \angle ADB = 90^\circ$ and the sum of the three angles of a Δ is 180^o

$\therefore \angle ABD = \angle BAD = 45^\circ$

Thus, $\angle BAD = 45^\circ$

Now, $\angle ACD = \angle ABD$ |Angles in the same segment = 45^o

36. We are given that $AB \parallel CD$,$CD \parallel EF$ and $y : z = 3 : 7$

We need to find the value of x in the figure given below.

We know that lines parallel to the same line are also parallel to each other.

We can conclude that $AB \parallel EF$

Let $y = 3a$ and $z = 7a$

We know that angles on the same side of a transversal are supplementary.

$\therefore x + y = 180^\circ$

$x = z$ Alternate interior angles

$z + y = 180^\circ$

or $7a + 3a = 180^\circ$

$\Rightarrow 10a = 180^\circ$

$a = 18^\circ$.

$z = 7a = 126^\circ$

$y = 3a = 54^\circ$.

Now, as $x = z$

$\Rightarrow x = 126^\circ$.

Therefore, we can conclude that $x = 126^\circ$

37. i. $p(x)$ will be a multiple $g(x)$ if $g(x)$ divides $p(x)$.

Now, $g(x) = x - 2$ If g(x) is a factor of p(x) then g(x)=0 $\Rightarrow x = 2$

Remainder $= p(2) = (2)^3 - 5(2)^2 + 4(2) - 3$

$= 8 - 5(4) + 8 - 3 = 8 - 20 + 8 - 3$

= - 7

Since remainder $\neq 0$, So p(x) is not a multiple of g(x).

ii. Now, $g(x) = 2x + 1$ give $x = -\frac{1}{2}$

Remainder $= p\left(-\frac{1}{2}\right) = 2\left(\frac{-1}{2}\right)^3 - 11\left(\frac{-1}{2}\right)^2 - 4\left(\frac{-1}{2}\right) + 5$

$= 2\left(\frac{-1}{8}\right) - 11\left(\frac{1}{4}\right) + 2 + 5 = \frac{-1}{4} - \frac{11}{4} + 7$

$= \frac{-1-11+28}{4} = \frac{16}{4} = 4$

Since remainder $\neq 0$, So, p(x) is not a multiple of g(x).

OR

$(a + b + c)^3 = [a + (b + c)]^3$

$= a^3 + 3a^2(b+c) + 3a(b+c)^2 + (b+c)^3$

$= a^3 + 3a^2b + 3a^2c + 3a[(b^2 + 2bc + c^2)] + (b^3 + 3b^2c + 3bc^2 + c^3)$

$= a^3 + 3a^2b + 3a^2c + 3ab^2 + 6abc + 3ac^2 + b^3 + 3b^2c + 3bc^2 + c^3$

$= a^3 + b^3 + c^3 + 3a^2b + 3a^2c + 3b^2c + 3b^2a + 3c^2a + 3c^2b + 6abc$

$= a^3 + b^3 + c^3 + 3a^2(b+c) + = a^3 + b^3 + c^3 + 3a^2(b+c)$

$\therefore (a+b+c)^3 = a^3 + b^3 + c^3 + 3(a+b)(b+c)(c+a)$

$\therefore (a+b+c)^3 - a^3 - b^3 - c^3 = 3(a+b)(b+c)(c+a)$

38. 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 = $\pi rl = 3.14 \times 6 \times 10 = 188.4\ m^2$
Width of tarpaulin = 3 m
Let Length of tarpaulin = L
$\therefore$ Area of tarpaulin = $Length \times Breadth\ =\ L \times 3$ = 3L
Now According to question, 3L = 188.4
$\Rightarrow$ L = 188.4/3 = 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

OR

Diameter of a wooden sphere = 21 cm.
therefore Radius of wooden sphere (R) $= \frac{21}{2}$ cm
And Radius of the cylinder (r) = 1.5 cm
Surface area of silver painted part = Surface area of sphere - Upper part of cylinder for support

= $4\pi R^2 - \pi r^2$
= $\pi\left(4R^2 - r^2\right)$
= $\frac{22}{7} \times \left[4 \times \left(\frac{21}{2}\right)^2 - \left(\frac{15}{10}\right)^2\right]$
= $\frac{22}{7} \times \left[\frac{4\times441}{4} - \frac{9}{4}\right]$
= $\frac{22}{7}\left[\frac{1764-9}{4}\right]$
= $\frac{22}{7} \times \frac{1755}{4}$
= 1378.928 cm^2

Surface area of such type of 8 spherical part = 8 $\times$ 1378.928

= 11031.424 cm^2

$\because$ Cost of silver paint over 1 cm^2 = Rs. 0.25

$\therefore$ Cost of silver paint over 11031.928 cm^2 = 0.25 $\times$ 11031.928

= Rs. 2757.85

Now, curved surface area of a cylindrical support = $2\pi rh$

= $2 \times \frac{22}{7} \times \frac{15}{10} \times 7$

= 66 cm^2

Curved surface area of 8 such cylindrical supports =66$\times$8 = 528 cm^2

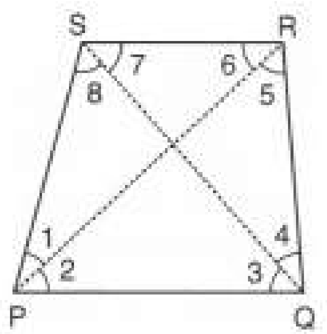
$\because$ Cost of black paint over 1cm^2 of cylindrical support = Rs. 0.50

$\therefore$ Cost of black paint over 528cm^2 of cylindrical support = -0.50 $\times$ 528

= Rs. 26.40

Total cost of paint required = Rs. 2757.85 + Rs. 26.4

= Rs. 2784.25

39. 

Given: PQRS is a quadrilateral. PQ is its longest side and RS is its shortest side.

To prove:

i. $\angle R > \angle P$
ii. $\angle S > \angle Q$

Construction: Join PR and QS.

Proof:

i. Since PQ is the longest side of quadrilateral PQRS. Therefore, in ΔPQR, we have
   $PQ > QR$
   $\Rightarrow \angle 5 > \angle 2$ [$\because$ Angle opp. to longer side is greater] ......(i)
   Since RS is the smallest side of quadrilateral PQRS.
   Therefore, in $\triangle PSR$, we have
   $PS > RS$
   $\Rightarrow \angle 6 > \angle 1$ [$\because$ Angle opp. to longer side is greater] ......(ii)
   Adding (i) and (ii), we get
   $\angle 5 + \angle 6 > \angle 2 + \angle 1$
   $\Rightarrow \angle R > \angle P$
ii. In $\triangle PQS$, we have
   $PQ > PS$ [$\because$ PQ is the longest side]
   $\Rightarrow \angle 8 > \angle 3$ ...(iii)
   In $\triangle SRQ$, we have
   $RQ > RS$ [$\because$ RS is the shortest side]
   $\Rightarrow \angle 7 > \angle 4$ ...(iv)
   Adding (iii) and (iv), we get
   $\angle 8 + \angle 7 > \angle 3 + \angle 4$
   $\Rightarrow \angle S > \angle Q$
   Hence, $\angle R > \angle P$ and $\angle S > \angle Q$

40. For section A

Classes	**Class-Marks**	**Frequency**
0-10	5	3
10-20	15	9
20-30	25	17

30-40	35	12
40-50	45	9

For section B

Classes	Class-Marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1