Tripura Board
Class IX
Mathematics
Sample Paper 2 – Solution

Group A

1. The construction of the triangle with the given sides is not possible as the sum of any two sides must be greater than the third side, which is not true in this case.
Here, AB + BC = 6.5, AC = 6. So, we see that the required condition is not satisfied.

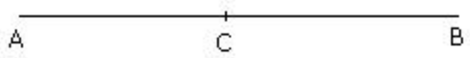
2. Let the angles be 3x, 5x, 9x, and 13x.
$3x + 5x + 9x + 13x = 360^\circ$ (angle sum of a quadrilateral)
$\Rightarrow 30x = 360^\circ \Rightarrow x = 12^\circ$
Hence, the angles are 36°, 60°, 108° and 156°.

3. The collection of all points in a plane which are at a fixed distance from a fixed point in the plane is called a circle and this fixed point is called the centre of the circle.

Group B

4. Factorising $ky^2 - 6ky + 8k$, we have
$= k(y^2 - 6y + 8)$
$= k(y^2 - 4y - 2y + 8)$
$= k(y - 4)(y - 2)$
Thus, the dimensions of cuboid are given by the expressions k, (y-4) and (y-2).

5.
Given: AC = BC



AC + AC = BC + AC

(If equals are added to equal the wholes are equal)

$\Rightarrow$ 2AC = AB

Hence, AC = $\frac{1}{2}$AB

6. Here $\angle ADC = y = \angle ACD$

Ext. $\angle ACD = \angle ABC + \angle BAC$

$\therefore 2\angle BAC = \angle ACD = y$

$\Rightarrow \angle BAC = \frac{y}{2}$

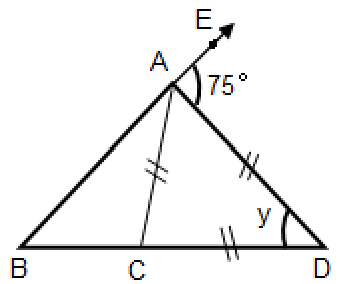
$\therefore \frac{y}{2} + (180° - 2y) = 180° - 75°$

$\Rightarrow \frac{y}{2} + 180° - 2y = 180° - 75$

$\Rightarrow \frac{y}{2} - 2y = -75°$

$\Rightarrow -\frac{3y}{2} = -75°$

$\Rightarrow y = 50°$



7. Let 'l' be the length of the cube.

Now, T.S.A. of the cube = 294 cm^2 ...(given)

$\therefore 6l^2 = 294$

$\therefore l^2 = \frac{294}{6} = 49$

$\therefore$ Side (l) = 7 cm.

Volume of cube = l × l × l = 7 × 7 × 7 = 343 cm^3

8. Number of students born in August = 6

Total number of students = 40

Required probability= $\frac{\text{Number of students born in August}}{\text{Total number of students}} = \frac{6}{40} = \frac{3}{20}$

Group C

9. Given: a = 3 + b

a – b = 3

Applying the cubic identity on both the sides

$(a - b)^3 = 3^3$

$\Rightarrow a^3 - b^3 - 3(a)(b)(a - b) = 27$

$\Rightarrow a^3 - b^3 - 3ab(3) = 27$ $(\because a - b = 3)$

$\Rightarrow a^3 - b^3 - 9ab = 27$

10.

Since AB || DC

$\angle x = 30^0$ [Alternate angles]

In ΔABD

$80^0 + 30^0 + \angle y = 180^0$

$\angle y = 180^0 - 110^0 = 70^0$

In ΔBDC

$30^0 + \left(70^0 - 30^0\right) + \angle z = 180^0$

$\angle z = 110^0$

11. $27p^3 + 8q^3 + 54p^2q + 36pq^2$

$= (3p)^3 + (2q)^3 + 18pq(3p+2q)$

$= (3p)^3 + (2q)^3 + 3 \times 3p \times 2q\ (3p + 2q)$

$= (3p + 2q)^3$ [$(a + b)^3 = a^3 + b^3 + 3ab\ (a + b)$ where $a = 3p$ and $b = 2q$]

$= (3p + 2q)\ (3p + 2q)\ (3p + 2q)$

12. $b^2 + c^2 + 2(ab + bc + ca)$

$= a^2 + b^2 + c^2 + 2ab + 2bc + 2ca - a^2$ [Adding and suntracting a^2]

$= [a^2 + b^2 + c^2 + 2ab + 2bc + 2ca] - a^2$

$= (a + b + c)^2 - (a)^2$ [Using $x^2 + y^2 + 2xy + 2yz + 2zx = (x + y + z)^2$]

$= (a + b + c + a)(a + b + c - a)$ [Because $a^2 - b^2 = (a+ b)\ (a - b)$]

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

13. $2x = z$ (Alternate angles, as $l_1 \ || \ l_2$)

$y = z$ (Alternate angles, as $a_1 \ || \ a_2$)

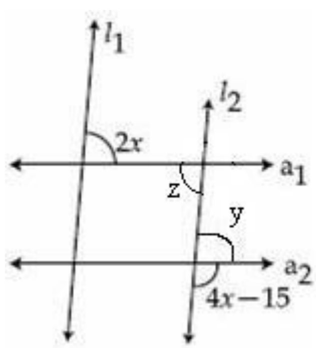
So, $2x = y$

Now, $y + 4x - 15 = 180°$(linear pair)

$2x + 4x - 15 = 180°$

$6x = 195°$

$x = 32.5$



14. Number of white balls = x

Total number of balls = 12

$\therefore P(\text{white ball}) = \frac{x}{12}$

If 6 white balls are added, we have

Total number of balls = 18

Number of white balls = x + 6

Now, P(getting a white ball) $= \frac{x+6}{18}$

According to the given information,

$\frac{x+6}{18} = 2\left(\frac{x}{12}\right)$

$\therefore \frac{x+6}{18} = \frac{x}{6}$

$\therefore 6x + 36 = 18x$

$\therefore 12x = 36$

$\therefore x = 3$

Or

Let the angles of a quadrilateral be 2x, 5x, 8x and 9x respectively.
By the angle sum property of a quadrilateral, we have
2x + 5x + 8x + 9x = 360°
∴ 24x = 360°
∴ x = 15°
Now,
First angle = 2x = 2 × 15 = 30°,
Second angle = 5x = 5 × 15 = 75°,
Third angle = 8x = 8 × 15 = 120° and
Fourth angle = 9x = 9 × 15 = 135°.
Thus, the angles of a quadrilateral are 30°, 75°, 120° and 135°.

15. Length (l_1) of the storehouse = 40 m
Breadth (b_1) of the storehouse = 25 m
Height (h_1) of the storehouse = 10 m
Volume of storehouse = $l_1 \times b_1 \times h_1 = (40 \times 25 \times 10)\ m^3 = 10000\ m^3$
Length (l_2) of a wooden crate = 1.5 m
Breadth (b_2) of a wooden crate = 1.25 m
Height (h_2) of a wooden crate = 0.5 m
Volume of a wooden crate = $l_2 \times b_2 \times h_2 = (1.5 \times 1.25 \times 0.5)\ m^3 = 0.9375\ m^3$
Let the number of wooden crates stored in the storehouse be ‘n’.
Hence, volume of ‘n’ wooden crates = Volume of storehouse
0.9375 × n = 10000

$\therefore n = \frac{10000}{0.9375} = 10666.66$

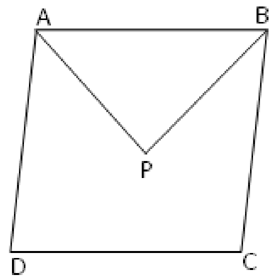
Thus, 10666 wooden crates can be stored in the storehouse.

16. Inner radius of hemispherical bowl = 5 cm
Thickness of the bowl = 0.25 cm
∴ Outer radius (r) of hemispherical bowl = (5 + 0.25) cm = 5.25 cm

Outer C.S.A. of hemispherical bowl = $2\pi r^2 = 2 \times \frac{22}{7} \times (5.25)^2 = 173.25\ cm^2$

Thus, the outer curved surface area of the bowl is 173.25 cm^2.

17. Given: ABCD is a parallelogram such that angle bisector of adjacent angles A and B intersect at point P.



To prove that m∠APB = 90°.

AD ∥ BC

∴ m∠A + m∠B = 180° [Consecutive interior angles]

$\therefore \frac{1}{2}m\angle A + \frac{1}{2}m\angle B = 90°$

But,

$\frac{1}{2}m\angle A + \frac{1}{2}m\angle B + m\angle APB = 180°$ ...(Angle sum property of a triangle)

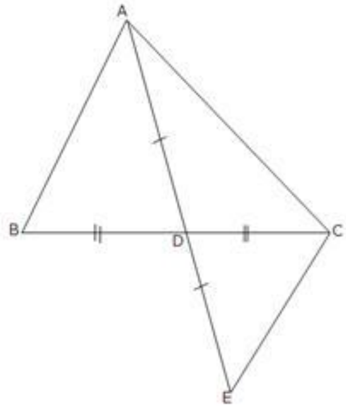
$\therefore 90° + m\angle APB = 180°$

$\therefore m\angle APB = 90°$

Thus, the angle bisectors of two adjacent angles intersect at right angles.

Group D

18. Given: AD is median of triangle ABC
To Prove: AB+AC>2AD
Proof: Produce AD so that AD = DE

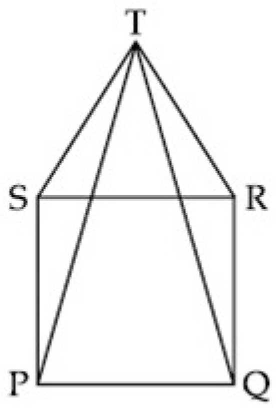


Now, in triangles ADB and EDC,
AD = DE
BD = DC
∠ADB = ∠EDC
Thus, triangles ADB and EDC are congruent (By SAS congruence criterion)
Hence, AB = EC (CPCT)
Now, in triangle AEC,
AC + CE > AE
AC + CE > 2AD
AC + AB > 2AD (since, AB = EC, proved above)

19.

$$\frac{16\times2^{n+1}-4\times2^{n}}{16\times2^{n+2}-2\times2^{n+2}}$$
$$=\frac{2^{4}\times2^{n+1}-2^{2}\times2^{n}}{2^{4}\times2^{n+2}-2\times2^{n+2}}$$
$$=\frac{2^{n+5}-2^{n+2}}{2^{n+6}-2^{n+3}}$$
$$=\frac{2^{n+5}-2^{n+2}}{2.2^{n+5}-2.2^{n+2}}$$
$$=\frac{\left(2^{n+5}-2^{n+2}\right)}{2\left(2^{n+5}-2^{n+2}\right)}=\frac{1}{2}$$

20.



□PQRS is a square

$\therefore$ PQ = QR = RS = SP ... (i)

Also $\angle$RSP = $\angle$SRQ = $\angle$RQP = $\angle$SPQ = 90º ... (ii)

Also ΔTSR is equilateral

TS = TR = SR ... (iii)

Also $\angle$STR = $\angle$TSR = $\angle$TRS = 60º

From (i) and (iii)

TR = QR

Also $\angle$TSP = $\angle$RSP + $\angle$TSR = 90º + 60º = 150º

Similarly $\angle$TRQ = 150º

In ΔTSP and ΔTRQ,

PS = QR [by (i)]

$\angle$TSP = $\angle$TRQ [both 150º]

TS = TR [by (iii)]

$\therefore$ ΔTSP $\cong$ ΔTRQ [by SAS criterion]

21.

a)

$$\left\{5\left(2^{3\times\frac{1}{3}}+3^{3\times\frac{1}{3}}\right)^{3}\right\}^{\frac{1}{4}}$$

$$=\left[5(2+3)^{3}\right]^{\frac{1}{4}}$$

$$=\left(5\times5^{3}\right)^{\frac{1}{4}}$$

$$=5^{4\times\frac{1}{4}}$$

$$=5$$

b) In order to represent $\sqrt{7}$ on number line, we follow the steps given below:

Step 1: Draw a line and mark a point A on it.

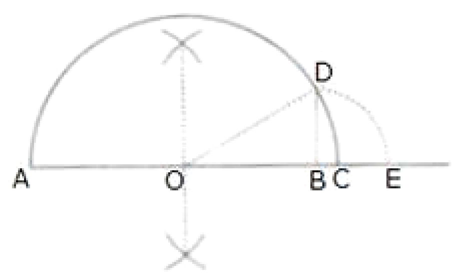
Step 2: Mark a point B on the line drawn in step 1 such that AB = 7 cm.

Step 3: Mark a point C on AB produced such that BC = 1 unit.

Step 4: Find mid-point of AC. Let the mid-point be O.

Step 5: Taking O as the centre and OC = OA as radius draw a semicircle. Then, draw a line passing through B perpendicular to OB. Let the perpendicular cut the semicircle at D.

Step6: Taking B as the centre and radius BD draw an arc cutting OC produced at E. Point E so obtained represents $\sqrt{7}$.



22. Arranging the given data in ascending order, we have

41, 43, 57, 58, 61, 71, 92, 99, 127

Here, n = 9 (odd)

$\therefore$ Median $= \left(\frac{n+1}{2}\right)^{th}$ value

$= \left(\frac{9+1}{2}\right)^{th}$ value

$= 5^{th}$ value

$= 61$

If 58 is replaced by 85, we get the following data:

41, 43, 57, 61, 71, 85, 92, 99, 127

$\therefore$ New median $= \left(\frac{n+1}{2}\right)^{th}$ value

$= \left(\frac{9+1}{2}\right)^{th}$ value

$= 5^{th}$ value

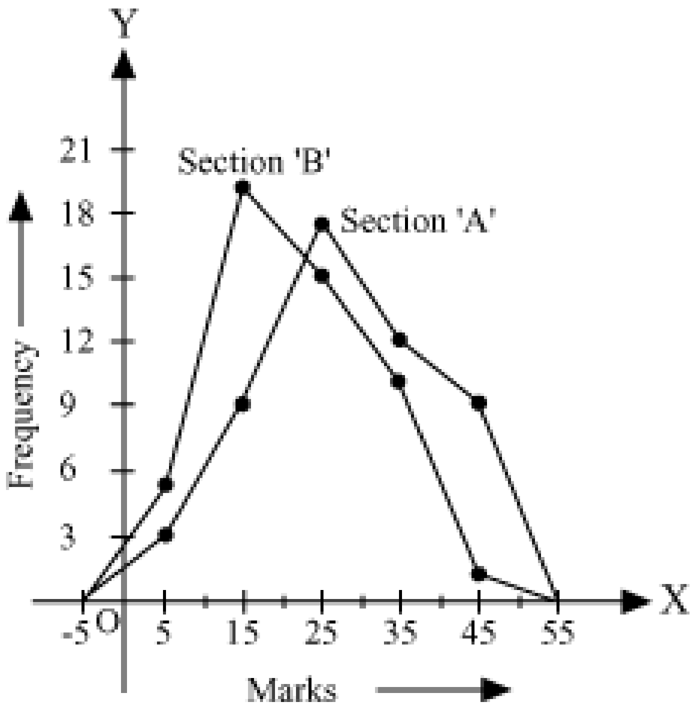
$= 71$

23. We can find class marks of the given class intervals by using the formula –

Class mark $= \frac{\text{upper class limit} + \text{lower class limit}}{2}$

Section A			**Section B**		
Marks	Class marks	Frequency	Marks	Class marks	Frequency
0 – 10	5	3	0 – 10	5	5
10 – 20	15	9	10 – 20	15	19
20 – 30	25	17	20 – 30	25	15
30 – 40	35	12	30 – 40	35	10
40 – 50	45	9	40 – 50	45	1

Now taking the class marks on the x-axis and frequency on the y-axis and choosing an appropriate scale (1 cm = 3 units on the y-axis) we can draw a frequency polygon as below:



From the graph we can see that the performance of students of section 'A' is better than the students of section 'B'.

24. Diameter = 24 m ⇒ radius = 12 m

Radius of the conical part = Radius of the cylindrical part (r) = 12 m

Height of cylindrical part (h) = 11 m, height of the cone (h) = 5 m

For the conical part of the circus tent,

$l^2 = r^2 + h^2$

$\therefore l = \sqrt{r^2 + h^2}$

$\therefore l = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13\ \text{m}$

Surface area of the tent = Curved surface area of the conical part + Curved surface area of the cylindrical part

$\therefore$ Surface area of the tent $= \pi rl + 2\pi rh$

$= \pi r(l + 2h)$

$= \frac{22}{7} \times 12(13 + 22)$

$= \frac{22}{7} \times 12 \times 35$

$= 1320\ \text{m}^2$

Breadth of the canvas (B) = 5 m

Let the length of the canvas = L

Now, area of canvas required = surface area of the tent

$\therefore$ L × B = 1320

$\therefore$ L × 5 = 1320

$\therefore$ L = 264 m

Thus, 264 m long canvas is required to make the tent.

25. Let us assume that Laxmi purchased x bananas and y oranges.
Since each banana costs Rs. 2, x bananas cost Rs. 2 × x = Rs. 2x
Similarly, each orange costs Rs. 3.
Thus, y oranges cost Rs. 3 × y = Rs. 3y
Thus, the total amount paid by Laxmi is Rs. (2x + 3y), which equals Rs. 30
Thus, we can express the given information in the form of a linear equation as 2x + 3y =30
Now, we know that Laxmi purchased 6 oranges, i.e., the value of y is 6.
Substitute this value of y in the equation 2x + 3y = 30, thereby reducing it to a linear equation in one variable.
We can then solve the equation to obtain the value of x.

2x + 3 × 6 = 30

⇒ 2x + 18 = 30

This is a linear equation in one variable.

⇒2x = 30 – 18

⇒2x = 12

⇒x = 6

Thus, we see that the value of x is 6, i.e., Laxmi purchased 6 bananas.

26. Let p(x) = $ax^2 + 5x + b$

Since both (x - 2) and (2x - 1) are factors of $ax^2 + 5x + b$.

x = 2 or x = ½

Therefore, substituting x = 2 in the equation,

4a + 10 + b = 0

Or, 4a + b = -10… (1)

Also, x = 1/2, therefore, substituting x = 1/2 in the equation,

$$\frac{a}{4} + \frac{5}{2} + b = 0$$

$$\Rightarrow a + 10 + 4b = 0$$

$$\Rightarrow a + 4b = -10 \qquad \ldots(2)$$

On solving (1) and (2), a = -2 and b = -2

Hence, a - b = -2 - (-2) = 0.

Or

If (x + 1) is a factor of $x^3 + ax^2 + 2x + b$ then

$(-1)^3 + a(-1)^2 + 2(-1) + b = 0$

$-1 + a - 2 + b = 0$

$a + b = 3$ ...(1)

If (x - 2) is a factor of $x^3 + ax^2 + 2x + b$ then

$(2)^3 + a(2)^2 + 2(2) + b = 0$

$4a + b = -12$ ... (2)

Subtracting (1) from (2), we get

$3a = -15$

Or, $a = -5$

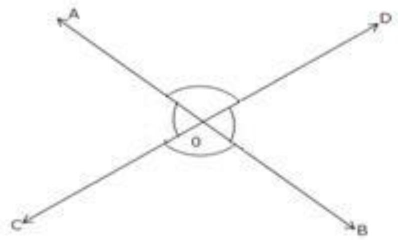
Using in (1), we get

$-5 + b = 3$

Or, $b = 8$

Hence, $a = -5$, $b = 8$.

27. Given: Two lines AB and CD which intersect each other at O.
To prove $\angle AOC = \angle BOD$
$\angle AOD = \angle BOC$



Proof: Since AB is line and ray OD stands on it

$\therefore \angle AOD + \angle BOD = 180^\circ$ ----(1)(Linear pair axiom)

Since CD is a line and ray OA stands on it

$\therefore \angle AOC + \angle AOD = 180^\circ$ ---(2)(linear pair axiom)

From (i) and (ii)

$\angle AOC + \angle AOD = \angle AOD + \angle BOD$

$\Rightarrow \angle AOC = \angle BOD$

Similarly, we can prove that

$\angle BOC = \angle AOD$

Or

Applying angle sum property in ΔABC, we have:

$\angle ABC + \angle BCA + \angle BAC = 180^\circ$
$\Rightarrow 25^\circ + 134^\circ + \angle BAC = 180^\circ$
$\Rightarrow \angle BAC = 180^\circ - 159^\circ = 21^\circ$

Now, AC is the bisector of $\angle$BAD.

$\therefore \angle BAC = \angle CAD$

$\Rightarrow \angle 2 = 21^\circ \quad (\because \angle BAC = 21^\circ)$

We know that the measure of one complete angle is 360°.

$\therefore \angle BCD + \angle BCA + \angle ACD = 360^\circ$
$\Rightarrow 126^\circ + 134^\circ + \angle 3 = 360^\circ$
$\Rightarrow \angle 3 = 360^\circ - 260^\circ = 100^\circ$

By exterior angle property of triangles, we have

$\angle 1 = \angle 2 + \angle 3$
$\Rightarrow \angle 1 = 21^\circ + 100^\circ = 121^\circ$

By applying angle sum property in ΔACD, we have:

$\angle ACD + \angle CDA + \angle CAD = 180^\circ$
$\Rightarrow 100^\circ + \angle 4 + 21^\circ = 180^\circ$
$\Rightarrow \angle 4 = 180^\circ - 121^\circ = 59^\circ$