CBSE Sample Paper-01 (solved)
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. Equation of x-axis is
   (a) x =0
   (b) x = y
   (c) y = 0
   (d) x + y =0
2. Linear equation of the type y = mx, $m \neq 0$ has
   (a) Infinitely many solutions
   (b) A unique solution
   (c) Only solution x = 0, y = 0
   (d) Solution m =0
3. The total surface area of a cone of radius 2r and slant height $\frac{l}{2}$ is
   (a) $2\pi r(l+r)$
   (b) $\pi r(l+\frac{r}{4})$
   (c) $\pi r(4r+l)$
   (d) $2\pi r$
4. Which of the following cannot be empirical probability of an event?
   (a) $\frac{4}{5}$
   (b) 1
   (c) 0
   (d) $\frac{5}{4}$

Section B

5. An edge of a cube is increased by 10%. Find the percentage by which the surface area of the cube has increased.
6. Find the mode of the following data: 5, 7, 6, 5, 9,8, 6, 7, 11, 10, 5, 7, 6, 8, 6, 9,10.
7. Prove that equal chords of a circle subtend equal angles at the centre.
8. In a cricket match, a batsman hits a boundary 4 times out of 30 balls, he plays. Find the probability that he did not hit a boundary.
9. Adjacent sides of a rectangle are 16 cm and 8 cm. find the area of the rectangle?

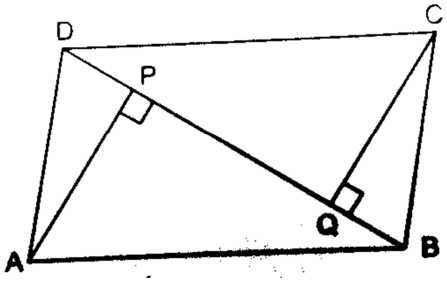
   Or

   A pair of parallel sides of a parallelogram measure 10 cm each. The perpendicular distance between them is 6 cm. what is the area of the parallelogram?

10. A conical pit of top diameter 3.25 m is 12 m deep. What is its capacity in kiloliters?

Section C

11. Draw the graph of the equation 2x-3y-12. At what points, the graph of the equation cuts the x-axis and the y-axis?
12. ABCD is a parallelogram and AP and CQ are perpendicular from vertices A and C on diagonal BD show that



   (i) $\Delta APB \cong \Delta CQD$

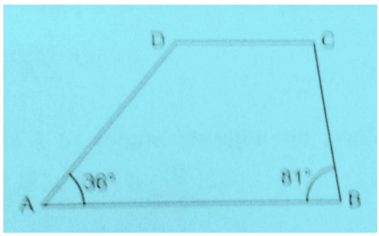
   (ii) AP = CQ

13. Show that 2 and $-\frac{1}{3}$ are the zeroes of the polynomial $3x^3 - 2x^2 - 7x - 2$. Also find the third zero of the polynomial.
14. Prove that a diagonal of a parallelogram divides it into two congruent triangles.
15. A led pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of the pencil is 7 mm and the diameter of the graphite is 1 mm. if the length of the pencil is 14 cm. find the volume of the wood.

    Or

    A heap of wheat is in the form of a cone, the diameter of whose base is 14 cm and height is 3 m. find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.

16. In the adjoining figure, ABCD is a trapezium in which AB || CD. If $\angle A = 36^0$ and $\angle B = 81^0$, then find $\angle C$ *and* $\angle D$



17. The radius of a spherical balloon increase from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.
18. A die is thrown 400 times with the frequencies for the outcomes 1, 2, 3, 4, 5 and 6 as given in the following table.

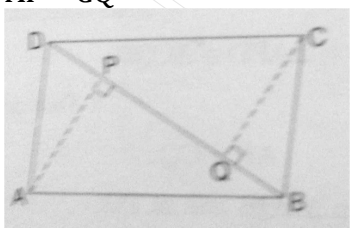
Outcomes	1	2	3	4	5	6
Frequency	72	65	70	71	63	59

Find the probability of

i) Getting a number less than 3
ii) Getting an outcome 6
iii) Getting a number more than 4

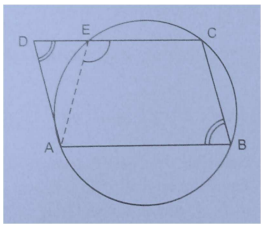
Section D

19. Draw the graph $x+2y=6$ and from the graph find the value of x when $y=-6$
20. Sara has a piece of land ABCD which is in the form of a parallelogram. Raghul has a plot BOE adjoining to Sara's land which is in triangular in shape. Such thar AB = BE and BO = CO. Welfare society plan to open an Physical Education centre in Raghul's plot. Raghul agrees to exchange it with another triangular plot of same area. Sara allows to donate a triangular piece along DC to be exchanged with Ragul Plot.
    i) How the above plan can be implemented
    ii) Which mathematical concept is involved in the above problem?
    iii) By helping the welfare society in making its plan feasible. Which values are depicted by Raghul and Sara?
21. If each edge of a cube is increased by 25% then find the percentage increase in its surface area.
22. ABCD is a parallelogram and AP and CQ are perpendicular from vertices A and C on diagonal BD respectively shown in the figure. Show that
    a) $\Delta APB = \Delta CQD$
    b) AP = CQ

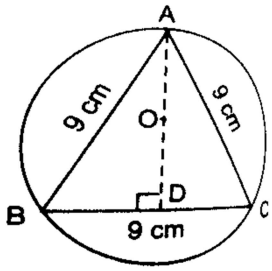


Or

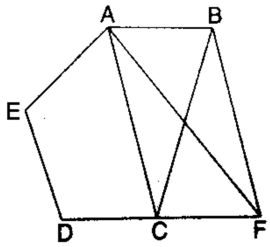
ABCD is a parallelogram. The circle through A, B and C intersect CD at E. prove that AE = AD.



23. An equilateral triangle is increased in a circle. Find the radius of the circle.



24. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer t (h
    a) Inner curved surface area
    b) Outer curved surface area
    c) Total surface area.
25. In the below figure ABCDE is a pentagon. A line through B parallel to AC meets DC produced at F. Show that.
    a) $ar(\Delta ACB) = ar(\Delta ACF)$
    b) $ar(\square AEDF) = ar(ABCDE)$



26. The radius of the cone is 5 cm and its height is 12 cm then find curved surface area and volume of the cone.
27. In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm. find the total radiating surface in the system.
28. Construct a histogram and frequency polygon for the following distribution

Weight(in Kg)	40-45	45-50	50-55	55-60	60-65	65-70
Number of Persons	15	25	28	15	12	5

Section E

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

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SOLUTIONS:

1. (c)
2. (a)
3. (c)
4. (d)
5. Let the edge of the cube be = x units

   Increased edge = $x+\frac{10}{100}x=\frac{11x}{10}units$

   Original surface area = $6x^2$

   New surface area = 6 x $\frac{121}{100}x^2$

   Increased in area = 6 x $\frac{121}{100}x^2-6x^2=\frac{126x^2}{100}$

   $\therefore$ Percentage of increases area = $\frac{126x^2 \text{ x } 100}{6x^2 \text{ x } 100}$ = 21%
6. Arranging the data in ascending order:

   5,5,5,6,6,6,6,7,7,7,8,8,9,9,10,10,11

   6 is repeated maximum number of times that is 4 times

   $\therefore$ Mode =6
7. In ΔOAB and $\Delta OA'B'$

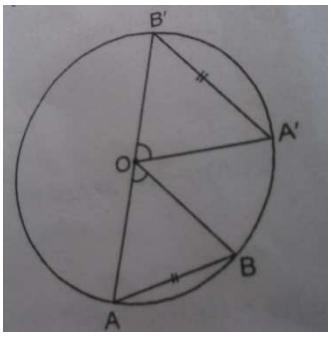
   OA = O'A'

   OB = O'B'

   AB = A'B'

   $\therefore \Delta OAB = \Delta O'A'B'$

   $\Rightarrow \angle AOB = \angle A'OB'$



8. Probability (batsman hits a boundary) = $\frac{4}{30}$

   Probability (batsman does not hit a boundary) = $1-\frac{4}{30}=\frac{30-4}{30}=\frac{26}{30}or\frac{13}{15}$
9. Area of the rectangle = Length x Breadth

   = product of adjacent sides

   = 16 x 8

   = 128 cm^2

Or

Area of a parallelogram = Base x Altitude

= 10 x 6

= 60 cm^2

10. Diameter = 3.5 cm

$\therefore$ Radius (r) = $\frac{3.5}{2} m = 1.75m$

Depth (h) = 12 m

$\therefore$ Capacity of the conical pit = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} x \frac{22}{7} x(1.75)^2 x12m^3$

= 38.5 kl

Section – C

11. 2x – 3y = 12

$$y = \frac{2x-12}{3}$$

When x =0 $\quad y = \frac{2(0)-12}{3} = -4$

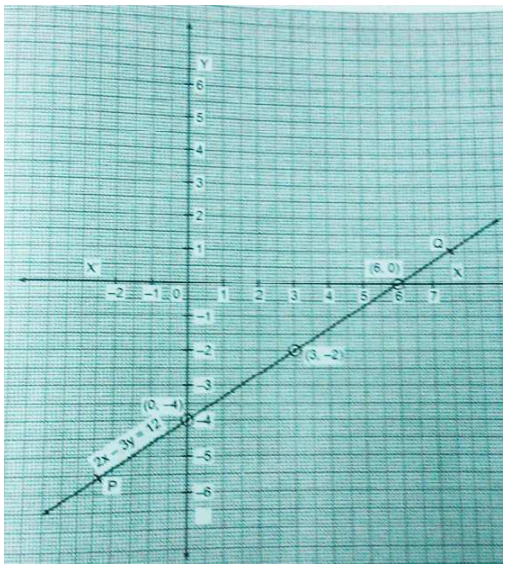
When x =3 $\quad y = \frac{2(3)-12}{3} = -2$

When x =6 $\quad y = \frac{2(6)-12}{3} = 0$

Plotting the ordered pairs (0,-4),(3,2) and (6,0) and joining them, we get a straight line PQ.

Thus, PQ is the graph of 2x – 3y = 12

From the graph we see that, it cuts the x-axis at the point(6,0) and the y-axis at the point(0,-4).



12. In ΔAPB and ΔCQD we have

$\angle APB = \angle CQD$

AB = CD

Opposite sides of parallelogram ABCD

$\angle APB = \angle CQD [AB \| CD \text{ and } AB \text{ is a transversal}]$

$\therefore \Delta APB = \Delta CQD$

Since $\therefore \Delta APB = \Delta CQD$

$\therefore$ Their corresponding parts are equal

AP = CQ

13. Let $p(x) = 3x^3 - 2x^2 - 7x - 2$

$p(2) = 3(2)^3 - 2(2)^2 - 14 - 2$

2 is a zero of p(x)

$p\left(\frac{-1}{3}\right) = 3\left(\frac{-1}{3}\right)^3 - 2\left(\frac{-1}{3}\right)^2 - 7\left(\frac{-1}{3}\right) - 2$

$= \frac{-1}{9} - \frac{2}{9} + \frac{7}{3} - 2 = 0$

$\Rightarrow \frac{-1}{3}$ Is a zero of p(x)

$(x-2)\left(x+\frac{1}{3}\right)$

$\left(3x^3 - 2x^2 7x - 2\right) + \left(3x^2 - 5x - 2\right) = x + 1$

$\therefore x = -1$is the third zero of p(x)

14. A parallelogram ABCD and BD is its diagonal

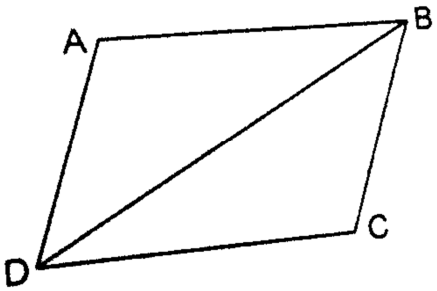
ΔABD and ΔCDB are congruent.

Since ABCD is a parallelogram then

AD = BC and AB = CD

BD = common

$\Delta ABD = \Delta CDB$



15. Inner radius of the graphite (r_1) = 0.5 mm

Outer radius of the pencil (r_2) = 3.5 mm

$\therefore$ Volume of the wood = $\pi(r_2^2 - r_1^2)h$

$$= \frac{22}{7}[(3.5)^2 - (0.5)^2]x140$$

$$= 5280 \text{ mm}^2$$

Or

r = 7m, h = 3m

Volume of the wheat $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3}x\frac{22}{7}x7x7x3 = 154m^3$$

$$l = \sqrt{h^2 + r^2} = \sqrt{9+49} = \sqrt{58}m$$

$$l = 22\sqrt{58}m^2$$

16. $\because AB \| CD$ and AD is a transversal.

$\angle A + \angle D = 180^0$

$\angle D = 180^0 - \angle A = 144^0$

Again AB || CD and BC is a transversal

$\angle B + \angle C = 180^0$

$\angle C = 180^0 - \angle B = 99^0$

$\therefore$ The required measures of $\angle A$ *and* $\angle D$ *are* 144^0 *and* 99^0

17. Initial radius (r_1) = 7 cm

Final radius (r_2) = 14 cm

Initial surface area (S_1) = $4\pi r_1^2 = 4\pi x7x7cm^2$

Final surface area (S_2) = $4\pi r_2^2 = 4\pi x14x14cm^2$

$$\frac{S_2}{S_1} = \frac{4\pi x14x14}{4\pi x7x7} = \frac{4}{1}$$

$S_2 : S_1 = 4:1$

18. The probability of getting a number less than 3 = $\frac{72+65}{400} = \frac{137}{400}$

Probability of getting an outcome 6 = $\frac{59}{400}$

Probability of getting a number more than 4 = $\frac{63+59}{400} = \frac{61}{200}$

Section – D

19. Given $x+2y=6$

$$\Rightarrow y=\frac{6-x}{2}$$

When $x=0$, then $y=\frac{6-0}{2}=3$

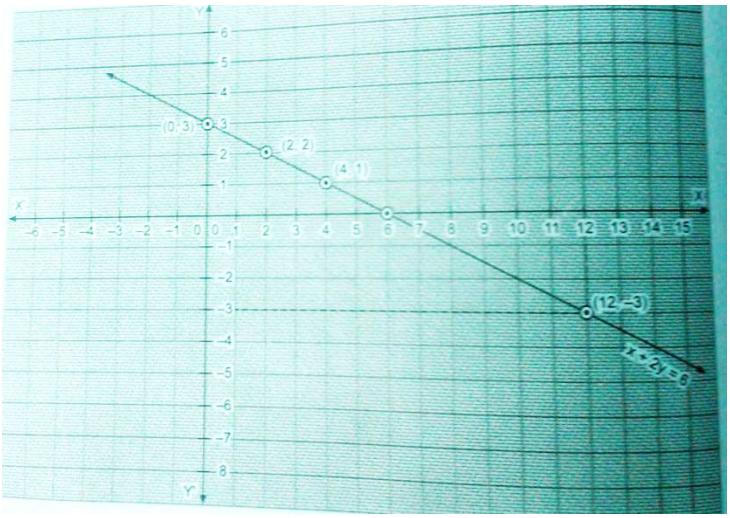
When $x=2$, then $y=\frac{6-2}{2}=2$

When $x=4$, then $y=\frac{6-4}{2}=1$

We get the following table of values x and y

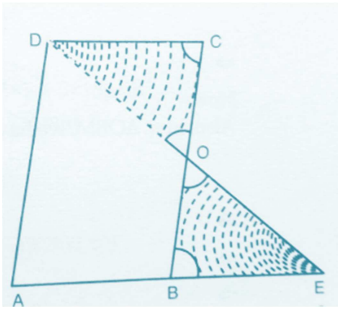
x	0	2	4
y	3	2	1
(x, y)	(0,3)	(2,2)	(4,1)

Based on the table values plotting the ordered pairs (0, 3), (2, 2) and (4, 1) and then joining them, we get the graph of $x+2y=6$



From the above graph we find that $y=-6$, the value of $x=12$

Ans:



20. In the above figure parallelogram ABCD is Sara's piece of land and ΔBOE is Raghul plot.

Since congruent triangles have same area.

$\therefore$ We gave to cut off an Δ along DC, which is congruent to ΔBOE.

Join OD in the parallelogram ABCD, AB || DC and AB = DC

BE = DC

Now in ΔBOE and ΔCOD, we have

$\angle OBE = \angle OCD$

$\angle BOE = \angle COD$

BE = DC

$\Delta BOE = \Delta COD$

$ar(\Delta BOE) = ar(\Delta COD)$

Thus triangular pieces BOE and COD can be exchanged.

Areas of parallelogram and triangles

Charity and Co-operation.

21. Let edge of cube = x units

$\therefore$ Surface area = $6x^2$ square units

New edge = $x + \frac{25}{100}x = \frac{5x}{4} units$

New surface area = $6x\frac{25}{16}x^2$ square units = $\frac{75}{8}x^2 square\ units$

Increase in surface area = $\frac{75}{8}x^2 - 6x^2 = \frac{27}{8}x^2$

Percentage of increase = $\frac{\frac{27}{8}x^2}{6x^2}x100 = 56.25\%$

22. ABCD is a parallelogram and AP and CQ are perpendicular from vertices A and C on diagonal BD respectively.

a) In $\Delta APB = \Delta CQD$, AB = CD

$\angle ABP = \angle CDQ$

$\because$ AB || DC and transversal BD intersects them

$\angle APB = \angle CQD$

As per AAS rule each 90^0

$\therefore \Delta APB \cong \Delta CQD$

b) $\because \Delta APB \cong \Delta CQD$ from the above equation

Then

AP = CQ is proved.

Or

Given a parallelogram ABCD. A circle passing through A, B and C is draen such that it intersects CD at E.

$\because$ ABCE is a cyclic quadrilateral.

$\angle AEC + \angle B = 180^0$ ----(i)

If ABCD is a parallelogram

$\therefore \angle D = \angle B$ -----(ii)

From (i) and (ii) we get

$\angle AEC + \angle D = 180^0$ -----(iii)

But $\angle AEC + \angle AED = 180^0$ ------(iv)

From (iii) and (iv) we get

$\angle D = \angle AED$

That is the base angles of ΔADE are equal

$\therefore$ Opposite sides must be equal

Hence AD = AE

23. Let ABC be an equilateral triangle such that

AB = BC = AC = 9 cm each

Let us draw a median AD corresponding to BC

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

$BD = \frac{1}{2} x 9cm = \frac{9}{2} cm$

And also AD is perpendicular to BC

In right ΔADB

$AD^2 = AB^2 - BD^2$

$AD^2 = 9^2 - \left(\frac{9}{2}\right)^2 = \left(9 - \frac{9}{2}\right)\left(9 + \frac{9}{2}\right)$

$= \left(\frac{9}{2}\right)\left(\frac{27}{2}\right) = \frac{9}{2} x \frac{9}{2} x 3 = \left(\frac{9}{2}\right)^2 x 3$

$AD = \frac{9}{2}\sqrt{3} cm$

Since in an equilateral triangle, the centroid and circumcentre coincide.

$\therefore AO : OD = 2 : 1$

$$AO = \frac{2}{3}AD = \frac{2}{3}x\frac{9}{2}\sqrt{3}$$

$$= \frac{9}{3}\sqrt{3} = 3\sqrt{3}cm$$

Required radius = $3\sqrt{3}cm$

24. Length of the metal pipe = 77 cm

$\therefore$ It is in the form of cylinder.

$\therefore$ Height (h) of the cylinder = 77 cm

25. Given

Inner diameter is 4 cm

$\therefore$ Inner radius (r) = $\frac{4}{2}$ = 2 cm

Outer radius (R) = $\frac{4.4}{2}$ = 2.2 cm

a) Curved surface area = $2\pi rh = 2 \text{ x } \frac{22}{7} \text{ x } 2 \text{ x } 77cm^2$

= 968 cm^2

b) Outer surface area = $2\pi Rh = 2 \text{ x } \frac{22}{7} \text{ x } 2.2 \text{ x } 77cm^2$

$= \frac{2 \text{ x } 22 \text{ x } 22 \text{ x } 11}{10}cm^2$ = 1064.8 cm^2

c) Total surface area = [inner curved surface area] + [outer curved surface area] + [Two base circular lamina]

$= [2\pi rh] + [2\pi Rh] + [2\pi(R^2 - r^2)]$

$= [986\ cm^2] + [1064.8\ cm^2] + 2 \text{ x } \frac{22}{7}(2.2^2 - 2^2)$

= 2032.8 cm^2 + 5.28 cm^2 = 2038.08 cm^2

Given – ABCDE is a pentagon. A line through B parallel to AC meets DC produced at F.

a) $\because \Delta ACB$ and ΔACF are on the same base AC and between the same parallels AC and BF.
Since AC || BF
$\therefore ar(\Delta ACB) = ar(\Delta ACF)$
Note: two triangles on the same base and between the same parallels are equal in area.

b) From (a)

$ar(\Delta ACB) = ar(\Delta ACF)$

$ar(\Delta ACB) + ar(\square AEDC) = ar(\Delta ACF) + ar(\square AEDC)$

$ar(ABCDE) = ar(\square AEDF)$

Or

$ar(\square AEDF) = ar(ABCDE)$

26. Radius of the cone = 5 cm

Height of cone = 12 cm

$l = \sqrt{r^2 + h^2} = \sqrt{144 + 25}$ = 13 cm

Curved surface area = πrl

= 3.14 x 5 x 13

= 204.10 cm^2

Volume of the cone = $\frac{1}{3}\pi r^2 h$ = $\frac{1}{3}$ x 3.14 x 25 x 12 = 314 cm^3

27. Length of the cylindrical pipe = 28 m

Height = 28 m

Diameter of the pipe = 5 cm

Radius (r) = $\frac{5}{2} cm = \frac{5}{200} m$

$\therefore$ Curved surface area = $2\pi rh$

= 2 x $\frac{22}{7}$ x $\frac{5}{200}$ x 28 m^2 = 4.40 m^2

Thus the total radiating surface is 4.40 m^2

28.