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Class: 9
Subject: Mathematics
Topic: OASK1509SA203
No. of Questions: 34

General Instructions:

1. All questions are compulsory
2. The question paper consists of 34 questions divided into 4 sections A ,B ,C and D. Section A comprises of 10 questions of 1 mark each .Section B comprises of 8 questions of 2 marks each. Section C comprises of 10 questions of 3 marks each. And Section D comprises of 6 questions of 4 marks each.
3. Question numbers 1 to 10 in Section A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, an internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four mark each. You have to attempt only one of the alternatives in all such questions. .
5. Write the serial number of the question number before attempting it.
6. Use of calculators is not permitted.
7. An additional 15 minutes time has been allotted to read this question paper only.

Q1. Given figure A and figure B such that ar (A) = 20 sq. units and ar (B) = 20 sq. units.

(a) Figure A and B are congruent
(b) Figure A and B are not congruent
(c) Figure A and B may or may not be congruent
(d) Figure A and B are similar

Sol. (c)

Two congruent figures are equal in area but the converse is not true.

Q2. If the surface area of a sphere is 616 cm^2 , then its radius is

(a) 14cm
(b) 3.5 cm
(c) 7 cm
(d) 28cm

Sol. (c)

Let the radius of the sphere be r cm.

The surface area of the sphere

$$= 4 \sqcap r^2 \ cm^2$$

According to the question,

$$4 \sqcap r^2 = 616$$

$$4 \times \frac{22}{7} \times r^2 = 616$$

$$r^2 = (616 \times 7)/(4 \times 22)$$

$$r^2 = 49$$

$$r = 7 \ cm$$

Q3. The surface area of a cuboid is 1372 sq.cm.If its dimensions are in the ratio of 4 :2: 1, then its length is

(a) 7 cm
(b) 14 cm
(c) 21 cm
(d) 28cm

Sol. (a)

$$2(lb + bh + hl) = 1372 \Longrightarrow 2(4x.2x + 2x.x + 4x.x) = 1372$$

$$\Longrightarrow 2(8x^2 + 2x^2 + 4x^2) = 1372$$

$$\Longrightarrow 28\,x^2 = 1372 \Longrightarrow x = 7$$

Q4. In a frequency distribution, the class-width is 4 and the lower limit of first class is 10. If there are six classes, the upper limit of last class is

(a) 32
(b) 26
(c) 30
(d) 34

Sol. (d)

The class-width is 4 and the lower limit of first class is 10. There are six classes, the upper limit of last class is 10+24=34

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Q5. A die is thrown 200 times and the following outcomes are noted, with their frequencies:

Outcome	1	2	3	4	5	6
Frequency	56	22	30	42	32	18

What is the empirical probability of getting a number less than 4?

(a) 0.50
(b) 0.54
(c) 0.46
(d) 0.52

Sol. (b)

$(56 + 22 + 30)/(200 = 0.54)$

Q6. The equation of x-axis is

A. a = 0
B. y = 0
C. x = 0
D. y = k

Sol. (b)

The equation of x-axis is y = 0

Q7. Given a rectangle ABCD and P, Q, R, S mid points of AB, BC, CD and DA respectively. Length of diagonal of rectangle is 8 cm the quadrilateral PQRS is

(a) parallelogram with adjacent sides 4 cm
(b) rectangle with adjacent sides 4 cm
(c) rhombus with side 4 cm
(d) square with side 4 cm

Sol. (a)

Given a rectangle, a quadrilateral joining its mid points is a parallelogram. Length of diagonal of rectangle is 8 cm the quadrilateral PQRS is a parallelogram with adjacent sides 4 cm (using mid-point theorem)

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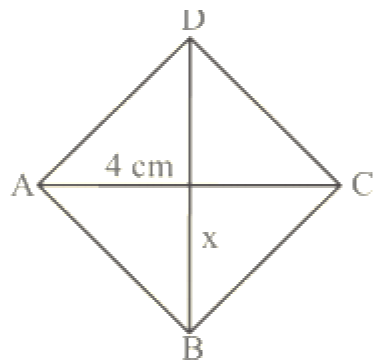
Q8. In the given figure, find x, if ABCD is a rhombus and AE = 4 cm, ar(ABCD) = 20 cm^2.



(a) 4 cm
(b) 5 cm
(c) 10 cm
(d) 2.5 cm

Sol. (d)

Area of a rhombus $= 1/2\ xd_1xd_2 = \frac{1}{2}.2x.8 = 20$

Q9. A circle divides the plane on which it lies into
(a) three parts
(b) two parts
(c) one part
(d) none of these

Sol. (a)

Interior of the circle, circle, exterior of the circle.

Q10. A cone of height 8m has a curved surface area 188.4 sq. metres. Its volume is
(a) 298 m^3
(b) 300 m^3
(c) 301.44 m^3
(d) 305.23m^3

Sol. (c)

$301.44\ m^3$

$\sqcap rl = 188.4$

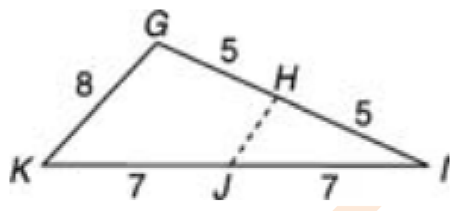
$r^2 = 36 \, or \, r = 6$

Volume $= 1/3 \sqcap r^2 h$

$= 1/3 \times 3.14 \times 6 \times 6 \times 8 = 301.44 m^3$.

SECTION-B

Q11. In the given figure, find HJ.



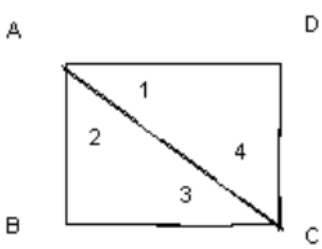
Sol. Because Hand J are midpoints of two sides of a triangle:

$HJ = \frac{1}{2} GK$ (by mid point theorem)

$= \frac{1}{2}(8) = 4 \, units.$

OR

In a quadrilateral ABCD ∠ = ∠ ADC ABC ,∠ ≅ ∠ ∠ ≅ ∠ 1 3 and 2 4, prove that the quadrilateral ABCD is a parallelogram



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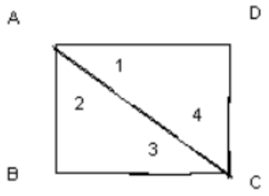
Sol.



$\angle 1 \cong \angle 3$ amd $\angle 2 \cong \angle 4$

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

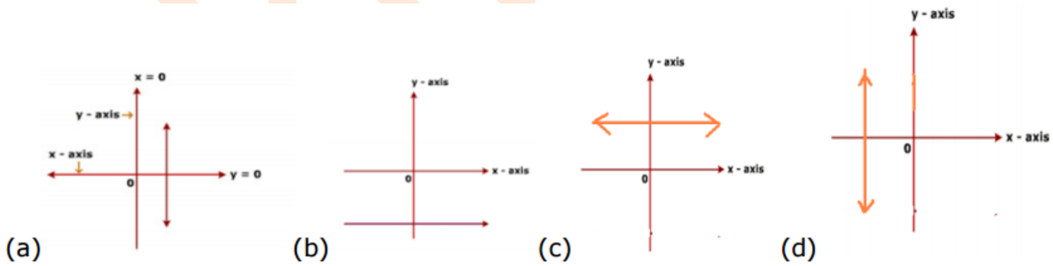
$\Longrightarrow \angle BAD = \angle BCD$

And ∠ADC = ∠ABC

We know that, If in a quadrilateral, each pair of opposite angles is equal, then it is a parallelogram.

∴ ABCD is a parallelogram.

Q12. Which of the following graphs may correspond to the equation y = k where k is a negative rational number.



Sol. The graph of the equation y = k is a straight line parallel to the X-axis. Therefore either lines of option b or c may represent this equation.

But k is a negative rational number, k lies on the Y-axis but below the X-axis. So the option b represent the equation y =- k.

Q13. Solve -3(-x + 5) + 20 = -10(x - 3) + 4

Sol. $-3(-x+5)+20=-10(x-3)+4$

$\Longrightarrow 3x-15+20=-10x+30+4$

$\Longrightarrow 13x=34-5$

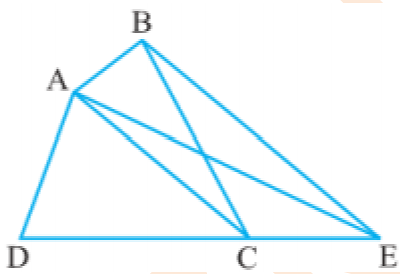
$\Longrightarrow 13\,x=29$

$\Longrightarrow x=29/13$

Q14. Vivek bought a cell phone for Rs5804. He made a down payment of Rs32 and will pay the rest in 6 equal payments. Form an equation to represent this information.

Sol. If x represents the amount of each payment, the equation that can be used to find this amount is 5804 = 32+ 6x

Q15. In equilateral triangle KLM, P Q and R are the mid-points of KL, LM and MK. Prove that ΔPQR is an equilateral triangle.



Sol. By mid-point theorem,

PQ = ½ kM

QR = ½ KL

PR = ½ LM

But KM = KL = LM. (Since ΔKLM is equilateral)

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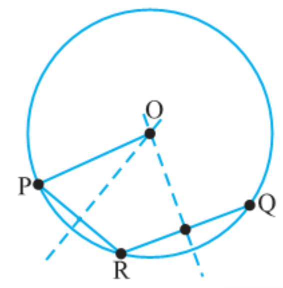
Q16. In the given Figure, ABCD is a quadrilateral and BE || AC and also BE meets DC produced at E. Show that area of Δ ADE is equal to the area of the quadrilateral ABCD.

Sol. Ar(BAC) = ar(EAC) (Δ BAC and Δ EAC lie on the same base AC and between the same parallel AC and BE.)

Q17. Given an arc of a circle, give a method to complete the circle

Sol.



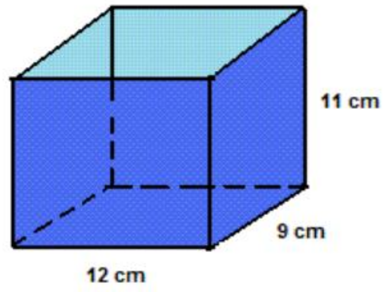
Let arc PQ of a circle be given. We have to complete the circle, which means that we have to find its centre and radius.

Take a point R on the arc.

Join PR and RQ. Construct perpendicular bisectors of chords PR and RQ. Let them intersect at O

O is the centre and OP is the radius.
Taking the centre and the radius so obtained, we can complete the circle

Q18. Find the total surface area of the box open at the top.



Sol. Surface area of the box open at the top = 2 (lh+bh+lb)-lb

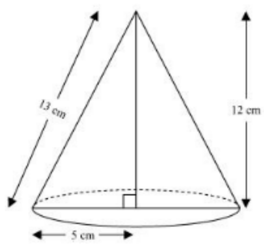
$= 2(12 \times 11 + 11 \times 9 + 9 \times 12) - 12 \times 9$

$= 2(132 + 99 + 108) - 108$

$= 2(339) - 108 = 678 - 108 = 570\ cm^2$

Q19. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

Sol.



When right-angled ΔABC is revolved about its side 12 cm, a cone with height (h) as 12 cm, radius (r) as 5 cm, and slant height (l) 13 cm will be formed.

Volume of cone $\frac{1}{3}\pi r^2 h$

$\frac{1}{3}\pi(5)^2 \times 12$

$= 100\pi\ cm^3 = 100 \times 3.1457 = 314.57\ cm^3$

So, the volume of the cone so formed is 100 π cm^3. = 314.57 cm^3

Or

If the lateral surface area of a cylinder is 94.2 cm2 and its height is 5 cm, then find (i) radius of its base (ii) its volume. (Use π = 3.14)

Sol. (i) Height (h) of cylinder = 5 cm.

Let radius of cylinder be r.

CSA of cylinder = 94.2 cm^2

$\Longrightarrow 2 \sqcap rh = 94.2\ cm^2$

$(3 \times 3.14 \times r \times 5)\ cm = 94.2\ cm^2$

$r = 3\ cm$

Volume of cylinder $= \sqcap r^2 h$

$= (3.14 \times (3)^2 \times 5) cm^3 141.3\ cm^2$

Q20. The distance, in km, from school to homes of thirty children was found out. The results were found as follows: 16,2,3,5,12,5,8,4,8,10, 3, 4, 12, 2, 8, 15, 1, 17, 6,3,2,8,5,9,6,8,7,14,12,11.

(i) Make a grouped frequency distribution table for this data, taking class width 5 and one of the class intervals as 5 - 10.

(ii) How many children lived more than 15 km from school?

Sol. (i) Our class intervals will be $0 - 5, 5 - 10, 10 - 5$.

The grouped frequency distribution table can be constructed as follows.

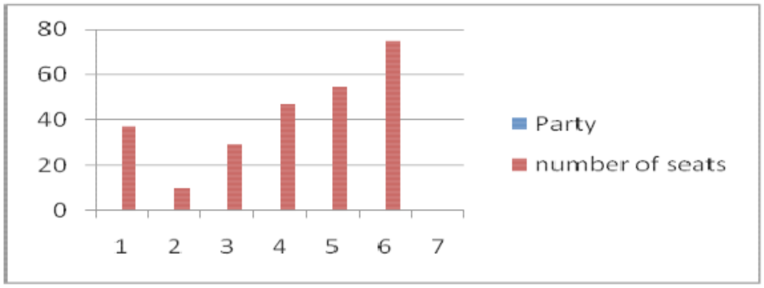
Distance	Number of children
0 – 5	10
5 – 10	13
10 – 15	5
15 – 20	2
Total	30

(ii) The number of children who lived more than 15 km from school. (i.e., the number of children in class interval 15 – 20).

Q21. The table shows the number of seats won by 6 political parties in an election. Make a Bar graph for the same and find the total number of seats

Party	Number of seats
A	37
B	10
C	29
D	47
E	55
F	75

Sol.



The total number of seats $= 37 + 10 + 29 + 47 + 55 + 75 = 253$

Q22. If a dice is rolled once, what is the probability that it will show (i) a multiple of 1? (ii) a multiple of 7 ?

Sol.

(i) The number of multiples of 1 = 6

∴ the probability of a multiples of $1 = 6/6 \ = 1$

(ii) The number of multiples of $7 = 0$

∴ The probability of a multiple of 7 = 0/6 = 0

OR

In 1000 trials, outcomes and their frequencies were recorded. Show that the table covers all the possible outcomes of a trial.

Outcome	1	2	3	4	5	6
Frequency	179	150	157	149	175	190

Sol. Let Ei denote the event of getting the outcome I, where $i = 1, 2, 3, 4, 5, 6$ Then,

$P(E_1) = \frac{179}{1000}, P(E_2) = \frac{150}{1000}, P(E_3) = \frac{157}{1000}, P(E_4) = \frac{149}{1000}, P(E_5) = \frac{175}{1000}, P(E_6) = \frac{190}{1000}$

We find that , $P(E1) + P(E2) + P(E3) + P(E4) + P(E5) + P(E6) = 1$

$\Longrightarrow E1, E2, \dots\dots, E6$ cover all the possible outcomes of a trial.

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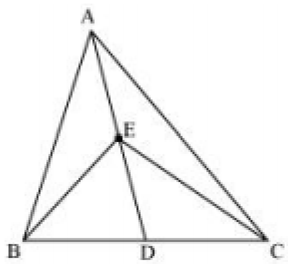
Q23. In the given figure, E is a point on median AD of a ΔABC. Show that ar (ABE) = ar (ACE)



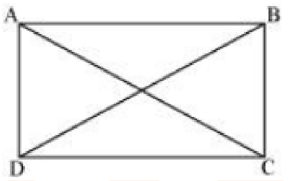
Sol. Given: a ΔABC , AD is the median on side BC.E is a point on median AD of a ΔABC

To Prove: ar (ABE) = ar (ACE)

Proof: AD is the median on side BC
∴ Area (ΔABD) = Area (ΔACD)
ED is the median of ΔEBC.
∴ Area (ΔEBD) = Area (ΔECD)
On subtracting equation (2) from equation (1), we obtain
Area (ΔABD) − Area (EBD) = Area (ΔACD) − Area (ΔECD)
Area (ΔABE) = Area (ΔACE)

Q24. If the diagonals of a parallelogram are equal, then show that it is a rectangle.

Sol.



Given: A parallelogram ABCD with diagonal AC = BD

To Prove: ABCD is a rectangle.

Proof: In ΔABC and ΔDCB,

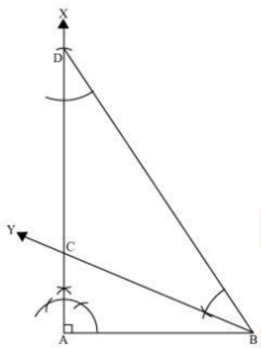
AB = DC (Opposite sides of a parallelogram are equal)
BC = BC (Common)
AC = DB (Given)
∴ΔABC ≅ ΔDCB (By SSS Congruence rule)
⇒ ∠ABC = ∠DCB
We know that the sum of the measures of angles on the same side of transversal is 180º.

∠ABC + ∠DCB = 180º (AB || CD)
⇒∠ABC + ∠ABC = 180º
⇒2∠ABC = 180º
⇒∠ABC = 90º
Since ABCD is a parallelogram and one of its interior angles is 90º, ABCD is a rectangle.

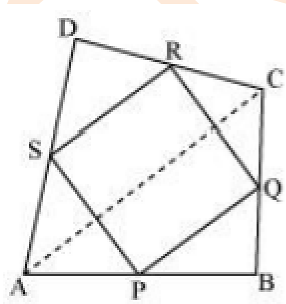
Q25. Construct a right triangle whose base is 4 cm and sum of its hypotenuse and other side is 8 cm.

Sol.

(i) Draw line segment AB of 4 cm. Draw a ray AX making 90° with AB.
(ii) Cut a line segment AD of 8 cm (as, sum of the other two sides is 8cm from ray AX)
(iii) Join DB and make an angle DBY equal to ADB.
(iv) Let BY intersect AX at C. Join AC, BC.ΔABC is the required triangle.



Q26. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA, as shown in the given figure. AC is a diagonal. Prove that:



(i) SR || AC and SR = ½ AC
(ii) PQ = SR
(iii) PQRS is a parallelogram

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Sol.

(i) n ΔADC, S and R are the mid-points of sides AD and CD respectively. In a triangle, the line segment joining the mid-points of any two sides of the triangle is parallel to the third side and is half of it. (by mid-point theorem)
∴ SR || AC and SR = ½ AC ... (1)

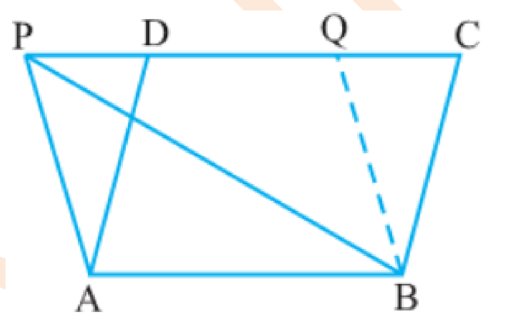
(ii) In ΔABC, P and Q are mid-points of sides AB and BC respectively. Therefore, by using mid-point theorem,
PQ || AC and PQ = ½AC ... (2)
Using equations (1) and (2), we obtain
PQ || SR and PQ = SR ... (3)
⇒PQ = SR

(iii) From equation (3), we obtained
PQ || SR and PQ = SR
Clearly, one pair of opposite sides of quadrilateral PQRS is parallel and equal.
Hence, PQRS is a parallelogram

OR

If a triangle and a parallelogram are on the same base and between the same parallels, then prove that the area of the triangle is equal to half the area of the parallelogram

Sol.



Given: F ABP and parallelogram ABCD lie on the same base AB and between the same parallels AB and PC

To prove : ar (PAB) = ½ ar (ABCD)

Construction: Draw BQ || AP to obtain another parallel ogram ABQP. Now parallelograms ABQP and ABCD are on the same base AB and between the same parallels AB and PC.
Therefore, ar (ABQP) = ar (ABCD) (1)
But Δ PAB ≅ Δ BQP (Diagonal PB divides parallelogram ABQP into two congruent triangles.)
So, ar (PAB) = ar (BQP) (2)
Therefore, ar (PAB) = ½ ar (ABQP) [From (2)] (3)
This gives ar (PAB) = ½ ar (ABCD)

[From (1) and (3)]

Q27. In an examination, one mark is awarded for every correct answer, while 1/4 mark is deducted for every wrong answer. A student answered 120 questions and got 20 marks. How many questions did he answer correctly?

Sol. Let No. of question answered wrong = x

Then, No. of questions answered correctly = 120 – x

$x(-1/2) + (120 - x)(1) = 20$

$\Rightarrow \frac{-x}{4} + 120 - x = 20$

$\Rightarrow -x + 480 - 4x = 80$

$\Rightarrow 400 = 5x$

$\Rightarrow x = 80$

So, No. of question answered incorrectly = 80

No. of question answered correctly = 40

Q28. A village, having a population of 4000, requires 150 litres of water per head per day. It has a tank measuring 20 m × 15 m × 6 m. For how many days will the water of this tank last?

Sol. The given tank is cuboidal in shape having its length (l) as 20 m, breadth (b) as 15 m, and height (h) as 6 m.

Capacity of tank = l × b× h

$= (20 \times 15 \times 6)\ m^3 = 1800\ m^3 = 1800000\ litres$

Water consumed by the people of the village in 1 day $= (400 \times 150)$ litres

$= 600000\ litres$

Let water in this tank last for n day.

Water consumed by all people of village in n days = Capacity of tank

$n \times 600000 = 1800000$

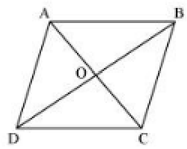
$n = 3$

Therefore, the water of this tank will last for 3 days.

SECTION-D

Q29. Show that the diagonals of a parallelogram divide it into four triangles of equal area.

Sol.



We know that diagonals of parallelogram bisect each other.

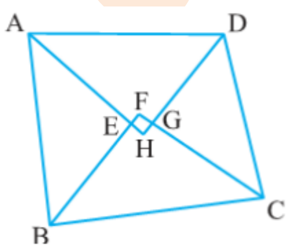
Therefore, O is the mid-point of AC and BD.

BO is the median in ΔABC. Therefore, it will divide it into two triangles of equal areas.

∴Area (ΔAOB) = Area (ΔBOC) ... (1)
In ΔBCD, CO is the median.
∴ Area (ΔBOC) = Area (ΔCOD) ... (2)
Similarly, Area (ΔCOD) = Area (ΔAOD) ... (3)
From equations (1), (2), and (3), we obtain
Area (ΔAOB) = Area (ΔBOC) = Area (ΔCOD) = Area (ΔAOD)
Therefore, it is evident that the diagonals of a parallelogram divide it into four triangles of equal area.

Q30. Prove that the quadrilateral formed (if possible) by the internal angle bisectors of any quadrilateral is cyclic.

Sol.



Given: A quadrilateral ABCD. AH, BE, CF, DH are the angle bisectors of angles A, B, C and D respectively

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To prove the quadrilateral EFGH is cyclic.

Proof: ABCD is a quadrilateral in which the angle bisectors AH, BF, CF and DH of

Internal angles A, B, C and D respectively form a quadrilateral EFGH.

Now, ∠FEH = ∠AEB (vertically opposite angles)

$= 180° - \angle EAB - \angle EBA$ (ASP of a triangle)

$= 180° - 12\ (\angle A + \angle B)$ …….. (1)

And $\angle FGH = \angle CGD = 180° - \angle GCD - \angle GDC$ (ASP of a traingle)

$= 180° - \frac{1}{2}(\angle C + \angle D)$ ……(2)

Therefore, ∠FEH+∠FGH =180°$-\frac{1}{2}\angle A + \angle B) + 180° - \frac{1}{2}(\angle C + \angle D)$ (From (1) and (2))

$= 360° - \frac{1}{2}(\angle A + \angle C + \angle C + \angle D) = 360° - \frac{1}{2} \times 360°$

$= 360° - 180° = 180°$

We know, f the sum of a pair of opposite angles of a quadrilateral is 180°, the quadrilateral is cyclic

Therefore, the quadrilateral EFGH is cyclic.

Q31. The paint in a certain container is sufficient to paint an area equal to 9.375 m^2. How many bricks of dimensions 22.5 cm ×10cm ×7.5cm can be painted out of this container?

Sol. Total surface area of one brick $2(lb + bh + lh)$

$= [2(22.5 \times 10 + \times 7.5 + 22.5 \times 7.5)]\ cm^2$

$= 2(225 + 75 + 168.75)\ cm^2$

$= (2 \times 468.75)\ cm^2$

$= 937.5\ cm^2$

Let n bricks can be painted out by the paint of the container.

Area of n bricks = (n × 937.5) cm^2 = 937.5n cm^2

Area that can be painted by the paint of the container = 9.375 m^2 = 39750 cm^2

∴ 93750 = 937.5n

N = 100

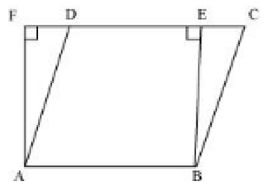
Therefore, 100 bricks can be painted out by the paint of the container.

Q32. Parallelogram ABCD and rectangle ABEF are on the same base AB and have equal areas. Show that the perimeter of the parallelogram is greater than that of the rectangle.

Sol. Given: Parallelogram ABCD and rectangle ABEF are on the same base AB and have equal areas.

To Prove: perimeter of the parallelogram is greater than that of the rectangle.

Proof: Parallelogram ABCD and rectangle ABEF are on the same base AB and have equal areas. Therefore, they lie between the same parallels.
Proof: Consider the parallelogram ABCD and rectangle ABEF



Parallelogram ABCD and rectangle ABEF are between the same parallels ABand CF. We know that opposite sides of a parallelogram or a rectangle are of equal lengths.
Therefore,
AB = EF (rectangle ABEF)
AB = CD (parallelogram ABCD)
∴ CD = EF
⇒ AB + CD = AB + EF ... (1)
Of all the line segments that can be drawn to a given line from a point not lying on the perpendicular line segment is the shortest.

∴ AF < AD
And similarly, BE < BC
∴ AF + BE < AD + BC ... (2)
From equations (1) and (2), we obtain
AB + EF + AF + BE < AD + BC + AB + CD
Perimeter of rectangle ABEF < Perimeter of parallelogram ABCD

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Q33. A survey was taken on 30 classes at a school to find the total number of lefthanded students in each class. The table below shows the results:

No. of left-handed students	0	1	2	3	4	5
Frequency (no. of classes)	1	2	5	12	8	2

(A) A class was selected at random.

(i) Find the probability that the class has 2 left-handed students.

(ii) What is the probability that the class has at least 3 left-handed students?

(iii) Given that the total number of students in the 30 classes is 960, find the probability that a student randomly chosen from these 30 classes is left-handed.

Sol. (A)

(i) Let S be the sample space and
A be the event of a class having 2 left-handed students.
n (S) = 30
n(A) = 5
$P(A) = \frac{5}{30} = \frac{1}{6}$

(ii) Let B be the event of a class having at least 3 left-handed students.
n (B) = 12 + 8 + 2 = 22
$P(E) = \frac{22}{30} = \frac{11}{15}$

(iii) First find the total number of left-handed students:

No. of left-handed students, X	0	1	2	3	4	5
Frequency, f (no. of classes)	1	2	5	12	8	2
Fx	0	2	10	36	32	10

Total no. of left-handed students = 2 + 10 + 36 + 32+ 10 = 90

Here, the sample space is the total number of students in the 30 classes, which was given as 960.

Let T be the sample space and C be the event that a student is left-handed.

n (T) = 960
n (C) = 90

$P(C) = \frac{90}{960} = \frac{3}{32}$

Q34. Solve |2x - 4| - 2 = 6.

Sol. The expression 2x – 4 may be positive or negative.

Case I: 2x - 4| - 2 = 6.
⇒ 2x -4 -2 = 6
⇒ 2x – 6 = 6
⇒ 2x = 12
⇒ x = 6
Case II: |2x - 4| - 2 = 6.
⇒ -2x +4 -2 = 6
⇒ -2x +2 = 6
⇒ -2x = 4
⇒ x = -2
∴The solutions are x = -2 and x = 6

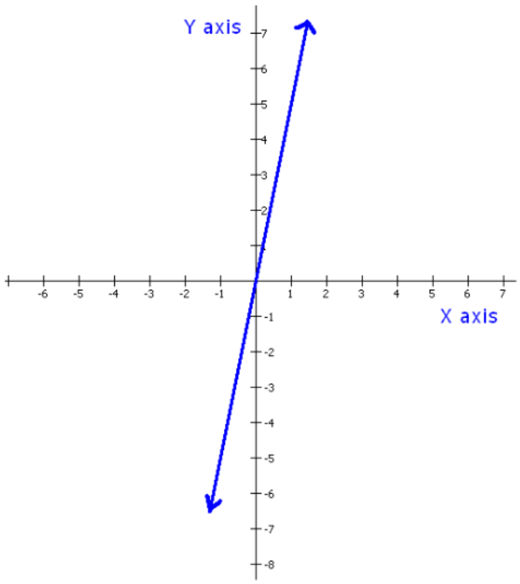
OR

If the work done by a body on application of a constant force is directly proportional to the distance travelled by the body, express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 5 units. Also read from the graph the work done when the distance travelled by the body is (i) 2units (ii) 0 unit.

Sol. Here the variables involved are distance and work done. Let the distance travelled by the body be x units and the work done by a body be y units.

We can express this in the form of equation in two variables y = kx, where k is a constant force.

Given constant force as 5units, i.e. k=5, we get y=5x.
From the graph we get, (0,0) and (1,5) as solutions.
When the distance travelled by the body is 2 units, the work done by a body is
10units and work done is 0 units when the distance travelled is 0 units.


Y axis
X axis