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Class: X
Subject: Math's
Topic: Coordinate geometry
No. of Questions: 20

Q.1 Find the distance between the points A(-6, 7) and B(-1, -5).

Sol: $x_1 = -6, y_1 = 7, x_2 = -1, y_2 = -5$
$AB = \sqrt{\{(-1 + 6)^2 + (-5 - 7)^2\}} = \sqrt{169} = 13$

Q.2 Find a point on x-axis which is equidistant from A(2,-5) and B(-2,9). (CBSE-2009)

Sol: Let P be the point equidistant from A and B.
PA=PB
$\sqrt{\{(x - 2)^2 + (0+5)^2\}} = \sqrt{\{(x + 2)^2 + (0 - 9)^2\}}$
$(x - 2)^2 + 25 = (x + 2)^2 + 81$
$-8x = 56$
$x = -7$

Q.3 The x-coordinate of a point P is twice its y-coordinate. If P is equidistant from Q(2, -5) and R(-3,6), then find the coordinates of P. (CBSE-2010)

Sol: Let the coordinates of P be (x,y)
Also x=2y
PQ = PR
$\sqrt{\{(x - 2)^2 + (y + 5)^2\}} = \sqrt{\{(x + 3)^2 + (y - 6)^2\}}$
$5y^2 + 2y + 29 = 5y^2 + 45$
$2y = 16$
$y = 8$
Coordinates of P are (16,8)

Q.4 Show that A(6,4), B(5,-2) and C(7,-2) are the vertices of an isosceles triangle. Also, find the length of the median through A. (CBSE-2010)

Sol: Let A(6,4); B(5,-2); C(7,-2)
$AB = \sqrt{37}$; $AC = \sqrt{37}$
AB=AC
This shows that ΔABC is isosceles.
Let D be the mid-point of BC.
Coordinates of D are (6, -2)
$AD = \sqrt{\{(6 - 6)^2 + (4+2)^2\}}$

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AD=6

Q.5 Determine the ratio in which the line 3x + y – 9=0 divides the segment joining the points (1,3) and (2,7). (CBSE-2008)

Sol: Suppose the ratio is K:1

The coordinates of points are: $(\frac{2K+1}{K+1}, \frac{7K+3}{K+1})$

Also, the point lies on 3x + y – 9=0

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

6K + 3 + 7K + 3 – 9K – 9=0

K= 3/4

K:1= 3:4

Q.6 If A(-2,-1), B(a,0), C(4,b) and d(1,2) are the vertices of a parallelogram, find the values of a and b. (CBSE-2006)

Sol: Since the diagonals of a parallelogram bisect each other.
Coordinates of mid-point of AC are same as the coordinates of mid-point of BD.

$(\frac{-2+4}{2}, \frac{-1+b}{2}) = (\frac{a+1}{2}, \frac{0+2}{2})$

$(1, \frac{b-1}{2}) = (\frac{a+1}{2}, 1)$

$\frac{a+1}{2}, =1 ; \frac{b-1}{2} =1$

a+1=2; b – 1=2

a=1 ; b=3

Q.7 If A(5,-1), B(-3,-2) and C(-1,8) are the vertices of ΔABC, find the length of median through A and the coordinates of the centroid. (CBSE-2006)

Sol: Let AD be the median through vertex A of ΔABC. Then, D is the mid-point of BC.

Coordinates of D= $(\frac{-3-1}{2}, \frac{-2+8}{2})$ i.e., (-2,3)

AD= $\sqrt{\{(5 + 2)^2 + (-1 - 3)^2\}}= \sqrt{65}$ units.

Let G be the centroid.

Coordinates of G are $(\frac{2x(-2)+1x5}{2+1}, \frac{2x3+1x(-1)}{2+1}) = (1/3, 5/3)$.

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Q.8 Find the coordinates of the centroid of a triangle whose vertices are (0,6), (8,12) and (8,0).

Sol: $\{(x_1 + x_2 + x_3)/3 , (y_1 + y_2 + y_3)/3\}$
$\{(0+8+8)/3, (6+ 12+0)/3\} = (16/3, 6)$

Q.9 If x – 2y + k=0 is a median of the triangle whose vertices are at points A(-1,3), B(0,4) and C(-5,2), find the value of k.

Sol: $\left(\frac{-1+0-5}{3}, \frac{3+4+2}{3}\right) = (-2,3)$
Now, the point lies on the median x – 2y + k=0
-2 -2(3) + k=0
k=8

Q.10 Find the area of the triangle whose vertices are (t, t – 2), (t + 2, t + 2) and (t + 3, t)

Sol: Area= $1/2 |x_1(y_2 – y_3) + x_2(y_3 – y_1) + x_3(y_1 – y_2)|$
$= 1/2 | \{ t(t+2 – t) + (t + 2)(t – t+2) + (t+3)(t – 2 – t – 2)\}|$
$=1/2 |\{2t + 2t + 4 – 4t – 12\}| = |-4| = 4$ sq. units

Q.11 Prove that the points (a, b + c); (b, c + a) and (c, a + b) are collinear. (CBSE-2010)

Sol: $\Delta= 1/2 |\{a(c + a) + b(a + b) + c(b + c)\} – \{b(b + c) + c(c + a) + a(a + b)\}|$
$= 1/2 |(ac + a^2 + ab + b^2 + bc + c^2) – (b^2 + bc + c^2 + ca + a^2 + ab)|$
= 0
Hence, the given points are collinear.

Q.12 For what value of x will the points (x, -1), (2,1) and (4,5) lie on a line? (CBSE-2013)

Sol: Area =0
$|\{ x * 1 + 2 * 5 + 4 * (-1)\} – \{ 2 * (-1) + 4 * 1 + x * 5\}|=0$
$(x + 10 – 4) – (-2 + 4 + 5x)=0$
$(x+ 6) – (5+2)=0$
$-4x + 4=0$
$x=1$

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Q.13 If P(x,y) is any point on the line joining the points A(a,0) and B(0,b), then find the value of x/a + y/b. (CBSE-2009)

Sol: (x * 0 + a * b + 0 * y) – (a * y + 0 * 0 + x * b)=0
Since A,B and C are collinear points
ab – (ay + bx)=0
ab= ay + bx
ab/ab= ay/ab + bx/ab
1= y/b + x/a or x/a + y/b=1

Q.14 Find k so that the point P(-4,6) lies on the line segment joining A(k,10) and B(3,-8). Also, find the ratio in which P divides AB. (CBSE-2010)

Sol: P, A and B are collinear
(-4 * 10 + k * -8 + 3 * 6) – (6k + 30 – 4 * -8)=0
(-40 _ 8k + 18) – (6k + 30 + 32)=0
-14k – 84=0
Let P divides AB in the ratio X:1
Coordinates are $(\frac{3X-6}{X+1}, \frac{-8X+10}{X+1})$

$\frac{3X-6}{X+1} = -4$ and $\frac{-8X+10}{X+1} = 6$
X=2

Ratio= 2:7

Q.15 Three vertices of a parallelogram ABCD are A(3,-4), B(-1,-3) and C(-6,2). Find the coordinates of vertex D and find the area of the parallelogram ABCD. (CBSE-2013)

Sol: Mid-points of diagonals AC and BD are same as they bisect each other.
$(\frac{x-1}{2}, \frac{y-3}{2}) = (\frac{3-6}{2}, \frac{-4+2}{2})$
$\frac{x-1}{2} = \frac{3}{2}$ and $\frac{y-3}{2} = -1$
x=-2 , y=1
coordinates of D are (-2,1)
Area of parallelogram ABCD= 2(Area of ΔABC)
Area of ΔABC= 1/2 |{3 * (-3) + (-1) * 2 + (-6) * (-4)} - {3 * 2 + (-6) * (-3) + (-1) * (-4)}|
= 15/2 sq. units
Area of parallelogram ABCD= 2 * 15/2= 15 sq. units

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Q.16 If the area of ΔABC formed by A(x,y), B(1,2) and C(2,1) is 6 square units, then prove that x+y=15 or x+y+9=0. (CBSE-2010)

Sol: Area of ΔABC=6
1/2 |(2x + 1+ 2y) – (x + 4 + y)}=6
|x + y – 3|=12
x + y – 3=±12
x + y – 15=0 or x + y + 9=0
x + y=15 or x + y + 9=0

Q.17 Find the area of the quadrilateral, the coordinates of whose vertices are (-3,2), (5,4), (7,-6) and (-5,-4).

Sol: Let A(-3,2), B(5,4), C(7,-6) and D(-5,-4)
Area of ΔABC= 1/2 |(-12 – 30 + 14) – (10 + 28 + 18)| = 42 sq. units
Area of ΔACD= 1/2 |(18 – 28 – 10) – (14 + 30 + 12)| = 38 sq. units
Area of quadrilateral ABCD= (42 + 38)= 80 sq. units

Q.18 If the points A(1,-2), B(2,3), C(-3,2) and D(4,-3) are the vertices of a parallelogram ABCD, then taking AB as the base, find the height of the parallelogram. (CBSE-2013)

Sol: : Let the height be h, BD is the diagonal
Area of ΔABD= 1/2 * b * h
H= 2(Area of ΔABD)/AB
b= $\sqrt{(2-1)^2 + (3+2)^2} = \sqrt{26}$
Area of ΔABD= 1/2 |{1 * 3 + 2 * (-3) + (-4) * (-2)} – { 1 * (-3) + (-4) * 3 + 2 * (-2)}|
=1/2 (5 + 19)= 12 sq. units
h= 2 * 12/ $\sqrt{26}$ = 24/ $\sqrt{26}$ units

Q.19 If the points (p,q), (m,n) and (p – m, q – n) are collinear, show that pn=qm. (CBSE-2010)

Sol: Points are collinear
{p * n + m(q – n) + (p – m)q} – {m * q + (p – m)n + p(q – n)} = 0
(pn + qm – mn + pq – mq) – (mq + pn – mn + pq – pn)=0
(pn + pq – mn) – (mq – mn + pq)=0
pn – mq=0
pn = mq

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Q.20 Find the area of a triangle whose vertices are A(3,2), B(11,8) and C(8,12)

Sol: Area of $\Delta ABC = 1/2\ |\{3(8-12) + 11(12-2) + 8(2-8)\}| = 1/2\ |(-12 + 110 - 48)| = 25$ sq. units