PM SHRI KENDRIYA VIDYALAYA GACHIBOWLI,GPRA CAMPUS,HYD-32
PRACTICE PAPER (2023-24)
CHAPTER 09 STRAIGHT LINES (ANSWERS)

SUBJECT: MATHEMATICS	MAX. MARKS : 40
CLASS : XI	DURATION : 1½ hrs

General Instructions:
(i).   **All** questions are compulsory.
(ii).   This question paper contains **20** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv).   There is no overall choice.
(v).   Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. The equation of line whose intercepts on the axes of x and y are –2 and 3 respectively is
    (a) 3x – 2y = 6 (b) 3x – 2y + 6 = 0   (c) 3x + 2y = 6 (d) 3x + 2y = –6
    Ans: (b) 3x – 2y + 6 = 0
    a = intercepts on x-axis = –2
    b = intercepts on y-axis = 3
    ∴ equation of line is $\frac{x}{a} + \frac{y}{b} = 1 \Rightarrow \frac{x}{-2} + \frac{y}{3} = 1$
    $\Rightarrow$ 3x – 2y = –6

2. The new coordinates of point (3, –5), if origin is shifted to the point (–3, –2) are
    (a) (6, 3) (b) (6, –3) (c) (–6, 3) (d) (–6, –3)
    Ans: (b) (6, –3)
    coordinates of new origin are h = –3 and k = –2 whereas x = 3 and y = –5
    New coordinates of point be X = x – h
    = 3 – (–3) = 6
    Y = y – k
    = –5 – (–2) = –5 + 2 = –3
    new coordinates of point are (6, –3)

3. The angle between the X -axis and the line joining the points (3, − 1) and (4, − 2) is
    (a) 45° (b) 135° (c) 90° (d) 180°
    Ans: (b) 135°

    Slope of line $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 + 1}{4 - 3}$

    $\tan\theta = \frac{-1}{1} \Rightarrow \tan\theta = -1$

    $\Rightarrow \tan\theta = -\tan 45°$ $(\because 1 = \tan 45°)$
    $\Rightarrow \tan\theta = \tan(180° - 45°)$ $[\because \tan(180° - \theta) = -\tan\theta]$
    $\Rightarrow \tan\theta = \tan 135° \Rightarrow \theta = 135°$

4. The value of y will be, so that the line through (3, y) and (2, 7) is parallel to the line through (−1, 4) and (0, 6).
    (a) 7 (b) 8 (c) 9 (d) 10
    Ans: Let A(3, y), B(2, 7), C(−1, 4) and D(0, 6) be the given points.

Then, m_1 = Slope of the line AB = $\dfrac{7-y}{2-3} = y - 7$

and m_2 = Slope of the line CD = $\dfrac{6-4}{0-(-1)} = 2$

Since, AB and CD are parallel.

$\therefore m_1 = m_2 \Rightarrow y - 7 = 2 \Rightarrow y = 9$

5. The equation of the line passing through the point (1, 2) and perpendicular to the line x + y + 1 = 0 is
   (a) y − x + 1 =0 (b) y − x −1 =0 (c) y − x + 2 =0 (d) y − x −2 =0
   Ans: Given point is (1, 2) and slope of the required line is 1.
   $\because$ x + y + 1 = 0 $\Rightarrow$ y = − x −1 $\Rightarrow$ m1 = −1
   $\therefore$ Slope of the line = −1/−1 = 1
   $\therefore$ Equation of required line is y − 2 =1 (x −1)
   $\Rightarrow$ y − 2 = x −1 $\Rightarrow$ y − x −1 = 0

6. The equation of line, which passes through point (4, 3) and parallel to the line 2x − 3y = 7 is
   (a) 2x − 3y + 1 =0 (b) 2x − 3y −1 =0 (c) 2x + 3y + 1 =0 (d) 2x + 3y −1 =0
   Ans: (a) 2x − 3y + 1 =0
   Let the equation of line parallel to the given line is
   2x − 3y = λ …(i) [$\because$ In two parallel lines,m1 m2 =]
   Since, the line (i), passes through the point (4, 3).
   So, this point will satisfy the equation of line.
   $\therefore$ 2 × 4 − 3 × 3 = λ
   $\Rightarrow$ 8 − 9 = λ $\Rightarrow$ λ = −1
   Put the value of l in Eq. (i), we get 2x − 3y = −1
   $\Rightarrow$ 2x − 3y + 1 = 0
   which is the required equation of line.

7. The distance of the point (3, − 5) from the line 3x − 4y − 26 = 0 is
   (a) 3/7   (b) 2/5 (c) 7/5 (d) 3/5
   Ans: (d) 3/5
   Given line is 3x − 4y − 26 = 0 …(i)
   On comparing Eq. (i) with general equation of line Ax + By + C = 0, we get
   A = 3, B = − 4 andC = − 26
   Given point is (x1, y1) = (3, − 5).
   The distance of the given point from given line is
   $$d = \left| \dfrac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}} \right| \Rightarrow d = \left| \dfrac{3 \times 3 + (-4) \times (-5) - 26}{\sqrt{3^2 + (-4)^2}} \right| = \dfrac{3}{5}$$

8. The distance between the parallel lines 3x − 4y + 7 = 0 and 3x − 4y + 5 = 0, is
   (a) 3/7   (b) 2/5 (c) 7/5 (d) 3/5
   Ans: (b) 2/5
   Here, A = 3, B = − 4, C_1 = 7, and C_2 = 5.

   Therefore, the required distance is $d = \left| \dfrac{7-5}{\sqrt{3^2 + (-4)^2}} \right| = \dfrac{2}{5}$

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.
   (a) Both A and R are true and R is the correct explanation of A.
   (b) Both A and R are true but R is not the correct explanation of A.
   (c) A is true but R is false.

(d) A is false but R is true.

9. **Assertion (A):** Slope of line $3x - 4y + 10 = 0$ is 3/4.
Reason (R): x-intercept and y-intercept of $3x - 4y + 10 = 0$ respectively are −10/3 and 5/2.
Ans: (b) Both A and R are true but R is not the correct explanation of A.
Assertion: Given equation $3x - 4y + 10 = 0$
can be written as $y = \dfrac{3}{4}x + \dfrac{5}{2}$ …(i)
Comparing Eq. (i) with y = mx + c, we have
slope of the given line as m = 3/4.
Reason: Equation $3x - 4y + 10 = 0$ can be written as

$3x - 4y = -10 \Rightarrow \dfrac{x}{-\dfrac{10}{3}} + \dfrac{y}{\dfrac{5}{2}} = 1$ …(ii)

Comparing Eq. (ii) with $\dfrac{x}{a} + \dfrac{y}{b} = 1$, we have
x-intercept as a = −10/3
and y-intercept as b = 5/2.
Hence, Assertion and Reason both are true and Reason is not the correct explanation of Assertion.

10. **Assertion (A):** The slope of the line x + 7y = 0 is 1/7 and y-intercept is 0.
Reason (R): The slope of the line $6x + 3y - 5 = 0$ is − 2 and y-intercept is 5/3.
Ans: (d) A is false but R is true.
Assertion: Given equation is x + 7y = 0

$\Rightarrow y = -\dfrac{x}{7} + 0$

On comparing with y = mx + c, we get
Slope (m) = −1/7, y-intercept = 0
Reason: Given equation is $6x + 3y - 5 = 0$

$\Rightarrow y = -2x + \dfrac{5}{3}$

On comparing with y = mx + c, we get
Slope (m) = − 2, y-intercept = 5/3
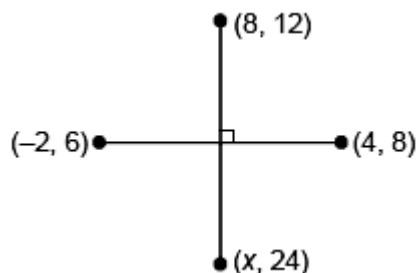Hence, Assertion is false and Reason is true.

SECTION – B
Questions 11 to 14 carry 2 marks each.

11. Line through the points (–2, 6) and (4, 8) is perpendicular to the line through the points (8, 12) and (x, 24), find the value of x.
Ans:

As two lines are perpendicular
∴ product of the slopes of two lines is –1
$\Rightarrow \dfrac{8-6}{4+2} \times \dfrac{24-12}{x-8} = -1$

$$\Rightarrow \frac{2}{6} \times \frac{12}{x-8} = -1 \Rightarrow 4 = 8 - x \Rightarrow x = 4$$

12. Find the equation of the straight line passing through the point (6, 2) and having slope – 3.

Ans: Given, A straight line passing through the point (6, 2) and the slope is – 3

By using the formula, the equation of line is [$y - y_1 = m(x - x_1)$]

Here, the line passes through (6, 2). It is given that the slope of the line, m = –3

Now, substitute the values, and we get y – 2 = – 3(x – 6)

$\Rightarrow$ y – 2 = – 3x + 18 $\Rightarrow$ y + 3x – 20 = 0

∴ *The equation of line is 3x + y – 20 = 0*

13. If the lines $2x + y - 3 = 0$, $5x + ky - 3 = 0$ and $3x - y - 2 = 0$ are concurrent, find the value of *k*.

Ans: Here given lines are

$2x + y - 3 = 0$ ...(*i*)

$5x + ky - 3 = 0$ ...(*ii*)

$3x - y - 2 = 0$ ...(*iii*)

Solving (*i*) and (*iii*), we get, $x = 1$, $y = 1$

Therefore, the point of intersection of two (*i*) and (*iii*) lines is (1, 1). Since above three lines are concurrent, the point (1, 1) will satisfy equation (*ii*)

i.e., $5.1 + k.1 - 3 = 0$ or $k = -2$.

14. Find the equation of lines passing through (1, 2) and making angle 30° with *y*-axis.

Ans: Slope of line = tan (90º – 30º) = $\sqrt{3}$

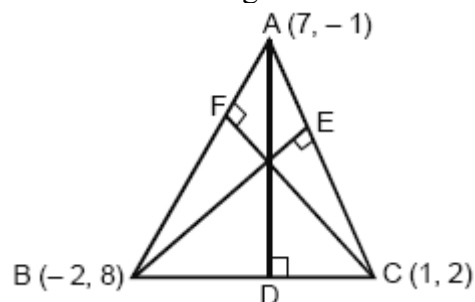∴ Equation of line is y – 2 = $\sqrt{3}$ (x – 1)

$\Rightarrow \sqrt{3} x - y + (2 - \sqrt{3}) = 0$.

SECTION – C
Questions 15 to 17 carry 3 marks each.

15. Find the equations of the altitudes of the triangle whose vertices are A(7, –1), B(–2, 8) and C (1, 2).

Ans: Let AD, BE and CF be three altitudes of triangle ABC.

Let m_1, m_2 and m_3 be the slopes of AD, BE and CF respectively. Then

AD $\perp$ BC $\Rightarrow$ Slope of AD × Slope of BC = –1

$$\Rightarrow m_1 \times \left(\frac{2-8}{1+2}\right) = -1 \Rightarrow m_2 = \frac{1}{2}$$

BE $\perp$ AC $\Rightarrow$ Slope of BE × Slope of AC = –1

$$\Rightarrow m_2 \times \left(\frac{-1-2}{7-1}\right) = -1 \Rightarrow m_2 = 2$$

and CF $\perp$ AB $\Rightarrow$ Slope of CF × Slope of AB = –1

$$\Rightarrow m_3 \times \left(\frac{-1-8}{7+2}\right) = -1 \Rightarrow m_3 = 1$$

Since AD passes through A(7, – 1) and has slope $m_1 = \frac{1}{2}$. So its equation is

$y + 1 = \dfrac{1}{2}(x - 7) \Rightarrow x - 2y - 9 = 0$

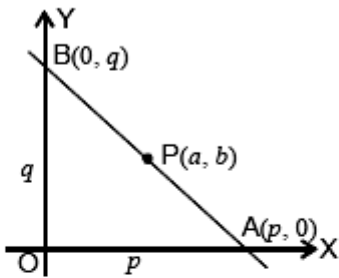Similarly equation of BE is $(y - 8) = 2(x + 2) \Rightarrow 2x - y + 12 = 0$

Equation of CF is $y - 2 = 1\ (x - 1) \Rightarrow x - y + 1 = 0$

16. If P (a, b) is the mid-point of a line segment between axes. Show that equation of the line is $\dfrac{x}{a} + \dfrac{y}{b} = 2$.

Ans:

Let line be $\dfrac{x}{p} + \dfrac{y}{q} = 1$ \qquad\qquad ...(i)

Then coordinates of A and B are $(p, 0)$ and $(0, q)$

$\therefore\ \dfrac{p + 0}{2} = a$ and $\dfrac{0 + q}{2} = b$
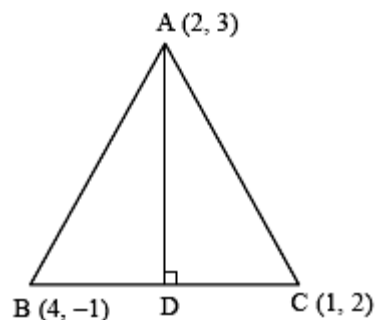
$\Rightarrow p = 2a$ and $q = 2b$

Substituting in (i), we get

$\dfrac{x}{2a} + \dfrac{y}{2b} = 1$

$\Rightarrow\ \dfrac{x}{a} + \dfrac{y}{b} = 2$ is the required equation.

17. The vertices of the triangle are A(2, 3), B(4, –1) and C(1, 2). Find the length and equation of the perpendicular drawn from the point A on side BC.

Ans: Vertices of a triangle are A(2, 3), B(4, – 1) and C(1, 2).

Equation of BC is

$y + 1 = \dfrac{2 + 1}{1 - 4}(x - 4) \Rightarrow x + y - 3 = 0$ \qquad\qquad ...(i)

Length of AD $= \left| \dfrac{2 + 3 - 3}{\sqrt{1 + 1}} \right| = \left| \dfrac{2}{\sqrt{2}} \right| = \sqrt{2}$

Slope of BC $= -1$ \qquad [From (i)]

As AD is perpendicular to BC

∴ Slope of AD = 1

∴ Equation of AD is, $y - 3 = 1(x - 2)$

$\Rightarrow y - 3 = x - 2 \Rightarrow x - y + 1 = 0$

SECTION – D
Questions 18 carry 5 marks.

18. Find the equations of the lines which pass through the point (4, 5) and make equal angles with the lines $5x - 12y + 6 = 0$ and $3x = 4y + 7$.

Ans: Equations of a line through (4, 5) is

$y - 5 = m (x - 4)$ ... (*i*)

Line (*i*) makes equal angles with the lines

$5x - 12y + 6 = 0$ and $3x - 4y - 7 = 0$

$$\left| \frac{m - \frac{5}{12}}{1 + \frac{5}{12}m} \right| = \left| \frac{m - \frac{3}{4}}{1 + \frac{3}{4}m} \right| \Rightarrow \frac{12m - 5}{12 + 5m} = \pm \frac{4m - 3}{4 + 3m} \qquad ...(ii)$$

Consider + sign from (*ii*), we get

$48m - 20 + 36m^2 - 15m = 48m - 36 + 20m^2 - 15m$

$\Rightarrow 16m^2 = -16 \Rightarrow m^2 = -1$, not possible.

Consider – sign from (*ii*), we get

$48m - 20 + 36m^2 - 15m = -48m + 36 - 20m^2 + 15m$

$\Rightarrow 56m^2 + 66m - 56 = 0$

$\Rightarrow 28m^2 + 33m - 28 = 0$

$\Rightarrow 28m^2 + 49m - 16m - 28 = 0$

$\Rightarrow 7m (4m + 7) - 4 (4m + 7) = 0$

$\Rightarrow (7m - 4) (4m + 7) = 0$

$\Rightarrow 7m - 4 = 0; 4m + 7 = 0 \Rightarrow m = \frac{4}{7}, \frac{-7}{4}$

–Substituting in (*i*), we get For $m = \frac{4}{7}$ and For $m = \frac{-7}{4}$

$y - 5 = \frac{4}{7} (x - 4)$ and $y - 5 = \frac{-7}{4} (x - 4)$

i.e. $7y - 35 = 4x - 16$ and $4y - 20 = -7x + 28$

i.e. $4x - 7y + 19 = 0$ and $7x + 4y - 48 = 0$

SECTION – E (Case Study Based Questions)
Questions 19 to 20 carry 4 marks each.

19. One triangular shaped pond is there in a park. Three friends Rani, Mansi, Sneha are sitting at the corners of the triangular park. They are studying in Class XI in an International.

Rani marked her position as (2, –2), Mansi marked as (1, 1) and Sneha marked her position as (–1, 0) as shown in figure given below.
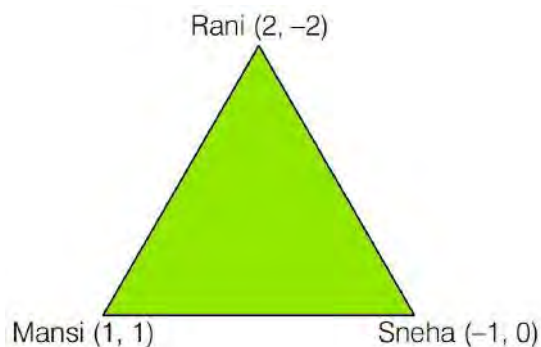
Based on the above information answer the following questions.
(i) Find the equation of lines formed by Rani and Mansi. (1)
(ii) Find the Slope of equation of line formed by Rani and Sneha. (1)
(iii) Find the equation of median of lines through Rani. (1)
(iv) Find the equation of altitude through Mansi. (1)

Ans: (i) The equation of line AB is $y - 1 = \dfrac{-2-1}{2-1}(x-1)$ $\left[\because y - y_1 = \dfrac{y_2 - y_1}{x_2 - x_1}(x - x_1)\right]$

$\Rightarrow y - 1 = -3x + 3 \Rightarrow 3x + y = 4$
(ii) Slope of equation of line AC is
(iii) Let D be the mid-point of BC.

Coordinates of D are $\left(\dfrac{1-1}{2}, \dfrac{0+1}{2}\right) = \left(0, \dfrac{1}{2}\right)$

$\therefore$ Equation of AD is $y + 2 = \dfrac{\dfrac{1}{2}+2}{0-2}(x-2) \Rightarrow y + 2 = \dfrac{-5}{4}(x-2)$

$\Rightarrow 4y + 8 = -5x + 10$
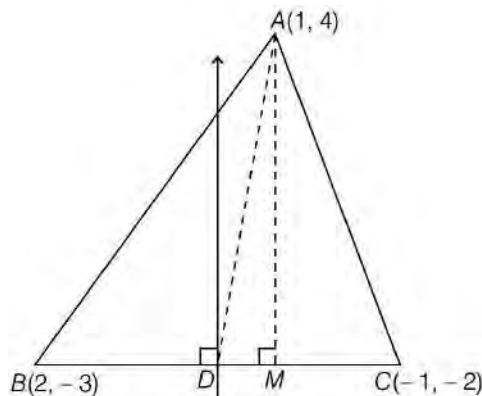$\Rightarrow 5x + 4y = 2$
(iv) Slope of AC = $-2/3$
$\therefore$ Slope of BE = $3/2$ [$\because$ BE $\perp$ AC]

Equation of altitude through B is $y - 1 = \dfrac{3}{2}(x-1) \Rightarrow 3x - 2y = 1$

20. One day the mathematics teacher drew a triangle $\triangle ABC$ while revising straight lines. He marked vertices A(1, 4), B (2, − 3) and C(− 1, − 2) as shown in the given below figure. AD is the median and AM is the altitude through A.

Based on the above information answer the following questions.
(i) Find the slope of BC. (1)
(ii) Find the equation of median through A. (1)
(iii) Find the equation of the altitude through A. (1)
(iv) Find the equation of right bisector of side BC. (1)
Ans:

(i) Slope of BC = $\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{-2-(-3)}{-1-2} = \dfrac{-2+3}{-3} = -\dfrac{1}{3}$

(ii) Since D is the mid-point of BC.

$\therefore$ Coordinates of D are $\left(\dfrac{2-1}{2}, \dfrac{-3-2}{2}\right) = \left(\dfrac{1}{2}, -\dfrac{5}{2}\right)$

$\therefore$ Slope of AD = $\dfrac{-\dfrac{5}{2}-4}{\dfrac{1}{2}-1} = \dfrac{-\dfrac{13}{2}}{-\dfrac{1}{2}} = 13$

∴ Equation of the median AD is $y - 4 = 13(x - 1)$

$\Rightarrow 13x - y - 9 = 0$

(iii) Since AM is the altitude through A.

∴ Slope of AM $= -1/$slope of BC $= 3$

∴ Equation of the altitude through A is given by $y - 4 = 3(x - 1)$

$\Rightarrow y - 4 = 3x - 3 \Rightarrow 3x - y + 1 = 0$

(iv) Equation of the right bisector of BC is a line which passes through D and having slope is 3.

$$\therefore y - \left(-\frac{5}{2}\right) = 3\left(x - \frac{1}{2}\right) \Rightarrow y + \frac{5}{2} = 3x - \frac{3}{2}$$

$\Rightarrow 3x - y - 4 = 0$