Unit 11 · Straight Line

WORKSHEET

Full marks 40

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 40

1 Key words [3]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

bisector	foot	hypotenuse	origin	parallel	perpendicular	same	same side

The distance from a point to a line is the length of the _____ from the point, the shortest path to the line; it meets the line at its _____. Two points are on the _____ of a line when $ax_1 + by_1 + c$ has the same sign at both. A point equally far from two crossing lines lies on a _____ of the angles between them. With $c_1, c_2 > 0$, the + sign in the bisectors' equation gives the bisector of the angle containing the _____. Before using $\frac{|c_1 - c_2|}{\sqrt{a^2 + b^2}}$ for two parallel lines, make their coefficients of x and y the _____.

2 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Correct the false ones.

i. The distance between $3x + 4y - 7 = 0$ and $6x + 8y + 11 = 0$ is $\frac{5}{2}$. ☐

ii. The distance from $(1, 1)$ to $3x - 4y + 5 = 0$ is $\frac{3 - 4 + 5}{3^2 + 4^2} = \frac{4}{25}$. ☐

iii. $(2, 1)$ and $(-1, -1)$ are on opposite sides of $x + y - 1 = 0$. ☐

iv. With $c_1, c_2 > 0$, the + sign always gives the bisector of the acute angle. ☐

v. The points equally far from $x + 2y - 4 = 0$ and $x + 2y + 6 = 0$ lie on $x + 2y + 1 = 0$. ☐

vi. $(3, 4)$ is on the origin's side of $2x + y - 8 = 0$. ☐

3 Multiple choice [6]

Choose the correct option for each of the following questions.

i. The length of the perpendicular from (x_1, y_1) to $ax + by + c = 0$ is: [1]

a. $\frac{ax_1 + by_1 + c}{a^2 + b^2}$

b. $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

c. $\frac{|ax_1 + by_1 + c|}{|a| + |b|}$

d. $\sqrt{x_1^2 + y_1^2}$

ii. The two bisectors of the angles between two intersecting lines are: [1]

a. parallel

b. perpendicular to each other

c. at 60° to each other

d. the same line

iii. The distance between the lines $3x + 4y - 5 = 0$ and $6x + 8y + 5 = 0$ is: [1]

a. 1 **b.** $\frac{3}{2}$

c. 2 **d.** 0

iv. If p is the length of the perpendicular from the origin to $\frac{x}{a} + \frac{y}{b} = 1$, then: [1]

a. $p^2 = a^2 + b^2$

b. $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

c. $p = \frac{ab}{a+b}$

d. $\frac{1}{p} = \frac{1}{a} + \frac{1}{b}$

v. The point $(1, k)$ is 2 units from $3x - 4y + 1 = 0$. Then k is: [1]

a. $\frac{3}{2}$ or $-\frac{7}{2}$ **b.** $-\frac{3}{2}$ or $\frac{7}{2}$

c. $\frac{7}{2}$ only **d.** $-\frac{3}{2}$ only

vi. The line $y = 2x + c$ is equally far from $(0, 0)$ and $(2, 0)$. Then c is: [1]

a. -2 **b.** 2

c. -4 **d.** 0

4 Short answers [11]

Write short answers to the following questions.

a. Find the length of the perpendicular from $(2, -3)$ to $5x - 12y + 6 = 0$. [2]

b. Sandesh found the distance between $2x + y - 3 = 0$ and $4x + 2y + 4 = 0$ as $\frac{|-3-4|}{\sqrt{16+4}} = \frac{7}{\sqrt{20}}$. [2]

Find his mistake and the right distance.

c. Find the points on the X-axis whose perpendicular distance from the line $\frac{x}{3} + \frac{y}{4} = 1$ is 4 units. [2]

d. Find the equations of the lines parallel to $3x - 4y + 5 = 0$ whose distance from $(1, 1)$ is 2 units. **[3]**

e. N is the foot of the perpendicular from P to a line, and Q is any other point of the line. Explain why PN is shorter than PQ. **[2]**

5 Structured question **[5]**

Answer all the parts.

The lines are $4x + 3y - 7 = 0$ and $24x + 7y - 31 = 0$.

a. Find the equations of the bisectors of the angles between them. [2]

b. Which bisector bisects the acute angle? [2]

c. Which bisects the angle containing the origin? [1]

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6 Long question [8]

Write a long answer to the following question.

A triangle has its sides on $x = 0$, $y = 0$ and $12x + 5y = 120$.

a. Find the length of the perpendicular from the origin to the third side. [2]

b. Find the bisector of the angle of the triangle at $A(10, 0)$. [3]

c. Show that the bisectors of its three angles meet at one point, and find that point and its distance from each side. [3]

7 Think [4]

Find every point that is equally far from the three lines $x = 0$, $y = 0$ and $x + y = 2$. Which of them lies inside the triangle the three lines make?

8 Activity: Measure, then compute

(not marked)

On graph paper (1 cm a unit), draw the line $3x + 4y = 12$ and mark the four points in the table. For each, measure the perpendicular to the line with a ruler and a set square, then work it out with the formula.

Point	$3x + 4y - 12$	Side (same as the origin or not)	Distance by the formula	Distance measured
$(0, 0)$				
$(4, 3)$				
$(1, 1)$				
$(6, -1)$				

Which two points are the same distance from the line? Are they on the same side?