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VCE Mathematical Methods ½
Linear & Coordinate Geometry [1.1]
Homework

Homework Outline:

Compulsory Knowledge	Pg 2 – Pg 16
Extension Work	Pg 17 – Pg 29

Section A: Compulsory Questions

Sub-Section: Solve and Graph Linear Equations and Inequalities

Question 1

Solve the following linear equations and inequalities for x.

a. $3x + 2 = 20$

b. $2x + 6 = 3(x - 4)$

c. $5x + 2 < 4x + 7$

Question 2

Solve the following linear equations and inequalities for x.

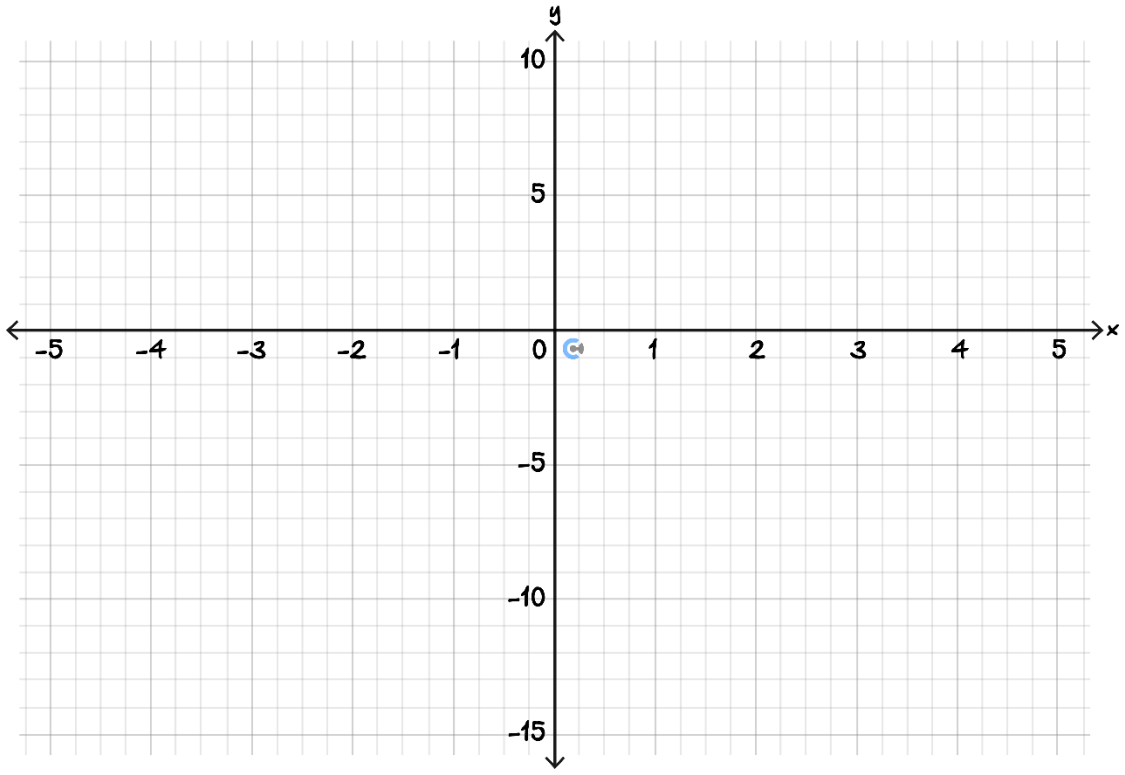
a. $3x + 2 = 9x + 3$

b. $\frac{2x+3}{3} > 3(x-4)$

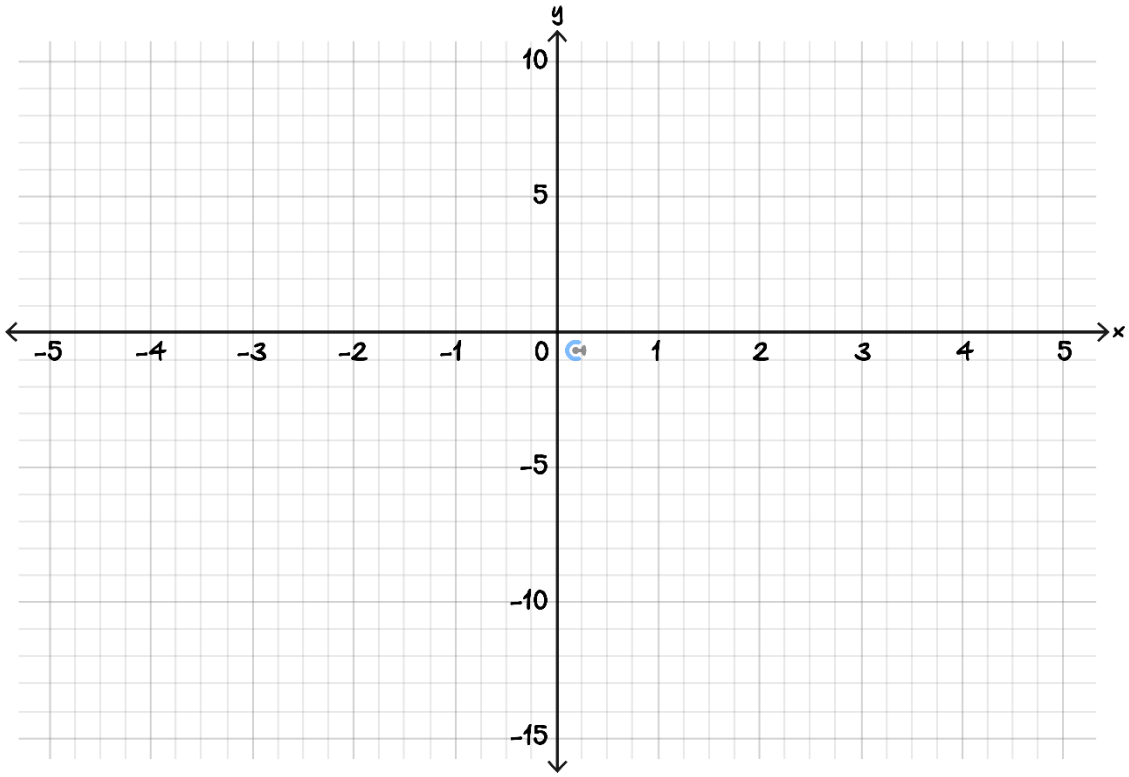
c. $\frac{5x+3}{4} \leq 8x+7$

Question 3

a. Sketch the line governed by the equation $2y - 4x = -6$ on the axis below. Label all axes intercepts.



b. Shade the region governed by the equation $2y - 4x < -6$ on the axis below.



Question 4 Tech-Active.

Solve the inequality $\frac{1}{4}(5x - 3) \geq 2x + 8$ for x.

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Sub-Section: Find the midpoint and distance between two points or functions

Question 5

a. Find the midpoint of $(1, -3)$ and $(5, -9)$.

b. The points (a, b) and $(1,3)$ have a midpoint $(2, 4)$. Find the values of a and b.

Question 6

a. Find the distance between points $(2, 3)$ and $(5, 2)$.

b. The curve $y = (x - 1)^2 + k$ and the line $y = 1$ has a minimum vertical distance of 5. Find the value of k.

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Question 7

The distance between the point $(1, 1)$ and a point P on the line $y = 2x + 1$ is 5 units. Find all possible coordinates for P.

Question 8 Tech-Active.

The distance between the point $(1, 2)$ and a point P on the line $y = x - 1$ is 5 units. Find all possible coordinates for P.

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Sub-Section: Find parallel and Perpendicular Lines

Question 9

State whether the following lines are parallel or perpendicular.

a. $y = 2x + 1$ and $y = 2x + 3$

b. $y = 3x + 3$ and $y = -\frac{1}{3}x + 2$

Question 10

Find the equation of the line that is parallel to the line $y = 2x + 1$ and passes through the point (2,3).

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Question 11

Find the equation of the line that is perpendicular to $y = 3x + 6$ and passes through the point $(3,2)$.

Question 12 Tech-Active.

Find the equation of the line that is perpendicular to $y = 2x + 1$ and passes through the point $(1,2)$.

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Sub-Section: Finding the angle between a line and the x-axis or between two lines

Question 13

Find the angle that $y = x + 1$ makes with the positive direction of the x-axis.

Question 14

A line that makes an angle $60°$ with the positive x-axis passes through the point $(1,1)$. Find the equation of the line.

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Question 15

It is known that the lines $y = mx + 1$ and $y = 3x - 1$ make an angle of 45° when they intersect. Find all possible values of m.

Question 16 Tech-Active.

Find the acute angle made between the lines $y = 2x + 1$ and $y = x - 1$. Give your answer in degrees correct to two decimal places.

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Sub-Section: Find the unknown value for a system of linear equations

Question 17

Consider the simultaneous linear equations

$$y = 2kx + k$$

$$y = 2x + 3$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 18

Consider the simultaneous linear equations

$$-2x - ky = -4$$

$$(k-1)x + 6y = 2(k-1)$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no real solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 19

Consider the simultaneous linear equations

$$kx + 3y = 6$$

$$x + (7 - 2k)y = 2$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no real solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 20 Tech-Active.

Consider the simultaneous linear equations

$$kx + 2y = 6$$

$$2x + (k-1)y = 3$$

where $x, y \in R$ and k is a real constant.

Find the value(s) of k for which the system has no real solution.

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Sub-Section: Final Boss

Question 21

Consider the points $A(1,2)$ and $B(3,6)$.

a. Find the equation of the line segment AB.

b. There is another point C such that A is the midpoint of the line segment CB.

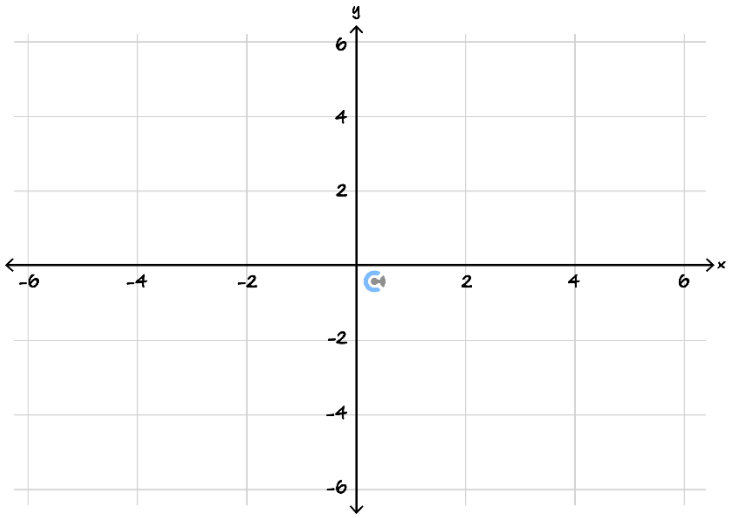
i. Find the coordinates of C.

ii. Find the length of CB.

c. Find the equation of the perpendicular bisector of the line segment CB.

d. Hence, find the minimum distance between the line segment CB and the line $y = 2x - 4$.

e. Sketch the line segment BC, the line $y = 2x - 4$ and the perpendicular bisector of BC on the axes below. Label the points A, B and C



f. It is known that the lines $y = mx + 1$ and $y = 2x - 4$ make an angle of $45°$ when they intersect. Find all possible values of m.

Section B: Supplementary Questions

Sub-Section: Solve and Graph Linear Equations and Inequalities

Question 22

Solve the following linear equations and inequalities for x.

a. $3x + 8 = 20$

b. $2x + 6 = 3(x - 2)$

c. $5x + 2 < 4x + 10$

Question 23

Solve the following linear equations and inequalities for x.

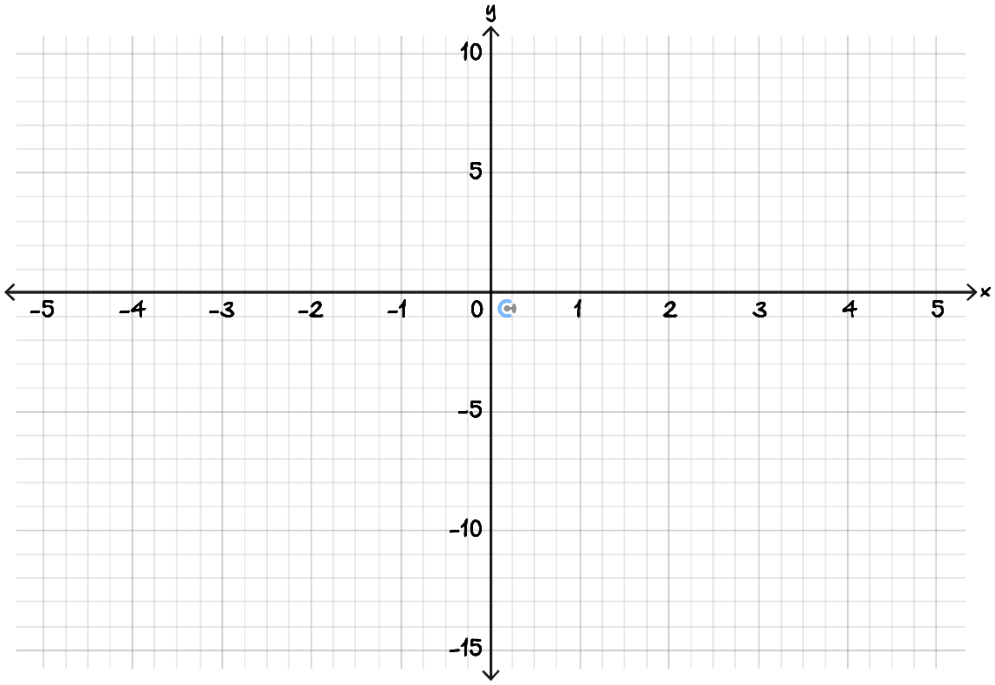
a. $3x + 2 = 12x + 3$

b. $\frac{2x+3}{3} > 3(x-5)$

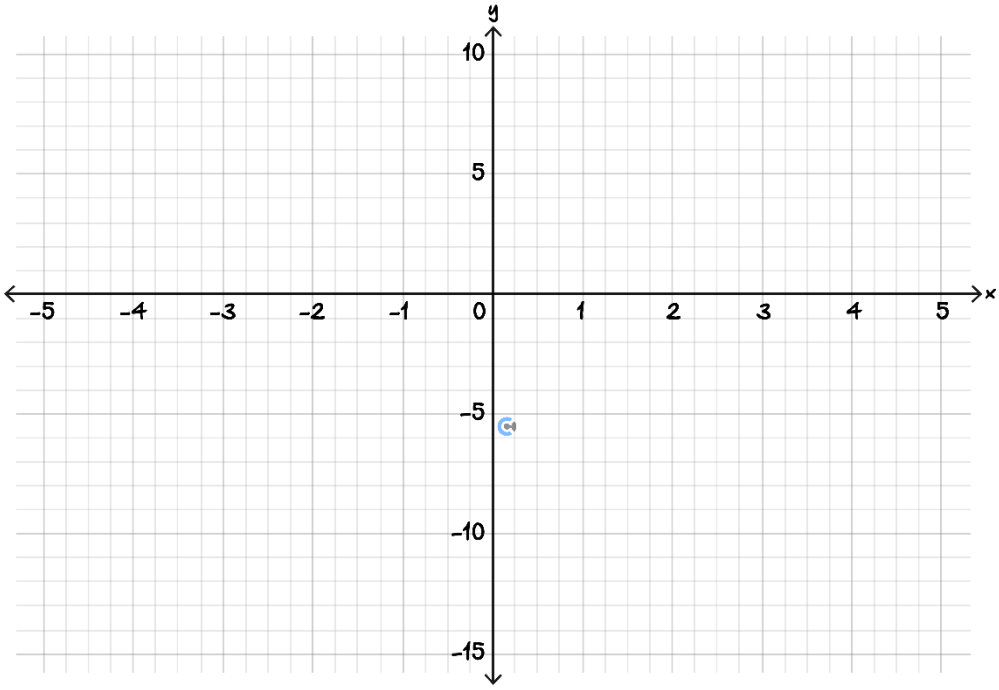
c. $\frac{5x+3}{4} \leq 10x+8$

Question 24

a. Sketch the line governed by the equation $2y-4x=-8$ on the axis below. Label all axes intercepts.



b. Shade the region governed by the equation $2y - 4x > -8$ on the axis below



Question 25

Solve the inequality $\frac{1}{4}(5x - 3) \geq 2x + 8$ for x.

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Sub-Section: Find the midpoint and distance between two points or functions

Question 26

a. Find the midpoint of $(1, -3)$ and $(6, -10)$.

b. The points (a, b) and $(3,4)$ have a midpoint $(2, 3)$. Find the values of a and b.

Question 27

a. Find the distance between points $(2, 5)$ and $(5, 2)$.

b. The curve $y = (x - 1)^2 + k$ and the line $y = 3$ has a minimum vertical distance of 4. Find the value of k.

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Question 28

The distance between the point (2,2) and a point P on the line $y = 2x + 2$ is 4 units. Find all possible coordinates for P.

Question 29

The distance between the point $(1, 2)$ and a point P on the line $y = 3x - 1$ is 4 units. Find all possible coordinates for P.

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Sub-Section: Find parallel and Perpendicular Lines

Question 30

State whether the following lines are parallel or perpendicular.

a. $y = 3x + 1$ and $y = 3x + 3$

b. $y = 2x + 3$ and $y = -\frac{1}{2}x + 2$

Question 31

Find the equation of the line that is parallel to the line $y = 2x + 1$ and passes through the point (5,2).

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Question 32

Find the equation of the line that is perpendicular to $y = 3x + 6$ and passes through the point $(6,3)$.

Question 33

Find the equation of the line that is perpendicular to $y = \sqrt{3}x + 1$ and passes through the point $(2,4)$.

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Sub-Section: Finding the angle between a line and the x-axis or between two lines

Question 34

Find the angle that $y = -x + 1$ makes with the positive direction of the x-axis.

Question 35

A line that makes an angle $30°$ with the positive x-axis passes through the point $(1,1)$. Find the equation of the line.

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Question 36

It is known that the lines $y = mx + 3$ and $y = 4x - 2$ make an angle of 45° when they intersect. Find all possible values of m.

Question 37

Find the acute angle made between the lines $y = \sqrt{3}x + 1$ and $y = \frac{x}{\sqrt{3}} - 1$. Give your answer in degrees correct to two decimal places.

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Sub-Section: Find the unknown value for a system of linear equations

Question 38

Consider the simultaneous linear equations

$$y = kx + 6$$

$$y = 2x + 5$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 39

Consider the simultaneous linear equations

$$-3kx + y = k$$

$$-3x + ky = -1$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no real solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 40

Consider the simultaneous linear equations

$$kx + y = 2$$

$$2x + (k-2)y = 4$$

where $x, y \in R$ and k is a real constant.

a. Find the value(s) of k for which the system of equations has no real solution.

b. Find the value(s) of k for which the system of equations has infinitely many solutions.

c. Find the value(s) of k for which the system of equations has a unique solution.

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Question 41

Consider the simultaneous linear equations

$$(k - 2)x + 3y = 5$$

$$4x + (k + 1)y = k + 7$$

where $x, y \in R$ and k is a real constant.

Find the value(s) of k for which the system has no real solution.

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