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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	STRAIGHT LINE
PAPER TYPE:	SOLUTION - 6
TOTAL QUESTIONS	8
TOTAL MARKS	42

Q1.

To determine if two lines are parallel, perpendicular or neither, we can compare their slopes.

The equation of line $l1$ is given as 4y - 3x = 10. To find the slope of $l1$, we can rearrange the equation into slope-intercept form (y = mx + b), where m is the slope:

4y - 3x = 10

4y = 3x + 10

y = (3/4)x + 10/4

Thus, the slope of $l1$ is 3/4.

To find the slope of $l2$ using the given points (5, -1) and (-1, 8), we can use the slope formula:

m = (y2 - y1) / (x2 - x1)

For $l2$:

m = (8 - (-1)) / (-1 - 5)

m = 9 / (-6)

m = -3/2

Now, we can compare the slopes:

If the slopes are equal, the lines are parallel.

If the slopes are negative reciprocals, the lines are perpendicular.

In this case, the slopes of $l1$ and $l2$ are not equal, nor are they negative reciprocals of each other. Therefore, lines $l1$ and $l2$ are neither parallel nor perpendicular.

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Q2.

Consider two lines, $l3$ and $l4$, and determine whether they are parallel, perpendicular, or neither.

Line $l3$:

The equation of $l3$ is 2y+5x=8. Rewrite it in slope-intercept form:

2y=-5x+8

y=-5/2x+4

So, the slope of $l3$ is -5/2.

Line $l4$

The points A(3,-2) and B(1,6) lie on $l4$. The slope of $l4$ can be calculated as follows:

m=(y2-y1)/(x2-x1)

m=(6-(-2))/(1-3)

m=8/-2

m=-4

Comparison:

Now, compare the slopes:

If the slopes are equal, the lines are parallel.

If the slopes are negative reciprocals of each other, the lines are perpendicular.

In this case, -5/2 (slope of 3l) and -4 (slope of $l4$) are not equal, and they are not negative reciprocals of each other. Therefore, lines 3l and 4l are neither parallel nor perpendicular.

Q3.

Consider two lines, 5l and 6l, and determine whether they are parallel, perpendicular, or neither.

Line 5l:

The equation of 5l is 3x+2y=6. To rewrite it in slope-intercept form, we solve for y:

3x+2y=6

2y=-3x+6

y=-3/2x+3

Thus, the slope of 5l is -3/2.

Line 6l:

The points (2,4) and (5,-1) lie on 6l. The slope of 6l can be calculated as follows:

m=(y2-y1)/(x2-x1)

m=(-1-4)/(5-2)

m=-5/3

Comparison:

If the slopes are equal, the lines are parallel. If the slopes are negative reciprocals of each other, the lines are perpendicular.

In this case, the slope of 5l is -3/2 and the slope of 6l is -5/3. These slopes are not equal and they are not negative reciprocals of each other. Therefore, lines 5l and 6l are neither parallel nor perpendicular.

Q4.

Consider two lines, line $l7$ and line $l8$, and determine whether they are parallel, perpendicular, or neither.

Line $l8$:

The equation of line $l7$ is y = 2x + 3. This equation is already in slope-intercept form, where the slope (m) is 2.

Line $l8$:

The points (-1,1) and (3,7) lie on line $l8$. The slope of line $l8$ can be calculated as follows:

m = (y2 - y1) / (x2 - x1)

m = (7 - 1) / (3 - (-1))

m = 6 / 4

m = 3 / 2

Comparison:

Now, compare the slopes:

If the slopes are equal, the lines are parallel.

If the slopes are negative reciprocals of each other, the lines are perpendicular.

In this case, the slope of line $l7$is 2 and the slope of line $l8$ is 3/2. They are not equal, and they are not negative reciprocals of each other. Therefore, lines $l7$ and $l8$ are neither parallel nor perpendicular.

Q5.

Consider two lines, $l9$ and $l10$, and determine whether they are parallel, perpendicular, or neither.

Line $l9$:

The equation of $l9$ is $2x-5y=3$. Rewrite it in slope-intercept form:

$2x-5y=3$

$-5y=-2x+3$

$y=25x-53$

So, the slope of $l9$ is 25/52.

Line $l10$:

The points (4,−1) and (1,6) lie on $l10$. The slope of $l10$ can be calculated as follows:

m=(y2-y1)/(x2-x1)

m=(6-(-1))/(1-4)=-7/3

Comparison:

Now, compare the slopes:

If the slopes are equal, the lines are parallel.

If the slopes are negative reciprocals of each other, the lines are perpendicular.

In this case, 25/52 (slope of 9l) and -7/3 (slope of $l10$) are not equal, and they are not negative reciprocals of each other. Therefore, lines $l9$ and $l10$ are neither parallel nor perpendicular.

Q6.

(a)

To find the value of 'm' for which line '1' and line '2' are perpendicular, we can use the fact that the product of the slopes of two perpendicular lines is -1.

The equation of line ′1′ is given as 2x + 4y - 3 = 0, and the equation of line 'l2' is y = mx + 7.

Let's compare the slopes of line '1' and line '2':

For 'l1', we rearrange the equation to get it in the form y = mx + c, where 'm' is the slope:

2x + 4y - 3 = 0

4y = -2x + 3

$y = -1/2x + 3/4$

Now, we compare this with the equation for 'l2', $y = mx + 7$. We get the slope of line '1' as -1/2, so for line '2', the pitch 'm' must be the negative reciprocal of -1/2, which is 2.

So, $m = 2$.

(b)

we find the point of intersection 'P' by solving the system of equations formed by line '1' and line '2':

$2x + 4y - 3 = 0$

$y = 2x + 7$

We substitute the expression for 'y' from the second equation into the first:

$2x + 4(2x + 7) - 3 = 0$

Now, we solve for 'x':

$2x + 8x + 28 - 3 = 0$

$10x + 25 = 0$

$10x = -25$

$x = -5/2$

So, the x-coordinate of point 'P' is -5/2.

Q7.

To calculate the slope (m), we use the formula:

$m = (y2 - y1) / (x2 - x1)$

For the two given points, C (2, 5) and D (6, -1), we can substitute the values to get:

$m = (-1 - 5) / (6 - 2) = -6 / 4 = -3 / 2$

Next, we use point-slope form to derive the equation of the line.

Let's use point C (2, 5) for this:

$(y - y1) = m(x - x1)$

Substituting the values, we get:

$(y - 5) = (-3 / 2) (x - 2)$

Simplifying the equation:

$2y - 10 = -3x + 6$

$3x + 2y = 16$

Therefore, the equation of the line passing through points

C(2, 5) and D(6, -1) is $3x + 2y = 16$.

Q8.

To find the slope (m), we use the formula:

$m = (y2 - y1) / (x2 - x1)$

Substituting the values of the given points I(1,4) and J(2,6), we get:

$m = (6 - 4) / (2 - 1) = 2$

Using point-slope form with point I(1,4), we get:

$(y - y1) = m(x - x1)$

Substituting the value of m and the coordinates of point I(1,4), we get:

$(y - 4) = 2(x - 1)$

Simplifying further, we get:

$y = 2x + 2$

Therefore, the equation of the line passing through points I(1,4) and J(2,6) is

$y = 2x + 2$.

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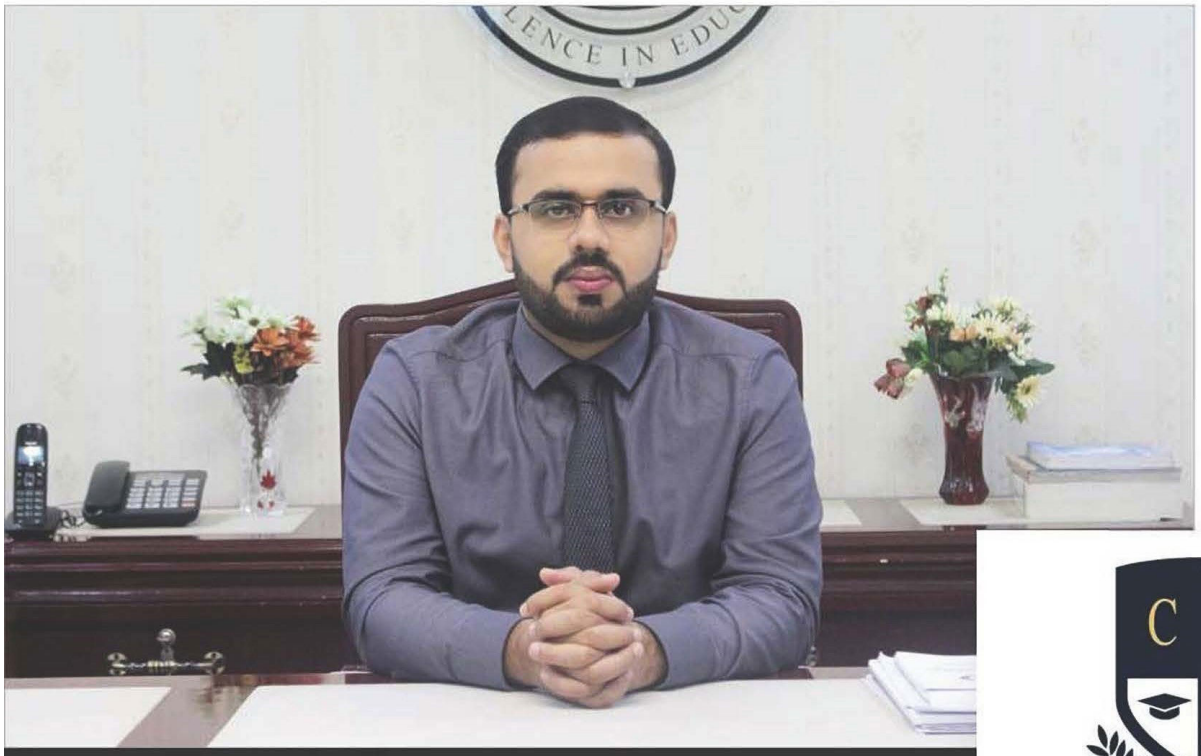

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