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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	STRAIGHT LINE
PAPER TYPE:	SOLUTION - 3
TOTAL QUESTIONS	8
TOTAL MARKS	45

Q1.

To calculate the slope (m) between two points

($x_1=2$, $y_1=5$) and ($x_2=5$, $y_2=-3$), we use the formula:

$m = (y_2 - y_1) / (x_2 - x_1)$

$m = (-3 - 5) / (5 - 2) = -8 / 3$

Next, we can use the point-slope form of the equation to find the equation of the line passing through the two points. For example, using point G(2,5), we can write:

$y - 5 = (-8 / 3) (x - 2)$

Simplifying this equation, we get:

$y - 5 = (-8 / 3) x + (16 / 3)$

Finally, we can write the equation in slope-intercept form, $y = mx + b$, where m is the slope and b is the y-intercept. For our example, the equation of the line passing through G(2,5) and H(5,-3) is:

$y = (-8 / 3) x + (31 / 3)$

Q2.

To find the slope (m) between two points - point E (-1, 3) and point F (5, 7), we use the following formula:

$m = (y_2 - y_1) / (x_2 - x_1)$

Substituting the values for x and y, we get:

$m = (7 - 3) / (5 - (-1))$

$m = 4 / 6$

$m = 2/3$

Now, we use the point-slope form with one of the points,

let's use point E (-1, 3):

y - y1 = m(x - x1)

Substituting the values, we get:

y - 3 = (2/3)(x - (-1))

Distributing the fraction, we get:

y - 3 = (2/3)x + (2/3)

Isolating y, we get:

y = (2/3)x + (11/3)

Therefore, the equation of the line passing through the points E(-1, 3) and F(5, 7) is y = (2/3)x + (11/3).

Q3.

(a)

Finding the value of "n"

We can find the slope of line 3 (l3) by looking at the coefficient of "x" in the equation when it's in the form y=mx+c. Let's rearrange the equation for line 3 to find its slope:

3x − 2y + 5 = 0

-2y = -3x - 5

y = 3/2x + 5/2

Now, let's compare this with the equation for line 4 (l4), y = nx - 2. The slope of line 3 is 3/2, so for line 4, the slope "n" must be the negative reciprocal of 3/2, which is -2/3. Therefore, n = -2/3.

(b)

Finding the x-coordinate of point "Q"

Let's find the point of intersection Q by solving the system of equations formed by lines 3 and 4:

$3x - 2y + 5 = 0$

$y = -2/3x + 2$

Substitute the expression for y from the second equation into the first:

$3x - 2(-2/3x + 2) + 5 = 0$

Now, solve for x:

$3x + (4/3)x + 13/3 = 0$

$13x = -13$

$x = -1$

So, the x-coordinate of point Q is -1.

Q4.

(a)

Finding the value of "p"

To find the slope of "5l5", we can rearrange the equation to the form y=mx+c where "m" is the coefficient of "x". Thus, for the equation of "5l5":

$4x + 3y - 6 = 0$

$3y = -4x + 6$

$y = (-4/3)x + 2$

Now, we can compare this with the equation for "6l6", which is y = px + 2. We know that the slope of "5l5" is -4/3, so the slope of "6l6" must be the negative reciprocal of -4/3, which is 3/4. Therefore, p = 3/4.

(b)

Finding the x-coordinate of point "R"

To find the point of intersection "R", we can solve the system of equations formed by "5l5" and "6l6":

$4x + 3y - 6 = 0$

$y = (3/4)x + 2$

Substitute the expression for "y" from the second equation into the first:

$4x + 3((3/4)x + 2) - 6 = 0$

Now, solve for "x":

$4x + (9/4)x + 6 - 6 = 0$

$(16/4)x + (9/4)x = 0$

$25/4\ x = 0$

$x = 0$

Thus, the x-coordinate of point "R" is 0.

Q5.

To find the equation of the line passing through two points, (x1, y1) and (x2, y2), you can use the point-slope form of the equation of a line: $y - y1 = m(x - x1)$, where m is the slope of the line.

First, let's find the slope (m) using the coordinates of points A(3, 1) and B(4, -2):

$m = (y2 - y1) / (x2 - x1) = (-2 - 1) / (4 - 3) = -3$

Now that we have the slope (m) let's use point-slope form with point A(3, 1):

$y - 1 = -3(x - 3)$

Distribute the -3:

$y - 1 = -3x + 9$

Add 1 to both sides:

$y = -3x + 10$

Therefore, the equation of the line passing through points A(3, 1) and B(4, -2) is $y = -3x + 10$.

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 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 $y = 2x + 2$.

Q8.

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 $3x + 2y = 16$.

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