HIGHER

2.1 Linear Programming: Test Pack

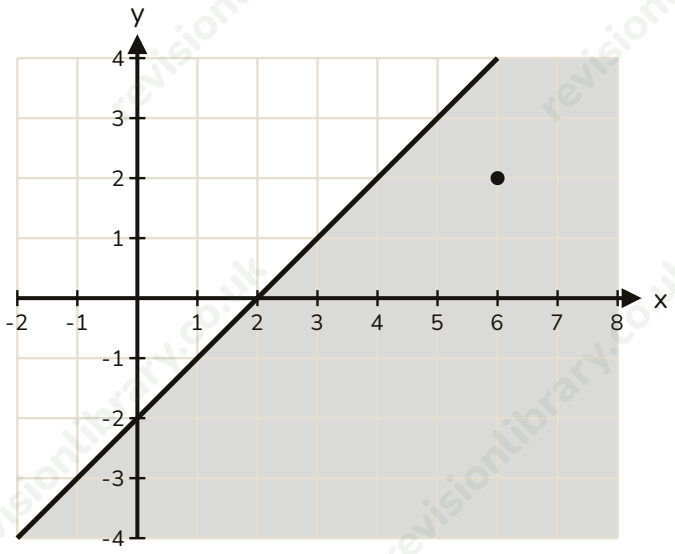
EDEXCEL 4MA1 · Calculator allowed · about 55 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A solid line has equation y = x - 2. The point (6, 2) lies in the shaded region and the line is included in the region.
Write down the inequality that defines the shaded region.



(Total for Question 1 is 3 marks)

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2 The region R satisfies all of the inequalities $x \geq 3$, $5x + 7y \leq 150$ and $x + y \leq 50$, with $x \geq 0$ and $y \geq 0$.

The points P(5, 6), Q(8, 10), R(15, 20), S(10, 20) are tested.

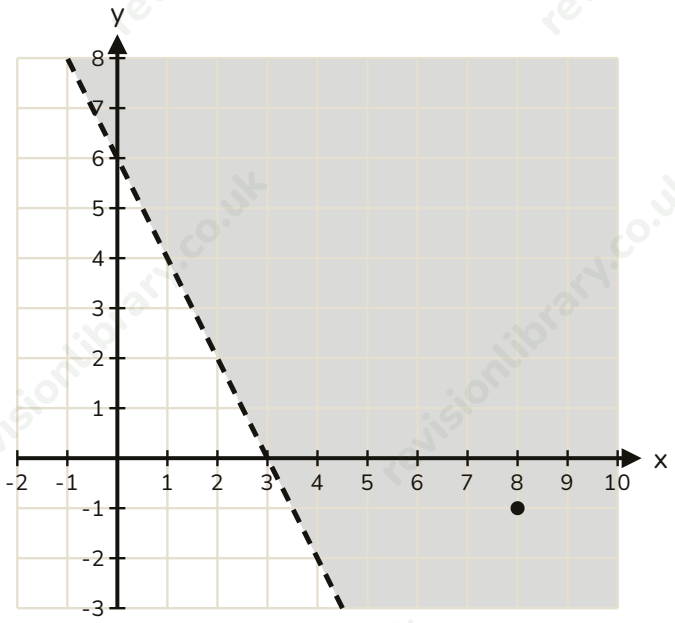
Which of the points lie inside R?

(Total for Question 2 is 3 marks)

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3 A dashed straight line passes through the points (3, 0) and (0, 6). The point (8, -1) lies in the shaded region on one side of the line and the line is not included in the region.

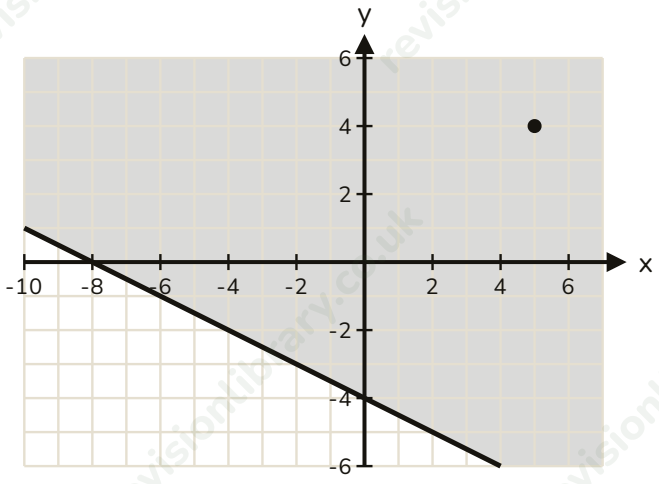
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 3 is 3 marks)

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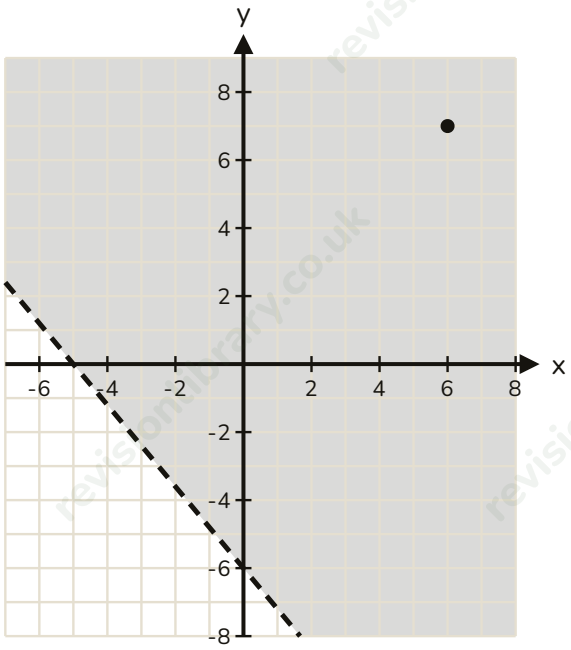
4 A solid straight line passes through the points (-8, 0) and (0, -4). The point (5, 4) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 4 is 3 marks)

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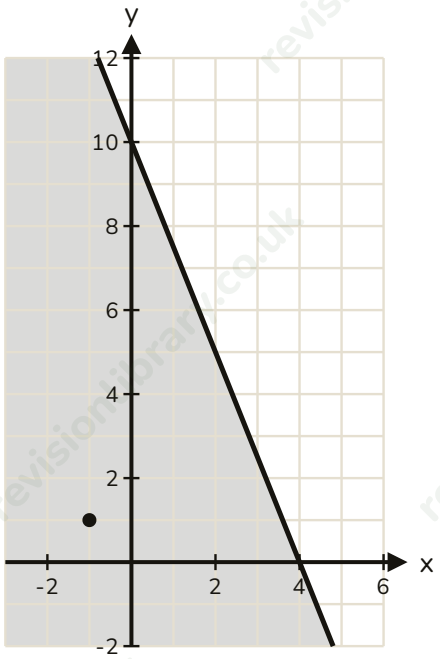
5 A dashed straight line passes through the points (-5, 0) and (0, -6). The point (6, 7) lies in the shaded region on one side of the line and the line is not included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 5 is 3 marks)

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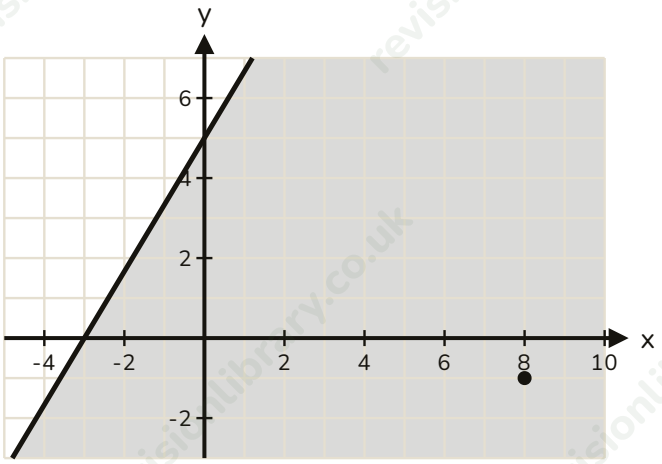
6 A solid straight line passes through the points (4, 0) and (0, 10). The point (-1, 1) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 6 is 3 marks)

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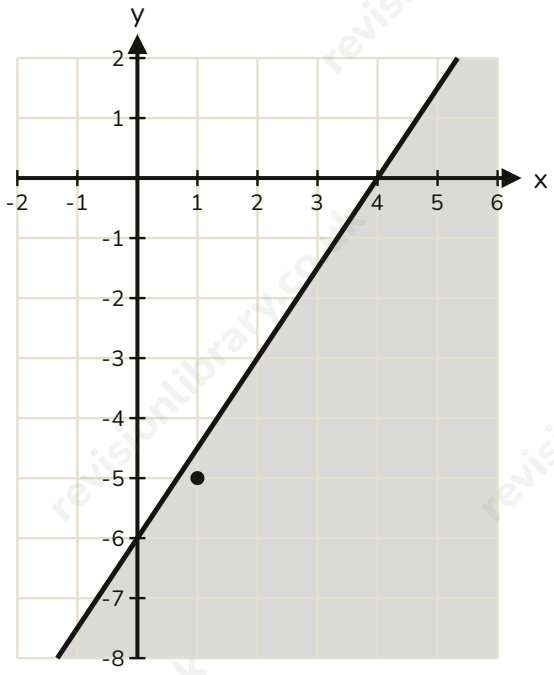
7 A solid straight line passes through the points (-3, 0) and (0, 5). The point (8, -1) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 7 is 3 marks)

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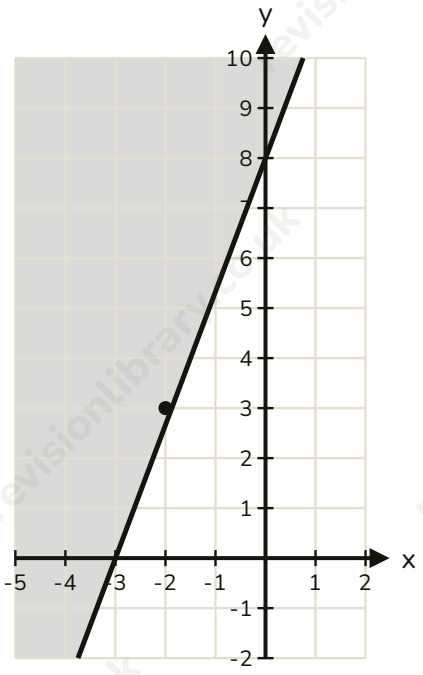
8 A solid straight line passes through the points (4, 0) and (0, -6). The point (1, -5) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 8 is 3 marks)

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9 A solid straight line passes through the points (-3, 0) and (0, 8). The point (-2, 3) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 9 is 3 marks)

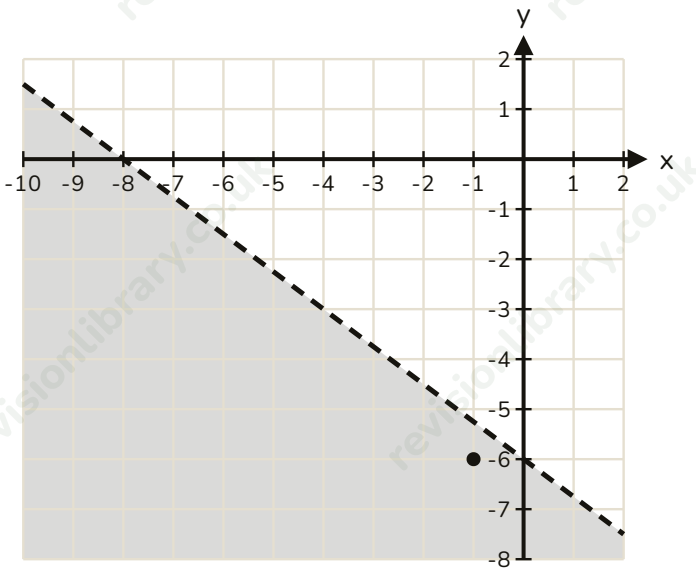
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10 Find the maximum value of $P = 3x + 6y$, where x and y satisfy $4x + 3y \leq 36$, $2x + 3y \leq 24$, $x \geq 0$ and $y \geq 0$.

(Total for Question 10 is 5 marks)

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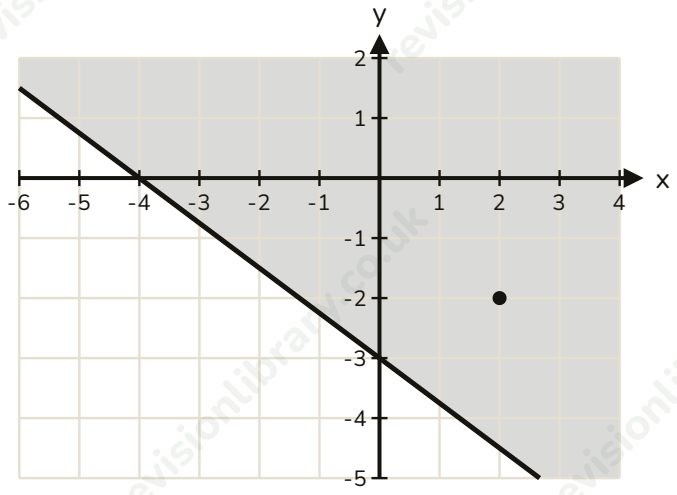
11 A dashed straight line passes through the points (-8, 0) and (0, -6). The point (-1, -6) lies in the shaded region on one side of the line and the line is not included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 11 is 3 marks)

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12 A solid straight line passes through the points (-4, 0) and (0, -3). The point (2, -2) lies in the shaded region on one side of the line and the line is included in the region.
Write down the inequality, in x and y, that defines the shaded region.



(Total for Question 12 is 3 marks)

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Mark scheme · 2.1 Linear Programming: Test Pack

Question 1

substitutes x = 6 to find the line's y value 4 at that x	**M1**
compares 2 with 4 to decide above or below the line	**M1**
y ≤ x - 2 cao	**A1**

Answer: y ≤ x - 2

Question 2

substitutes each point into each of the three inequalities	**M1**
correct decision for each point (at least three correct)	**A1**
inside R: P, Q; the other points break at least one inequality	**A1**

Answer: P, Q

Question 3

finds the equation of the line using the two intercepts, e.g. 6x + 3y = 18	**M1**
tests the point (8, -1) to decide which side is shaded	**M1**
2x + y > 6 cao (dashed line so the inequality is strict)	**A1**

Answer: 2x + y > 6

Question 4

finds the equation of the line using the two intercepts, e.g. -4x - 8y = 32	**M1**
tests the point (5, 4) to decide which side is shaded	**M1**
x + 2y ≥ -8 cao (solid line so the inequality is inclusive)	**A1**

Answer: x + 2y ≥ -8

Question 5

finds the equation of the line using the two intercepts, e.g. -6x - 5y = 30	**M1**
tests the point (6, 7) to decide which side is shaded	**M1**
6x + 5y > -30 cao (dashed line so the inequality is strict)	**A1**

Answer: 6x + 5y > -30

Question 6

finds the equation of the line using the two intercepts, e.g. 10x + 4y = 40	**M1**
tests the point (-1, 1) to decide which side is shaded	**M1**
5x + 2y ≤ 20 cao (solid line so the inequality is inclusive)	**A1**

Answer: 5x + 2y ≤ 20

Question 7

finds the equation of the line using the two intercepts, e.g. 5x - 3y = -15	**M1**
tests the point (8, -1) to decide which side is shaded	**M1**
5x - 3y ≥ -15 cao (solid line so the inequality is inclusive)	**A1**

Answer: 5x - 3y ≥ -15

Question 8

finds the equation of the line using the two intercepts, e.g. -6x + 4y = -24	**M1**
tests the point (1, -5) to decide which side is shaded	**M1**
3x - 2y ≥ 12 cao (solid line so the inequality is inclusive)	**A1**

Answer: 3x - 2y ≥ 12

Question 9

finds the equation of the line using the two intercepts, e.g. 8x - 3y = -24	**M1**
tests the point (-2, 3) to decide which side is shaded	**M1**
8x - 3y ≤ -24 cao (solid line so the inequality is inclusive)	**A1**

Answer: 8x - 3y ≤ -24

Question 10

solves 4x + 3y ≤ 36 and 2x + 3y ≤ 24 simultaneously to find the corner where the lines cross	**M1**
corner at (6, 4)	**A1**
finds the other corners of the region on the axes	**M1**
evaluates P at each corner: (0, 0) gives 0; (0, 8) gives 48; (6, 4) gives 42; (9, 0) gives 27	**M1**
maximum P = 48 at (0, 8)	**A1**

Answer: Maximum P = 48 at (0, 8)

Question 11

finds the equation of the line using the two intercepts, e.g. -6x - 8y = 48	**M1**
tests the point (-1, -6) to decide which side is shaded	**M1**
3x + 4y < -24 cao (dashed line so the inequality is strict)	**A1**

Answer: 3x + 4y < -24

Question 12

finds the equation of the line using the two intercepts, e.g. -3x - 4y = 12	**M1**
tests the point (2, -2) to decide which side is shaded	**M1**
3x + 4y ≥ -12 cao (solid line so the inequality is inclusive)	**A1**

Answer: 3x + 4y ≥ -12

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