1 Curve **C** has equation $y = px^3 - mx$ where p and m are positive integers.

Find the range of values of x, in terms of p and m, for which the gradient of **C** is negative.

gradient of curve C = $\frac{dy}{dx}$

$\frac{dy}{dx} = 3px^2 - m$ (1)

when gradient of C is negative,

$\frac{dy}{dx} < 0$

$3px^2 - m < 0$ (1)

$3px^2 < m$

$x^2 < \frac{m}{3p}$

$x = \pm\sqrt{\frac{m}{3p}}$ (1)

$-\sqrt{\frac{m}{3p}} < x < \sqrt{\frac{m}{3p}}$ (1)

$-\sqrt{\frac{m}{3p}} < x < \sqrt{\frac{m}{3p}}$

(Total for Question 1 is 4 marks)

2 The diagram shows a rectangle.

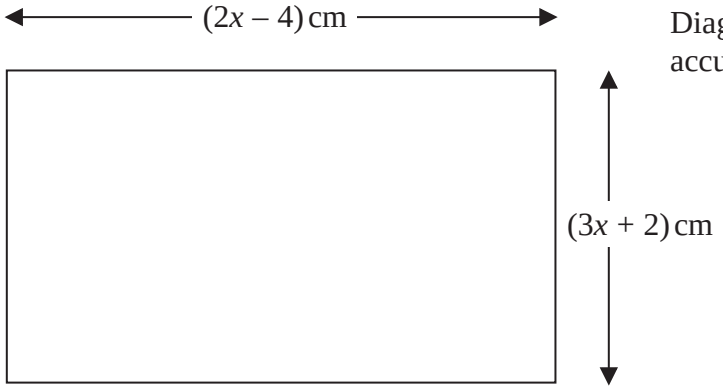


Diagram **NOT** accurately drawn

The area of the rectangle is A cm^2

Given that $A < 3x + 27$
find the range of possible values for x.

Area of rectangle = $A = (2x-4)(3x+2)$

$A = 6x^2 - 8x - 8$

Given : $A < 3x + 27$

$\therefore 6x^2 - 8x - 8 < 3x + 27$ (1)

$\therefore 6x^2 - 11x - 35 < 0$ (1)

$x = \dfrac{11 \pm \sqrt{11^2 - 4(6)(-35)}}{2(6)}$ (1)

$= \dfrac{11 \pm \sqrt{961}}{12}$

$= \dfrac{11 \pm 31}{12}$

$\therefore x = \dfrac{42}{12} = \dfrac{7}{2}$ or $x = \dfrac{-20}{12} = \dfrac{-5}{3}$ (1) (length of side will be negative)

∴ Since length of sides cannot be ≤ 0,

$\therefore x > 2$ hence, $2 < x < \dfrac{7}{2}$ (1)

↑ comes from inequalities $2x - 4 > 0$

$2 < x < \dfrac{7}{2}$

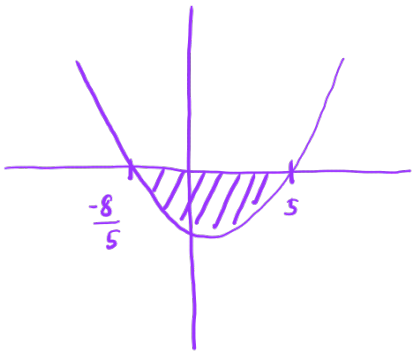
(Total for Question 2 is 5 marks)

3 (b) Solve the inequality $5y^2 - 17y \leqslant 40$

$5y^2 - 17y - 40 \leq 0$

$(5y + 8)(y - 5) \leq 0$ (1)

$y = -\frac{8}{5}$ or $y = 5$ (1)



$-\frac{8}{5} \leq y \leq 5$ (1)

$-\frac{8}{5} \leq y \leq 5$

(3)

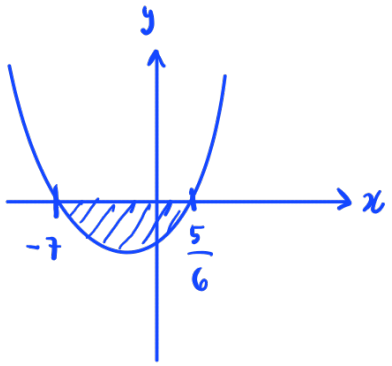
(Total for Question 3 is 3 marks)

4 Solve the inequality $6x^2 + 37x \leqslant 35$
Show clear algebraic working.

$6x^2 + 37x - 35 \leq 0$

$(6x - 5)(x + 7) \leq 0$ (1)

$x = \frac{5}{6}$, $x = -7$ (1)



$-7 \leq x \leq \frac{5}{6}$ (1)

$-7 \leq x \leq \frac{5}{6}$

(Total for Question 4 is 3 marks)