

Instructions:

- Answer all questions on foolscap.
 - The marks for each question or part question are shown in the brackets [].
 - **All working must be clearly shown and omission of essential working will result in loss of marks.**
 - If the numerical answer is not exact, correct your answer to *3 significant figures* unless otherwise stated in the question.
 - The use of electronic calculator is permitted.
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Q1 Simplify the following expressions

(a) $\frac{2p}{6p-3} + \frac{p-1}{8p-4}$ [2]

(b) $\frac{8y-12y^2}{4x-6xy-6+9y}$ [2]

(c) $\frac{9x^2}{4-x^2} + \frac{3x}{x-2}$ [3]

(d) $\frac{\left(\frac{3}{2} - \frac{3x}{4}\right)}{\left(\frac{2}{x} - 1\right)}$ [3]

Q2 Solve the following equations

(a) $2x^2 + x - 15 = 0$ [2]

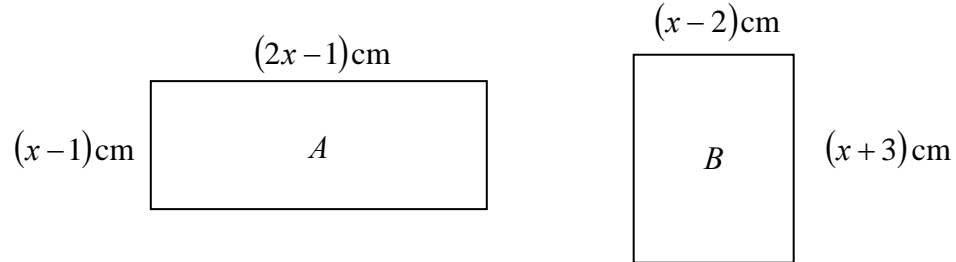
(b) $25 = (5y - 2)^2$ [2]

(c) $(5x - 1)(3x - 2) = 22$ [3]

(d) $\frac{1}{x-3} - \frac{3}{x+5} = \frac{1}{x}$ [3]

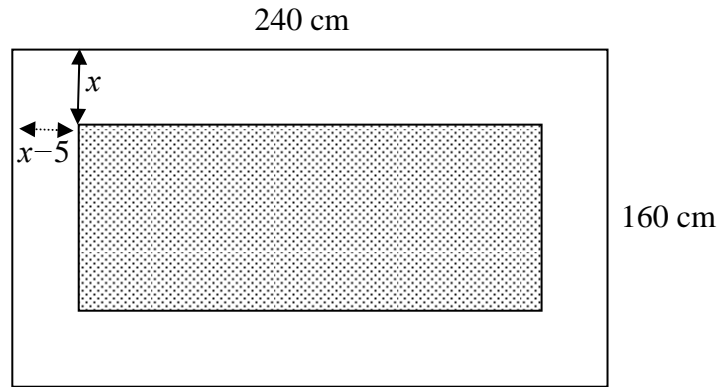
(e) $x - (2x - 3)^2 = -6(x^2 + x - 2)$ [4]

- Q3** The diagram shows two rectangles. Rectangle A has length $(2x - 1)$ cm and width $(x - 1)$ cm. Rectangle B has length $(x - 2)$ cm and width $(x + 3)$ cm.



- (a) Write down an expression in terms of x for the area of rectangle A . [1]
- (b) Write down an expression in terms of x for the area of rectangle B . [1]
- (c) It is given that the area of rectangle A is 52 cm^2 greater than the area of rectangle B . Form an equation in x and show that it reduces to $x^2 - 4x - 45 = 0$. [4]
- (d) Solve the equation $x^2 - 4x - 45 = 0$ and hence calculate the area of rectangle B . [3]

Q4 The diagram below shows a rectangle plot of land which is 240 cm by 160 cm.



The unshaded region is covered with rectangle tiles that measure x cm by $(x - 5)$ cm. Each tile is placed such that its longer side is vertical.

- (a) Write down an expression in terms of x for the number of tiles that will fit in the top row. [1]
- (b) Given that 44 tiles are required to fill the entire unshaded region, form an equation and show that it reduces to $3x^2 - 65x + 100 = 0$. [3]
- (c) Solve this equation in (b) and hence find the length of the shorter side of a tile. [3]

Bonus

Q5 Simplify the product $\left(1 + \frac{1}{x}\right)\left(1 + \frac{1}{x^2}\right)\left(1 + \frac{1}{x^4}\right)\dots\left(1 + \frac{1}{x^{1024}}\right)$ [4]