

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) $\frac{4a+5}{3a-2} \times \frac{15a-10}{4a}$ [2]

(b) $\frac{4x^2 - y^2}{8x^2 - 2xy - 3y^2}$ [2]

(c) $\frac{1}{x+2} - \frac{2}{x^2 - x - 6}$ [3]

(d) $\frac{\left(\frac{1}{a} - \frac{1}{b}\right)}{\left(\frac{1}{a^2} - \frac{1}{b^2}\right)}$ [3]

Q2 Solve the following equations

(a) $6a^2 - 13a + 5 = 0$ [2]

(b) $(5x - 9)^2 = 16$ [2]

(c) $(x + 2)(3x - 4) = 8$ [3]

(d) $2(x - 1)^2 + x - 16 = 0$ [3]

(e) $\frac{x}{x-1} + \frac{x}{x+1} = 3 + \frac{1}{1-x^2}$ [4]

- Q3** The area of a rectangle is three times the area of a square of side $(x + 1)$ cm. The length and breadth of the rectangle are $(2x + 5)$ cm and $(2x - 1)$ cm respectively.
- (a) Form an equation in x and show that it reduces to $x^2 + 2x - 8 = 0$. [4]
 - (b) Solve the equation in (a). [2]
 - (c) Hence, find the area of the rectangle. [2]

- Q4** A tank holds 30 tonnes of water.
- (a) In the morning, it pumps out x tonnes of water per hour. Write down an expression in terms of x for the number of hours it takes to empty the tank in the morning. [1]
 - (b) In the evening, it pumps out $(x + 2)$ tonnes of water per hour. Write down an expression, in terms of x , for the number of hours it takes to empty the tank in the evening. [1]
 - (c) It takes 10 *minutes* longer to empty the tank in the morning than in the evening. Write down an equation in x , and show that it simplifies to $x^2 + 2x - 360 = 0$ [3]
 - (d) Solve the equation $x^2 + 2x - 360 = 0$, find the time taken, in hours and minutes, to empty the tank in the morning. [3]

Bonus

Q5 Solve the equation $\frac{1}{x^2 - 10x - 29} + \frac{1}{x^2 - 10x - 45} - \frac{2}{x^2 - 10x - 69} = 0$ [4]