

UNIVERSITIES OF MANCHESTER, LIVERPOOL,
LEEDS, SHEFFIELD AND BIRMINGHAM.

SCHOOL CERTIFICATE EXAMINATION.

TWO HOURS.

Answer **ALL** questions in Section A and any **THREE** questions from Section B.

In Questions 1, 2 and 3 a candidate need not write down more of his working than he finds it convenient to do ; in all other questions full explanations and all necessary details of working are required.

SECTION A.

A 1. (a) Add together $a + 5b$, $2a - b$, and $3a$; subtract the result from $7a - 4b$.

(b) Multiply $2x^2 + 4x - 3$ by $x - 2$.

(c) If $x = b - \frac{1}{c}$ express c in terms of x and b .

(d) In your answer-book write down the following and fill up the blanks inside the empty brackets :

$$(i) \frac{2a}{b} = \left(\frac{\quad}{-2b} \right).$$

$$(ii) p - q + r = p - \left(\quad \right).$$

$$(iii) \frac{2x + 2a}{x^2 - a^2} = \left(\frac{2}{\quad} \right).$$

- A 2.** (a) Factorise $a^2 - ac + 2ab - 2bc$.
 (b) Factorise $y^2 - 4y + 4 - 4x^2$.
 (c) If $x = -5$ satisfies $x - 3 - 3(kx + 1) = 4$,
 find k .
 (d) Solve $8x^2 - 2x - 15 = 0$.

A 3. (a) What must be added to $36x^2 - 18x$ to make it a perfect square?

- (b) If $\frac{(a^2)^x \times a^y}{a^{x+y}} = a^z$, find p in terms of x and y .
 (c) Find the number whose logarithm is equal to $1.1602 - 2.6248$.
 (d) Express with rational denominator

$$\frac{\sqrt{2}}{\sqrt{3} - \sqrt{2}}$$

A 4. If $2(x - 3y) + (x + 8y) = (x + y)$, find the value of $\frac{x + 2y}{x - 2y}$.

A 5. My electric light charge per quarter is a fixed sum of shillings, plus 6 pence per unit used. When I used 100 units the charge was 11s. 3d. When I used 240 units the charge was £1. Find a and b .

A 6. Solve the simultaneous equations

$$\begin{aligned} x^2 + xy - 6y^2 &= -9 \\ x - 2y &= 9 \end{aligned}$$

A 7. Find the values of A , B , C for which $2x^2 - 3x + 5 = A(x - 1)(x - 2) + B(x - 1) + C$ for all values of x .

SECTION B.

Answer **THREE** questions in Section B.

B 8. Solve correct to two decimal places

$$\frac{2}{x-1} - \frac{3}{x+2} = \frac{1}{x+1}$$

B 9. Draw the graph $y = 2x^2 + x - 1$, taking 1 in. as unit for both x and y , and plotting points at $\frac{1}{2}$ intervals from $x = -2$ to $x = 1$.

With the same scale and axes draw the graph $y = \frac{1}{2}(x + 1)$.

Find the range of values of x for which $2x^2 + x - 1 < \frac{1}{2}(x + 1)$.

B 10. If $x = \sqrt{5} + \sqrt{3}$ and $y = \sqrt{5} - \sqrt{3}$, without using tables find the values of (i) xy , (ii) $x^2 + y^2$, (iii) $x^3 + y^3$.

B 11. In a trapezium one of the parallel sides is four times the other and the non-parallel sides are equal. The perimeter is 20 in. and the distance between the parallel sides is 4 in.

Find the lengths of the sides.

[Every step in your calculation must be clearly shown.]

B 12. If $x = \sqrt{\frac{b-y}{b}}$, evaluate x , as accurately as the tables permit, when $l = 19.6$, $b = 0.037$, $y = 4236$.

From the original formula express l in terms of the other letters. [No further calculations are required.]