

## D Michaelmas Pre Trial Practice

1. Factorise  $2q^3x + 3q^2x$ .  $q^2x(2q + 3)$
2. Factorise  $4axz^3 - 4axz^2 - 15axz$ .  $axz(2z + 3)(2z - 5)$
3. Factorise  $60a^2b^3c + 54a^2b^2c + 12a^2bc$ .  $6a^2bc(5b + 2)(2b + 1)$
4. Factorise  $162x^2yz^5 - 2x^2yz^3$ .  $2x^2yz^3(9z + 1)(9z - 1)$
5. Factorise  $px - py + 3qx - 2qy - qx$ .  $(p + 2q)(x - y)$
6. Expand and simplify  $(x - 5)(2x + 1)(3x - 2)$ .  $6x^3 - 31x^2 + 3x + 10$
7. Expand and simplify  $(a + 2b + 3c)^2$ .  $a^2 + 4b^2 + 9c^2 + 4ab + 6ac + 12bc$
8. Expand and simplify  $(x + 2y)^2 - (x - y)^2$ .  $3y^2 + 6xy$
9. Expand and simplify  $5 - 3(2x - 3)^2$ .  $-12x^2 + 36x - 22$
10. Expand and simplify  $(z - x)^2(x + 2z)$ .  $x^3 + 2z^3 - 3xz^2$
11. Expand and simplify  $(3x - 1)^4$ .  $81x^4 - 108x^3 + 54x^2 - 12x + 1$
12. Solve  $y^2 = 100$ .  $y = \pm 10$
13. Solve  $y^2 = 100y$ .  $y = 0$  or  $y = 100$
14. Solve  $\frac{2x + 3}{-4} < 5x + 1$ .  $x > -\frac{7}{22}$
15. Solve  $x^2 < 25$ .  $-5 < x < 5$
16. Solve  $(x + 1)(x - 3) \geq -3$ .  $x \leq 0$  or  $x \geq 2$
17. Solve  $\frac{x + 1}{2} - \frac{3 - 2x}{3} + x = 3 + \frac{x}{3} - \frac{x + 4}{2}$ .  $x = \frac{9}{17}$
18. Solve (for  $x$ )  $\frac{ax + 1}{3} + \frac{b - cx}{2} = kx$ .  $x = \frac{2+3b}{6k+3c-2a}$
19. Solve (for  $x$ )  $\frac{v}{x} + \frac{a}{v} = \frac{b}{x} + \frac{1}{v}$ .  $x = \frac{bv-v^2}{a-1}$
20. Solve  $\frac{x}{10} - \frac{1}{2} = \frac{5}{x}$ .  $x = -5$  or  $x = 10$
21. Solve  $\frac{3}{x} + \frac{4}{x + 1} = 5$ .  $x = -\frac{3}{5}$  or  $x = 1$
22. Solve  $\frac{5}{3 + x} - \frac{6}{x - 1} = 7$ .  $x = -2$  or  $x = -\frac{1}{7}$
23. Express  $\frac{x + a}{x + b} - \frac{x}{x + c}$  as a single, simplified fraction.  $\frac{ax - bx + cx + ac}{(x + b)(x + c)}$
24. Express  $\frac{1}{2 + \frac{3}{x - 4}}$  as a single, simplified fraction.  $\frac{x - 4}{2x - 5}$
25. Express  $\frac{\frac{2}{x - 1} - \frac{3}{x + 2}}{\frac{3}{x + 2} + \frac{1}{x + 1}}$  as a single, simplified fraction.  $\frac{(7 - x)(x + 1)}{(x - 1)(4x + 5)}$

26. Express  $\frac{2}{(x+1)^3} - \frac{4}{(x+1)^2}$  as a single, simplified fraction.

$$\frac{-2(2x+1)}{(x+1)^3}$$

27. Simplify  $\frac{2x^2 - 2x}{8x^2 - 4x - 4}$ .

$$\frac{x}{2(2x+1)}$$

28. Simplify  $\frac{3u^2 - 3u - 6}{4u^3 + 28u^2 + 48u} \div \frac{6u - 12}{2u + 6}$ .

$$\frac{u+1}{4u(u+4)}$$

29. Solve the simultaneous equations  $\begin{cases} x + 2y = 4 \\ x^2 + 2y^2 = 6 \end{cases}$ .

$$(x, y) = \left(\frac{2}{3}, \frac{5}{3}\right) \text{ or } (x, y) = (2, 1)$$

30. Solve the simultaneous equations  $\begin{cases} 3x + 2y = 5 \\ 2x^2 - y^2 = 1 \end{cases}$ .

$$(x, y) = (1, 1) \text{ or } (x, y) = (29, -41)$$

31. Find  $\frac{dy}{dx}$  when  $y = \frac{(x+1)(x-3)}{x}$ .

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

32. Find  $\frac{dy}{dx}$  when  $y = x(2\sqrt{x} + x)$ .

$$\frac{dy}{dx} = 3x^{\frac{1}{2}} + 2x$$

33. Find  $\frac{dy}{dx}$  when  $y = \sqrt[3]{x}(\sqrt[4]{x} - 1)$ .

$$\frac{dy}{dx} = \frac{7}{12}x^{-\frac{5}{12}} - \frac{1}{3}x^{-\frac{2}{3}}$$

34. Find  $\frac{dy}{dx}$  when  $y = \frac{1}{4x^4}$ .

$$\frac{dy}{dx} = -x^{-5}$$