

Revision Paper 13: Algebra I [Answer Key]

- Expansion
- Factorisation
- Algebraic Manipulation (addition, subtraction, multiplication and division of algebraic fractions)
- Change of subject of Formula

- Q1 Expand and simplify $-2a - [a + b - 2(b - c)]$. **$-3a + b - 2c$**
- Q2 Expand and simplify $2(6a - 5) - 8(2a - 4)$ **$-4a + 22$**
- Q3 Expand and simplify $(2x - 3)(3x - 1) + 11x - 3$. **$6x^2$**
- Q4 Expand and simplify $4(2x + 1)^2 - (2x - 1)^2$. **$12x^2 + 20x + 3$**
- Q5 Expand $(3x - 8)(3x + 2)$ **$9x^2 - 18x - 16$**
- Q6 Expand and simplify the following expressions.
- (a) $3(2x + y) - 4(y - x)$ **$10x - y$**
- (b) $2(3a + b) - [3(a - 3) - 4(2a - b)]$ **$31a + 27b$**
- Q7 Expand $(2x + 1)(x + 3)$. **$2x^2 + 7x + 3$**
- Q8 Expand $(2a + 3b)(6a - 2)$. **$12a^2 - 4a + 18ab - 6b$**
- Q9 Factorise $(2xy + 3x^2 + 2)(5x^2y - y)$. **$10x^2y^3 + 15x^4y + 7x^2y - 2xy^3 - 2y$**
- Q10 Expand and simplify the following expression: $(x - 1)(x + 3) - (x - 3)$ **$x^2 + 3x - 2$**
- Q11 Expand and simplify $(x + 1)(x^2 - x + 2)$. **$x^3 + x + 2$**
- Q12 Expand and simplify $(a + 3)(a - 3) + (a - 5)(a^2 + 3a - 1)$. **$a^3 - a^2 - 16a - 4$**
- Q13 Simplify $\left(\frac{2}{5}x^3\right)\left(\frac{1}{3}x^3\right)$. **$\frac{2}{15}x^6$**
- Q14 Expand and simplify $\left(x^3 - \frac{1}{4}\right)\left(x + \frac{1}{2}\right)$. **$x^3 + \frac{1}{2}x^2 - \frac{1}{4}x - \frac{1}{8}$**
- Q15 Expand and simplify $(x + 1)^3$. **$x^3 + 3x^2 + 3x + 1$**
- Q16 Using algebraic rules only, evaluate 299^3 without the use of a calculator. **89401**
- Q17 If $(a - b)^2 = 52$ and $ab = -9$, calculate the value of $2a^2 + 2b^2$. **68**
- Q18 (a) Simplify $(x + 1)^2 - (x - 1)^2$. **4x**
- (b) Using results from part (a), find the exact value of $10001^2 - 9999^2$. **40 000**
- Q19 If $a^2 + b^2 = 260$ and $ab = 112$, evaluate the following:
- (a) $(a - b)^2$, **36**
- (b) $\frac{(a + b)^2}{2}$. **242**
- Q20 Factorise completely $(4p - 2q) - 5(q - 2p)$ **$(2p - q)(2 + 5r)$**

- Q21 Factorise completely
- (i) $2x^2 - 50$, $2(x+5)(x-5)$
- (ii) $3ac - 9c - 4ab + 12b$. $(a-3)(3c-4b)$
- Q22 Factorise completely the following expressions:
- (a) $2xy + 6x$, $2x(y+3)$
- (b) $3x^2 - 9x$, $3x(x-3)$
- (c) $4y^2 - 36$. $4(y+3)(y-3)$
- Q23 Factorise completely
- (a) $8x^2y^2 - 18x^2y$, $2x^2y(4y-9)$
- (b) $9wx^2 - 3y + 2/yx^2 - w$, $(w+3y)(3x+1)(3x-1)$
- (c) $y^2 - 7y + 10$. $(y-5)(y-2)$
- Q24 Factorise
- (a) $x^2 + 12x - 45$ $(x-3)(x+15)$
- (b) $4x^2 - 8x^2 - x + 2$ $(4x-1)(x-2)$
- (c) $a^2 - 4ab + 4b^2 - 16$ $(a-2b+4)(a-2b-4)$
- Q25 Factorise completely the following
- (a) $18x^2 - 8$. $2(3x-2)(3x+2)$
- (b) $2x^2 - 7x - 22$. $(2x-11)(x+2)$
- Q26 Factorise each of the following completely:
- (a) $x^2 - 36y^2$, $(x+6y)(x-6y)$
- (b) $6ax + 3ay + 2bx + by$. $(2x+y)(3a+b)$
- Q27 Factorise completely
- (a) $8x^2y^2 - 18xy^2$ $2xy^2(2x+3)(2x-3)$
- (b) $a^2 + 2ab + b^2 - c^2$ $(a+b+c)(a+b-c)$
- Q28 Factorise $x^4 - x^2 + x - 1$ completely. $(x-1)(x^2+x^2+1)$
- Q29 Factorise fully $ab^2 - 4a - ab^2c^2 + 4ac^2$. $a(1-c)(1+c)(b+2)(b-2)$
- Q30 Factorise $3x^2 + 10xy + 8y^2$ completely $(3x+4y)(x+2y)$
- Q31 Express as a single fraction in its simplest form

$$\frac{x-11}{x^2-2x-3} - \frac{2}{x-3}$$

$$\frac{-x-13}{(x-3)(x+1)}$$

- Q32 Express as a single fraction in its simplest form

$$\frac{3}{t+5} - \frac{2t}{t^2-25}$$

$$\frac{t-15}{(t+5)(t-5)}$$

- Q33 Express $\frac{3x}{x^2+2x-3} - \frac{2}{1-x}$ as a single fraction in its simplest form.

$$\frac{5x+6}{(x+3)(x-1)}$$

- Q34 Simplify the following expression, leaving your answer in the factorised form:

$$\frac{1}{2} \left(\frac{11x}{15} + \frac{8}{5} \right) - \frac{2+x}{2} - \frac{2x-3}{5}$$

$$\frac{2(3-4x)}{15}$$

Q35 Express $\frac{3x}{x-3} - \frac{2}{9-x^2}$ as a single fraction in its lowest terms.

$$\frac{3x^2+9x+2}{(x+3)(x-3)}$$

Q36 Simplify $(m^2 - m - 6) \times \frac{m^2}{m^2 + 2m}$.

$$m(m-3)$$

Q37 Express $\frac{\frac{1}{2} + \frac{2}{x}}{\frac{x}{2} + 2}$ as a single fraction in its simplest form.

$$\frac{1}{x}$$

Q38 Simplify $\frac{2a-2b}{25} + \frac{a^2-2ab+b^2}{5(a+b)^2}$.

$$\frac{2(a+b)^2}{5(a-b)}$$

Q39 Simplify $\frac{a+4}{2a^2+6a} + \frac{a+4}{4(a+3)} \times \frac{a+6}{a^2+5a-6}$.

$$\frac{2}{a(a-1)}$$

Q40 Simplify $\left(\frac{16a^4}{9b^3}\right)^{\frac{1}{2}} \times \frac{10ab^2}{27}$.

$$\frac{5b^3}{18a}$$

Q41 Given that $\sqrt{\frac{x+y}{x-y}} = s$, make y the subject.

$$y = \frac{x(s^2-1)}{(s^2+1)}$$

Q42 Given that $1 = \frac{1+n}{m} + n$, express n in terms of m .

$$n = \frac{m-1}{m+1}$$

Q43 Given that $P = a + \frac{bv^2}{k}$, express v in terms of P , a , b and k .

$$v = \pm \sqrt{\frac{k(P-a)}{b}}$$

Q44 Given the formula $y = \frac{2x-3}{x+2}$, express x in terms of y .

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

Q45 Given that $q = \frac{5\sqrt{s-t}}{r}$, express t in terms of q , r and s .

$$t = s - \frac{q^2 r^2}{25}$$

Q46 Make x the subject of the following formulae $x = 3\sqrt{2x^3 - y}$

$$x = \pm \sqrt[3]{\frac{9y}{17}}$$

Q47 Make x the subject of the formula $y = \frac{a^2 + x^2}{2x^2}$.

$$x = \pm \frac{a}{\sqrt{2y-1}}$$

Q48 Given that $y = 2\sqrt{\frac{z-7y}{2x}}$ express z in terms of x and y .

$$z = \frac{y^2 x}{2} + 7y$$

Q49 Given that $2z = \pi\sqrt{\frac{y-z}{x}}$, express y in terms of x , z and π .

$$y = \frac{4x^2}{\pi^2} + z$$

Q50 Given $f = \sqrt{\frac{h}{x^2} + g^2}$, express x in terms of f , g and h .

$$x = \pm \sqrt{\frac{h}{f^2 - g^2}}$$