Vedgyan Tutorial

www.DiligentEdu.in

IGCSE 9th - Test-2
Chapter 6: Equations and Rearranging Formulae

Subject: **MATHEMATICS** Max:
Date: Score:

• Expansion • Linear equation • Solution • Common factor • Factorisation • Variable • Subject

• Watch out for **negative numbers** in front of brackets because they always require ***extra care***.
Remember: **+ × + = +** **+ × − = −** **− × − = +**

• **Linear equation** - 'Linear' refers to the fact that there are no powers of x other than one.

• **Solving linear equations** - It is important to remind yourself about BODMAS before working through this section.

•**Factorising algebraic expressions** - The process of writing an algebraic expression using brackets is known as factorisation. The expression, $12x - 4$, has been factorised to give $4(3x-1)$. Remind yourself about how to find HCFs; common factor.

• **Rearrangement of a formula** – when a formula is expressed with one variable written alone on one side of the **'='** symbol (*usually on the left but not always*). The ***variable*** that is written alone is known as the ***subject*** of the formula.

Consider each of the following formulae:

$s = ut + \frac{1}{2}at^2$ (s is the subject)

$F = ma$ (F is the subject)

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (x is the subject)

Example: In the formula $v = u + at$ note that v is currently the subject. To make a the subject of this formula: (by rearranging the formula.)

$a = \frac{v - u}{t}$

• **Accounting uses a great deal of mathematics**. Accountants use computer spreadsheets to calculate and analyse financial data. Although the programs do the calculations, the user has to know which equations and formula to insert to tell the program what to do.

• **Physicists often rearrange formulae**. If you have a formula that enables you work out how far something has travelled in a particular time, you can rearrange the formula to tell you how long it will take to travel a particular distance, for example.

Q1. Expand and simplify the following expressions.

a. 4(y − 7) − 5(3y + 5) b. 8(p + 4) − 10(9p − 6) c. −12(2t − 7) d. −1.5(8z − 4)

Q2. Expand each of the following and simplify your answers as far as possible.

$-4(2a-3b-6c+4d)$ $-6(x^2+6y^2-2y^3)$

$14(x-3)-4(x-1)$ $-7(f+3)-3(2f-7)$

$3g-7(7g-7)+2(5g-6)$ $6(3y-5)-2(3y-5)$

$4x(x-4)-10x(3x+6)$ $14x(x+7)-3x(5x+7)$

$x^2-5x(2x-6)$ $5q^2-2q(q-12)-3q^2$

$3x(x-2)-(x-2)$ $2x(3+x)-3(x-2)$

$3(x-5)-(3+x)$ $2x(3x+1)-2(3-2x)$

Q3. Solve the following equations.

a $12x+1=7x+11$ **b** $6x+1=7x+11$ **c** $6y+1=3y-8$

d $11x+1=12-4x$ **e** $8-8p=9-9p$ **f** $\frac{1}{2}x-7=\frac{1}{4}x+8$

i $\frac{2x+1}{3}=8$ **j** $\frac{2x}{3}+1=8$

k $\frac{3}{5}x+11=21$ **l** $\frac{x+3}{2}=x$

m $\frac{2x-1}{3}=3x$ **n** $\frac{3x}{2}+5=2x$

Q4. Solve the following equations for n / p / x

$-5(n-6)=-20$ $2(p-1)+7(3p+2)=7(p-4)$

$2(p-1)-7(3p-2)=7(p-4)$ $3(2x+5)-(3x+2)=10$

$7x-(3x+11)=6-(5-3x)$ $-2(x+2)=4x+9$

$3(x+1)=2(x+1)+2x$ $4+2(2-x)=3-2(5-x)$

$3^{3x}=27$ $2^{3x+4}=32$

$8.1^{4x+3}=1$ $5^{2(3x+1)}=625$

$4^{3x}=2^{x+1}$ $9^{3x+4}=27^{4x+3}$

Q5. Factorise each of the following expressions as fully as possible.

a $15x+12y$ **b** $18mn-30m$ **c** $36p^2q-24pq^2$ **d** $15(x-2)-20(x-2)^3$

Q6. Factorise as fully as possible.

a	$14m^2n^2 + 4m^3n^3$	**b**	$17abc + 30ab^2c$	**c**	$m^3n^2 + 6m^2n^2(8m + n)$
d	$\frac{1}{2}a + \frac{3}{2}b$	**e**	$\frac{3}{4}x^4 + \frac{7}{8}x$	**f**	$3(x-4) + 5(x-4)$
g	$5(x+1)^2 - 4(x+1)^3$	**h**	$6x^3 + 2x^4 + 4x^5$	**i**	$7x^3y - 14x^2y^2 + 21xy^2$
j	$x(3+y) + 2(y+3)$				

Q7. Make the variable shown in brackets the subject of the formula in each case.

a	$an - m = t$	(m)	**b**	$a(n-m) = t$	(a)	**c**	$\frac{xy}{z} = t$	(x)
d	$\frac{x-a}{b} = c$	(x)	**e**	$x(c-y) = d$	(y)	**f**	$a - b = c$	(b)
a	$p - \frac{r}{q} = t$	(r)	**b**	$\frac{x-a}{b} = c$	(b)	**c**	$a(n-m) = t$	(m)
d	$\frac{a}{b} = \frac{c}{d}$	(a)	**e**	$\frac{x-a}{b} = c$	(a)	**f**	$\frac{xy}{z} = t$	(z)
a	$\sqrt{b} = c$	(b)	**b**	$\sqrt{ab} = c$	(b)	**c**	$a\sqrt{b} = c$	(b)
d	$\sqrt{b+c} = c$	(b)	**e**	$\sqrt{x-b} = c$	(b)	**f**	$\frac{x}{\sqrt{y}} = c$	(y)

Q8. Rearrange the formula.

A rocket scientist is trying to calculate how long a Lunar Explorer Vehicle will take to descend towards the surface of the moon. He knows that if u = initial speed and v = speed at time t seconds, then:

$v = u + at$

where a is the acceleration and t is the time that has passed.

If the scientist wants to calculate the time taken for any given values of u, v, and a, he must rearrange the formula to make a the subject. Do this for the scientist.

Q9. Rearrange the formula.

If the length of a pendulum is l metres, the acceleration due to gravity is g m s^{-2} and T is the period of the oscillation in seconds then:

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Rearrange the formula to make l the subject.

Examination practice

Exam-style questions

1 Given that $T = 3p - 5$, calculate T when $p = 12$.

2 In mountaineering, in general, the higher you go, the colder it gets. This formula shows how the height and temperature are related.

$$\text{Temperature drop (°C)} = \frac{\text{height increase (m)}}{200}$$

a If the temperature at a height of 500 m is 23 °C, what will it be when you climb to 1300 m?
b How far would you need to climb to experience a temperature drop of 5 °C?

3 The formula $e = 3n$ can be used to relate the number of sides (n) in the base of a prism to the number of edges (e) that the prism has.
a Make n the subject of the formula.
b Find the value of n for a prism with 21 edges.

Past paper questions

1 Factorise $2x - 4xy$. [2]

[Cambridge IGCSE Mathematics 0580 Paper 22 Q2 Feb/March 2016]

2 Make r the subject of this formula.

$v = \sqrt[3]{p + r}$ [2]

[Cambridge IGCSE Mathematics 0580 Paper 22 Q5 October/November 2014]

3 Expand the brackets. $y(3 - y^3)$ [2]

[Cambridge IGCSE Mathematics 0580 Paper 13 Q9 October/November 2012]

4 Factorise completely. $4xy + 12yz$ [2]

[Cambridge IGCSE Mathematics 0580 Paper 13 Q13 October/November 2012]

5 Solve the equation. $5(2y - 17) = 60$ [3]

[Cambridge IGCSE Mathematics 0580 Paper 22 Q12 May/June 2013]

E

6 Solve the equation $(3x - 5) = 16$. [2]

[Cambridge IGCSE Mathematics 0580 Paper 13 Q5 May/June 2013]

7 Factorise completely. $6xy^2 + 8y$ [2]

[Cambridge IGCSE Mathematics 0580 Paper 13 Q9 May/June 2013]