

Revision Sheet 1: Algebra Basics, Simultaneous Equations and Inequalities

Q1. The Basics (1st Year Algebra)

a) Evaluate the following if $x = 3$, $y = -2$ and $z = -1$

i) $3x - 2y + 4z$ ii) $5x - 2z$ iii) $x^2 - 3y^2$ iv) $3y^2 - 4z^2$

b) Remove the brackets in the following and simplify when possible:

i) $4(x - 3y) + 5(x + 2y)$ ii) $3x(x - 1) - 7x(x + 4)$

iii) $2x^2(x^2 - 3) + x^3(x - 1)$ iv) $(3x - 2)(x + 5)$

v) $(2x - 3)(3x - 1)$ vi) $(3x + 1)(x^2 + 2x - 3)$

vii) $(2x + 1)^2$ viii) $(5x - 3)^2$

ix) $(x - 2)^3$ x) $(x - 1)^2 - (x + 3)^2$

c) Solve the following equations:

i) $3(x + 1) = 12$ ii) $4(2x - 5) = -36$

iii) $2(3x + 5) = 4(x - 2)$ iv) $2(x + 7) - 3 = 2 - 5(x + 1)$

Q2. Simultaneous Equations (2nd Year Algebra - Unit 2)

Solve the following Simultaneous Equations:

a) $2x + y = 10$ b) $x - y = -5$ c) $x - 2y = 9$
 $3x - 4y = 4$ $3x - 2y = -12$ $3x + 7y = 1$

d) $5y = 16 - 4x$ e) $5x + y = 19$ f) $9 = 2x - 3y$
 $6x = 13 - 2y$ $2x - y = 2y - 2x$ $3y + x = 9$

g) $\frac{x}{2} + \frac{y}{5} = 4$ h) $\frac{x-3}{4} + \frac{y}{2} = \frac{5}{2}$
 $\frac{x}{4} + \frac{y}{2} = 6$ $4x + y = 17$

Q3. Inequalities (2nd Year Algebra - Unit 2)

Solve the following inequalities and graph your solutions on a number line:

a) $3x - 7 \leq 5, x \in N$ b) $5x - 1 < 2x - 10, x \in Z$
c) $4x - 5 \leq x + 7, x \in R$ d) $4(x - 2) < 3x - 4, x \in R$
e) $-9 < 2x + 1 \leq 5, x \in Z$ f) $11 \geq 3x + 2 > -7, x \in R$
g) $\frac{1}{3} - 2x \geq \frac{25}{3}, x \in Z$ h) $-\frac{7}{2} \leq \frac{3x-1}{2} \leq 7, x \in R$

Q4. Extra Challenge Questions and Problem Solving:

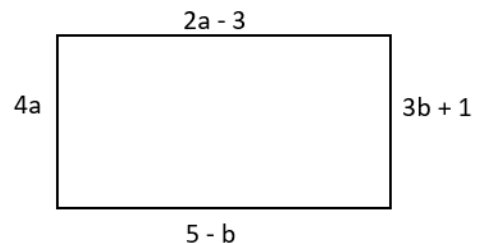
a) Find the coordinates of the point of intersection of the lines $3x + 4y = -1$ and $x - 2y = 3$.

b) A father is x years old, his son is y years old and the sum of their ages is 58 years. Five years ago the father was five times as old as the son. Find the age of the father and the son now.

c) The cost C of hiring a car for n days is given by the formula $C = a + bn$. It costs €280 for 5 days and €580 for 11 days to hire a car. Find the values of a and b . Hence, find the cost of hiring a car for 15 days.

d) A woman is paid € x per hour for a 30 hour week and is paid € y for each hour overtime worked. On a particular week she worked 35 hours and received €440. The following week she worked 42 hours and received €552. Find the values of x and y .

e) The diagram shows a rectangle. All side lengths are in centimetres. Find the values of a and b .



f) In this puzzle, each different symbol stands for a number. What does each symbol stand for?

$$\Phi + \Omega + \Phi + \Omega + \Omega = 68$$

$$\Omega + \Phi + \Psi + \Psi = 28$$

$$\Omega + \Phi + \Phi = 28$$

g) Write down the equations of two lines that have a point of intersection of $(0, -2)$.

h) Find the solution set E of $2x + 7 \leq 13, x \in R$. Then find the solution set H of $3 - 2x \leq 9, x \in R$. Hence find $E \cap H$ and illustrate your answer on the number line.

i) If $4u - 3 \leq 7$, where u is a natural number, find the biggest value u can take.

j) Which of the numbers shown below are in the set of values given by $0 < x \leq 5, x \in R$?

$$-3, \sqrt{9}, 0, -4.5, \sqrt{20}, 6$$

k) p is a multiple of 4. Find all the values of p so that $10 \leq p \leq 24$.

l) If $p > q$, circle which of the following are never true?

a) $2p < 2q$ b) $-p < -q$ c) $p - 3 < q - 3$ d) $\frac{p}{5} > \frac{q}{5}$

m) Find the solution set of $0 \leq 2x - 11 < x$, where x is a prime number.

n) In algebra, explain using an example, what is meant by the "coefficient of a term".

Revision Sheet 1 Solutions:

Q1.

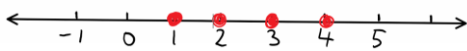
- a) i) 9 ii) 17 iii) -3 iv) 8
b) i) $9x - 2y$ ii) $-4x^2 - 31x$ iii) $3x^4 - x^3 - 6x^2$ iv) $3x^2 + 13x - 10$
v) $6x^2 - 11x + 3$ vi) $3x^3 + 7x^2 - 7x - 3$ vii) $4x^2 + 4x + 1$ viii) $25x^2 - 30x + 9$
ix) $x^3 - 6x^2 + 12x - 8$ x) $-8x - 8$
c) i) $x = 3$ ii) $x = -2$ iii) $x = -9$ iv) $x = -2$

Q2.

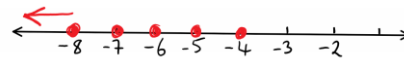
- a) $x = 4, y = 2$ b) $x = -2, y = 3$ c) $x = 5, y = -2$ d) $x = 1.5, y = 2$
e) $x = 3, y = 4$ f) $x = 6, y = 1$ g) $x = 4, y = 10$ h) $x = 3, y = 5$

Q3.

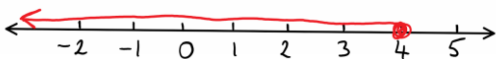
a) $x \leq 4$



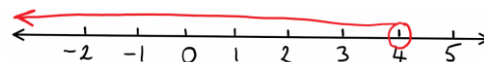
b) $x < -3$



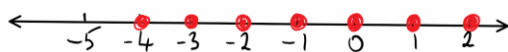
c) $x \leq 4$



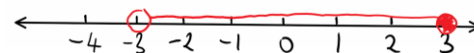
d) $x < 4$



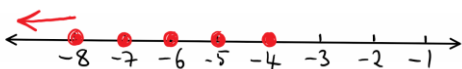
e) $-5 < x \leq 2$



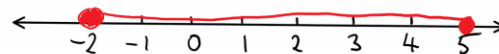
f) $-3 < x \leq 3$



g) $x \leq -4$

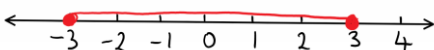


h) $-2 \leq x \leq 5$



Q4.

- a) $x = 1, y = -1$ b) $x = 45, y = 13$ c) $a = 30, b = 50$. Cost = €780 d) $x = €12, y = €16$
e) $a = 2.5, b = 3$ f) $\Phi = 4, \Omega = 20, \Psi = 2$
g) Many answers e.g. $3x - 4y = 8$ and $2x + 3y = -6$
h) E: $x \leq 3$, H: $x \geq -3$, $E \cap H$: $-3 \leq x \leq 3$



- i) $u = 2$ j) $\sqrt{9}, \sqrt{20}$ k) $p = \{12, 16, 20, 24\}$ l) $2p < 2q$ and $p - 3 < q - 3$
m) $x = \{7\}$ n) Coefficient: the number at the start of a term e.g. coefficient of $3x$ is 3.