

A sheet of Maths in order that you can enjoy your summer

1) Factorise and hence solve the following:

a)  $x^2 + 8x + 7 = 0$

b)  $x^2 - 7x + 12 = 0$

c)  $2x^2 + 7x + 3 = 0$

d)  $4x^2 - 17x = 15$

e)  $x^2 - 16 = 0$

2) Solve:

a)  $2x + 7 = 23$

b)  $10(x + 3) = 100$

c)  $4(x - 3) = 40$

d)  $15x - 4 = x + 80$

e)  $6(5x - 3) = 2(5x + 11)$

f)  $\frac{2x}{3} + 1 = 3$

g)  $\frac{5(8x + 8)}{12} = 30$

h)  $\frac{9(2x + 20)}{5} = 18$

i)  $\frac{5x + 1}{4} = \frac{3x + 6}{3}$

j)  $\frac{4x - 2}{5} = \frac{5x + 5}{7}$

3) Complete the square for the following expressions:

a)  $x^2 + 7x - 2$

b)  $2x^2 - 5x + 1$

4) Simplify the following

a)  $\sqrt{8}$

b)  $\sqrt{40}$

c)  $\sqrt{196}$

d)  $\sqrt{180}$

5) Expand, and simplify where possible.

a)  $(5 + \sqrt{3})(5 - \sqrt{3})$

b)  $(2\sqrt{3} + \sqrt{7})(\sqrt{3} + \sqrt{6})$

6) Rationalise the denominator for the following:

a)  $\frac{7}{\sqrt{2}}$

b)  $\frac{6\sqrt{3}}{\sqrt{5}}$

7) Given the 2 coordinates P(1 , 3) and Q(7 , -12) find the following

a) the length of the line PQ

b) the gradient of the line PQ

c) the midpoint of the line PQ

8) Find the gradient and the y intercept for the following equations

a)  $y = 3x - 7$

b)  $4y = 10 - 8x$

c)  $3x + 2y - 5 = 0$

9) Show that the point (6 , 3) lies on the line  $y = 2x - 9$

10) Evaluate the following without a calculator:

a)  $216^{1/3}$

b)  $27^{2/3}$

c)  $5^{-2}$

d)  $(2^5)^2$

e)  $16^{-1/2}$

f)  $16^{-3/4}$

11) Simplify the following:

a)  $12g^3 \times 2g^5$

b)  $(2x^3y^{-1})^3$

c)  $\frac{(2\sqrt{x})^4}{8x}$

d)  $\frac{x^{3/8}x^{1/2}}{x^{1/4}}$

12. Solve the following pairs of simultaneous equations.

a.  $2x + 5y = 24$   
 $4x + 3y = 20$

b.  $3a - b = 9$   
 $2a + 2b = 14$

c.  $5c - 7d = 27$   
 $3c - 4d = 16$

13. Make the variable in the square bracket the subject of each of the following:

a)  $v = u + at,$  [a]  
b)  $s = ut + \frac{1}{2}at^2,$  [a]  
c)  $a^2 = b^2 + c^2 - 2bc \cos A$  [cosA]  
d)  $\frac{a}{\sin A} = \frac{b}{\sin B}$  [sinB]  
e)  $a^2 = b^2 + c^2$  [c]  
f)  $v^2 = u^2 + 2as$  [s]  
g)  $Ax + B = Cx + D$  [x]  
h)  $\frac{A}{w+B} = \frac{C}{w+D}$  [w]

14) Through using the quadratic formula, prove that the solution to each of the following quadratics is the associated answer:

a)  $x^2 + 5x + 3 = 0,$   $x = \frac{-5 \pm \sqrt{13}}{2}$

a)  $x^2 + 6x + 3 = 0,$   $x = -3 \pm \sqrt{6}$

This set of questions is meant as an extension and should be stretching you a little more:

15) a) Complete the square for  $y = x^2 - 6x + 1$ .

b) Hence sketch the graph of  $y = x^2 - 6x + 1$ .

16) a) Sketch the graph for  $y = (x + 2)(x - 3)$

b) Hence solve  $(x + 2)(x - 3) < 0$

17) a) Sketch the graph of  $y = (x - 4)(x + 1)(2x + 3)$

b) Hence solve  $(x - 4)(x + 1)(2x + 3) > 0$

18) Solve the simultaneous equations:

$$y = x^2 - 2x$$

$$y = x + 4$$

19) Given the two curves verify that they intersect at (4, 2) and (-2, -4):

$$x^2 + y^2 = 20$$

$$y = x - 2$$

20) Solve the simultaneous equations:

$$xy = 8$$

$$y = x + 2$$