

## Level 3 Algebra - Formulae

June 2013 - Question 9

Jan 2014 - Question 4

Jan 2015 - Question 8

June 2015 - Question 4

Jan 2016 - Question 9

June 2016 - Question 2

Jan 2017 - Question 6

June 2017 - Question 5

June 2018 - Question 3

June 2018 - Question 10

Jan 2019 - Question 9

June 2019 - Question 3

Jan 2020 - Question 9

Jan 2021 - Question 8

Jan 2021 - Question 11

Jan 2022 - Question 9

June 2022 - Question 2

June 2022 - Question 14

Jan 2023 - Question 12

June 2023 - Question 5

Jan 2024 - Question 2

Jan 2024 - Question 14

9  $y = 180 - \frac{360}{x}$

(a) Make  $x$  the subject of the formula.

$x =$   
.....  
(2)

$$s = \frac{t}{t+2}$$

(b) (i) Find the value of  $s$  when  $t = -6$

.....

(ii) Make  $t$  the subject of the formula.

$t =$   
.....  
(5)

**(Total for Question 9 is 7 marks)**



4  $p = \frac{2}{n^2} - 5$

Make  $n$  the subject of the formula.

.....  
**(Total for Question 4 is 3 marks)**

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8  $v^2 = u^2 + 2as$

(a) Find the value of  $s$  when  $u = -4$ ,  $v = 5$  and  $a = 10$

.....  
(2)

$$f = \sqrt{\frac{g}{g+1}}$$

(b) Make  $g$  the subject of the formula.

.....  
(3)

**(Total for Question 8 is 5 marks)**

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4  $w = \frac{3x + 2}{2x}$

(a) Make  $x$  the subject of the formula.

.....  
(3)

$$k = \frac{(2x - 7)^2}{x}$$

(b) Work out the value of  $k$  when  $x = \frac{1}{2}$

.....  
(2)

**(Total for Question 4 is 5 marks)**

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9  $y^2 = \frac{x^2}{x^2 + 1}$

(a) Find the exact positive value of  $y$  when  $x = \frac{1}{2}$

.....  
(2)

(b) Make  $x$  the subject of  $y^2 = \frac{x^2}{x^2 + 1}$

.....  
(3)

(Total for Question 9 is 5 marks)

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$A$  is the point (3, 4)

- (b) (i) Draw the tangent to the graph at the point  $A$ .
- (ii) Write down the size of the angle between the tangent to the graph at  $A$  and the normal to the graph at  $A$ .

.....  
(2)

(Total for Question 1 is 4 marks)

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2  $w = \frac{4t^2}{t^2 + 2}$

Make  $t$  the subject of the formula.

.....  
(Total for Question 2 is 3 marks)

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6  $C = 4 + \frac{t^2}{100}$

(a) (i) Find the value of  $C$  when  $t = -10$

.....

(ii) Make  $t$  the subject of the formula.

.....

(4)

(b) (i) Write the quadratic expression  $x^2 + 6x + 5$  in the form  $(x + p)^2 + q$  where  $p$  and  $q$  are constants.

.....

(ii) Given that  $y = x^2 + 6x + 5$  use your answer to (b)(i) to express  $x$  in terms of  $y$ .

.....

(4)

(Total for Question 6 is 8 marks)



5  $h = k^3 - \frac{6m^2}{k}$

(a) Find the value of  $h$  when  $k = -1$  and  $m = 2$

.....  
(2)

$$p = \frac{a(b+c)}{2c}$$

(b) Make  $c$  the subject of this formula.

.....  
(3)

**(Total for Question 5 is 5 marks)**

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3  $(x + 4)^2 + (x - 2)^2 = ax^2 + bx + c$  for all values of  $x$ .

Work out the value of  $a$ , the value of  $b$  and the value of  $c$ .

$a =$  .....

$b =$  .....

$c =$  .....

(Total for Question 3 is 3 marks)



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10  $t = 7x^3 + \sqrt{(25 - k^2)}$

(a) Work out the value of  $t$  when  $k = 4$  and  $x = 3$

.....  
(2)

$$w = \frac{4(a + b)}{(a - b)}$$

(b) Make  $a$  the subject of the formula.

.....  
(3)

(Total for Question 10 is 5 marks)



9  $m = \sqrt{\frac{b}{c} - 1}$

(a) Find the value of  $m$  when  $b = 61$  and  $c = 25$

.....  
(2)

(b) Make  $c$  the subject of  $m = \sqrt{\frac{b}{c} - 1}$

.....  
(4)

**(Total for Question 9 is 6 marks)**

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3 Here is a formula  $P = \frac{4a^2b}{c^2}$

(a) Make  $b$  the subject of the formula.

.....  
(2)

(b) Make  $c$  the subject of the formula.

.....  
(2)

**(Total for Question 3 is 4 marks)**

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9  $t = \frac{n}{5 - 2n}$

(a) Find the value of  $t$  when  $n = \frac{1}{2}$

.....  
(1)

(b) Find the value of  $t$  when  $n = \sqrt{5}$   
Give your answer in the form  $c + \sqrt{d}$  where  $c$  and  $d$  are integers.

.....  
(4)

(c) Make  $n$  the subject of the formula  $t = \frac{n}{5 - 2n}$

.....  
(3)

(Total for Question 9 is 8 marks)



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8 Here is a formula  $B = \frac{13w}{25h^2}$

(a) Find the value of  $B$  when  $w = 8$  and  $h = 2$

.....  
(2)

(b) Make  $h$  the subject of the formula.

.....  
(2)

$$m - k = \frac{2k}{5n}$$

(c) Make  $k$  the subject of the formula.

.....  
(3)

(Total for Question 8 is 7 marks)



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11 Here is an identity.

$$2x^2 - 7x + 6 = (ax - b)(x - c) \text{ where } a, b \text{ and } c \text{ are integers.}$$

Find the value of  $a$ , the value of  $b$  and the value of  $c$ .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

$$c = \dots\dots\dots$$

(Total for Question 11 is 2 marks)



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9  $f$  is inversely proportional to  $d$ .  
 $f = 20$  when  $d = 0.25$

(a) Find a formula for  $f$  in terms of  $d$ .

.....  
(3)

$$w = \frac{3}{(2 - u)^2}$$

(b) Make  $u$  the subject of the formula.

.....  
(3)

(Total for Question 9 is 6 marks)



P 6 6 1 2 8 R A 0 1 1 2 4

2 Make  $x$  the subject of  $w = \frac{3x^2 + 2}{x^2 + 1}$

.....  
(Total for Question 2 is 3 marks)

3 Use the quadratic formula to solve the equation  $3x^2 - 2x = 6$

Give your answer in the form  $\frac{p \pm \sqrt{q}}{r}$  where  $p$ ,  $q$  and  $r$  are integers.

.....  
(Total for Question 3 is 2 marks)



13 Here is a quadratic equation.

$$6x^2 + 5x - 12 = 0$$

(i) Write down the sum of the roots of this equation.

.....  
(1)

(ii) Write down the product of the roots of this equation.

.....  
(1)

(Total for Question 13 is 2 marks)

14  $V = \frac{f(wh - 3)}{3} + f$

Work out the value of  $h$  when  $V = 20$ ,  $f = 12$  and  $w = \frac{f}{2}$

.....  
(Total for Question 14 is 3 marks)



(b) Use your graph to find an estimate for one of the solutions of  $x^3 - 5x + 1 = 0$

.....  
(2)

**(Total for Question 11 is 6 marks)**

12 Here is a formula  $B = \frac{2w^2 - wt}{4t}$

(a) Find the value of  $B$  when  $w = 5$  and  $t = 2$

$B =$  .....  
(2)

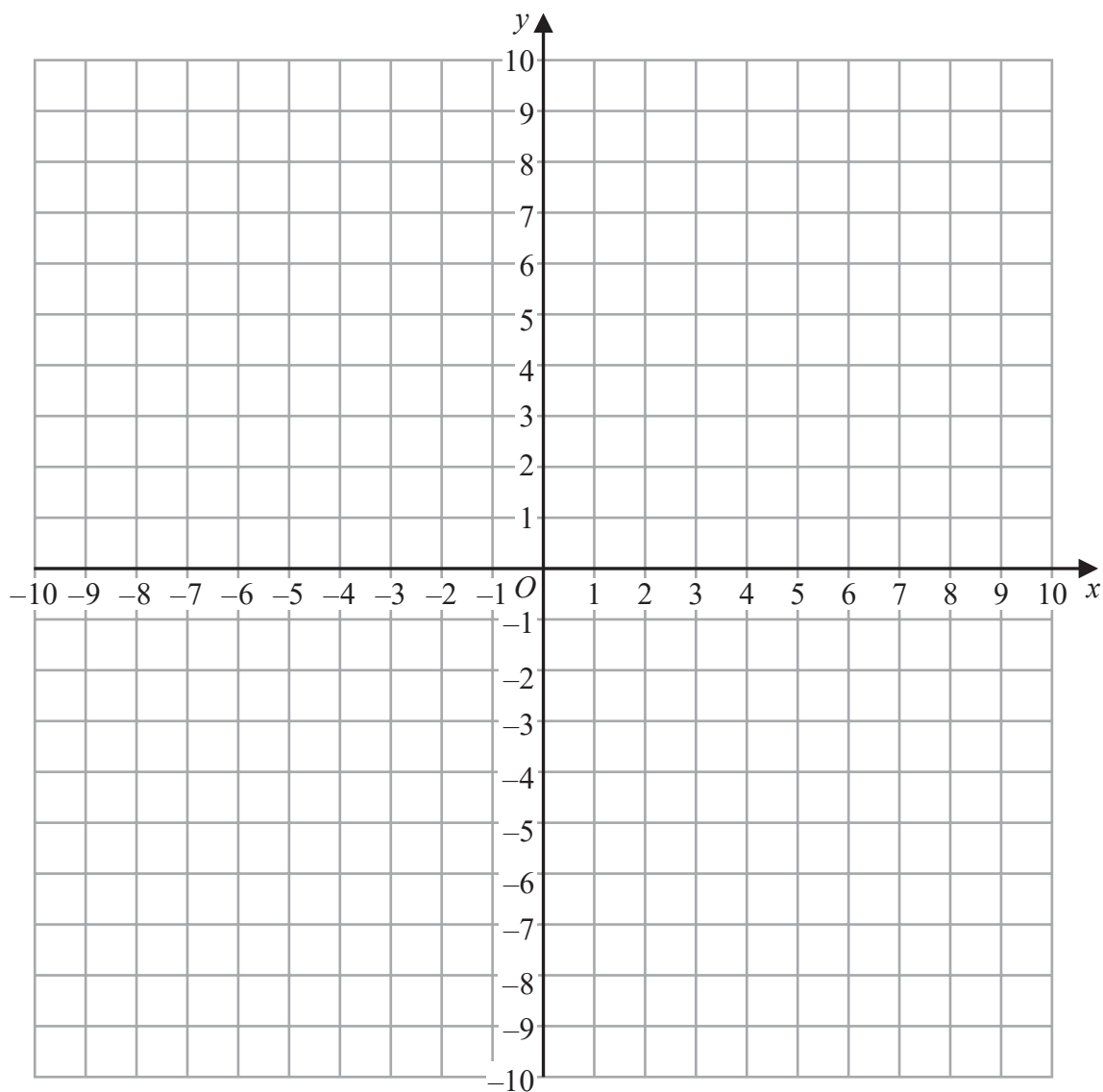
(b) Make  $t$  the subject of the formula  $B = \frac{2w^2 - wt}{4t}$

.....  
(3)

**(Total for Question 12 is 5 marks)**



5 (a) On the grid, construct the graph of  $3x^2 + 3y^2 = 75$



(2)

(b) Make  $y$  the subject of  $3x^2 + 3y^2 = 75$

.....  
(3)

(Total for Question 5 is 5 marks)



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2 Make  $m$  the subject of  $d = 6 - \frac{3}{m^2}$

.....  
(Total for Question 2 is 3 marks)

3 Use the quadratic formula to solve the equation  $5x^2 = 3x + 2$

.....  
(Total for Question 3 is 2 marks)



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13 Here is a quadratic equation.

$$3x^2 - 5x + 4 = 0$$

(i) Write down the product of the roots of this equation.

.....  
(1)

(ii) Write down the sum of the roots of this equation.

.....  
(1)

(Total for Question 13 is 2 marks)

14  $P = \frac{a(b+c)}{3c}$

Work out the value of  $c$  when  $P = 27, a = 9, b = 20$

.....  
(Total for Question 14 is 3 marks)

