Algebra – 2021/20 GCSE Mathematics Higher

1. Nov/2021/Paper_J560/04/No.10

Alex, Blake and Charlie play a computer game.

Alex goes first and scores n points.

- Blake scores 8 points less than 3 times the number of points scored by Alex.
- Charlie scores 25 more points than Blake.
- The three people score a total of 618 points.

Work out how many points they each score.
You must show your working.

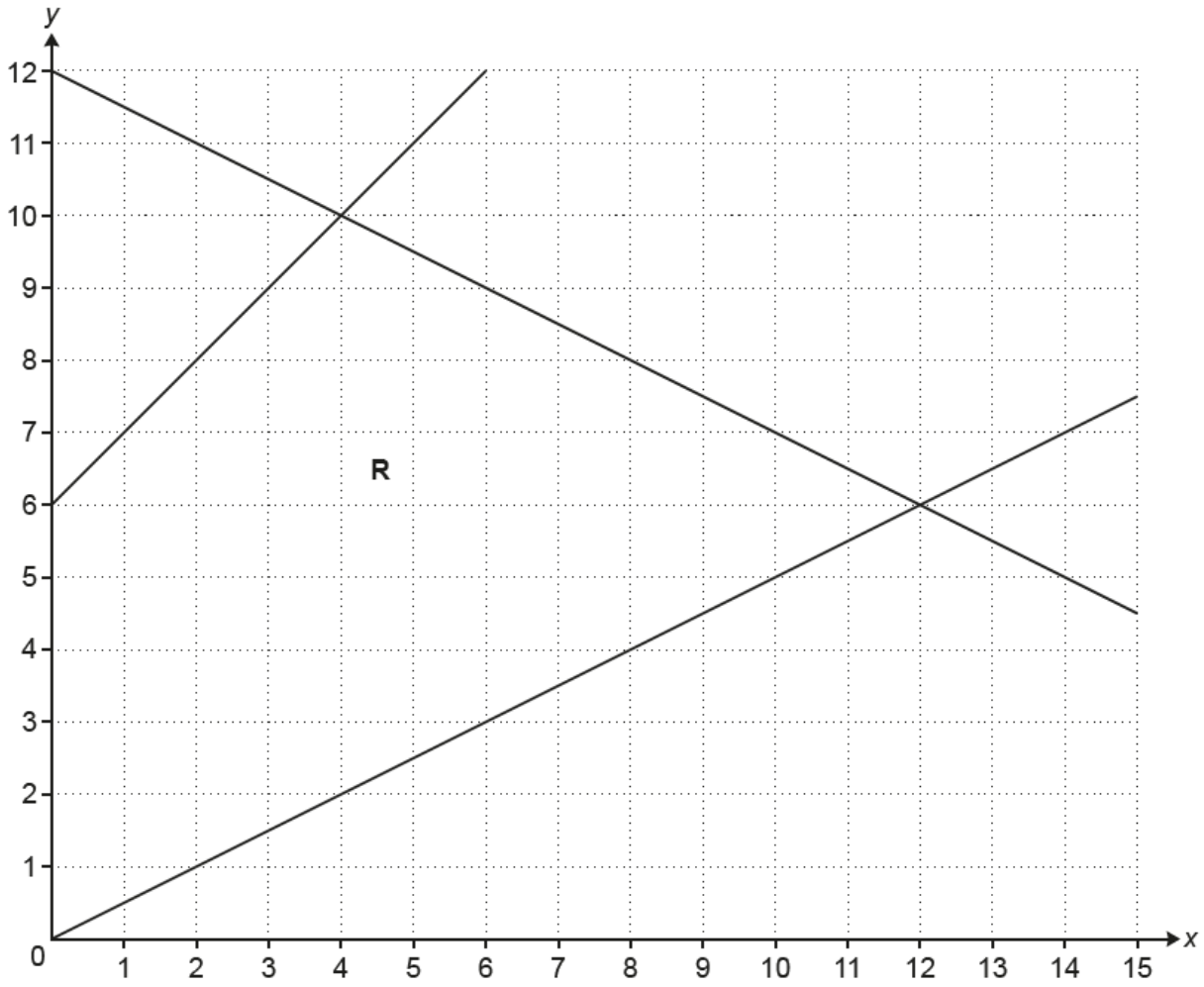
Alex = ...

Blake = ...

Charlie = ... **[7]**

2. Nov/2021/Paper_J560/04/No.12

(a) The region **R** is shown on this grid.



Region **R** is defined by four inequalities.
One of the inequalities is $x \geqslant 0$.

Use the symbols $\leqslant$ and $\geqslant$ to complete the other three inequalities.

$x \geqslant 0$

y ..... $\frac{1}{2}x$

$x + 2y$ 24

y ..... $x + 6$ **[2]**

(b) The inequality $x \geqslant 0$ is replaced by a new inequality.
Region **R** is then a kite.

Write down the new inequality.

(b) ..... **[3]**

3. Nov/2021/Paper_J560/04/No.15

Here are the first four terms of a quadratic sequence.

-1 3 13 29

The nth term is $an^2 + bn + c$.

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... **[4]**

4. Nov/2021/Paper_J560/04/No.20

Solve algebraically.

$$y = x + 3$$
$$(x-3)^2 + y^2 = 50$$

You must show your working.

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... **[5]**

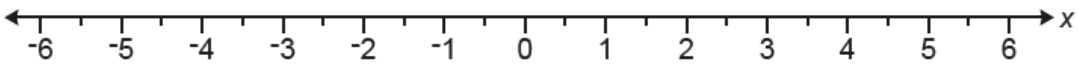
5. Nov/2021/Paper_J560/05/No.7

(a) Solve the inequality.

$4(x-3) < x$

(a) ..... **[3]**

(b) Show your answer to **part (a)** on the number line.



[2]

6. Nov/2021/Paper_J560/05/No.20

$x^2 - 2y = 5$ and $4y + z = 7$.

Write z in terms of x.
Give your answer in its simplest form.

..... **[4]**

7. Nov/2021/Paper_J560/05/No.22

n is a positive integer.

Prove that $(2n+1)(n-3)(n+2)+3n(n+7)$ is always even.

..... **[6]**

8. Nov/2021/Paper_J560/06/No.3

Multiply out and simplify.

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

..... **[2]**

9. Nov/2021/Paper_J560/06/No.15

(a) Show that the equation $x^3 - 5x - 1 = 0$ has a solution between $x = 2$ and $x = 3$. **[3]**

(b) Find this solution correct to **1** decimal place.
You must show your working.

(b) $x =$ ..... **[4]**

10. Nov/2021/Paper_J560/06/No.16

The following kinematics formulas may be used in this question.

$v = u + at$

$s = ut + \frac{1}{2}at^2$

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

The initial velocity of a particle is 20 m/s.
The acceleration of the particle is -8 m/s^2.
After t seconds, the particle has travelled 25 m.

(a) Show that $4t^2 - 20t + 25 = 0$. **[3]**

(b) Solve $4t^2 - 20t + 25 = 0$.

(b) $t =$ ..... **[3]**

(c) Show that the particle is stationary when it has travelled 25 m.

.....

..... **[3]**

11. Nov/2021/Paper_J560/06/No.18

Rearrange this formula to make y the subject.

$$\frac{5y+2}{y} = \frac{3t-7}{2}$$

..... **[5]**

12. Nov/2020/Paper_J560/04/No.15

Here are two pieces of work.

For each one, describe the error made and give the complete correct solution.

(a)

Question:

Solve by factorisation.

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

Solution:

$(3x + 5)(x - 1) = 0$

Therefore $x = -5/3$ or $x = 1$

Error: .....

.....

Correct solution:

(b)

Question:

Solve, giving your answers correct to 3 significant figures.

$$2x^2 - 8x + 3 = 0$$

Solution:

$$x = -(-8) \pm \frac{\sqrt{(-8)^2 - 4 \times 2 \times 3}}{2 \times 2}$$

Therefore $x = 6.42$ or $x = 9.58$

Error: .....

.....

Correct solution:

13. Nov/2020/Paper_J560/04/No.17

Expand and simplify.

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

..... **[3]**

14. Nov/2020/Paper_J560/04/No.20

Solve.

$$x^2 + y^2 = 34$$
$$y = x + 2$$

Show your working.

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... **[6]**

15. Nov/2020/Paper_J560/05/No.2

(a) Solve.

$4x + 3 = 13$

(a) $x =$ ..... **[2]**

(b) Multiply out and simplify.

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

(b) ..... **[3]**

16. Nov/2020/Paper_J560/05/No.15

Solve.

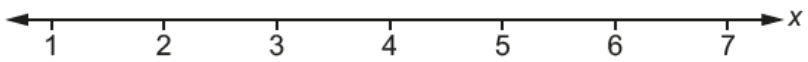
$$\frac{x}{x+6} = 5$$

$x =$ ..... **[3]**

17. Nov/2020/Paper_J560/06/No.2

Solve $3x + 4 < 19$.

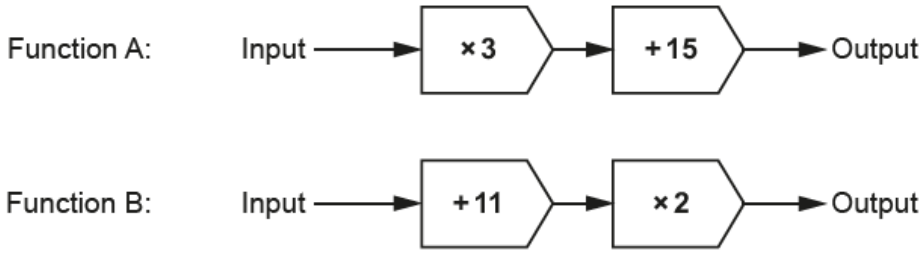
Show your solution on the number line.



[4]

18. Nov/2020/Paper_J560/06/No.11

Here are two functions.



(a) (i) Jo chooses a number, x.
She inputs x into each function.
The two outputs are equal.

Work out the value of x.

(a)(i) $x =$ ..... **[4]**

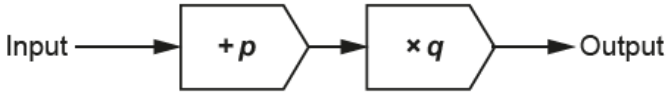
(ii) Explain why there is no other input that gives two outputs that are equal.

.....

..... **[1]**

(b) Here is function C.

Function C:



Kai chooses values for p and q so that if he inputs **any** number into both function A and function C, he will **always** get two outputs that are equal.

Find the value of p and the value of q.

(b) p = ...

q = ... **[3]**

19. Nov/2020/Paper_J560/06/No.17

Here is a sequence.

$3 \qquad 3\sqrt{5} \qquad 15 \qquad 15\sqrt{5}$

(a) Work out the next term.

(a) ..... **[1]**

(b) Find the nth term.

(b) ..... **[3]**

20. Nov/2020/Paper_J560/06/No.21

Write as a single fraction in its simplest form.

$$\frac{x}{x+2}+\frac{x+1}{x-2}-\frac{6x}{x^2-4}$$

..... **[6]**