Name:……

Total Marks:……

GCSE (9-1) Grade 8/9 Completing the Square

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – there may be more space than you need.
- **Show all your working out**

Information

- The total mark for this paper is 92.
- The marks for **each** question are shown in brackets.
  – use this as a guide as to how much time to spend on each question.
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed

Advice

- Read each question carefully before you start to answer it
- Attempt every question
- Check your answers if you have time at the end

1. (a) Write $x^2 - 8x + 20$ in the form $(x + a)^2 + b$ where a and b are integers

.....

(2 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph $y = x^2 - 8x + 20$

.....

(1 mark)

(c) Hence sketch the curve $y = x^2 - 8x + 20$

.....

(2 marks)

2. (a) Write $x^2 - 10x - 1$ in the form $(x + a)^2 + b$ where a and b are integers

.....

(2 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph $y = x^2 - 10x - 1$

.....

(1 mark)

(c) Hence sketch the curve $y = x^2 - 10x - 1$

.....

(2 marks)

3. (a) Write $x^2 - 4x - 6$ in the form $(x + a)^2 + b$ where a and b are integers

.....

(2 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph $y = x^2 - 4x - 6$

.....

(1 mark)

(c) Hence sketch the curve $y = x^2 - 4x - 6$

.....

(2 marks)

4. (a) Write $x^2 - 8x + 8$ in the form $(x + a)^2 + b$ where a and b are integers

.....

(2 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = x^2 - 8x + 8$

.....

(1 mark)

---

5. (a) Write $x^2 - 3x - 1$ in the form $(x + a)^2 + b$ where a and b are integers

.....

(2 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = x^2 - 3x - 1$

.....

(1 mark)

6. (a) Write $2x^2 - 12x + 8$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = 2x^2 - 12x + 8$

.....

(1 mark)

---

7. (a) Write $2x^2 - 12x + 23$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = 2x^2 - 12x + 23$

.....

(1 mark)

8. (a) Write $3x^2 - 6x + 6$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = 3x^2 - 6x + 6$

.....

(1 mark)

---

9. (a) Write $-x^2 + 6x + 10$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = 10 + 6x - x^2$

.....

(1 mark)

10. (a) Write $1 - 6x - x^2$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = 1 - 6x - x^2$

.....

(1 mark)

---

11. (a) Write $-3x^2 + 12x - 9$ in the form $a(x + b)^2 + c$ where a, b and c are integers

.....

(3 marks)

(b) Hence or otherwise write down the coordinates of the turning point of the graph
$y = -3x^2 + 12x - 9$

.....

(1 mark)

12. Solve the equation $x^2 + 8x + 10 = 0$ by completing the square. Give your answers in surd form

.....

(5 marks)

---

13. Solve the equation $x^2 + 4x - 2 = 0$ by completing the square. Give your answers in surd form

.....

(5 marks)

14. Solve the equation $2x^2 - 8x + 7 = 0$. Give your answers in surd form

.....

(5 marks)

---

15. Solve the equation $x^2 + 7x + 2.25 = 0$. Give your answers in surd form

.....

(5 marks)

16. The expression $x^2 - 3x + 8$ can be written in the form $(x - a)^2 + b$ for all values of x.

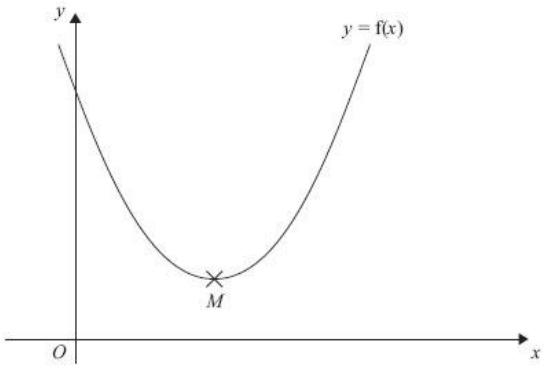
(i) Find the value of a and the value of b.

.....

(3 marks)

The equation of a curve is $y = f(x)$ where $f(x) = x^2 - 3x + 8$

The diagram shows part of a sketch of the graph of $y = f(x)$.



The minimum point of the curve is M.

(ii) Write down the coordinates of M.

.....

(1 mark)

17. (i) Sketch the graph of f(x) = x^2 – 6x + 10, showing the coordinates of the turning point and the coordinates of any intercepts with the coordinate axes.

.....

(4 marks)

(ii) Hence, or otherwise, determine whether f(x) − 3= 0 has any real roots.
Give reasons for your answer.

.....

(2 marks)

---

18. Write $2 + 0.8x - 0.04x^2$ in the form $A - B\,(x + C)^2$, where A, B and C are constants to be found.

.....

(4 marks)

19. The minimum point of a quadratic curve is (1, −4). The curve cuts the *y*-axis at −1.
Show that the equation of the curve is $y = 3x^2 - 6x - 1$

.....

(5 marks)

---

20. The maximum point of a quadratic curve is (−2, −5). The curve cuts the *y*-axis at −13.

Find the equation of the curve. Give your answer in the form $ax^2 + bx + c$.

.....

(5 marks)

TOTAL FOR PAPER IS 92 MARKS