

Surname: _____ Other Names: _____

Mathematics

Paper 2 (Calculator) Higher Tier

Time Allowed: 1 hour

You must have: Ruler graduated in centimetres and millimetres, Protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



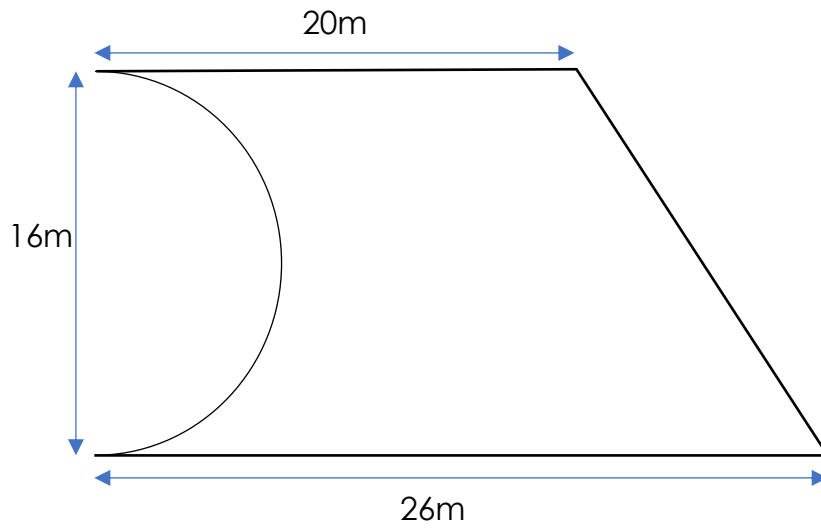
Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

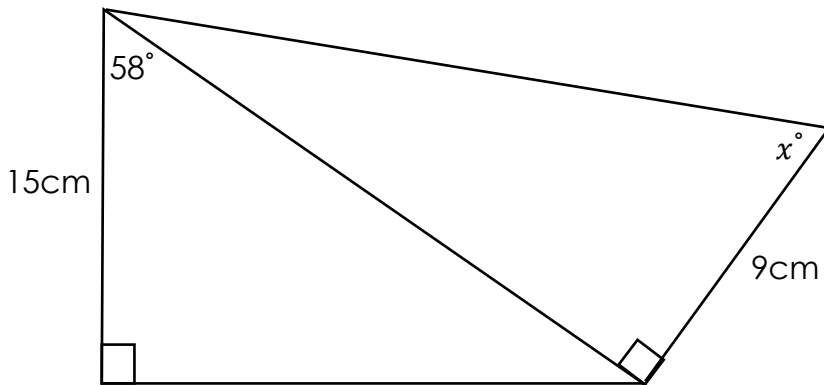
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

1. The diagram shows a trapezium with a semi-circle cut out of it. Find the area of the shape.



(4 marks)

2. Find the size of angle x



(4 marks)

3. A class contains 30 pupils. They do a mathematics test. The mean mark for the whole class is 53.4.
The 14 girls in the class have a mean mark of 55.
What is the mean mark of the boys?

(3 marks)

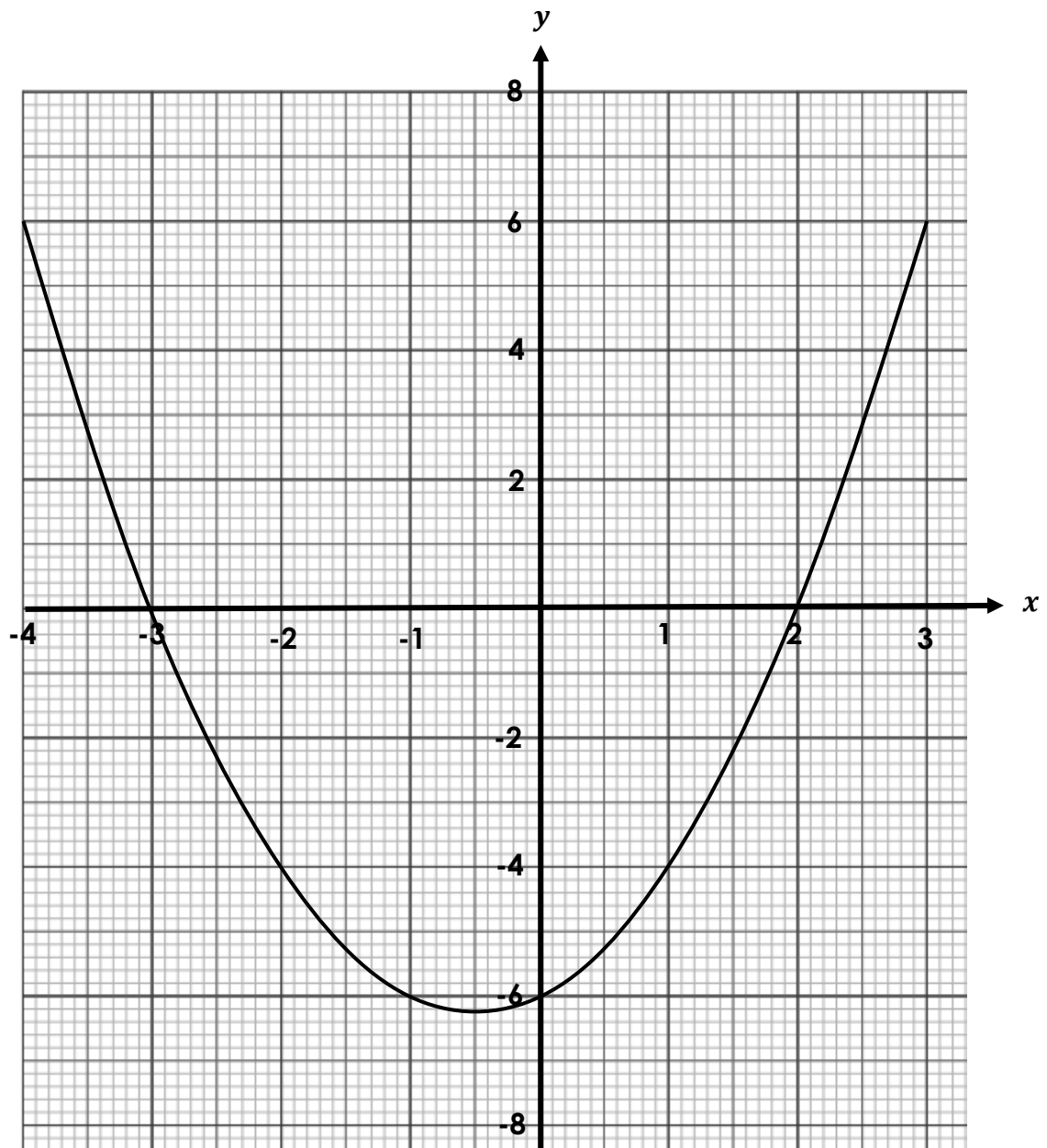
4. The population of Swillsborough has been declining at the rate of 12% per year. It is currently 170,368.
What was its population two years ago?

(3 marks)

5. The line L_1 connects A with coordinate (2, 4) to B with coordinate (6, 12).
Find the equation of line L_2 which is perpendicular to L_1 and goes through the midpoint of AB.

(4 marks)

6. The diagram below shows the graph of the function $y = x^2 + x - 6$.



(a) Estimate the coordinate of the turning point

(1)

(b) Use the graph to solve the following equations (you must show how you have used the graph and must not use an algebraic method)

(i) $x^2 + x - 6 = 2$

(2)

(ii) $x^2 + 3x - 4 = 0$

(3)

(6 marks)

7. (a) Show that $(x + 3)(2x - 1)(x - 5)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a, b, c and d are integers to be found.

(3)

- (b) Factorise fully $48x^3y^5z - 36x^6y^2$

(3)

(6 marks)

8. An agency is attempting to estimate the number of salmon in a river. They catch 25 salmon and tag them then release them back into the river. Later they catch 60 salmon and find that 3 are tagged. Estimate the number of salmon in this particular river.

(3 marks)

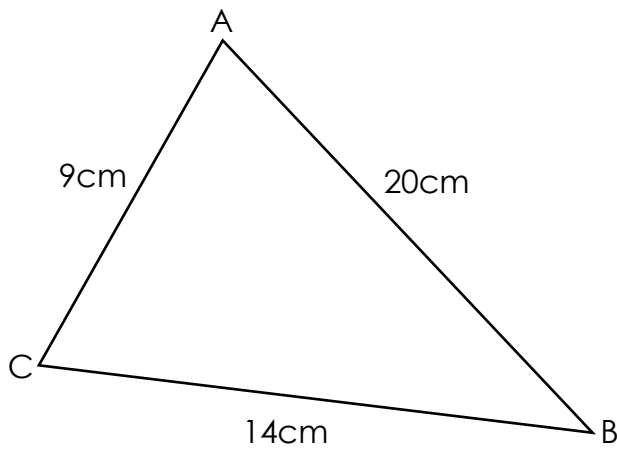
9. Two cylinders, A and B, are mathematically similar. Cylinder A has a volume of 32cm^3 . Cylinder B has a volume of 108cm^3 . Cylinder B has a surface area of 81cm^2 . What is the surface area of cylinder A?

(3 marks)

10. Find the n th term for the sequence 4, 5, 10, 19, 32, ...

(3 marks)

11. Find the area of triangle ABC



(5 marks)

12. (a) Show that the equation $x^3 - 4x^2 - 5x + 7 = 0$ has a solution between $x = 4$ and $x = 5$

(2)

- (b) Show that $x^3 - 4x^2 - 5x + 7 = 0$ can be rearranged to give

$$x = \pm \sqrt{4x + 5 - \frac{7}{x}}$$

(2)

- (c) Using $x_0 = 4.7$ and the iteration formula $x_{n+1} = \sqrt{4x_n + 5 - \frac{7}{x_n}}$ find x_4 giving your final answer correct to 3 decimal places.

(3)

(7 marks)

13. Barney has 8 orange, 4 strawberry and 9 banana flavoured sweets in a bag. He takes two out at random and eats them. What is the probability the two sweets were of different flavours?

(4 marks)

14. Solve the inequality $8x^2 < 14x + 15$

(5 marks)