AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

# Level 2 Certificate

PRACTICE PAPER

# FURTHER MATHEMATICS

## Paper 1 Non-Calculator

Time allowed: 1 hour 45 minutes

**Materials**

For this paper you must have:
- mathematical instruments
- the Formulae Sheet (enclosed).

You must **not** use a calculator.

**Instructions**
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

| For Examiner's Use | |
|---|---|
| Pages | Mark |
| 2–3 | |
| 4–5 | |
| 6–7 | |
| 8–9 | |
| 10–11 | |
| 12–13 | |
| 14–15 | |
| 16–17 | |
| 18–19 | |
| **TOTAL** | |

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more graph paper and tracing paper. These must be tagged securely to this answer book.

1 Expand and simplify $8(3x - 2) + 5(14 - x)$
Give your answer in the form $a(bx + c)$ where a, b and c are integers.

**[3 marks]**

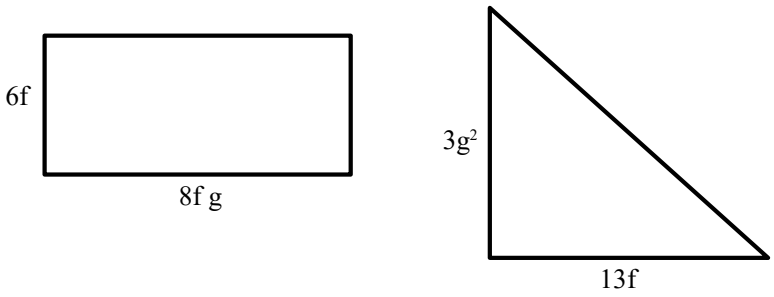
Answer _____

2 8m is decreased by 30%
The answer is $(m + 3)$
Work out the value of m.

**[2 marks]**

Answer _____

3 The rectangle and the triangle have equal areas.



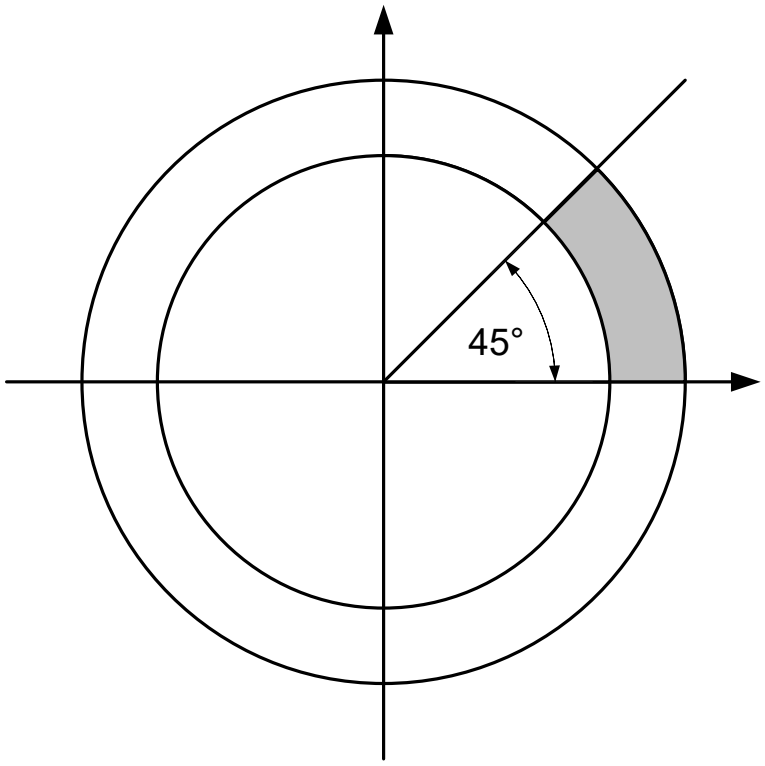

Find the ratio of f:g in its simplest form.

**[3 marks]**

Answer _____

4 The equations of two circles are shown.

$x^2 + y^2 = 144$ and $x^2 + y^2 = 256$



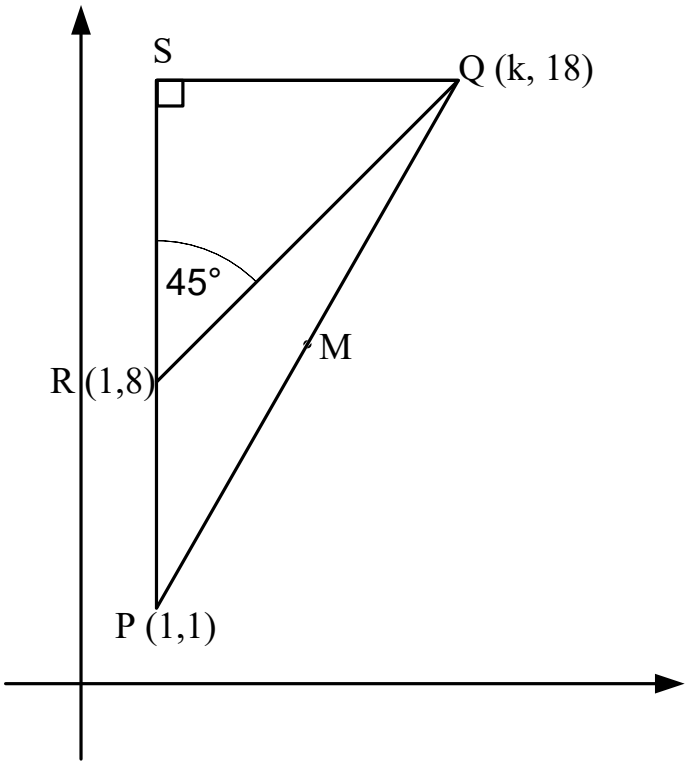

What is the area of the shaded section?

Give your answers in terms of $\pi$.

**[3 marks]**

Answer _____ units$^2$

5 SQR is a right angled triangle.
R is a point on SP.
Angle SPR is 45°
M is the midpoint of PQ.
k is a constant.




Find the co-ordinates of M.

**[3 marks]**

Answer ( _____ , _____ )

6 Rearrange $\boldsymbol{ty = \sqrt{\frac{3x+4t}{5}} - 7}$ to make t the subject.

**[3 marks]**

Answer _____

7 $v$ is a value greater than 1.

Work out the value of d for which $\left(v^d\right)^4 = (v^6)^{3d}$

**[2 marks]**

Answer _____

8 $\frac{2}{3}k^7t^3y^5 = \frac{1}{2}k^{15}t^4$

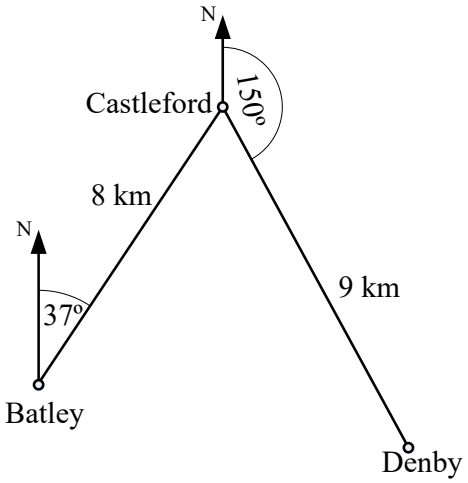
Write y in terms of k and t.

Give your answer in its simplest form.

**[2 marks]**

Answer _____

9 The diagram shows the towns of Batley, Castleford and Denby.




a Work out the size of the angle formed by Batley Castleford Denby.

**[2 marks]**

Answer _____

b Find the distance from Batley to Denby to the nearest 100 m.

**[3 marks]**

Answer _____

c Find the bearing from Denby to Batley to the nearest 0.1 degrees.

**[2 marks]**

Answer _____

10 Circle the expression that is equivalent to $\frac{2}{a}+\frac{3}{b}$

**[1 mark]**

$\frac{2a+3b}{ab}$ $\frac{2b+3a}{ab}$ $\frac{6ab^2}{b-a}$ $\frac{6}{ab}$

11 Simplify fully $\frac{8x^5-x^3}{40x^2-1}$

**[3 marks]**

Answer _____

12 The radius of a sphere is $\frac{5x}{3}$ cm.

The volume of the sphere is $5{,}208\frac{1}{3}\pi$ cm$^3$

Work out the value of x.

**[3 marks]**

Answer _____

13 $y = \frac{x^6(2x^5 - 5x)}{x}$

Find $\frac{dy}{dx}$

**[2 marks]**

Answer _____

14 $\boldsymbol{A} = \begin{pmatrix} 3 & 0 \\ 0 & -3 \end{pmatrix}$

Describe geometrically the single transformation represented by **A**

**[1 mark]**

15 $\boldsymbol{B} = \begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix}$

Describe geometrically the single transformation represented by $\mathbf{B}^2$

**[1 mark]**

16 $\boldsymbol{C} = \begin{pmatrix} 0 & -3 \\ 1 & 0 \end{pmatrix}$

Describe geometrically the single transformation represented by **C**

**[1 mark]**

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_____

_____

17 The following functions are

$$f(x) = 3x^2 \qquad g(x) = \frac{4}{x}$$

a Find $f^{-1}(x)$

**[2 marks]**

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_____

_____

_____

_____

Answer _____

b Find $gf(x)$

**[2 marks]**

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_____

_____

_____

Answer _____

18 A palindromic integer is one which has a mirror image of itself.
13531 is an example of a palindromic integer.
Find the number of four digit palindromic integers.

**[3 marks]**

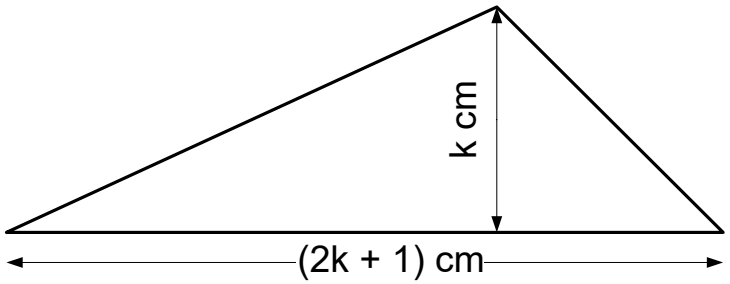
Answer _____

19 Work out the values of a, b and c such that $3x^2 + 5x - 1 = a(x + b)^2 + c$

**[3 marks]**

Answer _____

20 The area of a triangle is 68cm$^2$.




Form a quadratic equation and then find the length of the base of the triangle.

**[3 marks]**

Answer _____

21 Using binomial expansion, expand $\left(3x - \frac{\sqrt{3}}{2}\right)^5$

**[3 marks]**

22 a Using long division of polynomials, divide $6x^4 + x^3 - 21x^2 + 4x + 12$ by $3x + 2$

**[2 marks]**

Answer _____

b Using the factor theorem, show that (x+2) is a factor of the resulting quotient.

**[2 marks]**

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_____

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Answer _____