Mock Grade 8/9

Maths Booklet 4

Paper 1H
Non-Calculator

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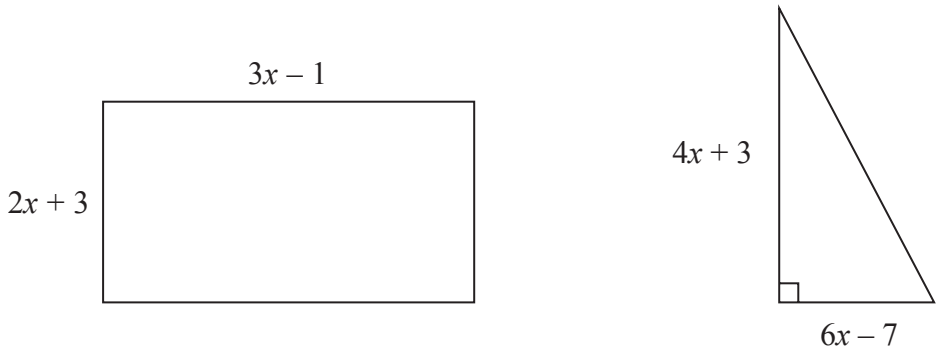
1 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.
The area of the rectangle is equal to the area of the triangle.

Find the value of x.

.....

(Total for Question 1 is 5 marks)

2 f and g are functions such that

$$f(x) = x^2 - 17 \quad \text{and} \quad g(x) = x + 3$$

(a) Work out an expression for $g^{-1}(x)$

.....

(2)

(b) Work out an expression for $f^{-1}(x)$

.....

(2)

(c) solve $g^{-1}(x) = f^{-1}(x)$

.....

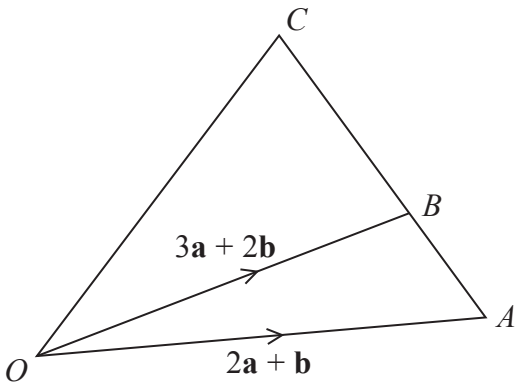
(4)

(Total for Question 2 is marks)

3 Show that $\dfrac{\sqrt{300}-7\sqrt{3}}{3\sqrt{3}-3}$ can be written in the form $\dfrac{a+b\sqrt{3}}{2}$ where a and b are integers.

(Total for Question 3 is 4 marks)

4



ABC is a straight line.

$AB : BC = 2 : 5$

$\overrightarrow{OA} = 2\mathbf{a} + \mathbf{b}$

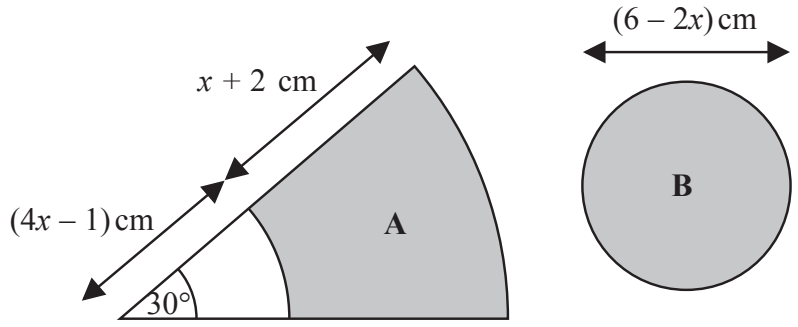
$\overrightarrow{OB} = 3\mathbf{a} + 2\mathbf{b}$

Express $\overrightarrow{OC}$ in terms of **a** and **b**.
Give your answer in its simplest form.

(Total for Question 4 is 4 marks)

5 The diagram shows two shaded shapes, **A** and **B**.

Shape **A** is formed by removing a sector of a circle with radius $(3x - 1)$ cm from a sector of the circle with radius $(5x - 1)$ cm.
Shape **B** is a circle of diameter $(2 - 2x)$ cm.



The area of shape **A** is equal to the area of shape **B**.

Find the value of x.
You must show all your working.

.....

(Total for Question 5 is 5 marks)

6 There are four types of cards in a game.

Each card has a black circle or a white circle or a black triangle or a white triangle.

number of cards with a black shape : number of cards with a white shape = 4 :

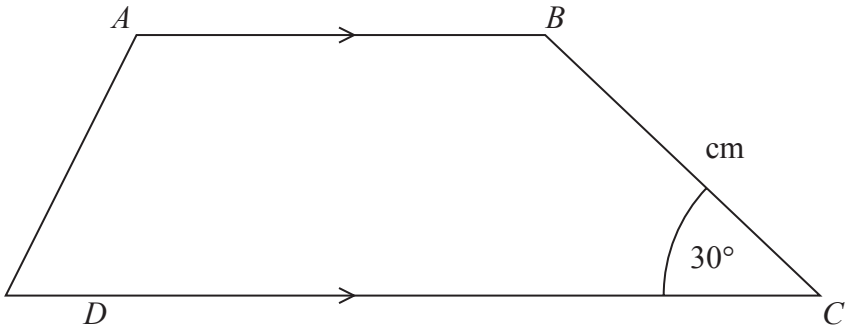
number of cards with a circle : number of cards with a triangle = 3 :

Express the total number of cards with a black shape as a fraction of the total number of cards with a triangle.

.....

(Total for Question 6 is 3 marks)

7 Here is trapezium $ABCD$.



The area of the trapezium is $56\,cm^2$

the length of AB : the length of $CD = 3 : 5$

Find the length of AB.

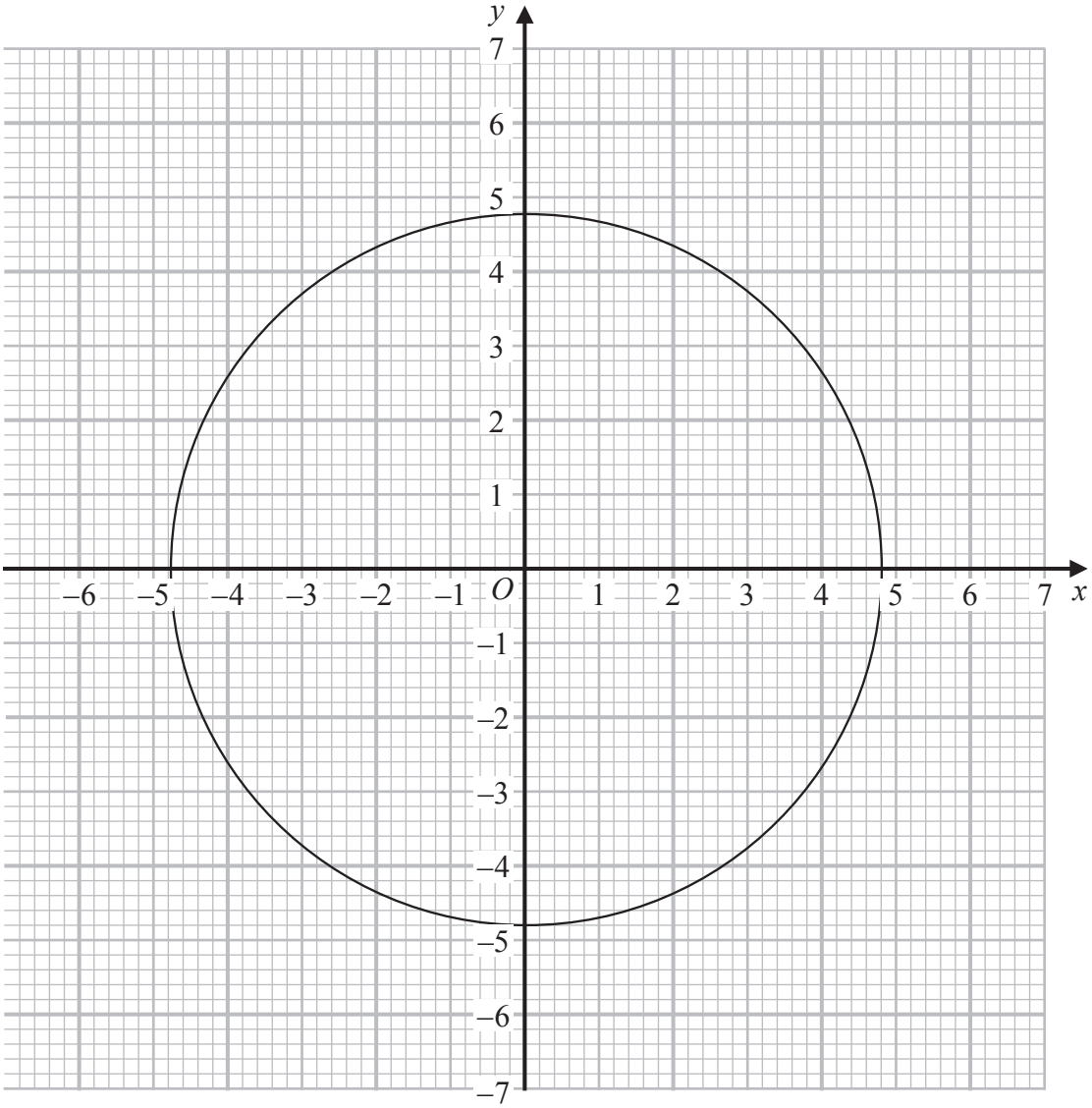
..... cm

(Total for Question 7 is 5 marks)

8 Show that $\dfrac{2+\sqrt{18}}{\sqrt{50}-5}$ can be written in the form $\dfrac{a+b\sqrt{2}}{5}$ where a and b are integers.

(Total for Question 8 is 4 marks)

9 The diagram shows the graph of $x^2 + y^2 = 30.25$



Use the graph to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 24.01$$
$$y + 2x = 3$$

.....

(Total for Question 9 is 3 marks)

10 The functions f and g are such that

$$f(x) = 2x^2 + 3 \quad \text{for } x > 0 \qquad \text{and} \qquad g(x) = \frac{4}{x^2} \quad \text{for } x > 0$$

(a) Work out gf(1)

(2)

The function h is such that $h = (gf)^{-1}$

(b) Find $h(x)$

(4)

(Total for Question 10 is 6 marks)