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0606/22

October/November 2018

2 hours

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

You are reminded of the need for clear presentation in your answers.

The total number of marks for this paper is 80.

This document consists of **15** printed pages and **1** blank page.

Mathematical Formulae**1. ALGEBRA***Quadratic Equation*

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY*Identities*

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

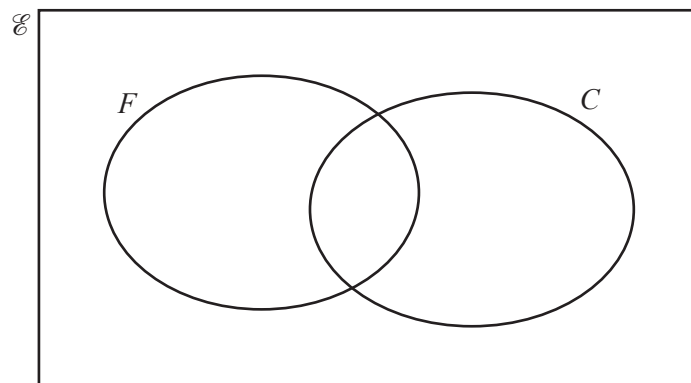
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

1 Solve the inequality $(x-3)(x+4) > x+13$.

[3]

2



There are 105 boys in a year group at a school. Some boys play football (F) and some play cricket (C).

- x boys play both football and cricket.
- The number of boys that play neither game is the same as the number of boys that play both.
- 40 boys play cricket.
- The number of boys that only play football is twice the number of boys that only play cricket.

Complete the Venn diagram and find the value of x .

[5]

3 A curve has equation $y = \frac{x^3}{\sin 2x}$. Find

(i) $\frac{dy}{dx}$, [3]

(ii) the equation of the tangent to the curve at the point where $x = \frac{\pi}{4}$. [3]

4 Solve

(i) $2^{3x-1} = 6,$ [3]

(ii) $\log_3(y+14) = 1 + \frac{2}{\log_y 3}.$ [5]

5 Solve the simultaneous equations

$$\frac{8^{p+1}}{4^q} = 2^{11},$$

$$\frac{3^{2p+5}}{27^{\frac{1}{3}}} = 9^{3q}.$$

[5]

- 6 (a) A 5-character code is to be formed from the 13 characters shown below. Each character may be used once only in any code.

Letters : A, B, C, D, E, F

Numbers: 1, 2, 3, 4, 5, 6, 7

Find the number of different codes in which no two letters follow each other and no two numbers follow each other. [3]

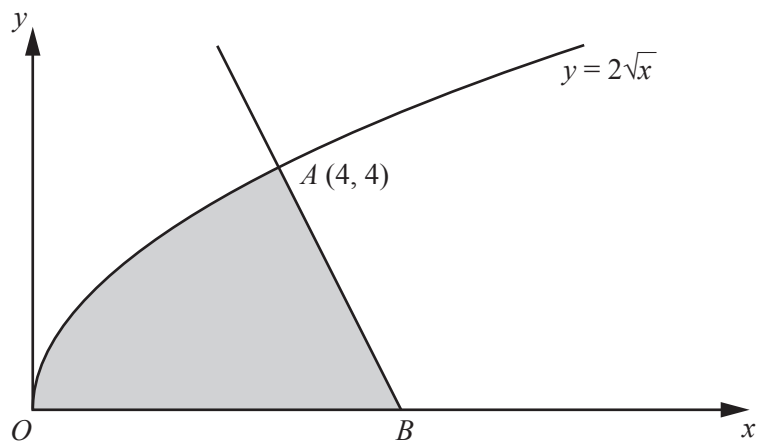
- (b) A netball team of 7 players is to be chosen from 10 girls. 3 of these 10 girls are sisters. Find the number of different ways the team can be chosen if the team does not contain all 3 sisters. [3]

- 7 Solve the quadratic equation $(1 - \sqrt{3})x^2 + x + (1 + \sqrt{3}) = 0$, giving your answer in the form $a + b\sqrt{3}$, where a and b are constants. [6]

8 (i) Show that $\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = 2 \tan x \sec x$. [4]

(ii) Hence solve the equation $\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = \operatorname{cosec} x$ for $0^\circ \leq x \leq 360^\circ$. [4]

9



The diagram shows part of the curve $y = 2\sqrt{x}$. The normal to the curve at the point $A(4, 4)$ meets the x -axis at the point B .

(i) Find the equation of the line AB .

[4]

(ii) Find the coordinates of B .

[1]

(iii) Showing all your working, find the area of the shaded region.

[4]

- 10** Two lines are tangents to the curve $y = 12 - 4x - x^2$. The equation of each tangent is of the form $y = 2k + 1 - kx$, where k is a constant.
- (i)** Find the two possible values of k . [5]

- (ii) Find the coordinates of the point of intersection of the two tangents.

[4]

11 The functions f and g are defined for real values of $x \geq 1$ by

$$f(x) = 4x - 3,$$

$$g(x) = \frac{2x+1}{3x-1}.$$

(i) Find $gf(x)$. [2]

(ii) Find $g^{-1}(x)$. [3]

(iii) Solve $fg(x) = x - 1$. [4]

- 12** A plane that can travel at 260 km/h in still air heads due North. A wind with speed 40 km/h from a bearing of 310° blows the plane off course. Find the resultant speed of the plane and its direction as a bearing correct to 1 decimal place. [6]

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