Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Trigonometric graphs and equations

Time allowed: 40 minutes

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 31

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 31 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 When $\sin x° = 0.36$, find

(a) the acute angle $x°$,

..... [1]

(b) the obtuse angle $x°$.

..... [1]

(a) SOHCAHTOA (b) Solving trigonometric equations Click for more variations

1(a)	21.1 or 21.10…	**1**	
1(b)	158.9 or 158.8 to 158.9	**1**	**FT** 180 – *their* **(a)** providing answer is an obtuse angle

2 Solve the equation $\tan x = 2$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [2]

Solving trigonometric equations Click for more variations

2	63.4 or 63.43... 243.4 or 243.4...	**2**	**B1** for each If 0 scored **SC1** for two answers with a difference of 180

3 Find all the solutions of $4\sin x = 3$ for $0° \leqslant x \leqslant 360°$.

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..... [2]

Solving trigonometric equations Click for more variations

3	48.6 or 48.59… and 131.4 or 131.4…	**2**	**B1** for each If 0 scored **SC1** for two answers with a sum of 180°

4 Solve $3\tan x = -4$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]

Solving trigonometric equations Click for more variations

4	126.9 or 126.86 to 126.87 and 306.9 or 306.86 to 306.87	**3**	**B2** for one correct or **M1** for $\tan x = -\frac{4}{3}$ if 0 scored then **SC1** for two answers with a difference of 180°

5 Solve $3(2 + \cos x) = 5$ for $0° \leqslant x \leqslant 360°$.

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..... [3]

Solving trigonometric equations Click for more variations

5	109.4 to 109.5 and 250.5 to 250.6	**3**	**B2** for one correct angle or **M1** for $\cos x = \frac{5}{3} - 2$ or better If 0 scored **SC1** for two angles that sum to 360

6 Solve the equation $3\sin x + 3 = 1$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]

Solving trigonometric equations Click for more variations

6	221.8 or 221.81... and 318.2 or 318.18 to 318.19	**3**	**B2** for one correct or **M1** for $\sin x = -\frac{2}{3}$ oe If **0** scored, **SC1** for two reflex angles with a sum of 540 or two non-reflex angles with a sum of 180

7 Solve $\tan x = -\frac{1}{\sqrt{3}}$ for $0° \leqslant x \leqslant 360°$.

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$x =$ ..... , $x =$ ..... [3]

Solving trigonometric equations Click for more variations

7	150 and 330	**3**	**B2** for one correct answer or **B1** for $[\tan^{-1}\ldots] = 30$ or -30 If 0 scored, **SC1** for two answers in range with a difference of 180

8 **(a)** Write down the exact value of $\tan 60°$.

..... [1]

(b) Solve $2\sin x - 1 = 0$ for $0° \leqslant x \leqslant 360°$.

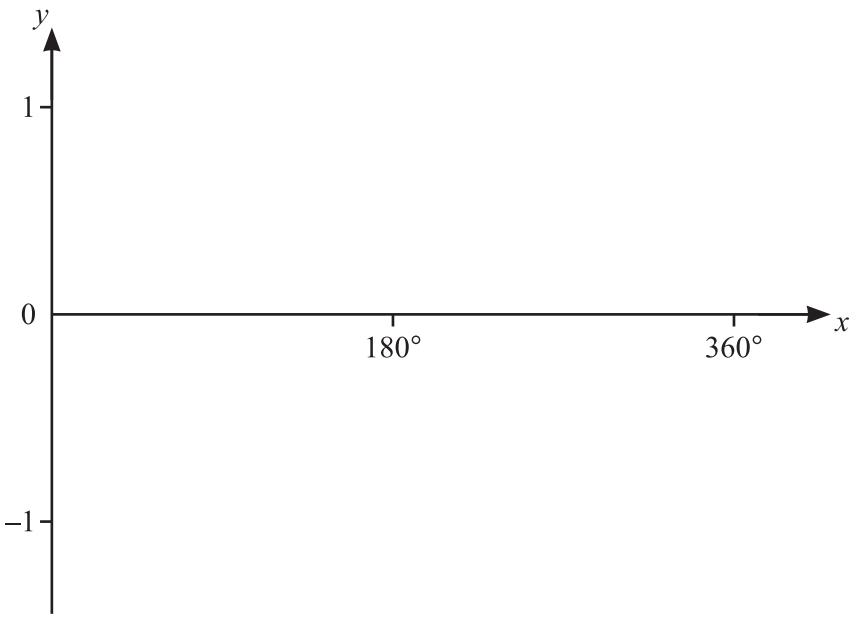
$x =$ ..... or $x =$ ..... [3]

(a) Exact trigonometric values (b) Solving trigonometric equations Click for more variations

8(a)	$\sqrt{3}$	**1**	
8(b)	30, 150	**3**	**B2** for 30 or 150 or **M1** for $\sin x = \frac{1}{2}$ If 0 or M1 scored, **SC1** for one acute angle and one obtuse angle with a sum of 180

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9 **(a)** Sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.



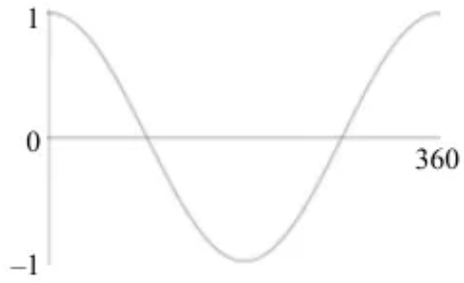
[2]

(b) $\cos x° = \frac{1}{\sqrt{2}}$ and x is a **reflex** angle.

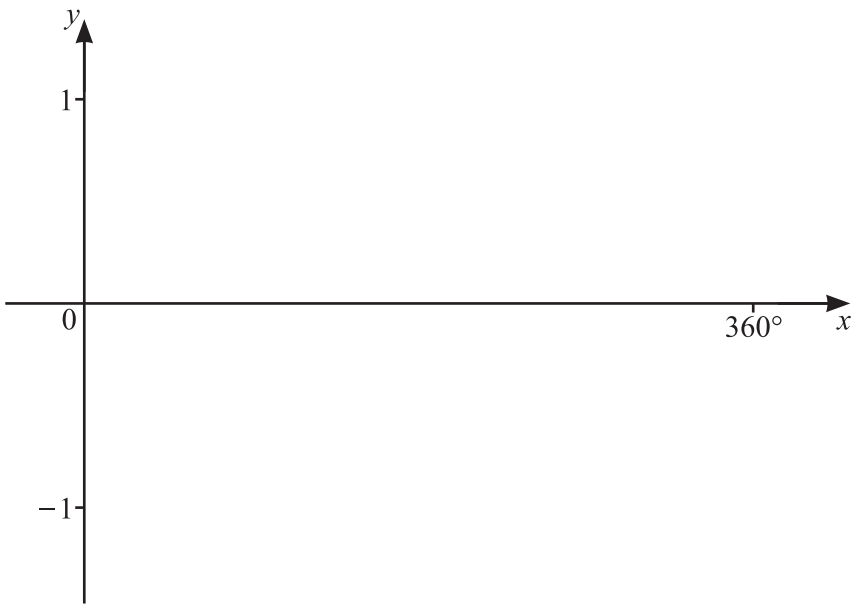
Find the value of x.

$x =$ ..... [2]

(a) Trigonometric graphs (b) Solving trigonometric equations Click for more variations

9(a)	Correct sketch to go through (0, 1), (180, –1) and (360, 1)  	**2**	**M1** for correct cos curve shape through (0, 1) or for almost correct sketch within tolerance but with an omission at either end or for almost correct sketch within tolerance but with incorrect curvature in one place only
9(b)	315	**2**	**B1** for 45

10 **(a)** Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(b) Solve the equation $2 + 5\sin x = 1$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

(a) Trigonometric graphs (b) Solving trigonometric equations Click for more variations

10(a)	Correct sketch to go through (0, 0), (180, 0) and (360, 0)	**2**	**B1** for correct sine curve shape through the origin (minimum one cycle)
10(b)	191.5, 348.5 and no others	**3**	**B2** for one correct or **M1** for $\sin x = -\frac{1}{5}$ oe If M1 or 0 scored, **SC1** for two reflex angles with a sum that rounds to 540.0 or two non-reflex angles with a sum that rounds to 180.0

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