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# National 5 Maths

# Trigonometric Equations

SQA past paper and specimen paper  
questions and answers by topic

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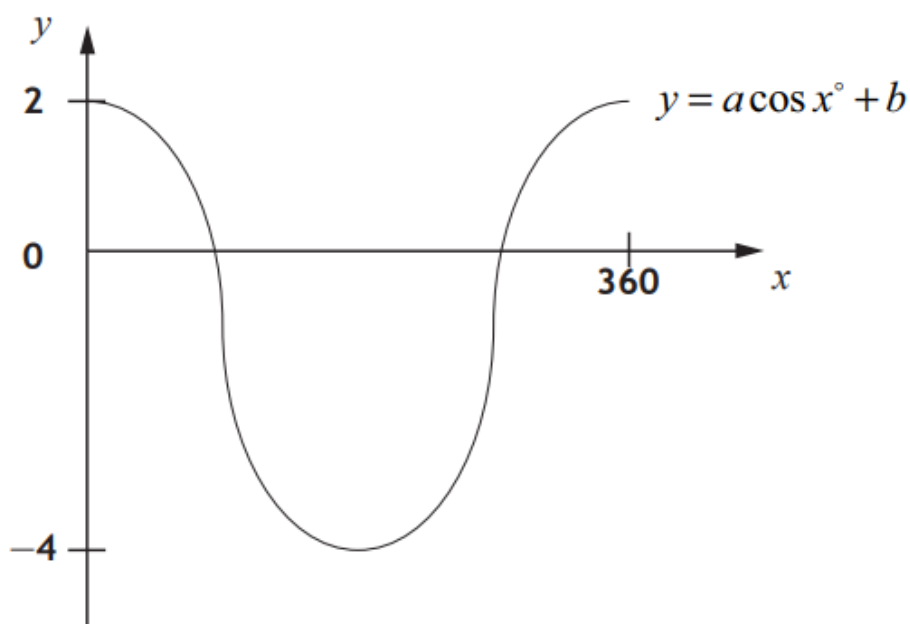
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Part of the graph of  $y = a \cos x^\circ + b$  is shown below.



- (a) Explain how you can tell from the graph that  $a = 3$  and  $b = -1$ . 2
- (b) Calculate the  $x$ -coordinates of the points where the graph cuts the  $x$ -axis. 4

Answers:

- (a)  $a = 3$  because  $2 - (-4) = 6$ , which is  $3 \times (1 - (-1))$ .  
 $b = -1$  because the graph of  $y = 3 \cos x$  has been moved down 1.
- (b)  $70.5^\circ, 289.5^\circ$

**National 5 Maths**  
**SQA 2014 Paper 2**  
**Question 12**

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Solve the equation  $11\cos x^\circ - 2 = 3$ , for  $0 \leq x \leq 360$ .

**3**

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Answer:

$$x = 63.0^\circ \text{ or } x = 297.0^\circ$$

**National 5 Maths**  
**SQA 2015 Paper 1**  
**Question 9**

Write the following in order of size starting with the smallest.

$\cos 90^\circ$        $\cos 100^\circ$        $\cos 300^\circ$

Justify your answer.

**2**

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Answer:

$\cos 100^\circ, \cos 90^\circ, \cos 300^\circ$

The justification should use either the ASTC quadrant diagram or the graph of  $y = \cos x$ .

**National 5 Maths**  
**SQA 2016 Paper 2**  
**Question 14**

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Solve the equation  $2 \tan x^\circ + 5 = -4$ , for  $0 \leq x \leq 360$ .

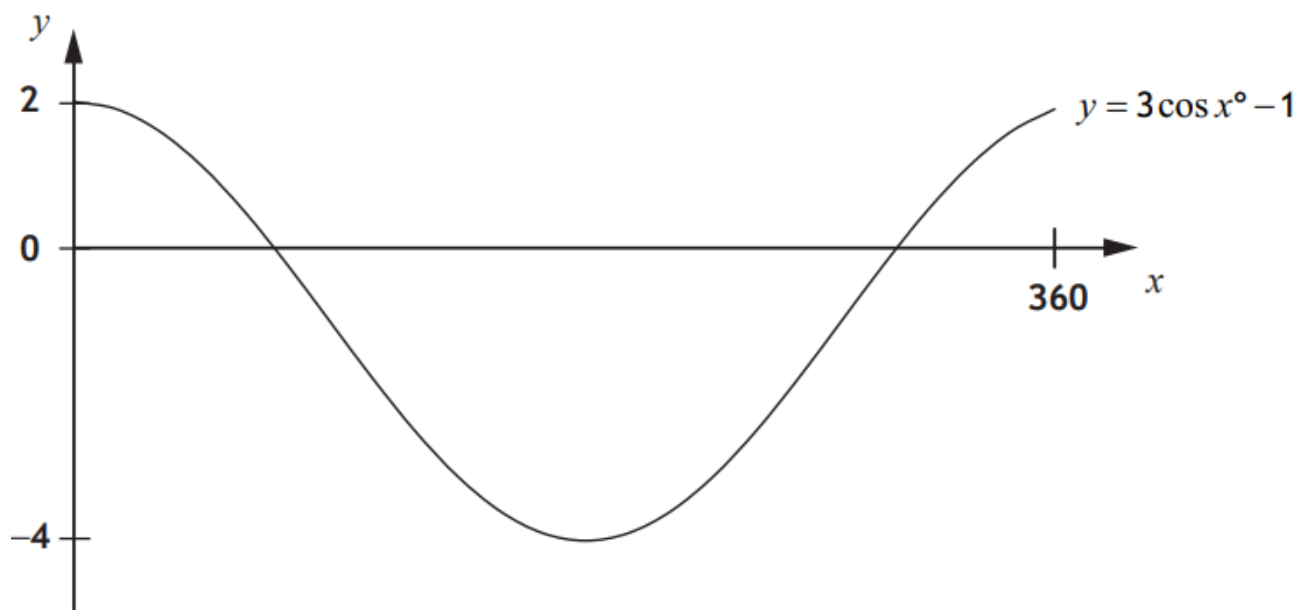
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**3**

Answer:

$$x = 102.5^\circ \text{ or } x = 282.5^\circ$$

Part of the graph  $y = 3 \cos x^\circ - 1$  is shown below.



Calculate the  $x$ -coordinates of the points where the graph cuts the  $x$ -axis.

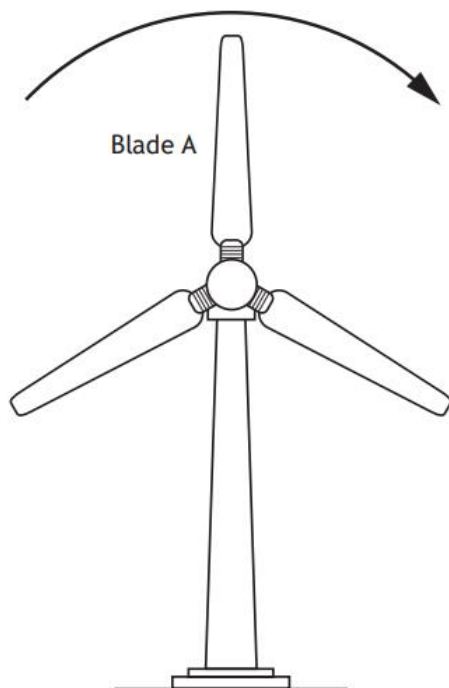
4

Answers:

$70.5^\circ$  and  $289.5^\circ$

**National 5 Maths**  
**SQA 2017 Paper 2**  
**Question 15**

A wind turbine has three blades as shown below.



The height,  $h$  metres, of the tip of blade A above the ground in each rotation is given by

$$h = 40 + 23 \cos x^\circ, \quad 0 \leq x < 360$$

where  $x$  is the angle blade A has turned clockwise from its vertical position.

- (a) Calculate the height of the tip of blade A after it has turned through an angle of  $60^\circ$ . 1
- (b) Find the minimum height of the tip of blade A above the ground. 1
- (c) Calculate the values of  $x$  for which the tip of blade A is 61 metres above the ground. 4

Answers:

- (a) 51.5 m  
(b) 17 m  
(c)  $24.1^\circ$  and  $335.9^\circ$

**National 5 Maths**  
**SQA 2018 Paper 1**  
**Question 12**

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Given that  $\cos 60^\circ = 0.5$ , state the value of  $\cos 240^\circ$ .

1

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Answer:

– 0.5

**National 5 Maths**  
**SQA 2018 Paper 2**  
**Question 8**

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Solve the equation  $7 \sin x^\circ + 2 = 3$ , for  $0 \leq x < 360$ .

**3**

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Answer:

$$x = 8.2^\circ \text{ or } x = 171.8^\circ$$

**National 5 Maths**  
**SQA 2019 Paper 2**  
**Question 14**

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Solve the equation  $5 \cos x^\circ + 2 = 1$ ,  $0 \leq x < 360$ .

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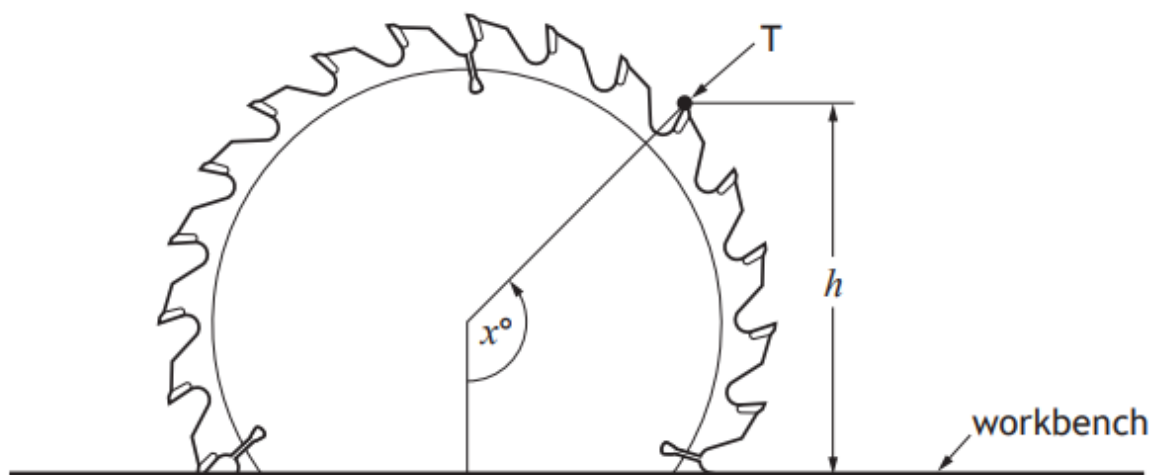
**3**

Answer:

$$x = 101.5^\circ \text{ or } x = 258.5^\circ$$



The diagram shows the part of the blade of a circular saw above a workbench.



As the blade rotates, the height,  $h$  millimetres, of point T above the workbench is given by

$$h = 57 - 85 \cos x^\circ$$

where  $x$  is the angle the blade has turned anti-clockwise from a starting position.

- (a) Calculate the value of  $x$  when point T is first at a height of 115 millimetres above the workbench. 3
- (b) Calculate the value of  $x$  when point T is next at this height. 1

Answers:

- (a)  $133.0^\circ$   
(b)  $227.0^\circ$

**National 5 Maths**  
**SQA 2022 Paper 2**  
**Question 9**

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Solve the equation  $3 \sin x^\circ + 4 = 6$ , for  $0 \leq x \leq 360$ .

**3**

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Answer:

$$x = 41.8^\circ \text{ or } x = 138.2^\circ$$

**National 5 Maths**  
**SQA 2023 Paper 1**  
**Question 11**

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Given that  $\sin 30^\circ = 0.5$ , state the value of  $\sin 330^\circ$ .

1

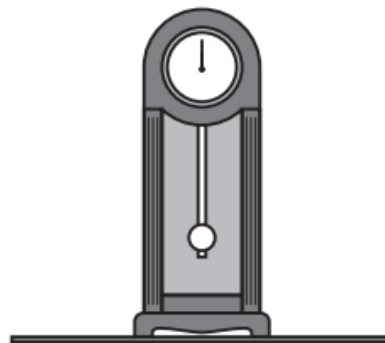
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Answer:

−0.5



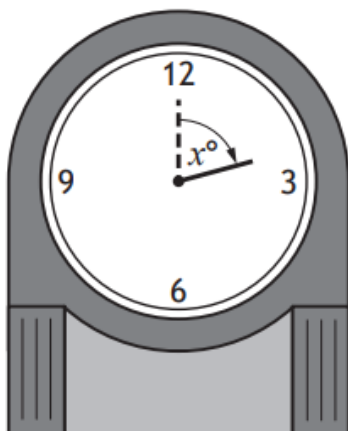
Anna has a grandfather clock in her house.



The height of the tip of the hour hand above the floor, in centimetres, is given by

$$h = 20 \cos x^\circ + 147$$

where  $x^\circ$  is the angle the **hour hand** has rotated through since 12 o'clock.



Calculate the first two values of  $x$  for which the tip of the hour hand is 150 centimetres above the floor.

4

Answers:

$$x = 81 \text{ or } x = 279$$

**National 5 Maths**  
**SQA 2024 Paper 2**  
**Question 11**

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Solve the equation  $17 \sin x^\circ + 1 = 9$ , for  $0 \leq x < 360$ .

**3**

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Answer:

$$x = 28.1^\circ \text{ or } x = 151.9^\circ$$

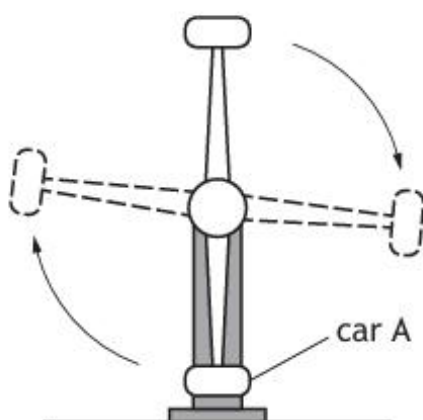


A ride at a theme park has a car attached to each end of a rotating arm.



MARK

The starting position of car A is shown in the diagram.



As the arm rotates clockwise, the height,  $h$  metres, of car A above the ground in each rotation is given by

$$h = 10 - 8 \cos x^\circ, \quad 0 \leq x < 360$$

where  $x^\circ$  is the angle the arm has turned from car A's starting position.

Calculate the **two** values of  $x$  for which the height of car A is 13 metres above the ground.

4

Answer:  $x = 112.0^\circ$  and  $x = 248.0^\circ$