CAST Diagram - Rearranging

Today we are learning...

How to solve trigonometric equations by rearranging.

I will know if I have been successful if...

I can rearrange the equation to make cos/sin/tan the subject.

I can find the first solution on my calculator.

I can find the second solution using the CAST diagram.

Example 1

Solve $1 + \cos(x) = 1.5$ for $0 < x < 360$

Example 2

Solve $3\cos(x) + 2 = 3$ for $0 < x < 360$

Exam Question

2018 Paper 2 National 5

Solve the equation $7\sin(x) + 2 = 3$ for $0 < x < 360$

(3 Marks)

Mark Scheme

Question	Generic scheme	Illustrative scheme	Max mark
8.	• 1 rearrange equation	• 1 $\sin x = \frac{1}{7}$	3
	• 2 calculate value of x	• 2 $8 \cdot 2(1\ldots)$	
	• 3 calculate 2nd value of x	• 3 $171 \cdot 8$ or $171 \cdot 7(8\ldots)$	

Notes:

1. Correct answers without working award 1/3 ××✓
2. Accept 8 and 172 with valid working
3. Degree signs are not required
4. Premature rounding: rounded working must be to at least 2 decimal places
   eg (a) $\sin x = \frac{1}{7} = 0 \cdot 14 \rightarrow x = 8(\cdot 04\ldots), 172$ or $171 \cdot (95\ldots)$ award 3/3
   (b) $\sin x = \frac{1}{7} = 0 \cdot 1 \rightarrow x = 6$ or $5(\cdot 73\ldots), 174 \cdot (26\ldots)$ award 2/3 ✓×✓
5. Inappropriate use of RAD or GRAD should only be penalised once in Q8, Q9, Q13 or Q17
   (a) 0·143… ,179·856… (RAD)
   (b) 9·125…. ,170·874… (GRAD)

Starter

1) Rationalise $\frac{3}{\sqrt{5}}$

2) Find the equation of the straight line passing through the point (3, -5) with a gradient of 2.

CAST Exam Questions

Today we are learning...

How to solve an exam question on the CAST Diagram.

I will know if I have been successful if...

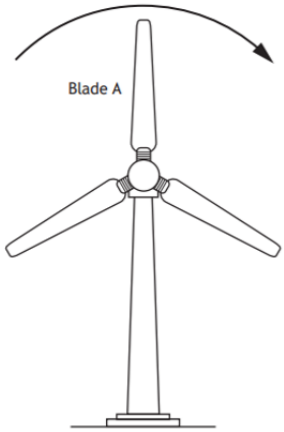
I can pick out the key pieces of information.

I can set out my working logically.

I can mark my work against the marking scheme.

2017 Question 15 Paper 2

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

$$h = 40 + 23\cos x°, \qquad 0 \leq x < 360$$

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°.

(b) Find the minimum height of the tip of blade A above the ground.

(c) Calculate the values of x for which the tip of blade A is 61 metres above the ground.

2017 Question 15 Paper 2

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

$$h = 40 + 23\cos x°, \qquad 0 \leq x < 360$$

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°. (1 Mark)

(b) Find the minimum height of the tip of blade A above the ground. (1 Mark)

(c) Calculate the values of x for which the tip of blade A is 61 metres above the ground. (4 Marks)

2017 Question 15 Paper 2

Question			Generic scheme	Illustrative scheme	Max mark
15.	(a)		Ans: 51·5 metres • 1 calculate height	• 1 51·5	1

2017 Question 15 Paper 2

	(b)		**Ans: 17 metres** •[1] calculate minimum height	•[1] 17	**1**

2017 Question 15 Paper 2

	(c)		**Ans: 24·1° and 335·9°** •[1] substitute 61 correctly into equation •[2] calculate cos x •[3] calculate value of x •[4] calculate 2nd value of x	•[1] $61 = 40 + 23\cos x$ •[2] $\cos x = \frac{21}{23}$ •[3] $24(\cdot 07\ldots)$ •[4] $335(\cdot 92\ldots)$	**4**

2016 Question 14 Paper 2

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

(3 Marks)

2016 Question 14 Paper 2

Question	Generic Scheme	Illustrative Scheme	Max Mark
14.	Ans: x = 102·5, 282·5		3
	• [1] rearrange equation	• [1] $\tan x = -\frac{9}{2}$	
	• [2] find one value of x	• [2] x = 102·5	
	• [3] find another value of x	• [3] x = 282·5	

Notes:
1. Correct answer without working award 2/3
2. For x = 178·6, 358·6 (uses RAD), award 3/3 (with working), 2/3 (without working)
3. For x = 93·9, 273·9 (uses GRAD), award 3/3 (with working), 2/3 (without working)

2018 Question 12 Paper 1

12. Given that $\cos 60° = 0{\cdot}5$, state the value of $\cos 240°$.

(1 Mark)