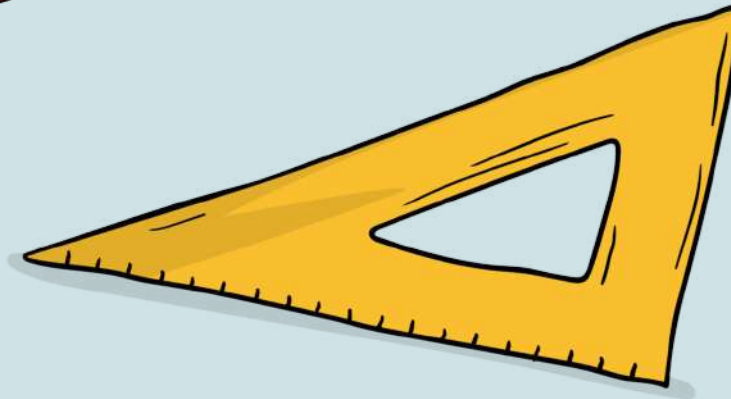
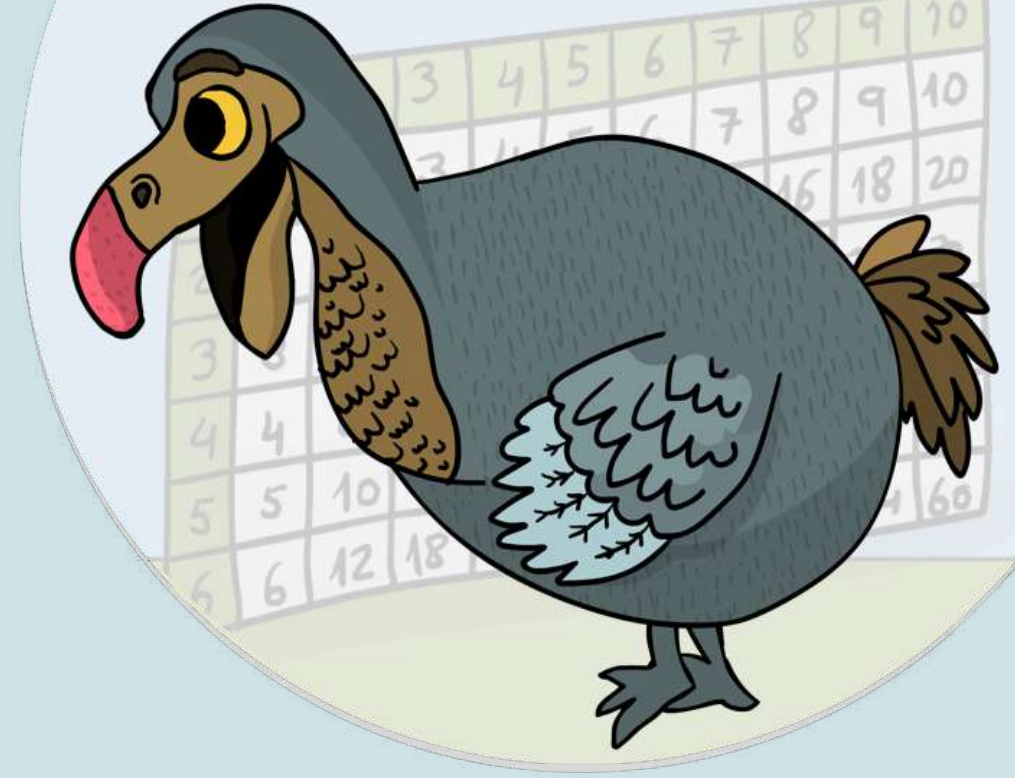


# DODO DOES MATH

## ANGLES



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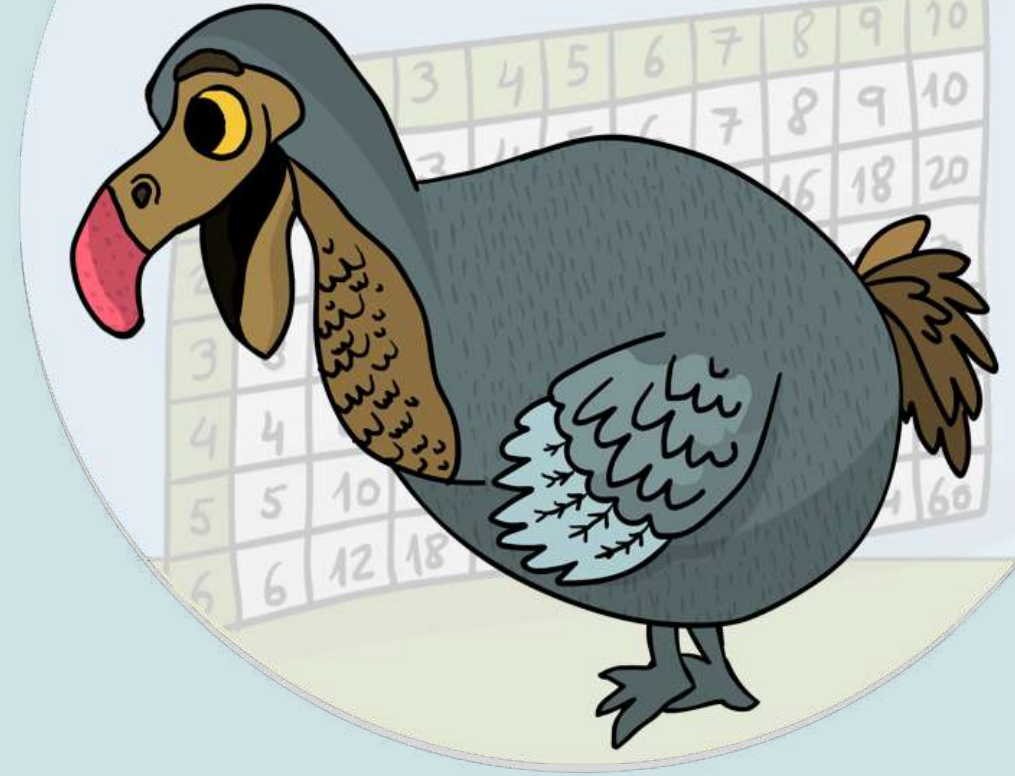
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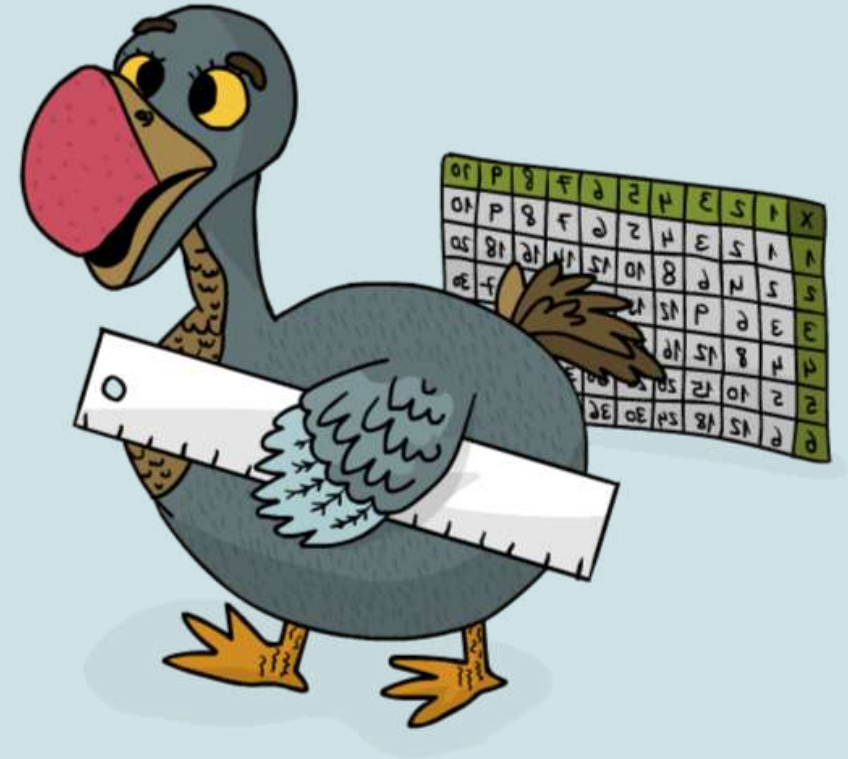
## Introduction

Thank you for choosing Dodo Does Math to provide your students with a fun and innovative way to practice math with code.

Dodo Does Math: Angles helps students practice adding, subtracting and measuring angles. In the upcoming challenges, students will be required to help a dodo find all the her missing eggs by using 2<sup>nd</sup>-4<sup>th</sup> grade math concepts.

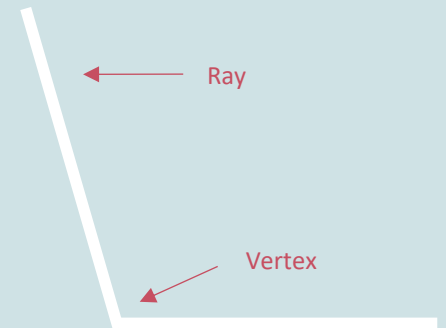
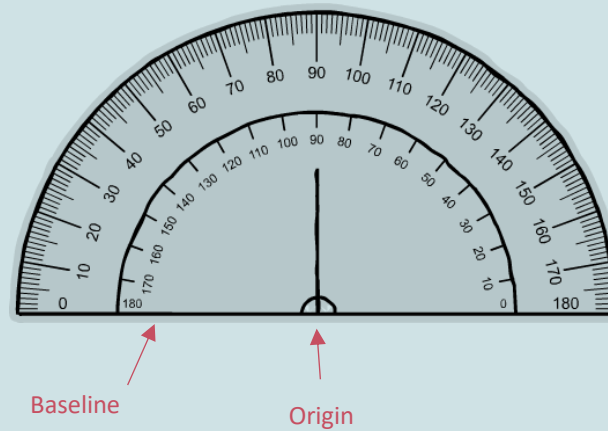
The following lesson plans will guide you on how to successfully integrate Dodo Does Math into your class.

Ready? Let's Begin!



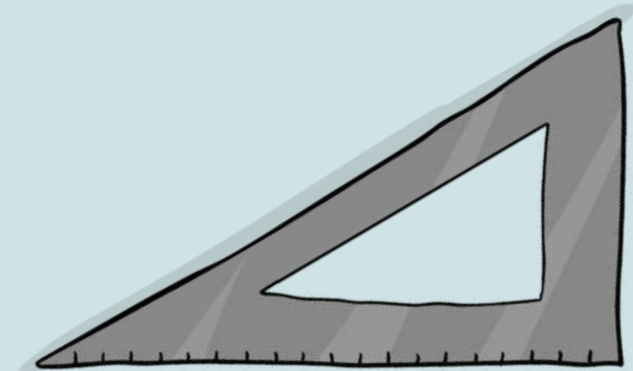
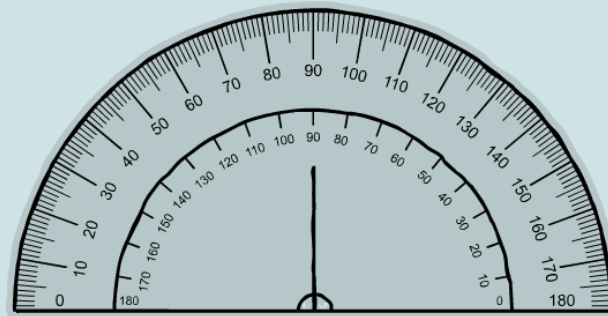
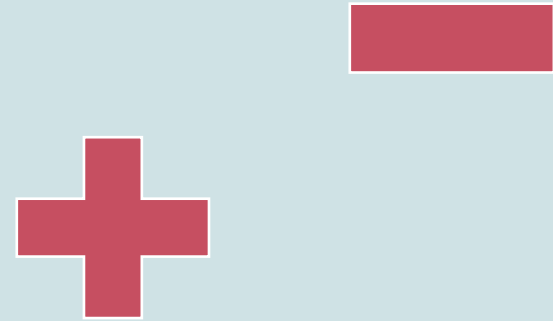
## Math Terms

- 🐼 **Baseline:** the line along the bottom of the protractor
- 🐼 **Origin:** the middle of the baseline
- 🐼 **Vertex:** the middle of the angle
- 🐼 **Ray:** a line that has one endpoint and goes on forever in the other direction
- 🐼 **Degrees:** the unit of measurement in angles



## Important Information

- 🧠 Pre-requisite: First 30 Coding Adventure challenges
- 🧠 20 total Dodo Does Math: Angles challenges
- 🧠 Challenges with a ruler practice measuring distances and angles
- 🧠 The challenges without a protractor help students practice adding and subtracting angles
- 🧠 Some challenges include adding or subtracting two or more angles



## Preliminary Coding Knowledge



## Coding in CoffeeScript

[CoffeeScript](#) is the programming language taught in CodeMonkey's Coding Adventure. Dodo Does Math requires basic knowledge of CoffeeScript in every challenge. The language compiles to JavaScript. Similarly to JavaScript, it is used in the industry primarily for web applications. The language was chosen mainly because of its friendly syntax, which resembles written English.





## Star-based Grading



- 🍪 1-Star = Incomplete solution (math problem left unsolved)
- 🍪 2-Stars = Solution completed, but guessed instead of measured
- 🍪 3-Stars = Solution completed, used tools to measure and wrote concise code.
- 🍪 Remind students to read the win message
- 🍪 The win message formalizes the equation solved
- 🍪 In order to practice math, all students are expected to write answers that will credit them with at least two stars (encourage 3-stars).
- 🍪 In most challenges, using the correct calculation will yield code with the least number of lines needed. This will result in a three-star solutions.



## Helpful Tips

- 🥚 In order to pick an egg up, the center of the dodo needs to be exactly on the center of the egg.

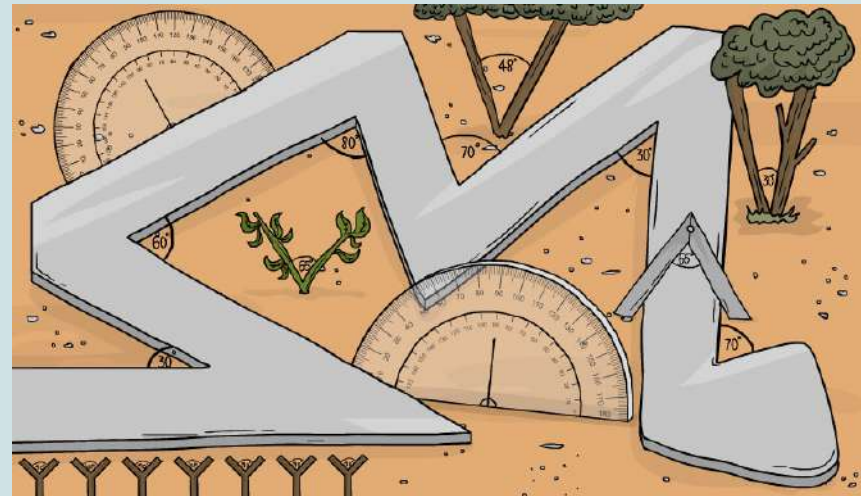


- 🥚 The dodo needs to step the correct distance and direction in order to pickUp() the egg.
- 🥚 Precise instructions on how to get to each egg and pick it up are needed in order for the dodo to successfully catch all of the eggs.
- 🥚 To write the correct instructions, the number of steps and degrees that the dodo needs to move should be measured and/or calculated.



## Common Core State Standards Addressed

- 🥚 CCSS.MATH.CONTENT.2.OA.B.2
- 🥚 CCSS.MATH.CONTENT.2.NBT.A.2/.B.5 /.B.7
- 🥚 CCSS.MATH.CONTENT.2.MD.A. 1
- 🥚 CCSS.MATH.CONTENT.3.OA.B.5/C.7
- 🥚 CCSS.MATH.CONTENT. 3.NBT.A.2
- 🥚 CCSS.MATH.CONTENT.4.MD./C.7

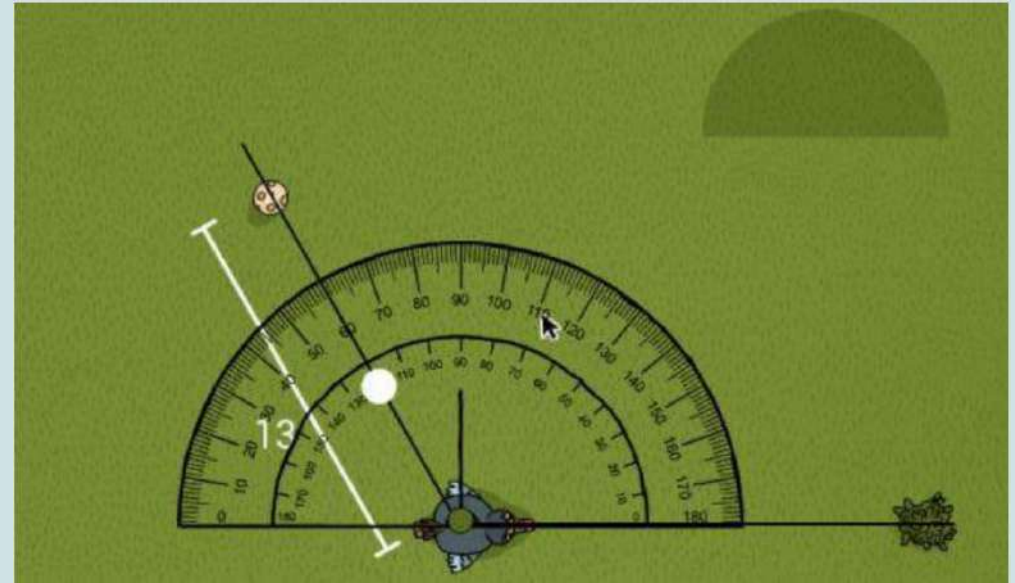


## Measuring Angles with a Life-like Protractor

In these challenges, students will need to use a protractor that simulates how one is used in real-life.

In order to measure an angle, students will need to:

- 🐼 Place the origin of the protractor on the vertex of the angle
- 🐼 Rotate the protractor (using the 🔄 icon) until the baseline is aligned to one of the angle's rays
- 🐼 Read the degrees the second ray points to

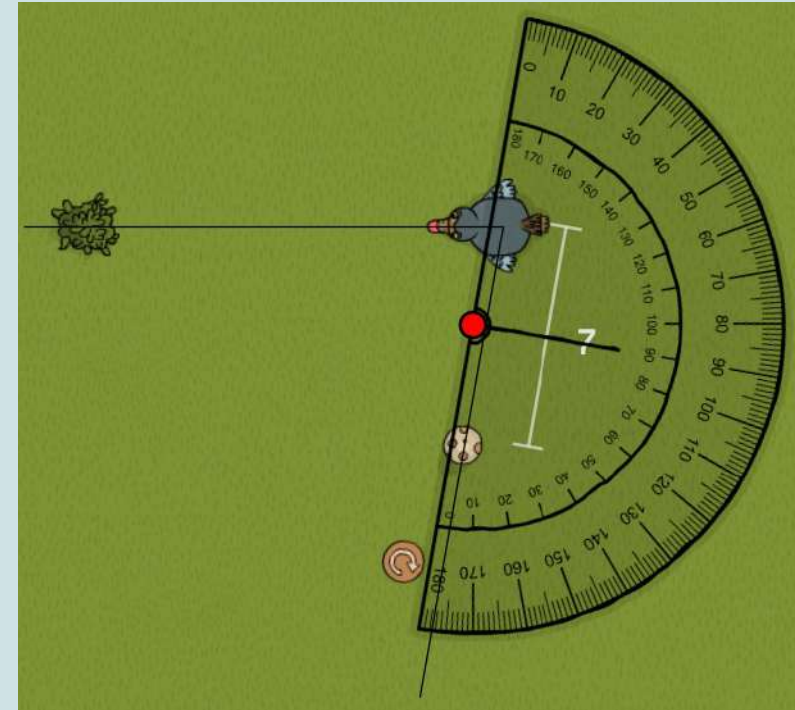


[Watch on YouTube](#)

## Measuring Angles with a Life-like Protractor

Meaning of Colored Dots:

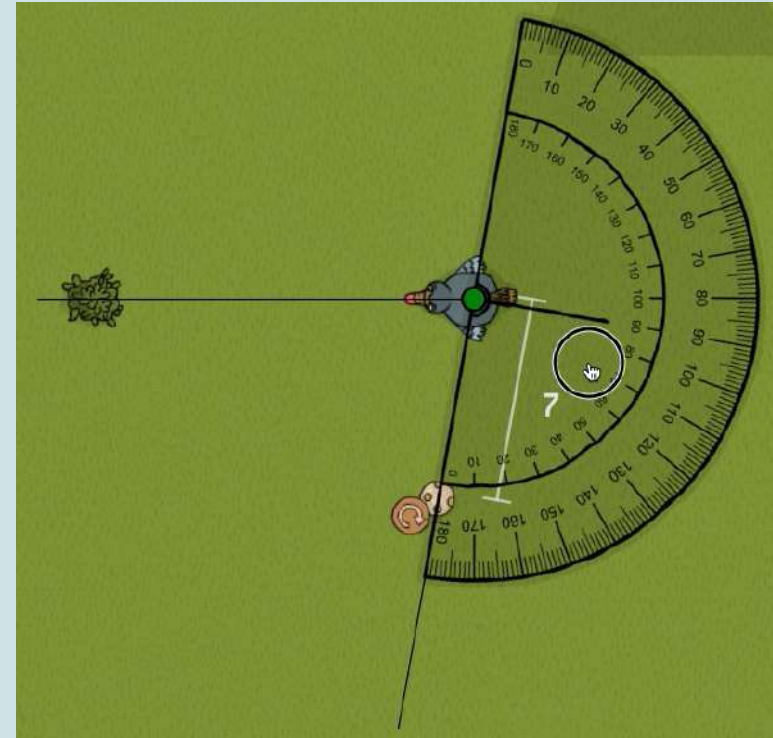
- 🐣 The red dot will flash when the protractor is moved.
- 🐣 The dot will change to green when the protractor is placed correctly on an object.
- 🐣 If it is placed anywhere else, the dot will either remain red or not appear at all.



## Measuring Angles with a Life-like Protractor

Placing the protractor:

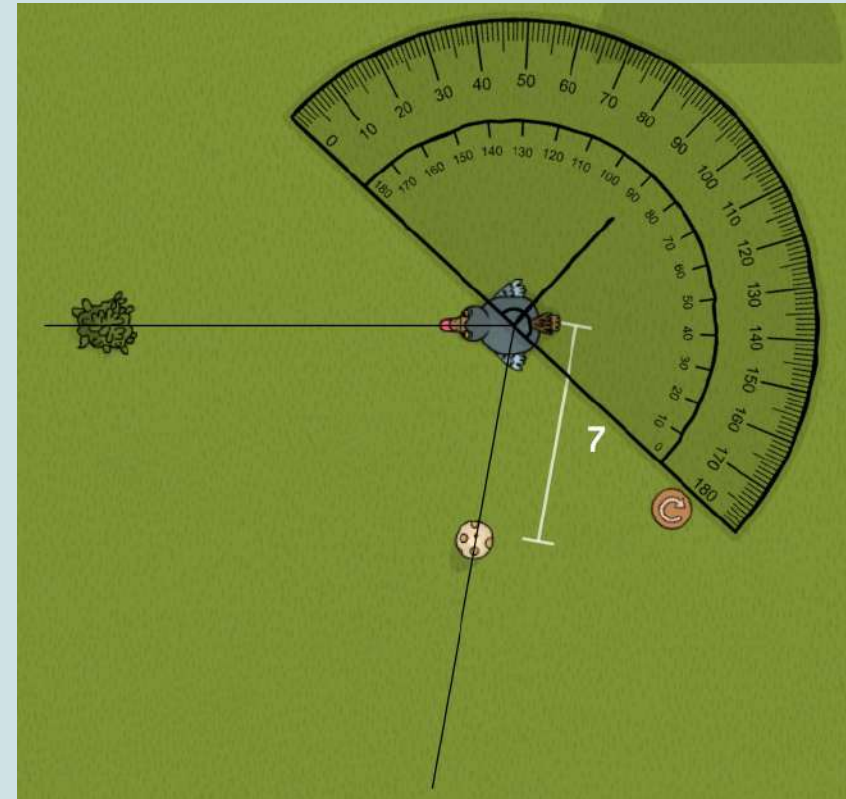
- When the origin of the protractor is placed on the vertex of an angle, the dot will change to green.
- When the protractor is very close to the vertex, it will gravitate to the correct location. This facilitates the understanding of where to place the protractor and eliminates the need for fine motor skills.



## Measuring Angles with a Life-like Protractor

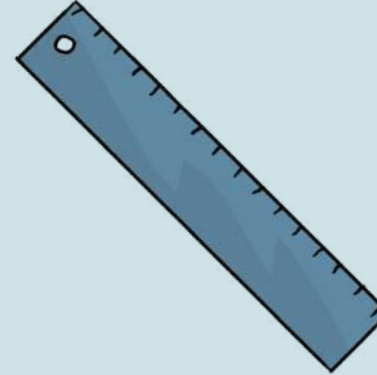
Rotation of the protractor:

- 🐪 To rotate the protractor, move the mouse over the rotate icon and click it.
- 🐪 Hold your click on the mouse and move the protractor until the baseline is aligned to one of the angle's rays.
- 🐪 To facilitate the understanding of how to measure the angle and minimize frustration, using fine motor skills, when the protractor is very close to the ray, it will automatically attach to the right place. This is meant
- 🐪 Incorrect measurement of an angle, even by one degree, will not take the dodo to the exact location of the egg.



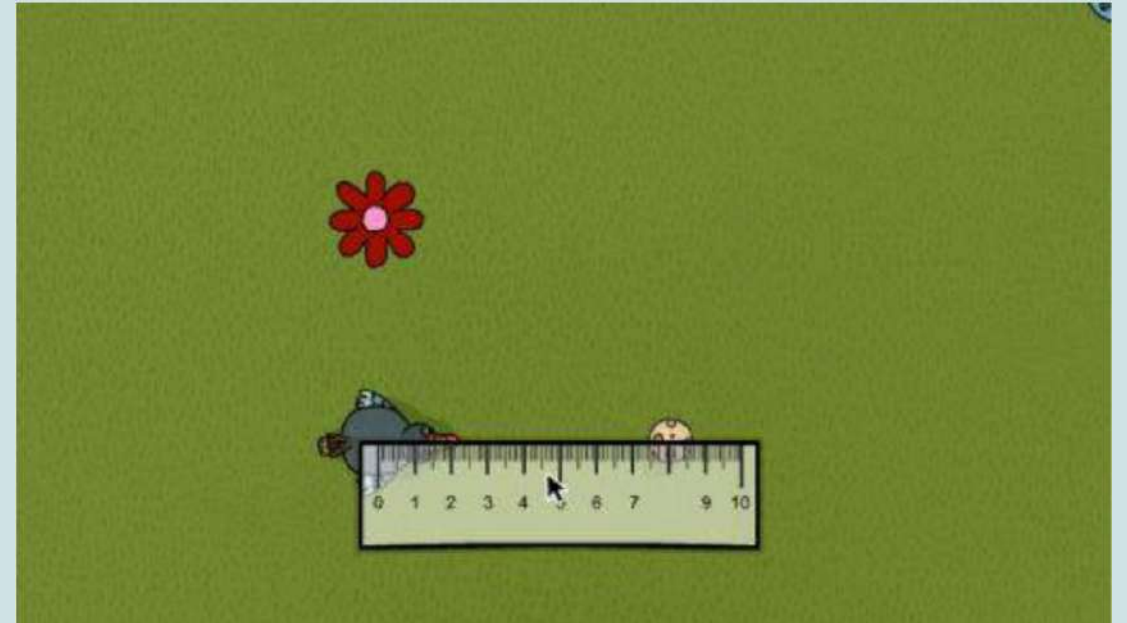
## Measuring Distance with a Life-like Ruler

- 🐘 Students will use a new type of ruler that simulates a real-life one.
- 🐘 The ruler has a fixed length of 10 steps.
- 🐘 In some challenges, students will use the ruler more than once to measure the full distance.
- 🐘 Students will discover the need to use a reference point for measuring to and from objects.



## Measuring Distance with a Life-like Ruler

- 🐼 For distance measuring, students will need to:
  - 🐼 Place the ruler on the center of an object
  - 🐼 Rotate the ruler (using the icon 🔄)
  - 🐼 Read the distance on the ruler

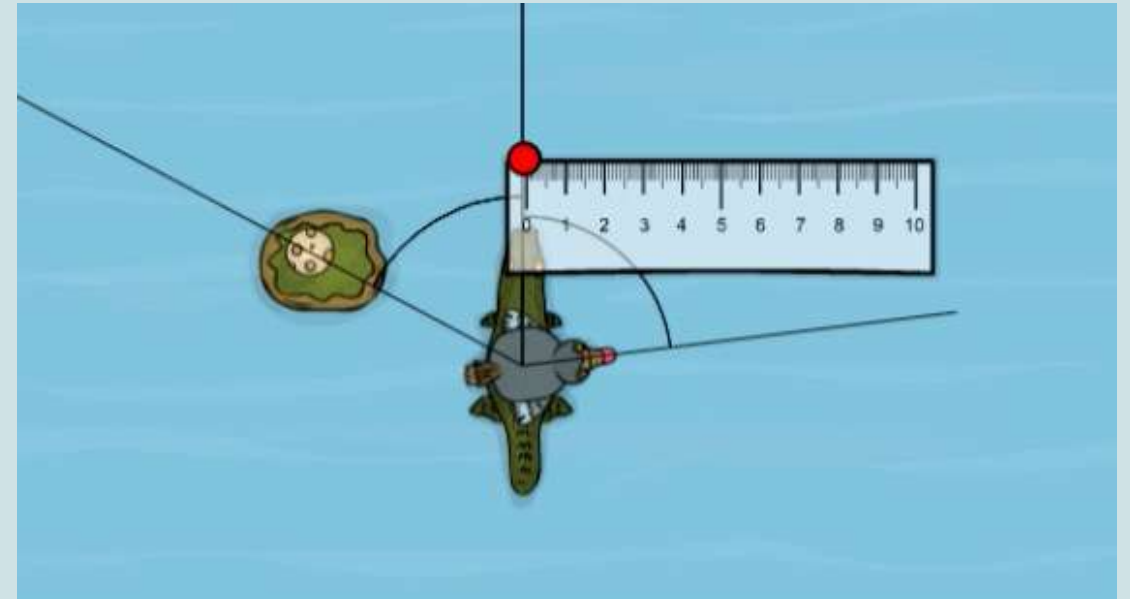


[Watch on YouTube](#)

## Measuring Distance with a Life-like Ruler

Meaning of Colored Dots:

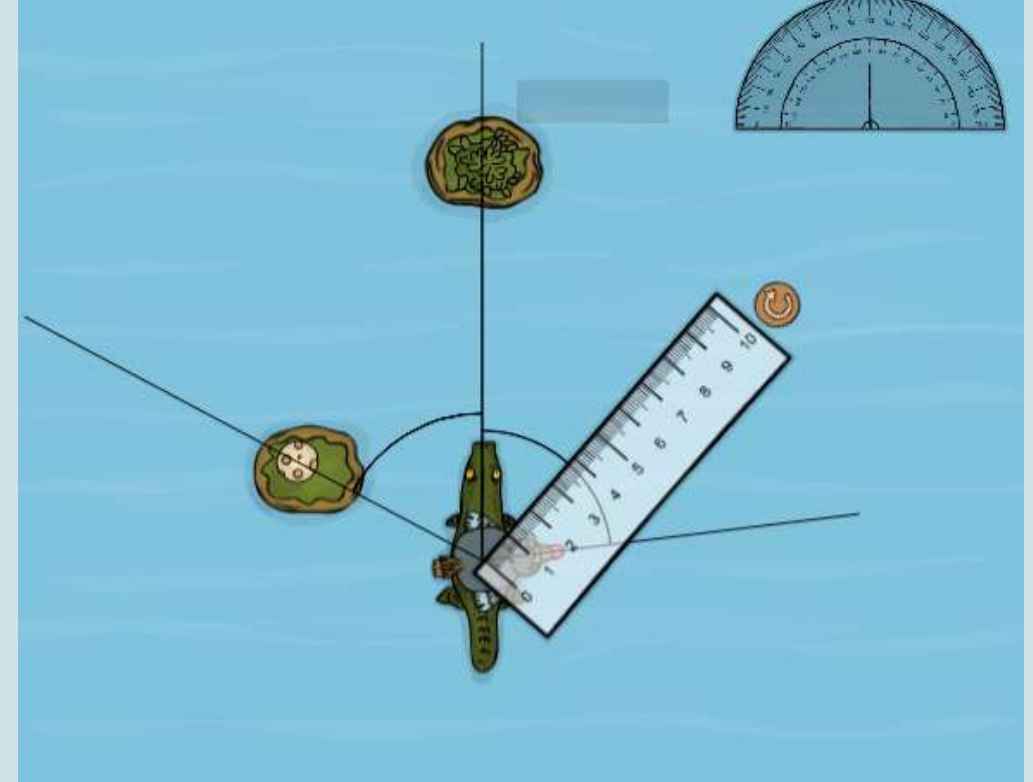
- 🐼 When the ruler is moved, a flashing red dot will appear above the zero.
- 🐼 The dot will change to green when the ruler is placed correctly on an object.
- 🐼 If the ruler is placed anywhere else, the dot will either not appear or remain red.



## Measuring Distance with a Life-like Ruler

Rotating the ruler:

- 🐼 To rotate the ruler, move the mouse over the rotate icon and click on it.
- 🐼 Keep on clicking your mouse and rotate the ruler until it is placed onto the second object that you want to measure the distance to.



## One more thing...

In some of the challenges the students have to demonstrate what they have learned by writing the entire code from scratch.

These are referred to as assessment challenges.



## Before We Begin...

Click [here](#) to access a beginner's guide that will help you get started with creating accounts for students and managing your classroom.

Should you have any questions, you can contact us anytime at: [info@codemonkey.com](mailto:info@codemonkey.com).

Good luck!

The CodeMonkey Team



## Lesson 1 – A Cute Angle





















In this lesson, students will:

- 🧐 Complete challenges 1-6
- 🧐 Measure easy-to-read angles in challenges 1 -4
- 🧐 Measure precise angles in challenges 5 -6

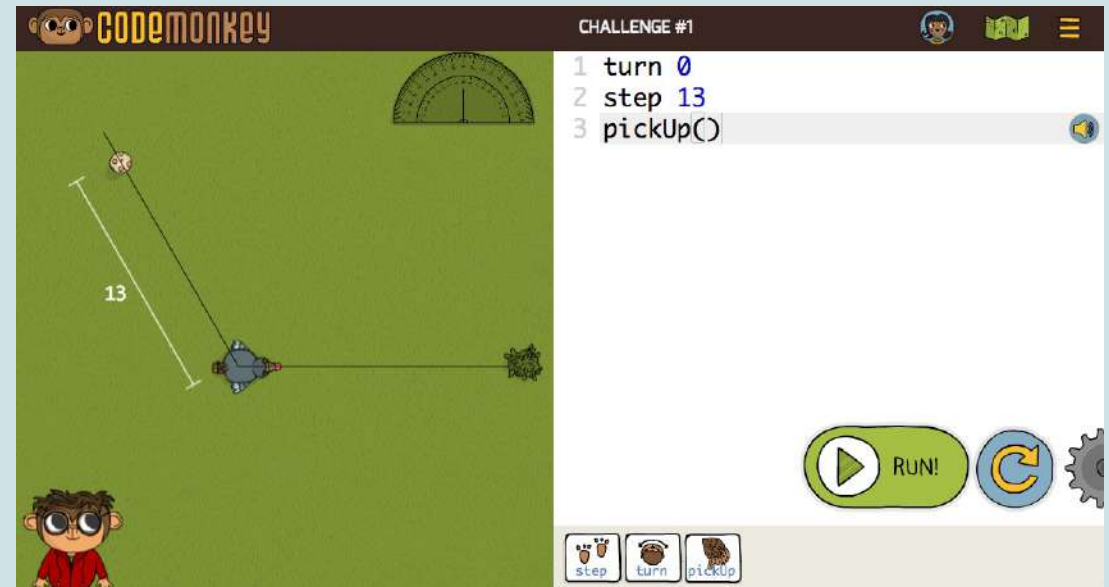
## A Cute Angle

# U.S. Standards Addressed

CCSS-Math Standards	
 MP.1	 4.NBT.4
 MP.4	 4.NBT.5
 MP.5	 4.MD.5
 MP.6	 4.MD.6
 MP.7	 4.MD.7
	 4.G.1
	 6.NS.4
	 7.G.5
CSTA-K12 Computer Science Standards	
 1B-AP-12	 2-AP-14
 1B-AP-15	 2-AP-16
	 2-AP-17

## A Cute Angle Challenge 1

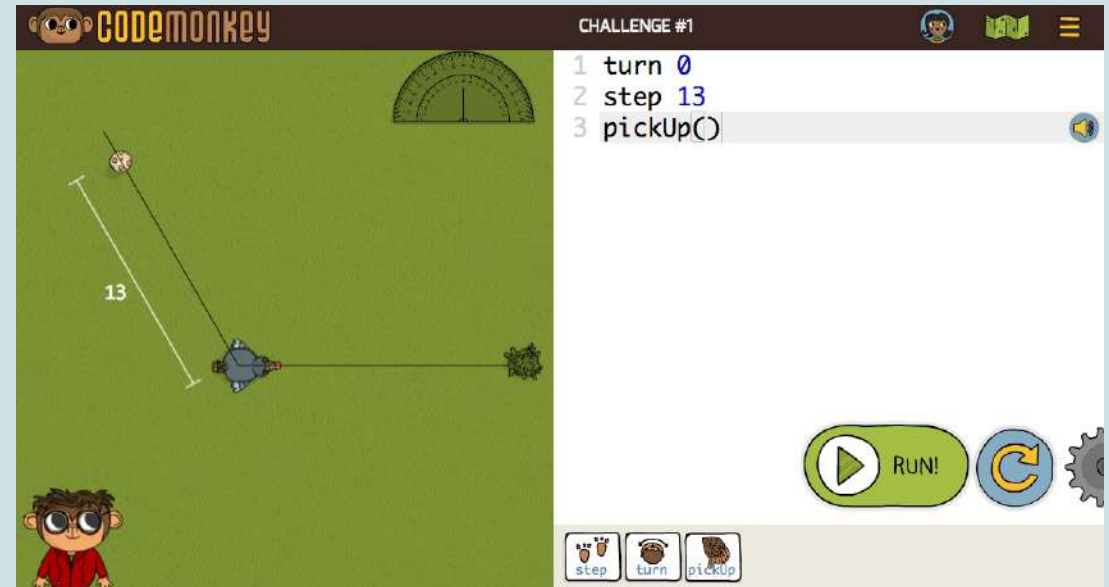
- Make sure students watch the clip at the beginning of the challenge to learn how to use the protractor.
- Students need to move the protractor and place its midpoint on the center of Dodo.
- There is no need to rotate the protractor.
- Once placed on Dodo, the baseline of the protractor will align to one of the angle's rays. Students will read the degrees to which the angle's second ray points to.
- Students need to change the number of degrees in the turn instruction.



## A Cute Angle

# Challenge 1 Continued

- 🧠 Emphasize the following:
  - 🧠 Dodo only turns left
  - 🧠 there are two angles - on the inner and outer circles
- 🧠 The correct angle for Dodo should be chosen
- 🧠 The correct angle here is 120 degrees.
- 🧠 Students need to change 'turn 0' to 'turn 120'
- 🧠 Note:
  - 🧠 Not moving the protractor (i.e. guessing the degrees), will only earn one star.



## A Cute Angle Challenge 2

In this challenge, students will practice their measuring skills by rotating the protractor.

- Once the origin of the protractor is placed on the vertex of the angle and the dot has turned green, the baseline of the protractor will be aligned to one of the rays.
- Students will rotate the protractor until one ray is aligned to the baseline and the other ray points to a number on the protractor.



## A Cute Angle

# Challenge 2 Continued

- 👤 Remind students to read the correct angle - the inner or the outer angle, depending on the baseline, and the side to which Dodo needs to rotate to.
- 👤 Students will add the code to turn Dodo by the correct degrees they measured:
  - 👤 turn 80



## A Cute Angle Challenge 3

This is an assessment challenge, which means that students will write all the code by themselves.

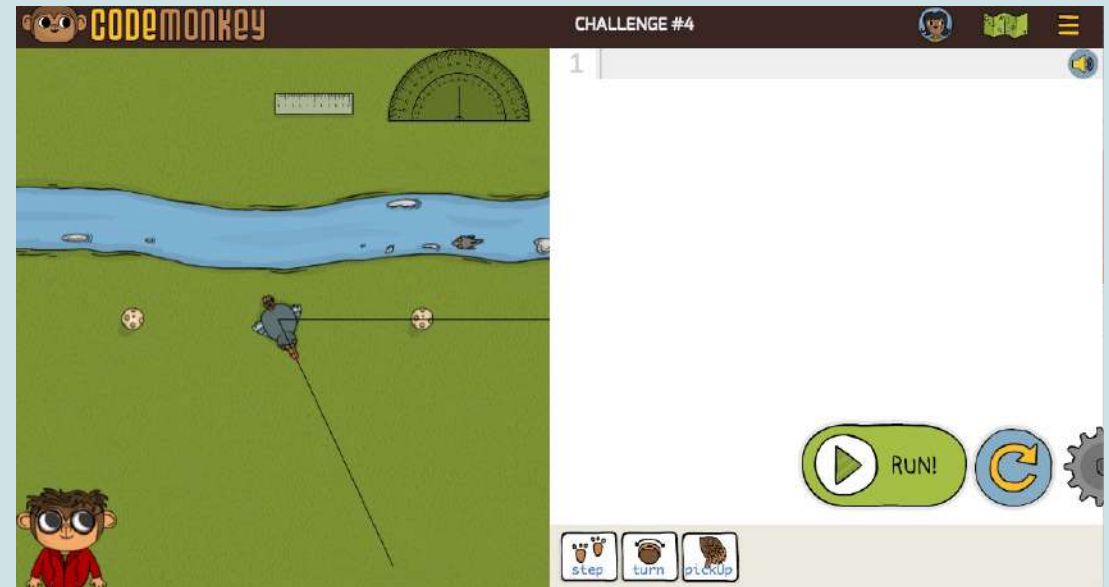
- 🥚 Students will integrate the measuring and coding skills they have acquired.
- 🥚 Remind them to pick up the egg when the dodo gets to it.
- 🥚 The command buttons at the bottom of the editor screen can be used remind students about the functions they've learned and to save typing.



## A Cute Angle Challenge 4

Students will:

- 🥚 Measure the angle from Dodo to the egg on the right.
- 🥚 Measure two distances using the ruler:
  - 🥚 The distance from Dodo to the egg on the right
  - 🥚 The distance from the egg on the left
- 🥚 A negative sign should be used to step backwards.
- 🥚 The distance between the two eggs is 16 units so to step backwards from the first to the second requires the command `step -16`.



## A Cute Angle Challenge 5

- 🐼 Students will measure an angle that does not lie on an easy-to-read number on the protractor.
- 🐼 The measurement needs to be precise.
- 🐼 The correct angle measure in this challenge is 62.
- 🐼 Show your students that if the dodo turns 61 or 63 degrees, the dodo cannot pick up the egg.
  - 🐼 Use the code:  
turn 61 (or turn 63)  
  
step 15  
  
pickUp()



## A Cute Angle Challenge 6

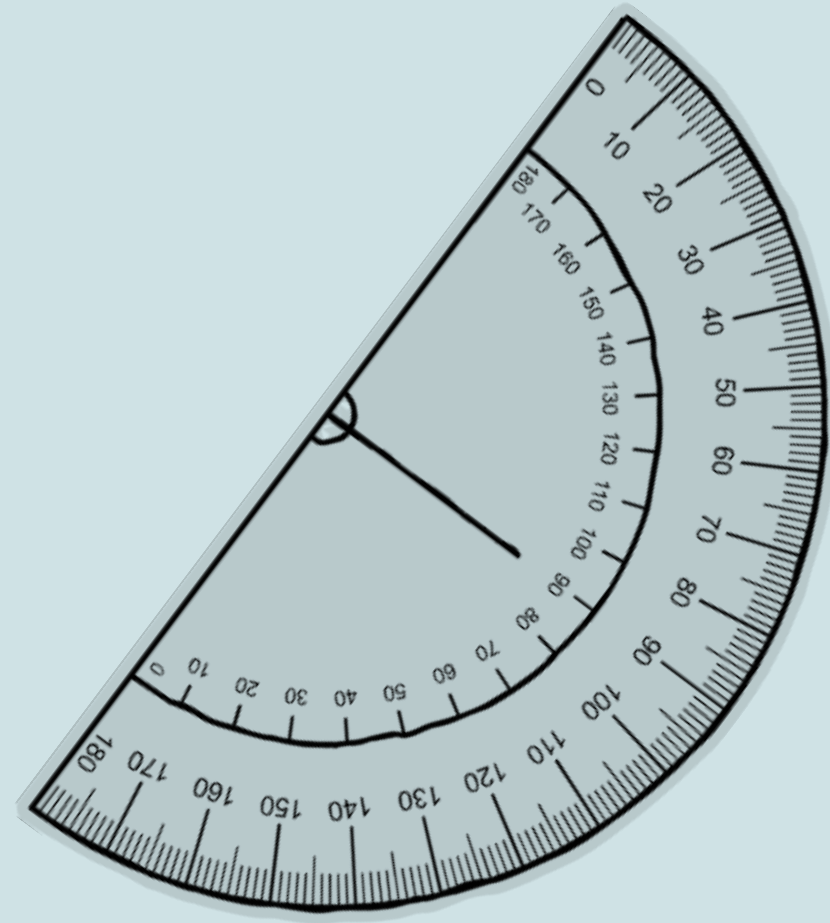
- 👤 This challenge is an assessment challenge.
- 👤 Students will practice measuring both the angle precisely with a protractor as well as measuring the distance precisely with a ruler.



## Lesson 2 – The Twist



















Within this lesson, students will:

- 🐼 Complete challenges 7-13
- 🐼 Measure one or more angles in challenges 7-10
- 🐼 Add two or more angles without measuring in challenges 11-13



## The Twist

# U.S. Standards Addressed

CCSS-Math Standards	
 MP.1	 4.NBT.4
 MP.4	 4.NBT.5
 MP.5	 4.MD.5
 MP.6	 4.MD.6
 MP.7	 4.MD.7
	 4.G.1
	 6.NS.4
	 7.G.5
CSTA-K12 Computer Science Standards	
 1B-AP-12	 2-AP-14
 1B-AP-15	 2-AP-16
	 2-AP-17

## The Twist Challenge 7

- 🥚 You can show your students that if Dodo turns instead of the crocodile she will fall into the water.
- 🥚 The following code will turn the dodo and not the crocodile:
  - 🥚 `turn 132`
- 🥚 Since Dodo is the main character, we can use functions without specifying `dodo.turn`; All other characters need to be written before the function's name
- 🥚 Point out to your students that when the crocodile turns, the dodo turns as well.
  - 🥚 `crocodile.turn 132`
  - 🥚 `step 9`
  - 🥚 `pickUp()`



## The Twist Challenge 8

- 🥚 Students will measure two angles.
- 🥚 Discuss the vertices and the rays of the angles that need to be measured with your students.
- 🥚 The vertices of these angles are:
  - 🥚 Dodo
  - 🥚 The upper egg (eggs[0])
- 🥚 When Dodo gets to this egg, she will face bushes[4]
- 🥚 The rays of the angle that needs to be measured are:
  - 🥚 from eggs[0] to bushes[4]
  - 🥚 from eggs[0] to eggs[1]
- 🥚 Students should not forget to pick up both eggs!



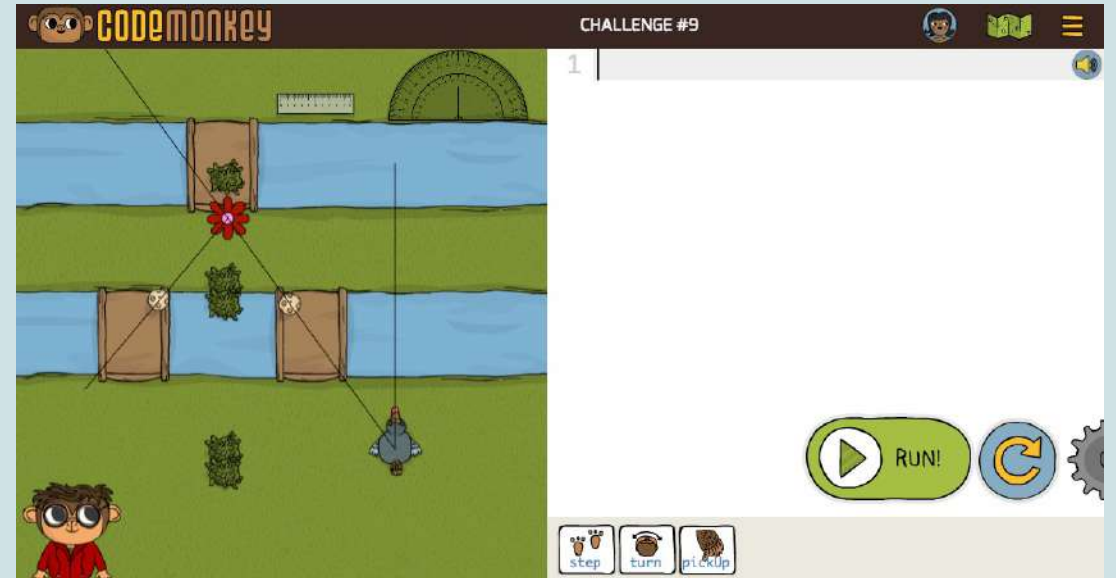
## The Twist Challenge 9

In this challenge, students will need to make Dodo pick up two eggs and turn Dodo twice.

- Students will need to measure distances:
  - From Dodo to the first egg
  - From the first egg to the flower
  - From the flower to the second egg

Discuss the vertices and the rays of the angles that need to be measured with your students. The vertices are:

- Dodo
- The flower



## The Twist Challenge 10

- Students will turn Dodo **and** the crocodile.
- Compare with challenge #7 to ask your students what the difference between the two challenges is.
  - Answer: In challenge #7 both the crocodile and Dodo faced the same direction, which meant that students only needed to turn the crocodile.



## The Twist

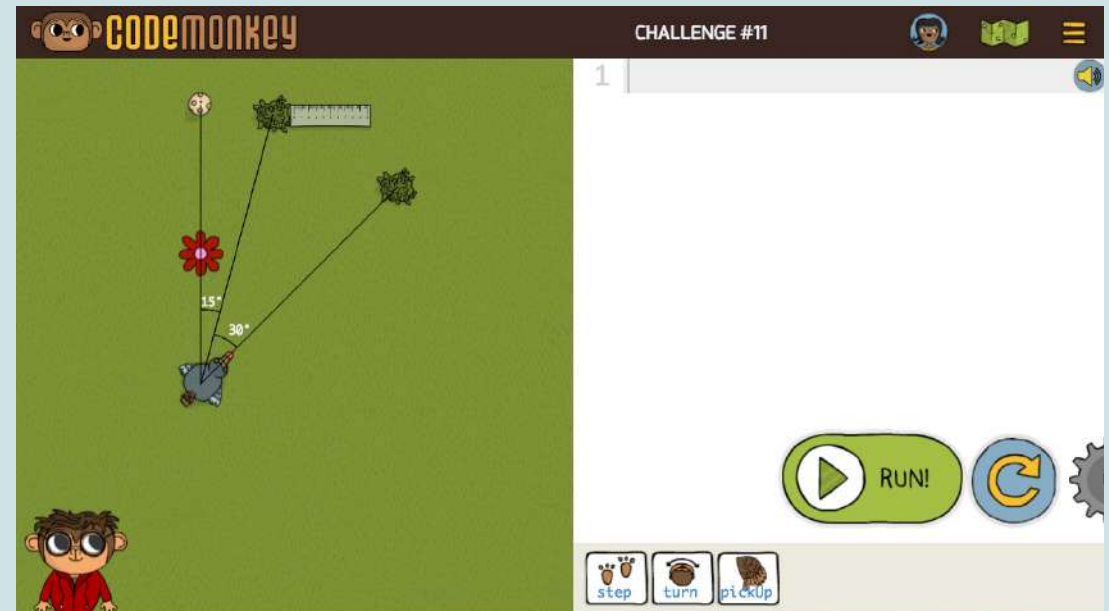
# Challenge 10 Continued

- Since in this challenge Dodo is not facing the same direction as the crocodile, students need to turn both the crocodile and Dodo and measure two angles.
- Specifically, they need to turn Dodo to face the same direction as the crocodile and turn the crocodile to face the egg



## The Twist Challenge 11

- Students will add the two displayed angles and use the sum to make Dodo **turn once**.
- There is no protractor in this challenge because the angle measures are on the screen.
- Students will measure the distance Dodo needs to step. The distance is larger than the ruler (more than ten steps) so discuss with your students how the measurement could be done and what could be used as a reference point.



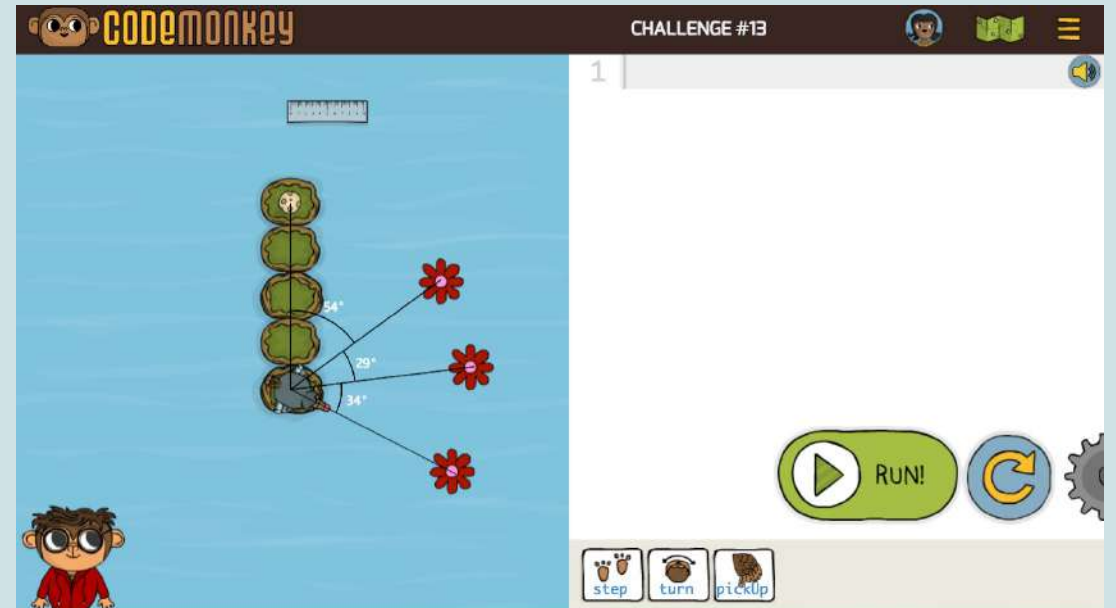
## The Twist Challenge 12

- 👤 In this challenge student will need to add the two displayed angles.
- 👤 By adding the angles they can complete the challenge with only one “turn”.



## The Twist Challenge 13

- 🐼 This challenge is similar to the previous one.
- 🐼 This time students must add all three angle measures.



## Lesson 3 - Eggs Galore



















Within this lesson, students will:

- 🥚 Solve Challenges 14-20
- 🥚 Subtract two or more displayed angles in challenges 14-17
- 🥚 Add two angles and subtract the sum from the total displayed in challenges 18 - 20
- 🥚 Implement all previous angles and code concepts in challenge 20



## Eggs Galore

# U.S. Standards Addressed

CCSS-Math Standards	
 MP.1	 4.NBT.4
 MP.4	 4.NBT.5
 MP.5	 4.MD.5
 MP.6	 4.MD.6
 MP.7	 4.MD.7
	 4.G.1
	 6.NS.4
	 7.G.5
CSTA-K12 Computer Science Standards	
 1B-AP-12	 2-AP-14
 1B-AP-15	 2-AP-16
	 2-AP-17

## Eggs Galore Challenge 14

- Students will subtract the smaller angle from the larger one in order to turn Dodo in the correct angle.
- Using a negative angle is not allowed in this challenge.
- Show your students what happens when trying to turn the Dodo twice using the displayed angles. First turn Dodo left 110 degrees, then turn Dodo right 34 degrees (for this, a negative angle needs to be used):
  - turn 110
  - turn -34
- Students will see that this does not solve the challenge. They must subtract to turn Dodo the correct angle.



## Eggs Galore Challenge 15

In this challenge, students need to subtract one angle from another and then using the difference to turn Dodo.

- One of the angles students need to use in the challenge is a right angle. The right angle is marked with a square.
- Clicking on Gordo will remind students that the number of degrees in a right angle is 90.
- The distance is displayed a bit further from Dodo than usual.



## Eggs Galore Challenge 16

- 🥚 Students will practice using the number of degrees in a full circle. A negative angle is not allowed in this challenge.
- 🥚 Only one angle is displayed.
- 🥚 Show students what happens when running the following code:
  - 🥚 `turn 46`
- 🥚 Dodo turns left instead of right.



# Challenge 16 Continued

- 🐼 Show the students what happens when running the following code:
  - 🐼 `turn -46`
- 🐼 This is not allowed..
- 🐼 Clicking on Gordo will remind students that the number of degrees in a full circle is 360.
- 🐼 Since negative angles are not allowed, students must figure out how to turn Dodo “the long way”, by subtracting 46 from 360.



## Eggs Galore Challenge 17

- 🥚 This is an assessment challenge.
- 🥚 Negative angle measures are once again allowed.
- 🥚 Students will need to use skills from previous challenges, including subtracting angles, turning the crocodile to turn Dodo as well, and stepping backwards.



# Challenge 17 Continued

- 🥚 Students will need to plan their algorithm well.
- 🥚 turn the crocodile to face an egg
- 🥚 step to the egg
- 🥚 pick up the egg
- 🥚 step back to the crocodile
- 🥚 turn to the other egg
- 🥚 use the angle calculated by subtraction
- 🥚 step to the other egg
- 🥚 pick up the egg
- 🥚 To get at least two stars, only use 'turn' twice.



# Challenge 17 Continued

There are at least two different three-star solutions in this challenge. The first solution can be found in your teacher's dashboard, the second solution is:

- crocodile.turn 151
- step 9
- pickUp()
- step -9
- crocodile.turn -105
- step 13
- pickUp()



## Eggs Galore Challenge 18

- Students are introduced to straight angles and will be required to use the measure of a straight angle (180 degrees) in their calculations.
- Negative angles are allowed in this challenge.
- There are at least two three-stars solutions for this challenge.
- In the next two slides, two three-stars solutions algorithm are presented.



# Challenge 18 Continued

Students will need to plan their algorithm well.

- 🐼 turn Dodo to face the egg on the right
  - 🐼 using the calculated sum of the displayed angles ( $34+24$ )
- 🐼 step to the egg
- 🐼 pick up the egg
- 🐼 step back
- 🐼 turn to the other egg
  - 🐼 using the calculated difference of a straight angle and the sum calculated before ( $180- 54$ )
- 🐼 step to the other egg
- 🐼 pick up the egg



## Challenge 18 Continued

Another solution would be:

- 🥚 turn 180 degrees
- 🥚 step to the egg on the left
- 🥚 pick up the egg
- 🥚 step back
- 🥚 turn to the right by using the negative calculated angle
  - 🥚 calculated by subtracting  $34+22$  from 180
- 🥚 step to the other egg
- 🥚 pick up the egg



## Eggs Galore

# Challenge 19

- Students will use the following skills :
  - using the number of degrees in a full circle
  - adding angles
  - subtracting angles
  - stepping backwards and forwards
- Students will need to plan their algorithm carefully.



# Challenge 19 Continued

- 🥚 This challenge can be solved in at least two ways.
- 🥚 Discuss two possibilities with your students:

### First algorithm

- 🥚 turning 62 degrees
- 🥚 subtracting 62 and 73 from 360
- 🥚 turning the difference



# Challenge 19 Continued

### Second Algorithm

- 🥚 subtracting 73 from 360
- 🥚 turning the difference
- 🥚 adding 73 and 62
- 🥚 turning the sum



## Eggs Galore Challenge 20

Students will apply the following skills and knowledge:

- 🍪 The number of degrees in a right angle
- 🍪 Subtracting angles
- 🍪 Adding angles

Discuss the angles that need to be calculated and how the calculations need to be done:



# Challenge 20 Continued

🥚 eggs[0]-Dodo-bushes[0]

🥚  $90 - 36$

🥚 bushes[2]-eggs[0]-eggs[1]



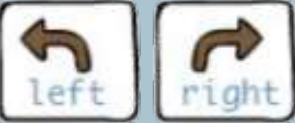

🥚  $126 - 45$

🥚 bushes[3]-eggs[1]-eggs[2]






🥚  $39 + 59$






## Reference Card

Keyword/Button	Description
	<p>To make the dodo “step” a certain distance, we have to write “step X” using the number of steps we want him to take, for example, “step 10”.</p> <p>Pressing the step button will write the word “step” in your code.</p>
	<p>“Turn” should be accompanied by a direction (left/right) or degrees (45, 90, 180).</p> <p>Examples: “turn right”, “turn 90”</p> <p>Pressing the turn button will write the word “turn” in your code.</p>
	<p>“Left” and “right” are used after the statement “turn” to make the dodo turn in the desired direction.</p> <p>Pressing the <b>left</b> or <b>right</b> buttons will write the word “left” or “right” in your code accordingly.</p>
	<p>“pickUp()” is a function without an argument that is used to pick up the eggs.</p> <p>Pressing the pickUp button will write the words “pickUp()” in your code.</p>

## Reference Card Continued

Keyword/Button	Description
	<p>The dodo and the turtle can step over the flower. The flower usually used as a reference point to measure the distance when two objects are too far apart (for example, the dodo and the egg).</p>
	<p>A life-like ruler to measure the distances between the different objects. Remember, exact measure is needed.</p>
	<p>A life-like protractor to measure the exact degrees the dodo needs to turn. Remember, exact measure is needed.</p>
	<p>Pressing the run button will make the code on the right run. You can see the outcome by looking at the scene on the left.</p>
	<p>The reset button will erase everything you wrote in the code on the right and will reset the code to how it was at the beginning of the challenge.</p>

## Character Review

Character	Description
	<p>Gordo, named after the first ape in space, is the guide who will help you and give you instructions along the way. His remarks are both funny and helpful. You can always click him to re-read the instructions.</p>
	<p>The dodo is the main character. You need to help the dodo pick up all the eggs in each challenge. The dodo needs to be exactly where the egg is in order to pick it up.</p>
	<p>Crocodiles are used to form a bridge on the water, to help the Dodo get to her eggs. They can only “turn” or “turnTo”.</p>