The Lab
Junior Program

Foundation Term 1
Home Workbook
Answer Key

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Preface

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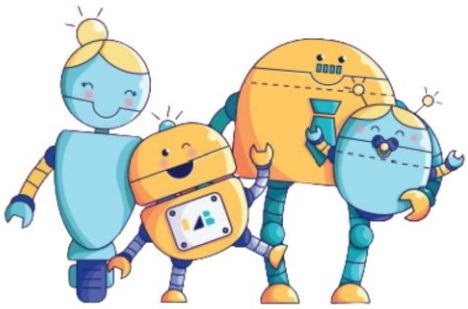
Welcome to The Lab Singapore's workbook—a guide designed to spark creativity, nurture logical thinking, and develop essential coding skills.

At The Lab, we believe that every child can achieve remarkable things when given the right tools and guidance. Our passionate educators, driven by a love for teaching and innovation, are dedicated to empowering students to solve real-world problems through coding and computational thinking.

This workbook reflects our commitment to making learning engaging, meaningful, and fun. It is more than a collection of exercises—it's a step towards building confidence, resilience, and a lifelong love for learning.

Let's embark on this exciting journey together!



A Friendly Note to Parents & Students

This workbook is designed to help our students revise and practise the concepts taught in class. Many of these ideas are new, so it's completely normal for students to need repetition and extra practice before they fully understand them. Not getting it the first time is part of the learning journey — and absolutely okay!

Please remember that this workbook is not a test and it does not reflect how well your child is performing in class or how well we teach. It simply gives students a chance to try things on their own at home, at their own pace.

To keep things encouraging, here's how we look at the scores:

✔ Scoring (Just for Practice!)

50% and above – Great job!

Your child has understood the main ideas.

Below 50% – Keep practising!

This is not a failure. It just shows which areas are still new or need a bit more time — and we'll continue to guide them in class.

At The Lab, we believe learning should feel positive, safe, and joyful. We hope this workbook supports your child as they grow, explore, and discover new concepts!

Answer Key

Decimals and Negative Numbers with Motors

Coding Concepts

1. Answer: D. Motor block, to activate the motor of the robot. Control direction, speed, rotation, seconds or degree.

2. Answer: C. There are a total of six ports on the Lego Spike Hub.

3. Answer: B. The maximum speed of the motor block is 100%. Even if the number is more than 100%, it will still be 100%.

4. Answer: B. As the name of the block which is Motor Block. The block is to control movement of the robot.

5. Answer: B. It converts electrical energy into mechanical movement, like a battery.

6. Answer: C. Single motor block can control direction (rotations), angle (degrees) and duration (seconds).

7. Answer: C. Need to adjust the number of seconds (duration) of the motor block.

8. Answer: B. If the speed is "0" the motor would not move.

9. Answer: C. The motor block can precisely control how the robot moves and turns. For example using decimals numbers like 0.1, 0.2, 0.3 etc.

10. Answer: A. The motor will move for 1 rotation as the number put in is 1.

11. Answer: B. If 1 is too much, we need a number less than 1 which is 0.5. If we choose "0" the robot will not move.

12. Answer: D. The minimum number is 0. If the speed is lower than 0 which is negative number, the motor will move anti-clockwise.

13. Answer A: If to open the grabber needs 100% speed and 1 rotation, to close, the grabber needs spin anticlockwise by using negative value on rotation or speed.

14. Answer D: If to open the grabber needs 100% speed and 1 rotation, to close, the grabber needs spin anticlockwise by using negative value on rotation or speed.

15. Answer C. Negative speed value makes the motor turn anticlockwise. Together with negative rotation value, it cancels out the anticlockwise command, making the motor spin clockwise again. Hence -100% speed and -1 rotation is the correct answer.

Decimals and Negative Numbers with More Motors

Coding Concepts

1. Answer: B. The Set Movement Motors block tells the robot which ports the motors are connected to.

2. Answer: D. To activate the motors of the robot. After set the movement block, we need to set movement speed and movement block.

3. Answer: C. Double motor movement block is to move two motors at the same time.

4. Answer C. Double motor movement block can control direction, and duration.

5. Answer C. Need to adjust the direction and duration.

6. Answer C. If one motor forward and the other go backward, the robot will spin in a circle.

7. Answer: C. Double motor movement block is important because it precisely controls both motors at the same time.

8. Answer: B. Clockwise, or using positive number.

9. Answer C. If we reverse the direction, the robot will move backward.

10. Answer D. The left code is a single motor block. It will follow the sequence, for example, Motor A, move for 1 rotation first then motor B move for 1 rotation. While the right code will move 2 motors at the same time.

11. Answer: C. The left code will turn 1 motor after the other (Motor A first then B), which make the robot turn right then left. The right code will move both motors simultaneously, which make the robot move forwards.

12. Answer: C. This code only controls motor A to spin clockwise for 1 rotation and the other motor remains stationary. Hence the robot will start to turn.

13. Answer: C. This code only controls motor B to spin clockwise for 1 rotation and the other motor remains stationary. Hence the robot will start to turn.

14. Answer: A. If 1 rotation is too much, we need a number lesser than 1. There are only 2 answers with lesser than 1 which are 0.2 and 0. If we choose 0, the robot won't move at all. Hence the correct answer is 0.2.

15. Answer: C. Since 9 is not enough and 10 is too much, 9.5 is the answer because the number is in between 9 and 10.

Logic with Motors

Coding Concepts

1. Answer: C. To turn a car, the wheels of the car must travel at different speed.

2. Answer: C. If one wheel spin faster than the other wheel, the car will turn.

3. Answer: D. When a car turns, the outer wheels need to travel a longer distance than the inner wheels. Using different motor speeds ensures a smooth turn.

4. Answer: C. When a car turns, the outer wheels need to travel a longer distance than the inner wheels. Using different motor speeds ensures a smooth turn.

5. Answer: C. The Spike Van will turn to the right.

6. Answer: D. The Spike van will turn to the left.

7. Answer: C. Spike Van will move forward for 2 seconds then turn right for 1 second. The action must follow the sequence of the coding block.

8. Answer: C. Spike Van will move forward for 2 seconds first then it will turn left for 1 second. The action must follow the sequence of the coding block.

9. Answer: D. Seconds cannot be negative, hence the robot will move backward and straight to turning block.

10. Answer: A. The robot will turn right first before moving forward since the turning block is above the moving forward block.

11. Answer: A. The robot will turn left first before moving forward for 3 seconds.

12. Answer: Left. The left code makes the robot turn more because it moves for 1 rotation, which is longer than 0.5 rotations in the right code. More rotations mean the robot turns a greater distance.

13. Answer: Right. The right code makes the robot turn lesser because it moves for 0.2 rotations, which is shorter than 2 rotations in the left code. Less rotations mean the robot turns a lesser distance.

14. Answer: Right. The right code makes the robot turn more because it moves for 0.7 rotations, which is longer than 0.4 rotations in the left code. More rotations mean the robot turns a greater distance.

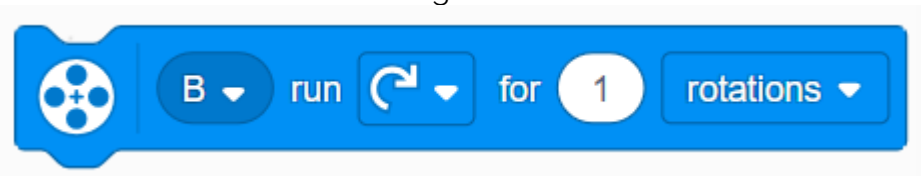
15. Answer: Left. The left code makes the robot turn lesser because it moves for 0.3 rotations, which is shorter than 0.8 rotations in the right code. Less rotations mean the robot turns a lesser distance.

Angles and Degrees with Motors

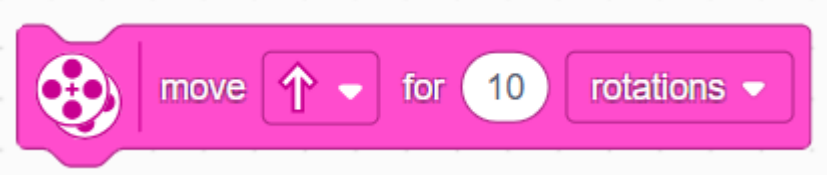
Coding Concepts

1. Answer: B. Degree is more accurate because it allows the motor to move in smaller, precise steps compared to rotations or seconds.

2. Answer: B. Blue. This is the single motor block.



3. Answer: A. Pink. This is the double motor block.



4. Answer: C. Rotation means one circle. If 1 rotation, it'll make 1 circle.

5. Answer: D. 1 circle equal to 360 degrees.

6. Answer: C. Degrees are units used to measure angles. Degrees in motor block function is to measure how much the motor has turned.

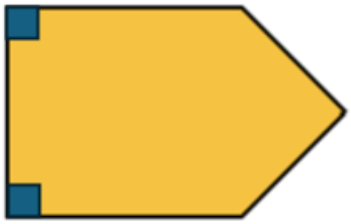
7. Answer: C**.** Half circle will be 180 degrees.

8. Answer: D. Degrees measure small angles of rotation, allowing the motor to turn a little bit instead of making a full rotation. This gives more precise control over the motor's movement.

9. Answer: C. There's 2 right angles at the base of the shape.

10. Answer: A. There's no right angle in a triangle.

11. Answer: B. There are 2 right angles on the left side of the shape.



12. Answer: D. There are 4 right angles. It's a square shape.

13. Answer: D. 1 rotation is 360 degrees. If the door needs 2 rotations, it will be 720 degrees (360 degrees x 2 = 720 degrees).

14. Answer: B. 1 rotation is 360 degrees. If the sliding door needs half rotation to open, it will be 180 degrees (360 degrees ÷ 2 = 180 degrees).

15. Answer: A. 1 rotation is 360 degrees. If the sliding door needs quarter of a rotation to open, it will be 90 degrees (360 degrees ÷ 4 = 90 degrees).

Multiplication with Motors

Coding Concepts

1. Answer: C. Seconds in coding is used to make the robot perform action like moving or waiting. For example, move for 1 seconds or wait for 1 second.

2. Answer: C. Second is used to move or pause the robot's action.

3. Answer: C. If we code the robot to move for 5 seconds, the robot will only move for 5 seconds.

4. Answer: C. Using seconds tells the robot exactly how long it should perform an action.

5. Answer: C. In programming, time is usually measured in seconds to control how long an action lasts or when something should happen.

6. Answer: D. Time cannot be negative as we cannot turn back time.

7. Answer: B. If the robot has two motors and we only code 1 motor, the robot will turn. Motor B will move for 1 second, while the other motor will remain stationary.

8. Answer: A. The unit of measurement (like seconds, rotations, or degrees) tells the robot how to interpret the number you enter. It quantifies the value so the robot knows how long or how far to move. Without a unit, the robot wouldn't understand what the number means.

9. Answer: B. The code directly controls the motors, not the robot's body itself. So B is more accurate, because the block tells the motors to rotate 10cm.

10. Answer: C. In 10 seconds, the robot moves 2 metres. In 20 seconds it will travel 4 metres (10 seconds x 2 = 20 seconds and 2 metres x 2 = 4 metres).

11. Answer: C. There is no error in the code.

12. Answer: D. Second cannot be negative as we cannot turn back time.

13. Answer: A. If the current speed is 20% and we want to go twice as fast, the speed will be 40% (20% x 2 = 40%).

14. Answer: B. If the current travel distance is 10 seconds and we want to travel further by 2 times the current distance, the seconds will be 20 seconds (10 seconds x 2 = 20 seconds).

15. Answer: D. If the current speed is 20% and we want the robot to go slower by halving the current speed, the speed will be 10% (20% ÷ 2 = 10%).

Division with Motors

Coding Concepts

1. Answer: B. Multiplication and division help you calculate values such as distance, speed, and time, which are needed to give accurate instructions to the robot.

2. Answer: C. Multiplication helps you repeat actions multiple times in robotics. For example, if one wheel rotation moves the robot 10 cm, multiplying can calculate how many rotations are needed to move farther or repeat a motion several times.

3. Answer: A. If we want to repeat a movement, we will use multiplication.

4. Answer: C. Division helps you split tasks or values evenly among multiple robots or actions. For example, if you want several robots to share a job equally, you can use division to calculate how much work each robot should do.

5. Answer: C. Multiplication and division help the robot calculate how many times to repeat actions and divide tasks evenly. Without them, the robot might move the wrong distance or repeat actions incorrectly, causing it not to perform as intended.

6. Answer: A. If we want the robot to move faster. We need a larger number, so it will be multiplication.

7. Answer: B. If we want the robot to move slower. We need a smaller number, so it will be division.

8. Answer: D. If the racing car takes 30 seconds with a speed of 100% to finish 10 laps, each lap will take 30 seconds ÷ 10 = 3 seconds.

9. Answer: D. The maximum speed for a motor or movement block is 100%.

10. Answer: C. Spike Racing car has 2 motors. The single motor blocks will turn 1 motor after the other (Motor A first then B), which make the racing car turn right then left.

11. Answer: D. Spike Racing Car will not move. Because there's no set movement block for the motors. If the robot has 2 motors, we need to set the movement motor first.

12. Answer: C. The Spike Racing Car has 2 motors. If the code controls only one motor inside a forever block, that motor will keep running while the other stays still. As a result, the car will keep turning in circles endlessly.

13. Answer: A. The double movement motors block set both motors A and B to move forward at 100% speed for 3 seconds.

14. Answer: D. The Spike Racing Car will not move because seconds cannot be negative.

15. Answer: B. Each bend takes 10 seconds, so 2 bends take 20 seconds (10 seconds x 2 = 20 seconds). Straight takes half of 10 seconds, so it is 5 seconds (10 seconds ÷ 2 = 5 seconds) . Total seconds to complete the race: 20 + 5 + 5 = 30 seconds.

Multiplication and Division with Motors

Coding Concepts

1. Answer: B. Division. You are splitting 8 LEGO bricks into 4 pairs with equal numbers, you use division to find how many bricks go in each pair.

2. Answer: A. Multiplication. Robot will turn 90 degrees, and you need to repeat 4 times to complete a square. 90 degrees x 4 times.

3. Answer: B. Division. You are splitting 24 LEGO pieces into 6 equal compartments, you use division to find how many pieces go in each one.

4. Answer: B. Divison. You are splitting 15 minutes into 3 equal time intervals, you use division to find how long each interval lasts..

5. Answer: A. Multiplication. You are repeating the same action of adding 5 blocks each time, multiplication is the quickest way to find the total number of blocks needed.

6. Answer: B. Multiplication is used to calculate repeated actions, such as how many times the robot should repeat a movement or task.

7.Answer: B. Addition is used when you want to combine or total up all the LEGO pieces used.

8. Answer: B. Division. You are splitting 12 bricks equally among 3 robots, so you use division to find how many each one gets.

9. Answer: A. Multiplication. Repeating the same forward movement 5 times is a multiplication idea. You multiply one action by the number of repeats..

10. Answer: B. Division. You are dividing 20 seconds equally among 4 robots, so division tells you how many seconds each robot gets.

11. Answer: D. If 1 second to complete 1 round, 10 rounds will be 10 seconds.

12. Answer: B. if 3 seconds to complete 1 round, 10 rounds will be 30 seconds.

13. Answer: C. If the robot needs 30 seconds to spin 2 rounds, 1 round will be 15 seconds. So 10 rounds will be 150 seconds (15 x 10 = 150).

14. Answer: B. If the robot needs 30 seconds to spin 10 rounds, 1 round will be 3 seconds. So 2 rounds will be 6 seconds (3 x 2 = 6).

15. Answer: D. If the robot needs 60 seconds to spin 10 rounds, 1 round will be 6 seconds. So 2 rounds will be 12 seconds (6 x 2 = 12).

Estimation and Range with Motors

Coding Concepts

1. Answer: A. The code use is colour sensor, and the color is Red. So, when the color sensor sensor red, the code will be true means it will run.

2. Answer: C. Color sensor can only sense color at a time is because it uses one light at a time.

3. Answer: C. The color sensor shines different colors of light so it can tell how much of each color bounces back, which helps it identify the object's color correctly.

4. Answer: D. The color sensor detects the reflected color of the object, and a yellow object still reflects yellow light even if you shine blue light on it, so the sensor continues to read it as yellow.

5. Answer: D. The color sensor compares the amount of light reflected in different colour as different color has different amount of reflected light.

6. Answer: C. The color sensor measures the reflected light of an object, which tells it what color the object is.

7. Answer: C. Because color sensor can only sense 1 color at a time.

8. Answer: C. Because different colors of light help it distinguish between different objects.

9. Answer: C. The color sensor can only detect 1 colour at a time so the colors will be more specific and accurate.

10. Answer: D. Shining all colors at the same time would mix the light and make it hard for the sensor to figure out which color is being reflected, which would confuse the robot.

11. Answer: B. No, only 1 colour at a time.

12. Answer: A. It will play cat meow sound because the cat meow sound block is placed under red colour sensor block.

13. Answer: C. It will play crazy laugh if it senses yellow because the crazy laugh sound block is placed under yellow colour sensor block.

14. Answer: B. It will play boop bing bop sound because the boop bing bop sound block is placed under the blue colour sensor block.

15. Answer: D. It will play alert sound because the alert sound block is placed under green colour sensor block.