Assessment
Motion Ball

1) Which pin on the Raspberry Pi Pico should the SDA wire be connected to in the motion ball setup?
    a) GP21
    b) GND
    c) GP20
    d) 3V

2) Which of the following is used to measure rotational movements in the motion ball setup?
    a) Thermometer
    b) Motion sensor
    c) Light sensor
    d) Sound sensor

3) How do you display the readings from the motion sensor in Data View?
    a) Use the graph block and plot values
    b) Use the thermometer block and plot values
    c) Use the sound sensor block and plot values
    d) Use the light sensor block and plot values

4) Which light should turn on if the Z-rotation reading is less than 5?
    a) Green
    b) Red
    c) Yellow
    d) Blue

5) What coding structure is used to turn on specific lights based on sensor readings?
    a) Loops
    b) Variables
    c) If-then statements
    d) Functions

6) Explain how you could use the motion ball to improve your performance in a sport you play or an activity you enjoy. Provide an example.

Name: _____

7) Imagine you are designing a new game using the motion ball. Describe the game and how you would integrate the motion ball into it.

8) Look at the Python code provided. This code uses lights to show how much the ball is spinning. Can you change the code so that instead of three lights, it uses four lights to show the rotation of the ball? Describe what changes you made to the code and why.

Name: _____

Answer Key
Motion Ball

1) C - GP20

2) B - Motion sensor

3) A - Use the graph block and plot values

4) A - Green

5) C - If-then statements

6) *Example:* Students might explain how the motion ball can track their movements and provide data on their performance. For example, in basketball, the motion ball could help measure the spin and speed of a basketball shot, allowing the player to adjust their technique for better accuracy.

7) *Example:* Students might describe a game in which players balance a motion ball on a platform while completing an obstacle course. The motion ball's sensor would track its rotation and tilt, and the game would give feedback through lights and sounds if the ball moves too much. This could help players improve their balance and coordination.

8) *Example:* Here is an example of how you could change the code to use four lights:

```
## ---- Imports ---- ##
import time
import board
from piper_blockly import *
import busio
import math

## ---- Definitions ---- ##
Z_rotation = None
GP13 = piperPin(board.GP13, "GP13")
GP14 = piperPin(board.GP14, "GP14")
GP15 = piperPin(board.GP15, "GP15")
GP12 = piperPin(board.GP12, "GP12")  # New light

try:
  set_digital_view(True)
except:
  pass
```

Name: _____

```
i2c_bus = busio.I2C(scl=board.GP21, sda=board.GP20)
motion_sensor = piperMotionSensor(i2c_bus)

## ---- Code ---- ##
while True:
  GP13.setPin(0)
  GP14.setPin(0)
  GP15.setPin(0)
  GP12.setPin(0)  # Turn off the new light
  motion_sensor.read()
  Z_rotation = math.fabs(motion_sensor.gyro_z)
  if Z_rotation <= 0.5:
    GP13.setPin(1)
  if Z_rotation > 0.5 and Z_rotation <= 1:
    GP14.setPin(1)
  if Z_rotation > 1 and Z_rotation <= 1.5:
    GP15.setPin(1)
  if Z_rotation > 1.5:  # New condition for the fourth light
    GP12.setPin(1)

  time.sleep(0.2)
```

Explanation:
In this code, an additional light (GP12) is introduced. The conditions are adjusted so that the lights turn on at different levels of Z-rotation:

- GP13 turns on if Z-rotation is 0.5 or less.
- GP14 turns on if Z-rotation is between 0.5 and 1.
- GP15 turns on if Z-rotation is between 1 and 1.5.
- GP12 turns on if Z-rotation is greater than 1.5.

This change allows for a more detailed indication of the ball's spin.