# SENSORS AND LOGIC GATES

On behalf of The World Association of Technology Teachers
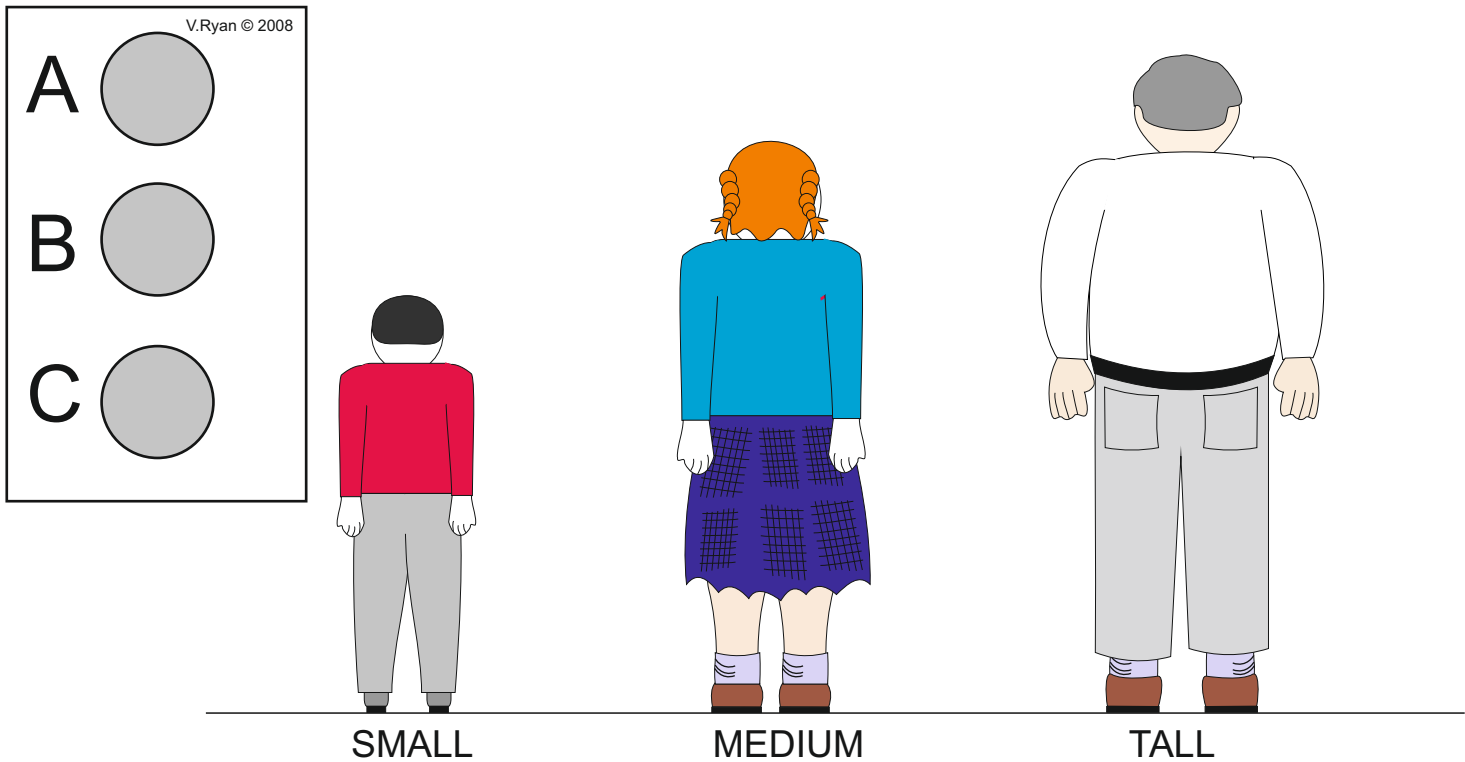
# W.A.T.T.
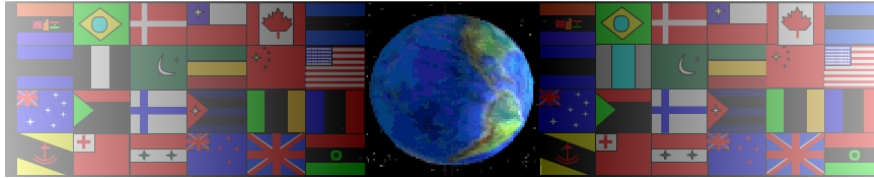


## World Association of Technology Teachers

This exercise can be printed and used by teachers and students.  It is recommended that you view the website (www.technologystudent.com) before attempting the design sheet .

# SENSORS AND LOGIC GATES

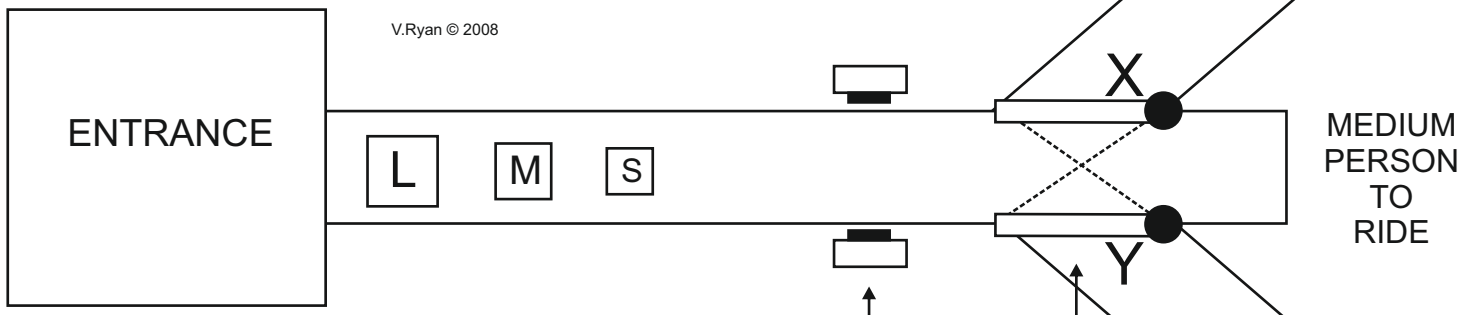The Theme Park owner has invested in an automatic height detection system. This checks that potential riders are the safe height for each ride. A person who is too small could easily slip through safety barriers leading to a serious accident. Anyone too small for the ride is directly to the exit. Medium and tall people are also separated so that they can be distributed equally throughout the carriages.

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A

B

C

SMALL

MEDIUM

TALL

## PLAN VIEW

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ENTRANCE

L    M    S

X

Y

SMALL PERSON TO EXIT

MEDIUM PERSON TO RIDE

TALL PERSON TO RIDE

SENSORS

BARRIERS

## SIDE VIEW

ENTRANCE

L    M    S

A
B
C
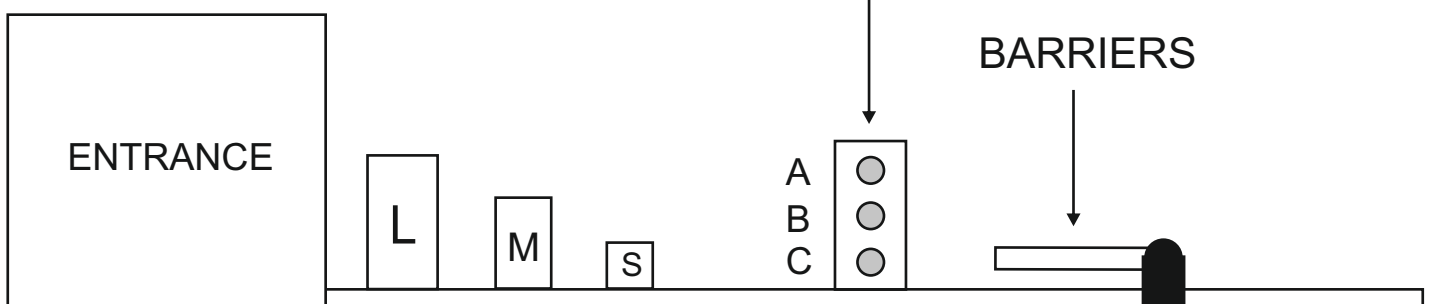
# SENSORS AND LOGIC GATES

The sensors detect the height of each person and are connected to two control circuits. One circuit controls barrier X and the other barrier Y. If the output of either of the control circuits is high (logic 1) then the appropriate arm will swing to the position of the dotted line.

A. Complete the truth table below to show the logic states of the three sensors that would give the correct outputs. The sensors provide a 'high' (logic 1) if they detect a person and a' low' (logic 0) if no person is detected.

|  | SENSOR | | | BARRIER | |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | X | Y |
| SMALL |  |  |  |  |  |
| MEDIUM |  |  |  |  |  |
| LARGE |  |  |  |  |  |

Part of each control circuit is composed of AND gates.

In the space below draw a diagram that represents an AND gate. Also, complete the truth table (opposite) for a two input AND gate.

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| Inputs | | Outputs |
| --- | --- | --- |
| A | B | Q |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Draw a circuit diagram to show how two of these gates could be used to control barrier 'Y'

The inputs from sensors A, B and C are already drawn along with the output - barrier 'Y'

SENSOR A _____


SENSOR B _____


SENSOR C _____

———— ARM 'Y'

# SENSORS AND LOGIC GATES

The control system has been found to be unreliable. It has been modified by using sensors which give logic 0 when they detect a person and logic 1 for NO person.

What type of gate could be added to your circuit (drawn above) to allow for this change?

_____

Draw the modified circuit in the space below

SENSOR A  _____


SENSOR B  _____


SENSOR C  _____

—— BARIER 'Y'

Suggest a more cost effective modification to the one shown above.

_____

_____

_____