# NEO LEARNING SYSTEMS

## DESIGN DOCUMENT – OPEN RESPONSE QUESTIONS

### MAY 2017

VERSION 1.1

CONFIDENTIAL

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## 2   OVERVIEW

This document is only concerned with detailing the requirements around the new Open Response type questions.  The requirements are divided into five different areas: Creating Open Response Questions, Creating Assessments, the Student App, Marking Assessments, and the Database.

### 2.1.1   OPEN-RESPONSE VS TEXT INPUT QUESTION TYPES

The Ministry of Education makes reference to Open-Response questions on their standardized tests. However, for our development purposes, we have identified two questions types within this category; internally, we will refer to these two types as "Text Input" and "Open-Response" types.

In general, Text Input type questions have a final answer that student responses can be measured against, and that they must type in.  There is also an area where they can write in to show their work.

Open-Response type questions have no final answer, rather they simply have an open area where the student can draw their response.  These hand drawn responses are then manually scored by the teacher.  See the Open-Response section below for more details.

In either case, displayed in the page header for the student assessment will be "Open-Response" for both of these question types.  As in Figure 1 below.
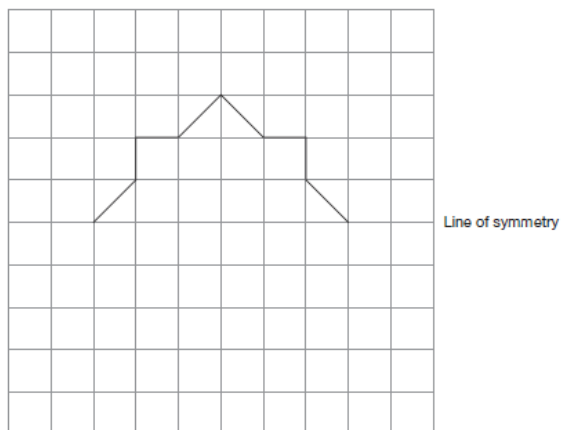
### 2.1.2   OPEN-RESPONSE QUESTIONS

Open-Response type questions are similar to Text Input questions in that they feature a large open area for the student to hand draw their answers.  Unlike Text Input questions, there is **NO** text box for the student to enter a final answer.

In most cases, the canvas area where they are drawing will have a background.  As an example, see Figure 1 below which has a lined chart as the background image for the students to draw their answer on top of.

Open-Response type questions will have an impact on how assessments are marked, when they are marked, how results are displayed, and how assessments are set up.

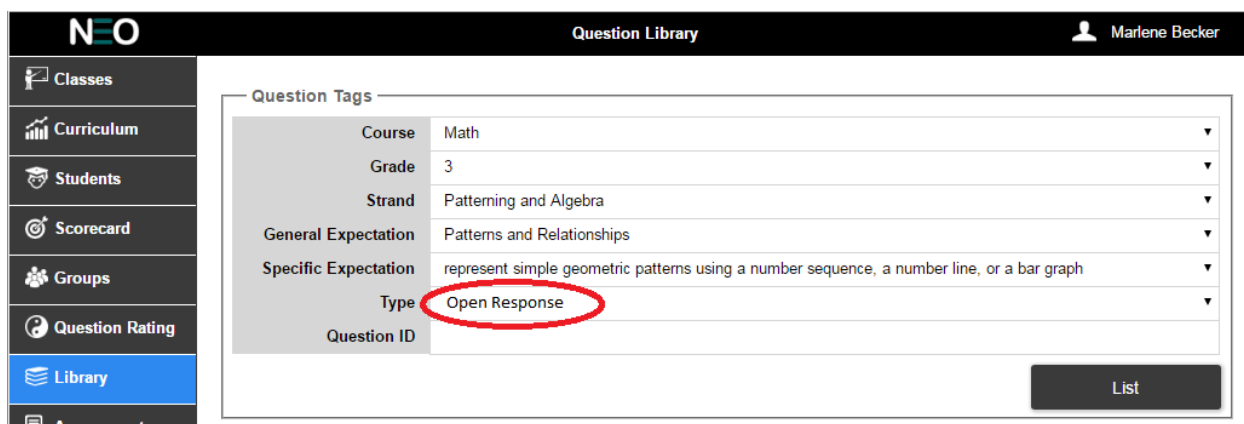**10** Complete the shape on the grid. Use the dotted line as a line of symmetry.



Line of symmetry

Draw all lines of symmetry on the shape.

Explain why these lines are lines of symmetry.

**Figure 1: Open-Response Question Type**

## 3 CREATING OPEN RESPONSE QUESTIONS

Creating Open Response type questions will require changes to the Library screen in the Teacher App. In the Question Tags field set at the top of the Library screen, "Open Response" must be added to the Type drop list. See Figure 2 below.



Figure 2: New Type of Question in Drop List

When Open Response is the selected type, the middle field set (Text and Images) remains the same. However, the bottom field set (Answers) should allow the user to enter a final answer and/or an image of the final answer. See Figure 3 below.

The "Correct Answer" and the stored answer image, will be used as a reference for the teacher. However, the user that creates the question is not required to provide either the answer or any associated image; these fields could be left blank.

If the user chooses to add an answer image, this image should be stored in a new directory in Amazon S3 (separate from any other existing directories currently being used to store images).

Figure 3: Answers Field Set for Open Response Questions

## 4 CREATING ASSESSMENTS

The Assessment setup screen in the Teacher App will also require the addition of "Open Response" to the Type drop list within the Filter Selections field set.  See Figure 4 below.



Figure 4: New Open Response Type in the Drop List

After the teacher saves the assessment, a new flag should be set in the database Test collection.  This new flag will simply be used to indicate the presence of Open Response questions within a given test. This flag can later be used by the Student App for the alternative logic needed to handle scoring these types of questions.

## 5 THE STUDENT APP

When a student submits a test for scoring, if there are **NO** Open Response questions, then the existing logic around scoring and submitting data to the database still applies.  However, if a given test **does contain one or more** Open Response questions, then the data submission logic changes dramatically.  In this second case, the following steps should occur instead of the standard logic for scoring and data submission:

1. **No test results are calculated** because no final score can be assigned to the test.

2. Transactional data (the student's answers) should **NOT** be recorded to the Transaction collection.  Rather, **all answers should be stored in a new database collection called Holding**.

3. The Holding collection will be virtually identical to the Transaction collection.  Except that the Holding collection will have an extra document field called **Marked**.  This field only needs to be set for Open Response questions, and it should default to **FALSE**.  This field will later be used by the Teacher App to query for questions that need the teacher's intervention before finally scoring the assessment.

4. Another new collection will be required for storing information about specific tests, and their related students, that require manual scoring by the teacher.  This new collection should be called **Pending**.  Documents within the Pending collection should have fields for Test ID, test name, Student ID, the Student's first and last names, Class ID, class name, grade and course.  When data is submitted by the Student App, a document should be written to the Pending collection with the above information.  **Every unique combination of Test ID and Student ID, that has Open Response questions that needs to be graded, should have a representative document in this collection.**

5. An image should be generated and stored for each Open Response question.  This image will later be used by the teacher to score the student's response.
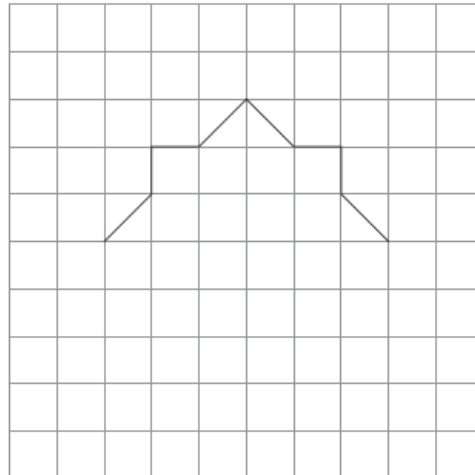
Figure 5: Student View of an Open Response Question

Above is a sample of what the student should see when confronted with an Open Response type of question. Notice that the drawing tools are located on the left side of the screen (Figure 5).

As a stretch goal, it would be nice if the drawing tools could float on the screen; this way they are always visible to the student, and are unaffected by vertical scrolling.

## 6   MARKING ASSESSMENTS

A new tab called **Pending** should be added to the Teacher App below the Tickets tab and above the Feedback tab (see Figure 6). The icon will be supplied.
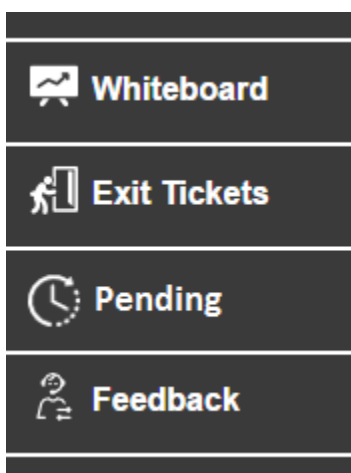
Figure 6: New Pending Tab in the Teacher App

> As a stretch goal, it would be nice if the font colour for "Pending" would automatically change colour when there are assessments waiting for the user to score.  For example, the font could be red (#ED1C24) when there are assessments to be scored, and the font could be white at all other times.

At the top of this screen there should be the standard UI filter elements for Course, Grade and Class.  As shown in Figure 6 below.

When the user first selects the Pending tab, the app should execute a query against the database Pending collection.  The query should use the user selected values for Course, Grade and Class.  This query should return a unique list of test names and associated dates.  In turn these will be used to populate the top field set called "**Pending Assessments**".  See Figure 7 below.



Figure 7: Pending Assessments Field Set

Each assessment will be preceded by a check box for selection purposes.  Only one box can be selected at any given time.  Selecting a box should automatically deselects all other check boxes.  The results list should be sorted by date in ascending order.  And the list should follow a Z-pattern back and forth between the two columns within the field set.

There should also be a list button within this field set to execute the second query to retrieve a list of student names associated with the selected test.  This second query should also use the Pending collection to retrieve the needed data; filtering on the selected Test ID.  The query should return a list of Student Names (User Name) and their OEN numbers (User ID).

Clicking on the List button should reveal the second field set called "**Students in Selected Assessment**". The list of names should follow a Z-pattern back and forth between the two columns within the field set. Each name should be preceded by a check box for selection purposes (see Figure 8).



Figure 8: Students in Selected Assessment Field Set

The second field set also contains a button labelled: **Show Unscored Questions**. Clicking on this button will reveal a third field set (see Figure 9 below) that lists all unscored Open Response questions that relate to the selected student and the previously selected Test ID; this query should be against the Holding collection.



Figure 9: Unscored Questions Field Set

The third field set should be called: **Unscored Questions**. Like the other field sets, it should consist of two columns going back and forth in a Z-pattern. Each result should be preceded by a check box for

selection purposes.  Followed by the Question ID number, which in turn is followed by Line 1 of the question.  The user cannot select more than one question at a time.

Within this field set is a button called: **Score Selected Question**.  Clicking on this button, after selecting a question, will take the user to another screen where the teacher can finalize the question score.

The selected course, grade, class, test ID and student ID will be required **AFTER** the teacher has finished scoring the selected question.  As such, this information should be temporarily stored somewhere for later use.

### 6.1.1   SCORING OPEN RESPONSE QUESTIONS

The scoring screen should consist of four elements:

1.  A background image.  Which is the image of the selected student's response that was previously stored in AWS S3 (and reference in the database).

2.  Literally canvas overlay.  Including the standard drawing tools used previously and located along the left side of the screen.

3.  Two text input boxes.  The teacher will use these to assign a score to this question and assign a total weight to the question (total possible score) as well.

4.  Save, Cancel and View Solution buttons at the very bottom of the screen.

Refer to Figures 10 and 11 below for an examples of this screen.

**Figure 10: Scoring Screen**

The background image should be horizontally centered within the canvas drawing area. However, the background image should be vertically placed very close to the top of the canvas drawing area. This placement will allow for commenting and markup around the entire image.

The teacher should have access to the standard drawing tools for marking up the image.

As a stretch goal: would it be possible to add a text tool to the standard tools? If Literally Canvas has this tool already, can it be enable for the teachers?

The two text boxes should be within a larger grey box and surrounded by the text indicated at the bottom of Figure 10 above. The database Holding and Transaction collections will likely need to be altered to store these two fields: question score and possible score. **Please Note: This will require further discussion.**

Figure 11: Scored and Marked Up by the Teacher

Clicking on the save button at the bottom of this screen will do several things:

1. Save the combined image. Once the teacher has finished scoring and marking up the student's response (example above in Figure 11), the new canvas markup and the background image should be saved back to S3. This new combined image should replace the original background image. For example, if the original background image was stored as 1234.png, then the new combined image should overwrite the old image and still be stored as 1234.png.

2. Verify that the question score and possible score have been entered into the provided fields. If it has not, display a short warning that this information is missing and then continue to step 3 below. If it has, then store the scoring information (that is the question score and the total possible score for this question) in the Holding Collection, and continue to step 3.

3. Use the previously stored course, grade, class, test ID and student ID to query the Holding collection for missing question scores AND possible scores for the Open Response question type. If any of this scoring data is missing, then skip to step 7 below in this process. If all of the scoring

data exists (for Open Response question types), then the selected student's test is ready for final calculation.

4. Query the Holding collection for all documents that relate to the selected course, grade, class, student ID and test ID.  Use this to calculate a final result document and store it the Result collection.

5. Move all of the documents from step 4 into the Transaction collection.  These documents should no longer exist in the Holding collection after this.

6. Delete the related record from the Pending collection.

7. Return the user to the initial Pending screen making use of their last selected Course, Grade and Class (as in Figure 7).

## 6.1.2   VIEWING THE SOLUTION

The "View Solution" button pictured in Figure 12 below is only visible if the selected question has stored answer information (either a text answer and/or an answer image).



Figure 12: View Solution Button Displayed

The Question collection will need to be queried to determine the visible state of the View Solutions button. Assuming that this information exists, and that the button is visible, clicking on this button will open a pop up window (very much like the question preview window) showing the answer information; see Figure 13 below.
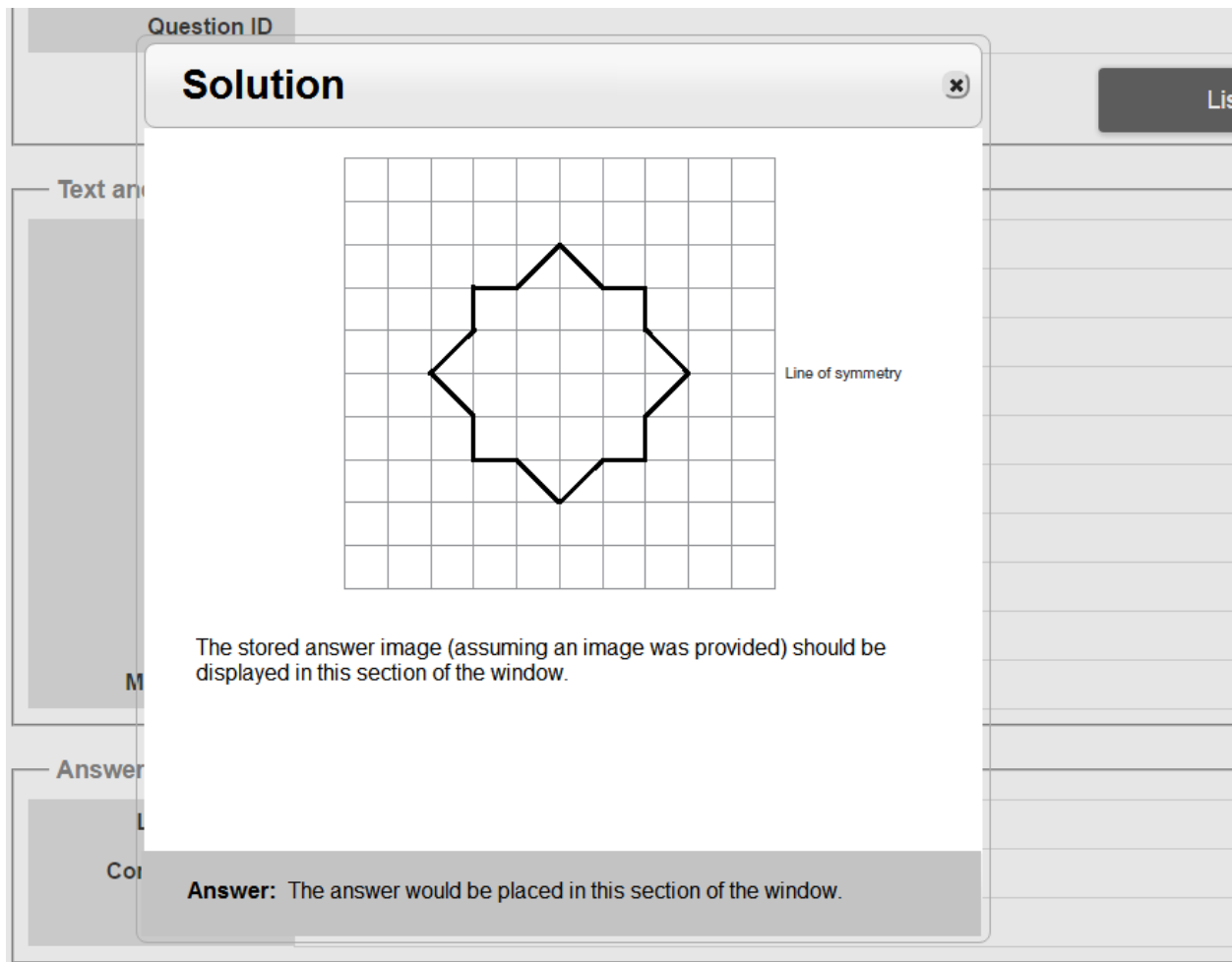


Figure 13: Solutions Pop Up Window

The top section of the Solution window should be used for the title of this pop up window. It should be formatted the same as the Question Preview popup windows and should simply read "Solution".

The middle section of the Solution window (and majority of the window space) should be dedicated to displaying the stored answer image (assuming that one was used). The image should be centered horizontally.

The bottom section of this window should show a grey bar (the width of the window) that displays the text of the correct answer (assuming that one was given). Refer to Figure 13 above.

## 7   DATABASE

This section will only show the changes to existing collections, and any new collections that need to be created for Open Response questions.

### 7.1   COLLECTION: TEST

| Field Name | Notes |
|---|---|
| orFlag | True or False flag.  True indicating the presence of Open Response type questions in a given test. |

### 7.2   COLLECTION: HOLDING

This collection is identical to the Transaction collection but it has one additional field called Marked.

| Field Name | Notes |
|---|---|
| marked | This field only needs to be set for Open Response questions, and it should default to **FALSE**.  This field will later be used by the Teacher App to query for questions that need the teacher's intervention before finally scoring the assessment. |

### 7.3   COLLECTION: PENDING

| Field Name | Notes |
|---|---|
| testID | |

| testname | |
|---|---|
| course | |
| grade | |
| classID | |
| classname | |
| startdate | Assessment start date |
| studentID | |
| firstname | Student's first name |
| lastname | Student's last name |

## 8    SAMPLE OPEN RESPONSE QUESTIONS

The following are examples of how open response questions are currently being used by the schools for grades 3, 6 and 9.

Section **1**   Mathematics  •  Open-Response           page 6

**9**  Mr. Scott plans a class trip for the 30 students in his class. He must pay the following costs per student:

• admission: $3.80
• bus: $10.40
• snack: $5.55
• supplies: $7.31

Round the costs to the nearest dollar and use them to estimate the total cost for the 30 students.

Show your work.

The estimated total cost for the 30 students is $ _____ .

**Figure 14: Example 1**

**11** Six polygons are shown below.

| | | | | | |
|---|---|---|---|---|---|
| Isosceles trapezoid | Square | Rhombus | Right triangle | Regular pentagon | Parallelogram |
| A | B | C | D | E | F |
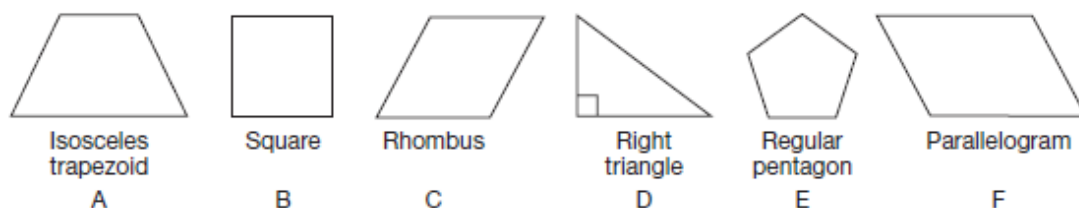
Write the letter of each of these polygons in the appropriate section of the Venn diagram below.

At least 1 line
of symmetry

Order of rotational
symmetry of at least 2
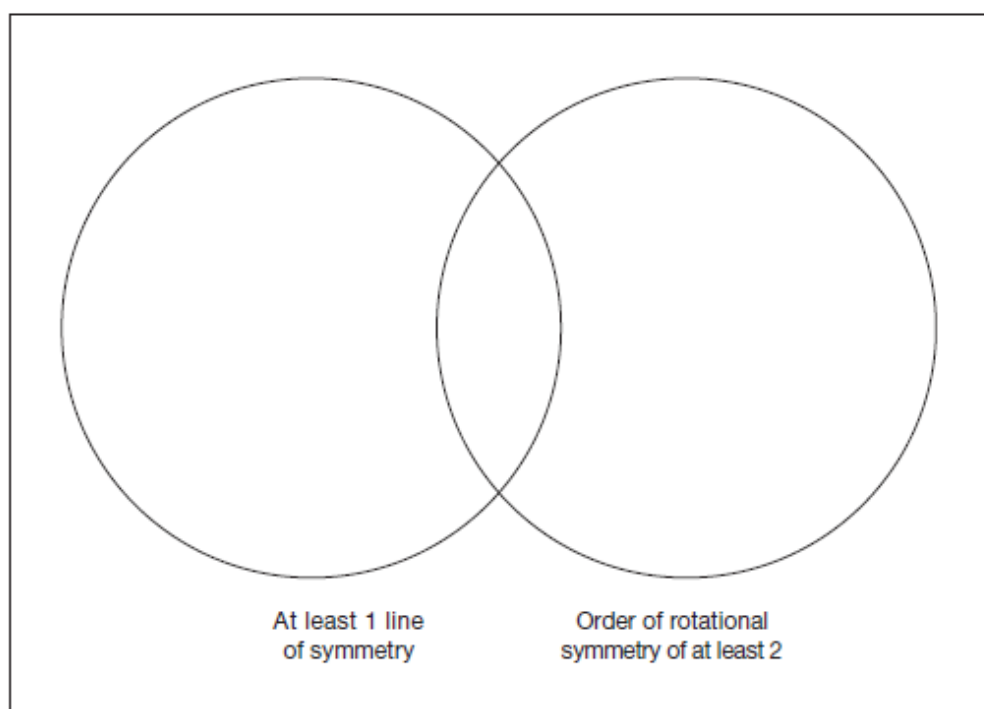
**Figure 15: Example 2**

10  The container of popcorn pictured below is in the shape of a rectangular prism.
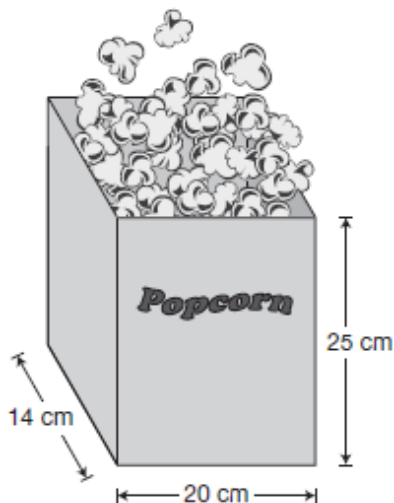


What is the smallest amount of paper needed to make this container?

Show your work.

The smallest amount of paper needed to make this container is _____ cm$^2$.

**Figure 16: Example 3**

**8** The pictograph below shows the results of Clark's survey about his friends' favourite zoo animals.

**Favourite Zoo Animal**

| Animal | Number of friends |
|--------|-------------------|
| Monkey | ☺ ☺ ☺ ☺ ☺ ☺ |
| Elephant | ☺ ☺ ☺ |
| Penguin | ☺ ☺(half) |
| Tiger | ☺ ☺ |

| Key |
|-----|
| Each ☺ represents 2 friends. |

Display and label Clark's data by completing the bar graph below. Complete the scale shown.

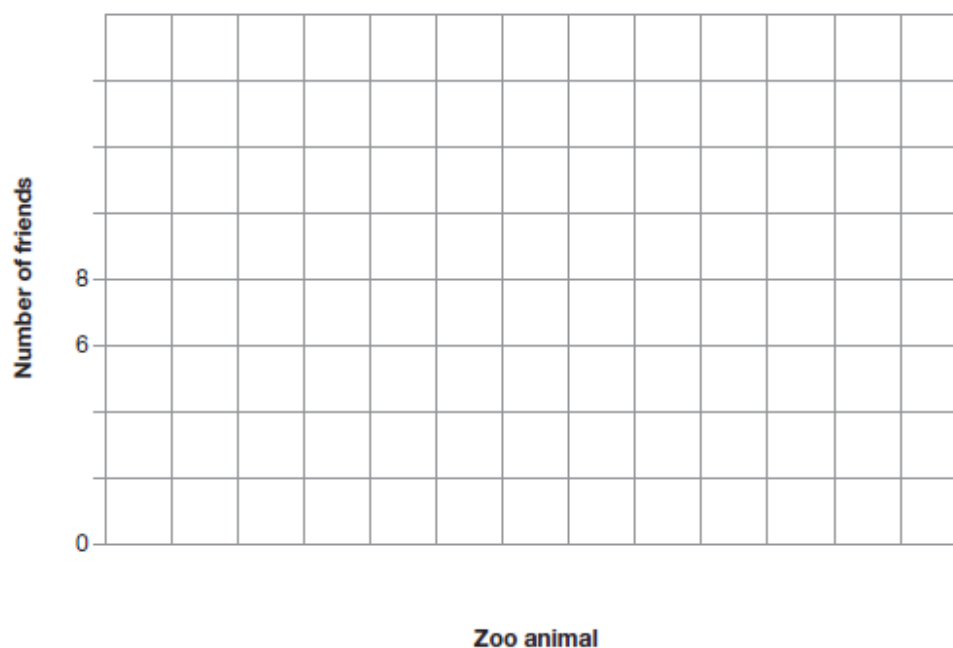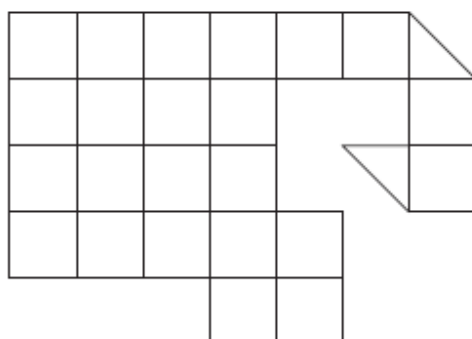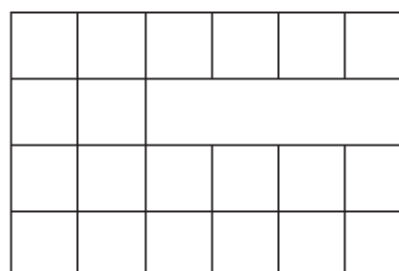**Favourite Zoo Animal**



Figure 17: Example 4

**9** Two playgrounds are pictured below.

**Playground A**                                          **Playground B**



1 square unit

Determine how much larger the area of Playground A is than the area of Playground B.

Show your work.

Playground A is _____ square units larger than Playground B.

Figure 18: Example 5

## 13 Getting Fit

Maddie enrols in a fitness program. Her total cost is made up of a sign-up fee and a cost per class.

The table below shows information about her total cost, $C$, in dollars, when she attends $n$ classes.

| Number of classes, $n$ | Total cost, $C$ ($) |
|---|---|
| 12 | 67 |
| 14 | 74 |

What is the sign-up fee?

Sign-up fee: _____

Show your work.

Is the relationship between the number of classes Maddie attends and her total cost a partial variation or direct variation?
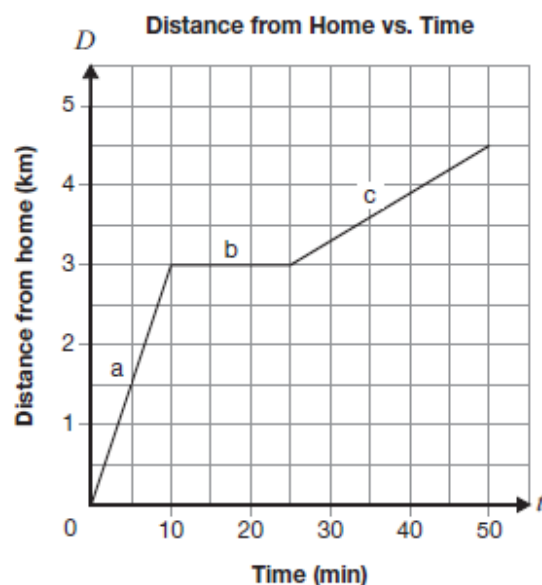
Circle one:       Partial variation       Direct variation

Justify your answer.

## 14 Kenny's Big Adventure

The following graph represents the relationship between Kenny's distance from home on a bike ride and time.

**Distance from Home vs. Time**



Describe the 3 segments of Kenny's ride. Include information about distance travelled, time, direction and speed, in km/min, for each segment.

| Segment | Distance travelled | Time | Direction | Speed (km/min) |
|---|---|---|---|---|
| a | | | | |
| b | | | | |
| c | | | | |

**Figure 20: Example 7**

## 16 Making Equations!

Determine the equation of the line that has the same $y$-intercept as $2x + y + 6 = 0$ and is perpendicular to the line shown on the grid.
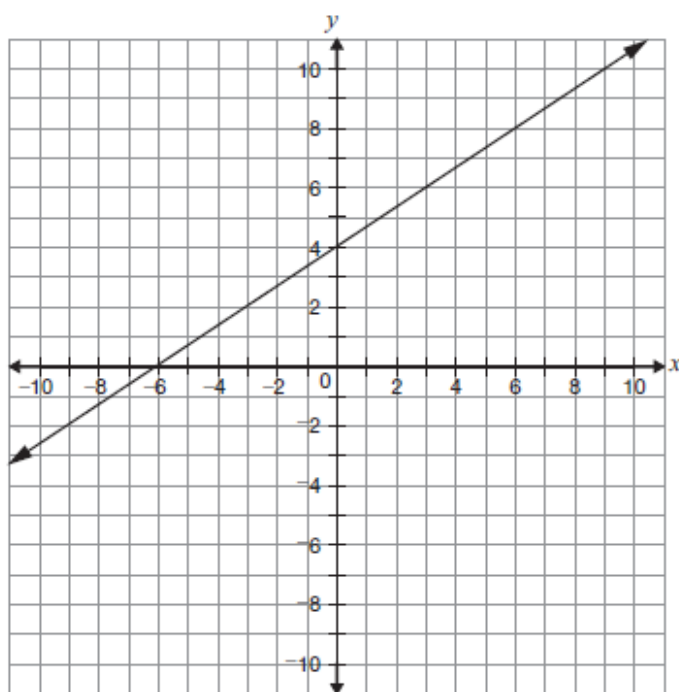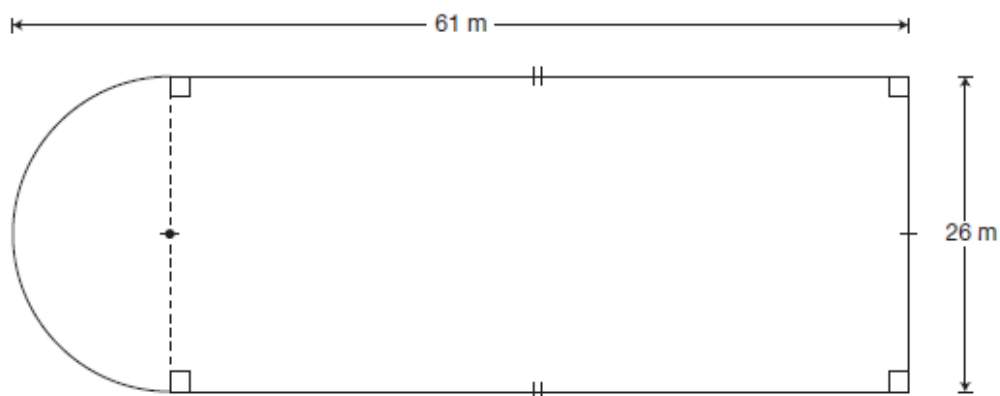


Show your work.

Figure 21: Example 8

## 17 Skate On!

A diagram of a community ice rink is shown below.



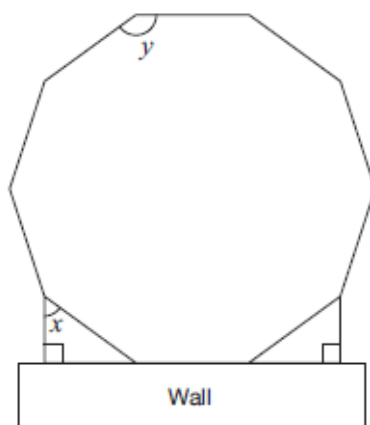The rink is being enclosed with fencing that costs $6.20/m.

Determine the total cost of fencing for the rink.

Show your work.

**Figure 22: Example 9**

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## 18  A Schoolyard

A schoolyard is in the shape of a regular decagon, as pictured below.



Complete the chart below with the values of $x$ and $y$. Justify your answers using geometric properties.

| Value | Justification using geometric properties |
|---|---|
| $x =$ _____ | |
| $y =$ _____ | |

Figure 23: Example 10