Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_ Day 123 456

Engineering Your Playground

Unit Concept: Number Sense

Unit Theme: Engineering/Financial Literacy

Task: You are an architect and have been asked to design a playground for the next elementary school that will be built in Scotch Plains/Fanwood District. We will create a report to present to the school board to convince them to use your design to build the playground. Show all work even if you use a calculator.

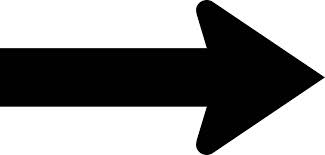
Guidelines:

1. The school received a grant from the state to spend $60,000.
2. You will have 5,000 – 7,000 square feet to build your playground.
3. There must have a wheel chair accessible walkway around the perimeter of your park.
4. There must be a fence around the walkway.
5. There must be 6 feet of walkway between each piece of equipment, which is included in the use zone of each piece of equipment.
6. There must be at least 3 pieces of equipment.
7. For safety reasons, there must be woodchips on the playground.
8. The walkway must be covered with gravel.



Part 1: Keep Track of Money Spent (10 points)

According to Guideline 1, the state grant is $60,000. You want to spend as much as possible, but you cannot go over $60,000. Use the spreadsheet in Google Classroom, to keep track of your money spent. It does not need to be handwritten below.



Write a brief description of each expense here!

|  |  |
| --- | --- |
|  | Balance |
| Starting Balance | $60,000.00 |
| Cost of woodchips |  |
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| Ending Balance |  |

Part 2: Dimensions of Your Playground (5 points)

Pick the area you want your actual playground to be. You have a choice between 5,000 – 7,000 square feet of land to work with. This does not include the walkway.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ x \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(length) (width) (area of playground)

Part 3: Wheelchair Accessible Walkway (5 points)

According to Guideline 3, there must be a wheel chair accessible walkway around the perimeter of your playground. The walkway must be at least 6 feet wide. Use the sketch below to label your dimensions of your playground and walkway.

Walkway

Walkway

Walkway

Playground

Walkway

1. What are the dimensions of the playground including the walkway? Include this in your sketch.
2. What is the area of just the walkway? Show all work.

Part 4: Flooring For Your Playground (10 points)

According to Guideline 7, you will need to have woodchips covering the entire area of your playground for safety reasons.

**1 bag of wood chips cost $3.33 and covers a 6 foot by 6 foot square**

1. How many square feet does 1 bag of wood chips cover?
2. Using your answer from Part a, determine the number of bags you will need. Show all work.
3. How much will the bags of wood chips cost you? Deduct this from your balance in Part 1. Do not forget to write a description.

Part 5: Gravel For Your Walkway (10 points)

According to Guideline 8, your walkway must be covered with gravel.

**1 bag of gray gravel, which covers 36 square feet of walkway with a 1 inch thickness costs $3.50. A bag of colored gravel covering the same space costs $7.00**

1. Choose gray or colored gravel. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Use Part 3 to find the area of the walkway. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How many bags of gravel are needed to cover the walkway? Show work below.
4. What is the total cost of gravel for your walkway? Deduct the total cost from your balance in Part 1.

Part 6: Fencing For Your Playground (10 points)

According to Guideline 4, your playground must have a fence around the walkway.

**1 piece of fencing costs $35.00 and is 5 feet long. The fencing is not bendable so you may need to cut pieces at each corner.**

1. How many pieces of fencing will you need to purchase for the LENGTH of one side? Show all work.
2. How many total feet are you purchasing for that one side?
3. Do you need to cut off the last piece? If so, how many feet?
4. How many pieces of fencing will you need to purchase for the WIDTH of one side? Show all work.
5. How many total feet are you purchasing for that one side?
6. Do you need to cut off the last piece? If so, how many feet?
7. How many pieces of fencing will you need to purchase to surround the entire playground?
8. What is the total cost of fencing for your playground? Deduct the total cost from your balance in Part 1.

Part 7: Business Meeting (10 points – not part of rubric)

Schedule a business meeting before moving on.

The Scotch Plains-Fanwood Board of Education requests a meeting with each architect bidding for the job of designing the next elementary school in district.

Each architect firm should sign up for a time slot and be prepared to discuss the progress of their design and any or all of the following:

* What are the dimensions of your playground including the walkway? Why did you choose these dimensions?
* In Math Explorations class you learned how to calculate the area of a shaded region. How does that relate to playground project?
* What is the purpose of drafting preliminary sketches before you order playground equipment? Is it really necessary?
* Planning is a key part of any job. What is in your plans that will convince the Board of Education to hire your firm?
* Thinking ahead, where do you think most of your budget will be spent?
* Are you planning on spending your entire $60,000 budget? Explain.

Part 8: Sketch (working copy)

On small graph paper, create a sketch of your playground including walkway. Use a scale factor of 1 box = 1 foot.

1. Label the dimensions of your playground with the walkway.
2. Label the dimensions of your playground without the walkway.

Part 9: Equipment Purchases (5 points)

Research playground equipment and determine what you can fit and afford on your playground. Remember Guideline 6, you must have at least 3 equipment purchases. Use the table below to record equipment information. Remember to deduct all purchases from your balance in Part 1.

AS YOU BUY EACH ITEM, UPDATE YOUR SKETCH!

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Equipment Description | Use Zone  Length and Width | Area of Use Zone (ft2) – of one item  Show all work | Quantity | Cost |
|  |  |  |  |  |
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1. For each piece of equipment, label the length and width on your sketch.
2. Label the distance between each piece of equipment.

Do not move on until your teacher approves your sketch. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher Signature

Part 10: Scale It! (50 points)

It’s time to make a blueprint of your playground to propose to the school Board of Education. You will need the following:

* Large Grid Paper
* Ruler
* Pencil
* Playground sketch from Part 9

The scale that you will use is the following:

1 box = \_\_\_\_\_\_\_ feet

Be sure that your blueprint shows the following:

* Title and Names
* Playground dimensions labeled
* Playground with walkway dimensions labeled
* Description of each piece of equipment with dimensions labeled
* The wheel chair accessible walkway around the playground
* Key with the scale

Scale Factor Workspace – Complete the table below to find out how many boxes each piece of equipment will require on your large grid paper.

|  |  |  |
| --- | --- | --- |
| Equipment Description | Dimensions | # of boxes required (show work) |
| Dimensions with walkway | Length - |  |
| Width – |  |
| Dimensions without walkway | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |
|  | Length - |  |
| Width – |  |

Part 11: Percentage of the Playground (20 points)

Determine the percentage of the area of each piece of equipment to the total area of your playground excluding the wheel chair accessible walkway.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Equipment Description | Use Zone  Area in ft2 |  | Percentage of one item | Quantity Purchased | Total Percentage |
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| Percentage of Playground Space Used  (Must be at least 40% used) | | | | |  |

Part 12: Covering the Playground with Shade (10 points)

You need have a shaded area. You must plant a tree on at one end of the length of your playground with the walkway to provide shade. The distance from the top of the tree to the other side of the playground is going to be twice the length of the playground with the walkway. Below draw a sketch from a person’s perspective of the length of the playground, showing the height of the tree.

|  |
| --- |
|  |

Length of the Playground with the Walkway: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Distance from top of tree to other side of playground: \_\_\_\_\_\_\_\_\_\_\_\_

Below calculate the minimum height of your tree:

|  |
| --- |
| Minimum height of tree:\_\_\_\_\_\_\_\_\_\_\_\_\_ |

The cost of the tree is going to be $300. Make sure to include this in your budget.

Part 13: Your Report

I. Cover Page Requirements: (5 points)

* Title – Elementary School Playground Proposal (center of page)
* Name of Architectural Firm – “K-H Architects, Inc.” (bottom of page)
* Name of the Architects – Group Member Names (under firm name)
* Project Due Date (under names)

II. Table of Contents Requirements: use example below: (5 points)

Table of Contents

Page

Cover Page 1

Table of Contents 2

Letter 3

Playground Budget 4

Pictures of Equipment 5-10

Small Sketch (Early Finishers option) 11

III. Letter Requirements: (30 points)

* Greeting (Dear Scotch Plains BOE)
* Date
* Paragraph 1 - Introduction of your firm and task
  + What are the names of the architects? (Your names)
  + What is the name of your architectural firm?
  + What was the task you were given by the Scotch Plains Fanwood Board of Education?
  + We are interested in bidding for this project because…
* Paragraph 2 – Discuss your budget.
  + What was the budget given by the Board of Education?
  + How much of the budget did you spend?
  + How much money did you save?
  + Explain why saving/spending your dollar amount supports the Board of Education choosing your architectural plan.
* Paragraph 3 – Discuss the measurements of your playground/safety
  + What are the dimensions of your playground with and without the walkway?
  + What is the area of your playground?
  + How will this information (dimensions, area, size & shape) help convince the BOE to choose your design? Be specific.
  + What percentage of your playground did you use (equipment, benches, etc.)? Explain why this % will help convince the BOE to choose your design.
  + How does your design address safety?
* Paragraph 4 - Conclusion – Summarize your top reasons for choosing your playground proposal
  + Why should the BOE choose your design?
  + What is unique/special about your design that will help convince the BOE to choose your design? Be specific.
* Closing (Sincerely)

IV. Playground Budget Requirements: Use the format below to show how you used your $60,000. (5 points)

Playground Budget

Income (money coming in)

School Grant $60,000

Expenses (money going out)

Woodchips $

Gravel

Fencing

Tree

List all equipment purchases



Total Expenses \_\_\_\_\_\_\_\_\_

Funds Remaining $\_\_\_\_\_\_\_\_\_

V. Pictures of Equipment Requirements: (5 points)

* Title of the piece of equipment
* A picture of each piece of equipment/bench/garbage can you purchased.
* Must be colored (colored printers at home or markers in class)

\*\* Your report must be stapled or put in a clear front report cover in this order!

\*\*Hand in: Completed Accurate Packet, Report, Large Blueprint, and turn in Google Spreadsheet

Part 14: Early Finishers – Extra Credit!

Create a brochure for your playground showcasing the design, the equipment, and fun factor. This brochure will be seen by parents, visitors of the playground, as well as the Board of Education.

Requirements:

* Trifold brochure (copy paper size)
* Colorful and creative
* You decide what goes in the brochure! What do you think would be important for people to see to come to your playground?

Resources:

* Create the brochure on the computer: <https://www.canva.com/>
* Create the brochure by hand!

|  |  |
| --- | --- |
|  | Project Rubric |
| Sense & Perseverance  Precision  Methods  (85 points) | * Completed Accurate Packet (85 points – see point values in packet) |
| Modeling  (50 points) | * Scaled blueprint drawing that shows: (50 points) * Playground dimensions labeled and scaled correctly * Playground with walkway dimensions labeled and scaled correctly * Description of each piece of equipment with dimensions labeled and scaled correctly * The wheel chair accessible walkway around the playground * Key with the scale |
| Reasoning  Abstraction  Justification  (50 points) | * Report in order including * Cover Page (5 points) * Table of Contents (5 points) * Letter persuading board using given format and questions (30 points) * Playground Budget (5 points) * Equipment Colored Pictures (5 points) |
| Class Participation  (10 points) | * Always on task (receive 10 points) * Frequently on task (receive 5 points) * Sometimes on Task (receive 2 points) * Never on Task (receive 0 points) |
| (10 points) | * Organization/Neatness (10 points) |
| Project Total | /205 (maximum points) |