Greener Grass

The West Hancock Booster Club is considering replacing the existing grass football field with a new type that is softer for the benefit of the opposing team. Visiting teams have been complaining about the large number of injuries from our hard-hitting players smashing them into the ground. Local fans have agreed to volunteer labor and equipment. The Booster Club is concerned only with the cost of the sod for the field. They are looking for the best buy for their money.

Below are price quotes from various local nurseries:

6' x 2' roll $1.35
6' x 6' roll $4.00
8' x 3' roll $2.75
6' x 3' roll $2.25

The field dimensions are 120 yards x 160 feet.

Which is the best buy?
How many rolls of sod will be needed?
What will be the total cost of the sod?

Bonus:

Make a scale diagram of how the sod will be laid down on the field.

Grade Levels 6 - 8

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Context

This problem was developed to correspond with a geometry unit. This year we had an outstanding football team and thought this theme would foster student interest in the problem.

What This Task Accomplishes

Along with the use of multiplication and division of whole numbers and decimals, students need to compute the area of each roll of sod and the area of the football field. Students will need to recognize that all units of measure need to be converted to the same unit. Students will need to find a way to compare unit prices, which may include comparing decimal amounts if students determine the cost per square foot of each size sod.

What the Student Will Do

Several strategies were used to solve this task, including diagramming and using formulas.

Most students knew to convert yards into feet. Some students had difficulty computing the unit price.

An extension to the problem would be for students to create a scale diagram of how the sod would be laid. When this problem was first used, this part was included. It created a great deal of difficulty and was dropped from the next field test. Students had difficulty "cutting" the sod into 4' x 6' pieces and then putting the 2' x 6' remainders together.

Time Required for Task

1-2 hours

Interdisciplinary Links

This task could be linked to a consumer unit on comparison shopping. It can also be linked to other tasks involving working with areas such as shingling, carpeting, wall papering, etc.

Teaching Tips

To get students started, the area of a rectangle and customary unit conversions were reviewed. In one situation, students worked in groups of three for about 15 minutes to brainstorm ideas on how to approach the problem, then separated to do individual work. This format worked well.

Suggested Materials

- Calculators
- Graph paper

Possible Solutions

The cost per square foot is as follows:

6' x 2' roll $1.35 cost per square foot = $0.1125

6' x 6' roll $4.00 cost per square foot = $0.1111

8' x 3' roll $2.75 cost per square foot = $0.115

6' x 3' roll $2.25 cost per square foot = $0.125

So the least expensive rolls are the 6' x 6'. There does not seem to be a big difference in the costs per square foot, but it really adds up when you buy the quantity needed. In fact, there is an $800 difference when comparing the least expensive, to the most expensive sod.

57,600 square feet of sod is needed. 1,600 6' x 6' rolls would be needed and would cost $6,400.

Benchmark Descriptors

Novice
The Novice will have no solution. The explanation will be unclear and there will be little evidence of mathematical reasoning and/or language. The Novice will not know where to begin and will not have a strategy for even getting started toward a correct solution.

Apprentice
The Apprentice will have some understanding of the task. The Apprentice might be able to convert yards to feet, finding the area of the football field. The Apprentice may be able to determine the number of pieces of sod that are needed, but will have no strategy for determining the least expensive. There will be some evidence of mathematical reasoning and/or language and perhaps an attempt at a mathematical representation.

Practitioner
The Practitioner will have a solid understanding of the problem. The Practitioner will be able to convert yards to feet, finding the area of the football field. The Practitioner will be able to determine the number of pieces of sod that are needed and will have a strategy for determining the least expensive. The Practitioner will use mathematical language and representations to communicate clearly and will use sound mathematical reasoning.

Expert
The Expert will have extensive understanding of the problem. The Expert will have an efficient strategy for finding a solution and will compare the four different costs for the reader. The Expert will use sophisticated mathematical language and may make mathematically relevant comments or observations about his/her solution, such as discussing the significance in decimal amounts when determining the cost per square foot.

Novice

Greener Grass

The west Hancock Buster club is considering replacing the existing grass on the football field with a new type that is softer for the benefit at the opposing team. Visiting teams have been complaing about the large number of inguries from the hard hitting players smashing them into the ground. Local fans have agreed to volunteer labor and equipment. The Buster club is concerned only with the cost of the Sod for the field. They are looking for the best by for their money. Below the price quotes from various nurseries:

6ft x 2ft Roll = $1.35
6ft x 6ft Roll = $4.00
8ft x 3ft roll = $2.75
6ft x 3ft roll = $2.25

Solution with no work or justification.

20
80
100

field dimension are 120 yds x 160 ft

Which would be the best buy? (Best buy 6ft x 2ft)
How many rolls would be needed? (100 Roll)
what would be the total cost of the sod? $135.00

Apprentice

The West Hancock Booster Club is considering replacing the existing grass on the football field with a new type that is softer for the benefit of the opposing team. Visiting teams have been complaining about the large number of injuries from our hard hitting players smashing them into the ground. Local fans have agreed to volunteer labor and equipment. The Booster Club is concerned only with the cost of the sod for the field. They are looking for the best buy for the money.

Below are price quotes from various local nurseries:

12
6 ft x 2 ft roll $1.35 .1125

* 6 ft x 6 ft roll $4.00 .1111

8 ft x 3 ft roll $2.75 .1145

6 ft x 3 ft roll $2.25 .125

} cost

Student shows work and attempts to find unit cost.

27.
Field dimensions are 120 yards x 160 feet.

Good use of mathematical language.

Which would be the best buy?
How many rolls of sod will be needed?
What will be the total cost of the sod?

(1) 6 ft x 6ft. roll for 4.00 would be the best buy
(TOOK 6x6 = 36. took 4.00 ÷ 36 = .1111 cheapest)

(2) 27 rolls would be needed
(took + 6 = 20
so it will fill

20 across | 27 this way

but you want to fill the field

(3) 108.00
(took 27 4.00

Practitioner

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Below are price quotes from various nurseries

6 ft x 2 ft. roll $1.35
6 ft x 6 ft. roll $4.00
8 ft x 3 ft roll $2.75
6 ft x 3 ft roll $2.25

Uses correct notation and labels.

Shows work used to obtain a solution.

Field dimensions are 120 yds x 160 ft

Which would be the best buy?
How many rolls would be needed?
What would be the total cost of the sod?

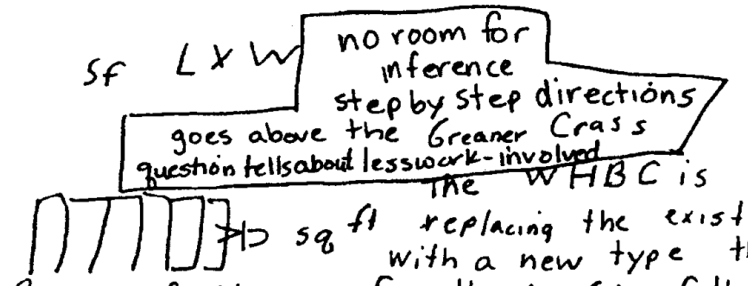
Communication could be clearer. Which is best?

120 yds. x 3 = 360 ft. 360 ft x 160 ft = 57,600 sq. ft.

6 ft. x 2 ft. = 12 sq. ft. 57,600 ft ÷ 12 ft = 4,800 rolls
4,800 x $1.35 = $6,480.00

6 ft. x 6 ft = 36 sq. ft 57,600 ft ÷ 36 = 1,600 rolls
1,600 x 4.00 = $6,400.00

Expert



sq ft
football field

The WHBC is considering replacing the existing grass on the with a new type that is softer for the benefit of the opposing team. Visiting teams have been complaining about the large number of injuries from hard hitting players smashing them into the ground. Local fans have agreed to volunteer labor and equipment. The BC is concerned only with the cost of the seed for the field. They are looking for the best buy for their money. Below our price quotes from various nurseries:

6 x 2 feet rod $11.35
6 x 6 feet roll $4.00
6 x 3 feet roll $2.75
6 x 3 roll $2.25

field dimensions are 120 yds x 160 feet

Uses appropriate math language.

Which would be the best buy?
How many rolls would be needed?
What would be the total cost of the seed?

15
8
23

120
x 3
300 x 160 Feet
= 57'600 sq ft

3200
18 | 57600

6 x 2 ft rolls
4 800 rolls
Cost $ 6,450

6 x 6 ft rolls
1,600 rolls
Cost $6,400

8 x 3 ft rolls
2,400 rolls
cost $6,600

6 x 3 ft rolls
3,200 rolls
cost $7,200

12
x 9
108

Expert

the best buy would be the 6x6 footrolls.
1,600 rolls would be needed.
the total cost of the sod would be $6,400 dollars.

Student explains strategy used.

First I took 120 yards times 3 and the product is 360. I took 360 times 160 to get the square feet of the field and the product is 57,600. I took the length times width of each roll. I divided 57,600 and however many square feet of each roll and got so many rolls. I took the number of rolls and multiplied it by the price of each roll. I compared each price, and I found that the 6x6 foot rolls are cheaper and there are less rolls to be landed.

Student solves problem two different ways.

States correct solution.

Answer2

6x2 = ft rolls ÷ 1.35 = .1125 per foot
Cost $6,480
rolls 4800
6x6 ft rolls ÷ 4.00 = .11 111111 per foot
cost $6,400
rolls 1,600
8x3 ft rolls ÷ 2.75 = .1145833 per foot
cost $6,600
rolls 2,400
6x3 ft rolls ÷ 2.25 = .125 per foot
cost $7,200
rolls 3,200
57,600 sq ft.

Student shows unit and price, and compares decimal amounts.

360x160 = 57,600

Greener Grass

Expert

The best buy will be 6X6 ft. rolls
1,600 rolls will be needed
the total cost will be $6,400

Student makes mathematically relevant comments.

I took the 6X2 foot rolls and get the square feet of the roll. I took the amount that each roll cost $1.35 and divided it by the square feet and the product is 1125¢ per foot I took this number and multiplied it by 57,600 feet and the product was $6,480. I did this process for the 6X2 ft rolls and the 6X3 ft rolls. I found that I had to round the last answers on the 6X6 and 8X3 ft rolls. To get the number of rolls, I took 57,600 ft divided by the square feet of each roll. the 6X6 ft rolls are cheaper and the less rolls to load.