



Name: **Answers**

Introduction

Sporting grounds are constructed to support communities to be physically active. In this task you will be part of a construction team commissioned to build an athletics field. Your job will be to calculate the amount and cost of materials required to build the planned athletics field.

Task

The attached document shows the plans for the athletics field with measurements. You are to determine the amount of running track, concrete, gravel and sand that will be needed to complete the program. You will need to calculate both the surface area and volume of the various shapes that make up the field in order to do this.

Materials

Use the information in the following tables to help calculate the amount and cost of materials needed for the project.

Table one: Materials Needed

Material	Colour code on plan	Cost
Running track	Blue	\$75 per m ²
Concrete	Grey	\$250 per m ³
Gravel	Red	\$72 per m ³
Fine sand	Yellow	\$94 per m ³

Table two: Safety standards

Feature	Safety standard
Discus ring	Concrete must be 0.10 m thick
Discus field	Gravel must be 0.15 m thick
Long jump pit	Sand must be 0.35 m deep

Calculations

Perform your calculations for each material on a separate piece of paper. Each material calculation must show the following:

1. Drawing of the shape to be calculated with dimensions.
2. Formula used to calculate either surface or volume of the shape.
3. Formula with values substituted in.
4. Answer of area or volume.
5. Calculation of cost of material.

Final report

Complete the following table and submit worksheet along with a photo of your working out to your teacher.

Table three: Volume and Cost of Materials

Material	Volume required	Cost
Running track	288 m ²	\$21,600
Concrete	0.49 m ³	\$122.50
Gravel	180.38 m ³	\$12,987.36
Sand	13.86 m ³	\$1302.84

Skills analysis

Other than working in construction, name and describe an occupation that would use the maths skills demonstrated today.

Occupation: Any occupation where volume and costing calculations are required

Description:

Click or tap here to enter text.

Further task

The designers have decided to fill in the area where there no activities with grass (cost \$11 per m²). The area that the field is being built has a length of 135 m and a width of 115 m. Calculate the amount and cost of the grass.

Table four: Amount and Cost of Grass

Amount	Cost
13,990 m ²	\$153,890



Running surface

Surface Area

Drawing of 2 rectangular shapes

Shape one = 100 m x 2.4 m

Shape two = 40 m x 1.2 m

$$\begin{aligned}\text{Surface area (m}^2\text{)} &= (L_1 \times W_1) + (L_2 \times W_2) \\ &= (100 \times 2.4) + (40 \times 1.2) \\ &= 240 + 48 \\ &= 288 \text{ m}^2\end{aligned}$$

Cost

$$288 \text{ m}^2 \times \$75/\text{m}^2 = \$21,600$$

Concrete

Volume

Drawing of cylinder with radius of 1.25 m and height of 0.10 m

$$\begin{aligned}\text{Volume (m}^3\text{)} &= \Pi r^2 \times h \\ &= \Pi(1.25^2) \times 0.10 \\ &= 0.49 \text{ m}^3\end{aligned}$$

Cost

$$0.49 \text{ m}^3 \times \$250/\text{m}^3 = \$122.50$$



Gravel

Volume

Drawing of triangular prism with base of 37 m, height of 65 m and length of 0.15 m

$$\begin{aligned}\text{Volume (m}^3\text{)} &= \frac{1}{2}bh \times l \\ &= \frac{1}{2} \times 37 \times 65 \times 0.15 \\ &= 180.38 \text{ m}^3\end{aligned}$$

Cost

$$180.38 \text{ m}^3 \times \$ 72/ \text{ m}^3 = \$12,987.36$$

Sand

Volume

Drawing of a rectangular prism with a length of 11 m, width of 3.6 m and a height of 0.35 m

$$\begin{aligned}\text{Volume (m}^3\text{)} &= w \times l \times h \\ &= 11 \times 3.60 \times 0.35 \\ &= 13.86 \text{ m}^3\end{aligned}$$

Cost

$$13.86 \text{ m}^3 \times \$ 94/ \text{ m}^3 = \$1302.84$$

Grass

Surface Area (m²)

$$\begin{aligned}\text{Surface area (m}^2\text{)} &= \text{Total area} - \text{running track m}^2 - \text{concrete m}^2 - \text{gravel m}^2 - \text{sand m}^2 \\ &= (135 \times 115) - 288 - 4.90 - 1,202.5 - 39.6 \\ &= 13,990 \text{ m}^2\end{aligned}$$

Cost

$$13990 \text{ m}^2 \times \$11/\text{m}^2 = \$153,890$$