

Practice Exam - 7-C1 PARTY ON!

An end-of-year celebration is being organized by Student Council for all 300 Grade 9 students at Green Valley High School.

The budget for the party is \$1400 and must cover all costs associated with: music, the photo booth, a dance trophy, the beverages and the venue.

Fire safety regulations must also be respected in the choice of the party venue.

Your task is to determine the least expensive venue to hold the party and the party's total cost.

MUSIC PLAYLIST

To ensure that everyone enjoys the music, Student Council conducted a survey of 60 students in the school asking them their preferred style of music.

Sample Survey Results: Preferred Music Style

MUSIC STYLE	POP	ROCK N' ROLL	HIP HOP
Number of Students	30	10	20

The playlist Student Council will download will contain 150 songs and will be proportionally representative of the sample survey.

Downloading Music From E-ZMusic.com

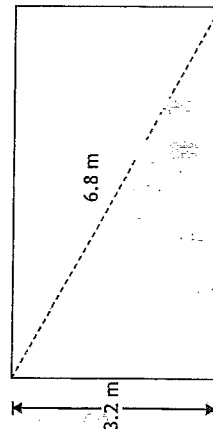
Every song will be downloaded from E-ZMusic.com. The cost of downloading songs depends on the music style.

The table on the right shows the costs for downloading each type of song.

MUSIC STYLE	COST PER SONG (\$)
Pop	\$ 1.50
Rock n' Roll	\$ 1.00
Hip Hop	\$ 1.25

PHOTO BOOTH

Student Council would like to have a photo booth. The photography club has donated a digital camera and the stand to hold the backdrop. They must only purchase the rectangular backdrop.



BACKDROP DIMENSIONS

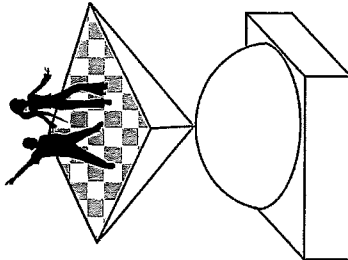
- Diagonal: 6.8 m
- Height: 3.2 m

The cost of the backdrop is \$4.75/m²

THE "DANCE-OFF" TROPHY

A trophy will be awarded to the winners of the "Dance Off" contest. The trophy consists of three solids: a rectangular based prism, a hemisphere and a square based pyramid.

Each solid is made by pouring liquid tin into a mold and letting it harden. Tin costs \$23.9/L. In addition, the pair of dancers on the top of the trophy cost \$10.00. Below is a diagram of the trophy and its given dimensions.



SQUARE BASED PYRAMID

- Height: 12 cm
- Perimeter of the base: 80 cm

HEMISPHERE

- Diameter: 20 cm

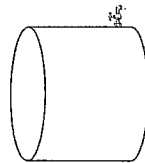
RECTANGULAR BASED PRISM

- Length: 30 cm
- Width: 20 cm
- Height: 5 cm

"PARTY ON" PUNCH

Refreshments will be ordered from "Party On". The punch is purchased and delivered in large cylindrical beverage containers and served to guests into small glasses. As illustrated in the diagram below, the small glasses and large containers are similar cylinders.

LARGE BEVERAGE CONTAINER



SMALL GLASS



SMALL GLASS

- Area of the base: 20 cm²
- Capacity: 240 mL

LARGE BEVERAGE CONTAINER

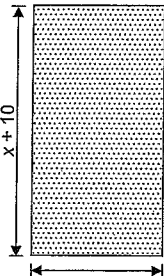
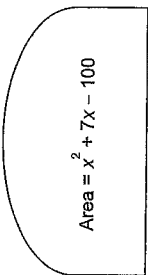
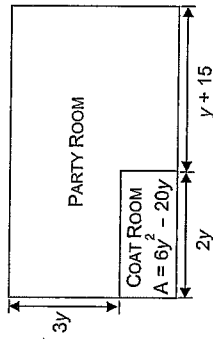
- Height: 60 cm

Enough containers need to be ordered so that each student can get 2 small glasses of punch. Large containers cost \$50 each.

PARTY VENUES

Student Council has narrowed the venue choices to three (3) possible locations: Abraham Centre, Bronson Theatre and City Hall.

- They will need to make sure the venues respect the fire safety regulations. Fire safety requires a minimum of 2 m^2 per guest.
- All dimensions in the diagram below are in meters.

<p>ABRAHAM CENTRE</p>  <p>The cost of renting this hall is \$0.75 per square metre with an initial rental fee of \$200.00.</p>	<p>BRONSON THEATRE</p>  <p>$f(a) = 0.5a + 250$</p> <p>where $f(a)$ is the rental cost in \$ where a is the area in m^2</p>
<p>Abraham Centre and Bronson theatre have the same area.</p>	
<p>CITY HALL</p> <p>City Hall has a rectangular floor plan with a perimeter of 100 m. Only the area of the Party Room will be considered for fire safety regulations. The cost of renting the hall is \$350.00.</p> 	

Your task is to determine the least expensive venue to hold the party and the party's total cost.

Practice Exam - 7 - C1 Solution

A. EXAMPLE OF A CORRECT SOLUTION

> The Cost of Purchasing the Music Playlist

Determining the number of songs for each genre and their costs...

Pop	Rock n Roll	Hip Hop
$\frac{30}{60} = \frac{x}{150}$	$\frac{10}{60} = \frac{x}{150}$	$\frac{20}{60} = \frac{x}{150}$
$x = 75$ songs	$x = 25$ songs	$x = 50$ songs
Cost of songs for each type $75 \times \$1.50 = \112.50	$25 \times \$1.00 = \25.00	$50 \times \$1.25 = \62.50

Total cost = $\$112.50 + \$25.00 + \$62.50$
= $\$200.00$

Therefore it costs **\\$200.00** to purchase all of the music for the party.

> The Cost of Purchasing the Photo Booth Backdrop

Finding length of backdrop...

$$\begin{aligned} a^2 + b^2 &= c^2 \\ a^2 + (3.2)^2 &= (6.8)^2 \\ a^2 + 10.24 &= 46.24 \\ a^2 &= 36 \\ a &= \sqrt{36} \\ a &= 6 \text{ m} \end{aligned}$$

Cost of backdrop...

$$19.2m \times \frac{\$4.75}{m} = \$91.20$$

Therefore it costs **\\$91.20** to purchase the backdrop for the photo booth.

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> The Cost of "Party On" Punch

Determine the height of the small glass...

$$\begin{aligned} V &= 240 \text{ mL} = 240 \text{ cm}^3 \\ V &= A_s h \\ 240 &= (20 \text{ cm}^2) h \\ h &= 12 \text{ cm} \end{aligned}$$

Determine the Scale Factor (k)...

$$\begin{aligned} k &= \frac{h_{\text{large}}}{h_{\text{small}}} = \frac{60 \text{ cm}}{12 \text{ cm}} = 5 \\ k^2 &= 25 \\ k^3 &= 125 \end{aligned}$$

Determine the volume of the large container...

$$\begin{aligned} V_{\text{large}} &= k^3 V_{\text{small}} \\ V_{\text{large}} &= (125)(240 \text{ cm}^3) \\ V_{\text{large}} &= 30\,000 \text{ cm}^3 \end{aligned}$$

Determine the volume of all the drinks required...

$$\begin{aligned} 300 \text{ students} \times 2 \text{ drinks/student} &= 600 \text{ drinks} \\ 600 \times 240 \text{ cm}^3 &= 144\,000 \text{ cm}^3 \end{aligned}$$

Determine number of large containers...

$$\frac{144\,000}{30\,000} = 4.8 \text{ containers}$$

Rounds up to 5 containers required. You can only buy full containers.

Final cost of the containers...

$$5 \text{ containers} \times \$50 \text{ each} = \$250$$

Therefore it costs **\\$250** to purchase the Party on Punch containers.

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> The Cost of Constructing the "Dance-Off" Trophy

Volume of the pyramid

$$\begin{aligned} P &= 4s \\ s &= \frac{P}{4} = \frac{80 \text{ cm}}{4} = 20 \text{ cm} \end{aligned}$$

$$\begin{aligned} V &= \frac{A_b h}{3} \\ V &= \frac{(20 \text{ cm})^2 (12 \text{ cm})}{3} \\ V &= 1600 \text{ cm}^3 \end{aligned}$$

Volume of the hemisphere

$$r = \frac{d}{2} = \frac{20 \text{ cm}}{2} = 10 \text{ cm}$$

$$\begin{aligned} V &= \frac{2\pi r^3}{3} \\ V &= \frac{(2\pi)(10 \text{ cm})^3}{3} \\ V &\approx 2094.4 \text{ cm}^3 \end{aligned}$$

Volume of the rectangular based prism

$$\begin{aligned} V &= \ell \times w \times h \\ V &= (30 \text{ cm})(20 \text{ cm})(5 \text{ cm}) \\ V &= 3000 \text{ cm}^3 \end{aligned}$$

Calculating the total volume...

$$\begin{aligned} V_T &= 1600 + 2094.4 + 3000 \\ &= 6694.4 \text{ cm}^3 \text{ or } 6693.3 \text{ cm}^3 \text{ if } 3.14 \text{ is used.} \end{aligned}$$

Convert from cm^3 to Litres and find costs...

$$\begin{aligned} 6694.4 \text{ cm}^3 &= 6.694 \text{ L} \\ 6.694 \text{ L} \times \frac{\$23.9}{\text{L}} &= \$160 \end{aligned}$$

Total cost with pair of dancers...

$$\begin{aligned} C_T &= \$160 + \$10 \\ &= \$170 \end{aligned}$$

Therefore it costs **\\$170** to purchase the trophy.

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> Choosing the Least Expensive Venue to Host the Party

The value of x

$$\begin{aligned} A_{\text{Abraham}} &= A_{\text{Bronson}} \\ (x-5)(x+10) &= x^2 + 7x - 100 \\ x^2 + 5x - 50 &= x^2 + 7x - 100 \\ 5x - 50 &= 7x - 100 \\ -2x &= -50 \\ x &= 25 \end{aligned}$$

Area of Abraham Centre

$$\begin{aligned} A &= x^2 + 5x - 50 \\ A &= (25)^2 + 5(25) - 50 \\ A &= 625 + 125 - 50 \\ A &= 700 \text{ m}^2 \end{aligned}$$

∴ The area of Bronson Theatre is also **700 m²**

Cost of renting Abraham Center

$$\begin{aligned} f(a) &= 0.75a + 200 \\ f(700) &= 0.75(700) + 200 \\ f(700) &= \$725 \end{aligned}$$

Cost of renting Bronson Theatre

$$\begin{aligned} f(a) &= 0.5a + 250 \\ f(700) &= 0.5(700) + 250 \\ f(700) &= \$600 \end{aligned}$$

Useable Area of City Hall

Expression for the length dimension of the coat room in City Hall

$$\begin{aligned} \ell &= \frac{A}{w} \\ \ell &= \frac{6y^2 - 20y}{2y} \\ \ell &= 3y - 10 \end{aligned}$$

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Value of y from the perimeter of City Hall

$$P = 2w + 2l$$

$$P = 2(3y + 3y - 10) + 2(2y + y + 15)$$

$$P = 2(6y - 10) + 2(3y + 15)$$

$$P = 12y - 20 + 6y + 30$$

$$P = 18y + 10$$

$$100 = 18y + 10$$

$$90 = 18y$$

$$y = 5$$

Area of the coat room at City Hall

$$A_{\text{coat}} = 6y^2 - 20y$$

$$A_{\text{coat}} = 6(5)^2 - 20(5)$$

$$A_{\text{coat}} = 150 - 100$$

$$A_{\text{coat}} = 50 \text{ m}^2$$

Numerical dimensions of City Hall

$$\ell = 3y + 15$$

$$w = 6y - 10$$

$$A_{\text{City Hall}} = \ell \times w$$

$$\ell = 3(5) + 15$$

$$w = 6(5) - 10$$

$$A_{\text{City Hall}} = 30 \text{ m} \times 20 \text{ m}$$

$$\ell = 30 \text{ m}$$

$$w = 20 \text{ m}$$

$$A_{\text{City Hall}} = 600 \text{ m}^2$$

Useable area of City Hall aka Party Room

$$A = A_{\text{City Hall}} - A_{\text{coat}}$$

$$A = 600 - 50$$

$$A = 550 \text{ m}^2$$

Therefore the area of City Hall is 550 m^2 .

Determining Area required for fire safety.....

$$300 \text{ guests} \times 2 \text{ m}^2/\text{guest} = 600 \text{ m}^2$$

City Hall does not meet the fire safety regulation ($550 \text{ m}^2 < 600 \text{ m}^2$).

> Total Costs of the Party Justification

Expense	Cost (\$)
Music	200
Photo Booth	91.20
Dance-Off Trophy	170
"Party On" Punch	250
Total	711.20

Amount left in the budget for the venue

$$\$1400 - \$711.20 = \$688.80$$

The cost of the venue cannot exceed **\$688.80**.

\therefore Abraham Center is too expensive for the amount of money left in the budget. ($\$725 > \688.80). The only possible venue is Bronson Theatre ($\$600 < \688.80).

> TOTAL COST OF THE PARTY

$$\$711.20 + \$600 = \$1311.20$$

> CONCLUSION

The least expensive venue that can hold the party is **Bronson Theatre**.

The total cost of the party is **\$1311.20**

Therefore Bronson Theatre is the only possible venue to host the party because it is within budget and meets the fire safety regulations.

> Calculating Bronson Theatre Costs

$$\$711.20 + \$600 = \$1311.20$$

Answer

The least expensive venue that can hold the party is Bronson Theatre.

The total cost of the party is \$1311.20.