Practice Exam #8

THE WORLD SKATEBOARDING CHAMPIONSHIPS

The city of Olliesville has been chosen to host this year's World Skateboarding Championships.

An event of this magnitude involves many costs, which include:

- purchasing a full-pipe
- constructing and painting the ramp and the half-pipe
- constructing a spectator area
- purchasing a giant video screen

The money generated from ticket sales will serve as the budget to cover all the costs of the championships.

Your task is to determine a possible measure for the diagonal of the giant video screen, while respecting the budget and costs.

TICKET SALES

The organizing committee's budget, used to cover all costs, will be based on an estimate of the number of tickets that will be sold during the championships.

To determine this estimate, the committee will use the median number of tickets sold from the eight previous championships, which are shown in the table below.

NUMBER OF TICKETS SOLD IN THE 8 PREVIOUS CHAMPIONSHIPS							
16 000	35 000	22 500	8600	32 000	14 000	17 500	12 000

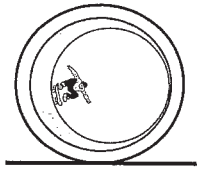
The price per ticket is $18.

THE FULL-PIPE

Two companies have offered their services to design and build the full-pipe based on volume. For the size of the full-pipe needed, the cost is the same for both companies.

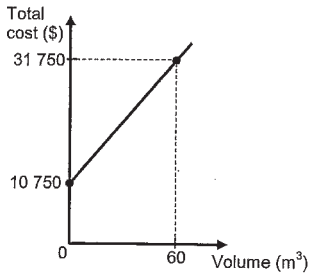
COMPANY A

Company A charges $30 per m^3 and an initial design fee of $26 750.



COMPANY B

PURCHASE OF A FULL-PIPE



WORLD CLASS RAMPS

The company *World Class Ramps* will be constructing the ramp and the half-pipe, and painting the skateboarding surfaces of both.

The table below represents the cost of concrete according to volume.

The cost of a protective paint can depend on its colour. A full can of paint covers up to 60 m^2.

COST OF CONCRETE

VOLUME OF CONCRETE (m^3)	COST ($)
25	4125
40	6600

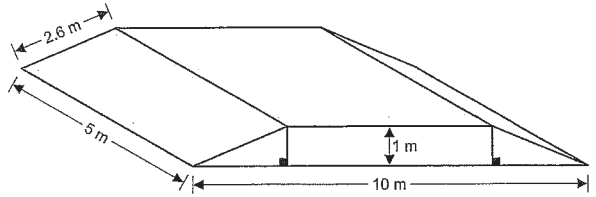
COST OF PROTECTIVE PAINT

PAINT COLOUR	COST PER CAN ($)
Blue	130.00
Red	136.25

➢ THE RAMP

The ramp, composed of one rectangular-based prism and two congruent triangular-based prisms, will be made out of concrete.

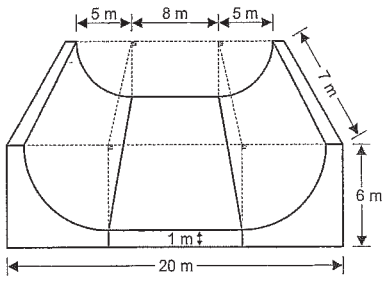
The skateboarding surfaces (shaded areas) will be covered with a coat of blue protective paint.



➢ THE HALF-PIPE

The half-pipe will be made out of concrete. Its shape can best be described as a large rectangular prism from which a smaller rectangular prism (in the middle) and two quarter-cylinders (one on either side) have been removed.

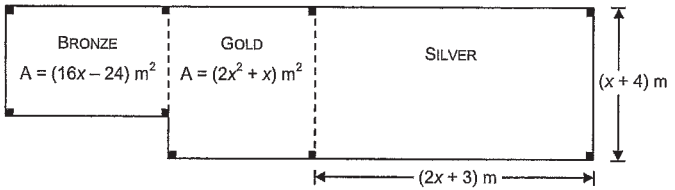
The skateboarding surfaces (shaded areas) will be covered with a coat of red protective paint.



SPECTATOR AREA

The spectator area will be divided into the three sections: bronze, gold, and silver.

The sum of the areas of the bronze and gold sections is equal to the area of the silver section.

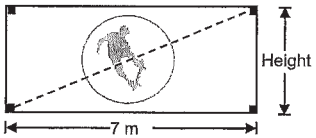


The cost of constructing the spectator area is $500 per square metre.

GIANT VIDEO SCREEN

With any money that is left after the full-pipe, ramp, half-pipe and spectator area costs, the organizing committee will purchase a giant video screen to display the live action at the event.

GIANT VIDEO SCREEN



- The base of the video screen measures 7 metres.

As shown in the table below, the cost of a video screen depends on its height.

HEIGHT (metres)	COST OF THE VIDEO SCREEN ($)
[2,4[	30 000
[4,6[	60 000
[6,8[	120 000
[8,10[	180 000

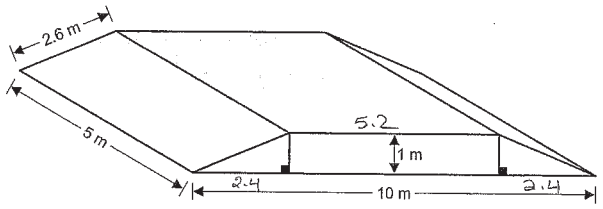
Your task is to determine a possible measure for the diagonal of the giant video screen, while respecting the budget and costs.

Practice Exam #8 – Solution

The World Skateboarding Championships

Show all your work.

THE RAMP

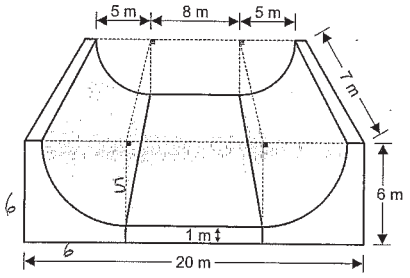


$A_b = \frac{(2.4)(1)}{2} + (5.2)(1) + \frac{(2.4)(1)}{2}$

$= 1.2 + 5.2 + 1.2$

THE HALF-PIPE $= 7.6\ m^2$

$V = (7.6)(5)$
$= 38\ m^3$



$A_b = \left(6^2 - \frac{1}{4}\pi(5)^2\right) + (8)(1) + \left(6^2 - \frac{1}{4}\pi(5)^2\right)$

$= (36 - 6.25\pi) + 8 + (36 - 19.63)$

$= 16.37 + 8 + 16.37$

$= 40.73\ m^2$

$V = 40.73(7)$
$= 285.11\ m^3$

$\times 7$
114.59

Show all your work.

Ticket Sales:

Reorder data:

8600 – 12000 – 14000 – 16000 { 17500 – 22500 – 32000 – 35000

$M_d = \frac{16000 + 17500}{2} = 16750$ tickets

Budget = $16750(18) = \$301\,500$

The Full-pipe:

$y_A = 30x + 26750$

$y_B = 350x + 10750$

Company B:

$a = \frac{31750 - 10750}{60} = \frac{21000}{60} = 350$

$b = 10\,750$

$y_B = 350x + 10750$

Same Cost: $y_A = y_B$

$30x + 26750 = 350x + 10750$

$16\,000 = 320x$

$50 = x$ (volume)

Cost: $y_A = 30(50) + 26750$
$= 28250$

$y_B = 350(50) + 10750$
$= 28250$

Cost of full pipe is $ 28250

Show all your work.

World Class Ramps:

Cost of Concrete: $a = \frac{6600-4125}{40-25} = \frac{2475}{15} = 165$

$b = 4125 - 165(25) = 0$

$\therefore C(v) = 165v$

The Ramp

Volume $= V_{prism} + 2V_{\Delta prism}$

$= A_B H + 2 A_{\Delta} h$

$= (5.2)(1)(5) + 2\left(\frac{(2.4)(1)}{2}\right)(5)$

$= 26 + 12$

$= 38\ m^3$

$a = \sqrt{2.6^2 - 1^2} = \sqrt{5.76} = 2.4$

Area $= 2(5)(2.6) + (5.2)(5)$

$= 26 + 26$

$= 52\ m^2$

$\therefore$ 1 can of blue

$C(38) = \$6270$

$38(165)$

cost of paint $130

Total $6400

The half Pipe

Volume $= V_{\Delta prism} - \left(V_{prism} + \frac{1}{2}V_{cyl}\right)$

$= A_B H - \left(A_{\Delta} h + \frac{1}{2}\pi r^2 h\right)$

$= (20)(6)(7) - \left((5)(8)(7) + \frac{1}{2}\pi(5)^2(7)\right)$

$= 840 - (280 + 274.89)$

$= 840 - 554.89$

$= 285.11\ m^3$

or * P.T.O

$C(285.11) = 285.11(165)$

$= 47043.15$

Area $= A_{rect} + \frac{1}{2}A_{Lcyl}$

$= (l)(w) + \frac{1}{2}\pi dh$

$= (8)(7) + \frac{1}{2}\pi(10)(7)$

$= 56 + 109.97$

$= 165.97\ m^2 \div 60 = 2.7$

$\therefore$ 3 cans of Red.

Cost $= 3(136.25)$

$= \$408.75$

Total $47,451.90

Show all your work.

Spectator Area:

$B + G = S$

$(16x - 24) + (2x^2 + x) = (2x+3)(x+4)$

$2x^2 + 17x - 24 = 2x^2 + 11x + 12$

$6x = 36$

$x = 6$

Total Area $= \overbrace{16(6)-24}^{B} + \overbrace{2(6)^2+(6)}^{G} + \overbrace{2(6)^2+11(6)+12}^{S}$

$= 96 - 24 + 72 + 6 + 72 + 66 + 12$

$= 72 + 78 + 150$

$= 300\ m^2$

Cost $= 300(500) = \$150\,000$

Show all your work.

Use the table below if needed.

	COST ($)
FULL-PIPE	28 250
RAMP	6 400
HALF-PIPE	47 451.90
SPECTATOR AREA	150 000
TOTAL	232 101.9

Giant Video Screen :

money left : 301 500 − 232 101.9

$= \$69\ 398.1$

∴ They can afford a screen with height $\in [4,6[$

if height is 5 m

Diagonal $= \sqrt{7^2+5^2}$

$= \sqrt{74}$

$= 8.6$ m

Answer:

A possible measure for the diagonal of the giant video screen is 8.6 metres.