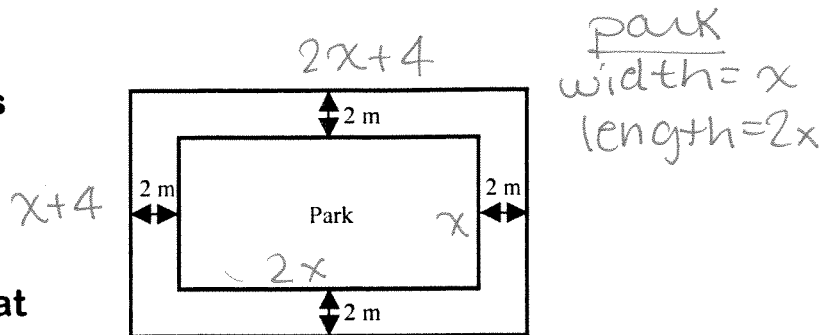


Name: Solution key

Sec 3 Review Material Sept to Feb

- 1 The length of a rectangular park is 2 times greater than its width.

The park is framed by sidewalk that is 2 m wide, as shown on the right.




The area of the park is increased by 136 m² if the sidewalk is included.

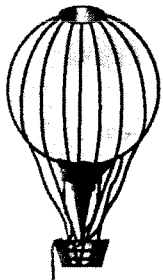
What is the area of the park without the surrounding sidewalk?

① $A = (2x+4)(x+4)$
 $= 2x^2 + 12x + 16$
 $A_p = x \cdot 2x = 2x^2$

② $2x^2 + 12x + 16 - 2x^2 = 136$
 $12x + 16 = 136$
 $x = 10$

③  $A = 20 \times 10 = 200 \text{ m}^2$

- 2 The special canvas that is used for a hot air balloon covers a total area of 1520 m². The balloon is inflated with helium.



How many cubic metres of helium can this sphere-shaped balloon hold?

② $V = \frac{4\pi r^3}{3}$
 $= \frac{4\pi(11)^3}{3}$
 $= 5572.45 \text{ m}^3$

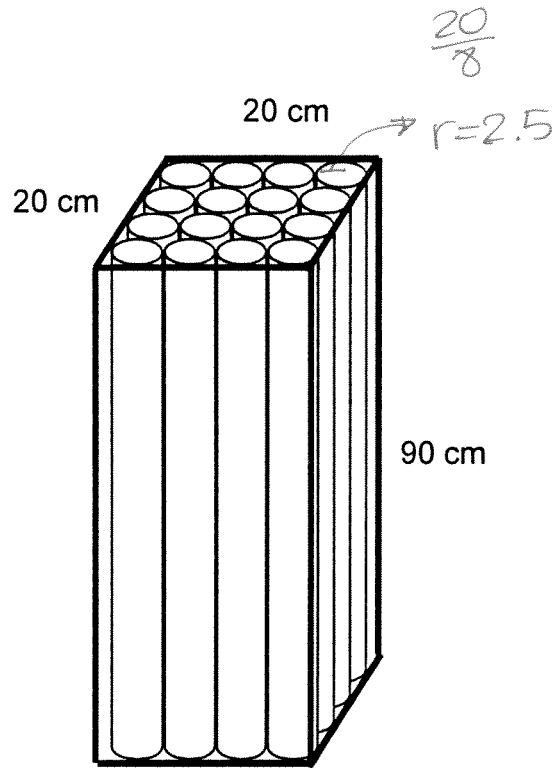
① $A = 4\pi r^2$
 $1520 = 4\pi r^2$
 $r = 11 \text{ m}$

- 3 Sixteen cylindrical neon tubes, each 90 cm long, are tightly packed in a box in the shape of a square prism.

The dimensions of the box are shown in the diagram.

To protect the tubes, foam is injected into the empty space in the box.

What volume of foam is required to completely fill the empty space?



① $V_{\text{rect}} = 20 \times 20 \times 90$
 $= 36000 \text{ cm}^3$

② $V_{\text{cyl}} = \pi r^2 h = \pi (2.5)^2 (90) = 1766.25$

③ $1766.25 \times 16 = 28260 \text{ cm}^3$

④ Left over
 $36000 - 28260$
 $= 7740 \text{ cm}^3$

- 4 Patricia used 216 identical small cubes to build a large cube whose total area is 3456 cm^2 .



How many centimetres long is the edge of one of the small cubes?

① $A = 6s^2 = 3456$
 $s = 24 \text{ cm}$

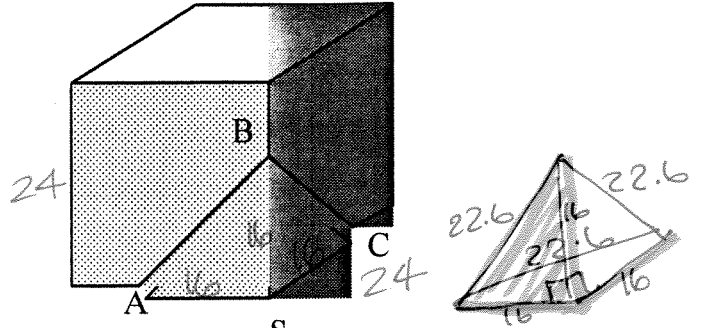
② $\sqrt[3]{216} = s$
 $s = 6 \text{ blocks}$

The cube is 6 blocks by 6 blocks by 6 blocks.

③ $\frac{24}{6} = 4 \text{ cm each block.}$

- 5 Each edge of a wooden cube is 24 cm in length.

This cube is cut into two pieces. The cut is made through the three points A, B and C, each of which is 16 cm away from vertex S of the cube.



① $16^2 + 16^2 = C^2$
 $C = 22.6$

② $V = \frac{A_b \times h}{3}$
 $= \frac{16 \times 16 \times 22.6}{3}$
 $= 682.7 \text{ cm}^3$

What is the volume of the pyramid that is formed?

- 6 Two men who install carpet must solve the following problem:

The length of one rectangular room, A, is 5 metres more than its width.

The width of a second rectangular room, B, is 2 metres more than the width of room A.

The length of room B is 7 metres more than the length of room A.

The difference between the areas of the two rooms is 51 m

What is the width in metres of room A?

Handwritten diagrams and equations for problem 6:

Room A: x by $x+5$

Room B: $(x+5)+7$ by $x+2$

Equation: $(x+12)(x+2) - (x)(x+5) = 51$
 $x^2 + 14x + 24 - x^2 - 5x = 51$
 $9x + 24 = 51$
 $x = 3 \text{ m}$

- 7 A rectangle has a length of $(x + 3)$ cm and a width of $(2x - 1)$ cm. A new rectangle is formed by taking 3 cm from each dimension.

Find the difference between the areas of the two rectangles.

Handwritten diagrams and equations for problem 7:

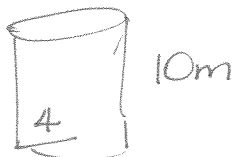
Big rectangle: $(x+3)$ by $(2x-1)$

Small rectangle: x by $(2x-4)$

Equation: $(x+3)(2x-1) - x(2x-4)$
 $2x^2 + 5x - 3 - 2x^2 + 4x$
 $9x - 3$

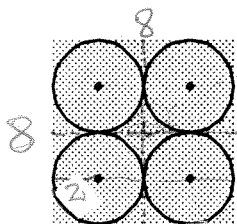
8 A farmer intends to store his wheat in four cylindrical silos each 10 m high and 4 m in diameter.

Tough

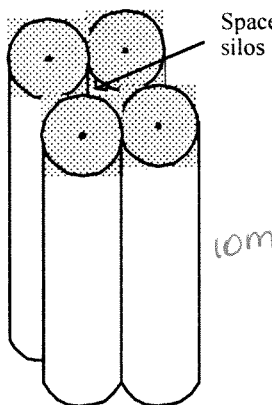


When the silos are filled, the wheat accumulates between them as indicated in the view of silos from above.

View of silos from above



View of silos in perspective



Space between silos

①

$$V = A_b \times h \times 4$$

$$= \pi(2^2)(10) \times 4$$

$$= 502.4$$

② wheat required
 $1.5 \times 365 = 547.5 \text{ m}^3$

③ Volume of area between silos:
 $A(\text{square} - \text{circle}) \times \text{height}$
 $[4^2 - \pi(2^2)] \times 10$
 34.4 m^3

④ $502.4 + 34.4$
 536.8 m^3

Not enough wheat for 365 days.

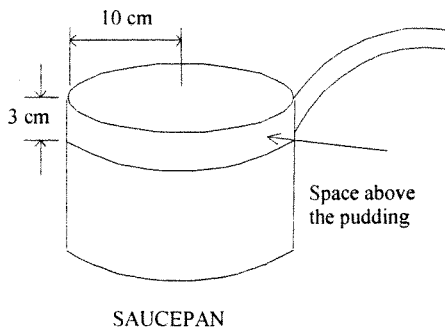
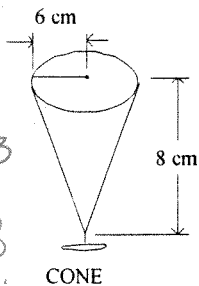
To feed his animals the farmer needs 1.5 m^3 of wheat per day.

If the silos and the space between them are filled to capacity, will the farmer have enough wheat for 365 days? (Use 3.14 for π .)

9 A pudding was prepared in a saucepan of radius 10 cm. The pudding filled 12 cones of the shape and dimensions shown below.

① $V_{\text{cone}} = \frac{\pi r^2 h}{3}$
 $= \frac{\pi(6)^2(8)}{3}$
 $= 301.44 \text{ cm}^3$

② $V \text{ for } 12 = 3617.28 \text{ cm}^3$



Space above the pudding

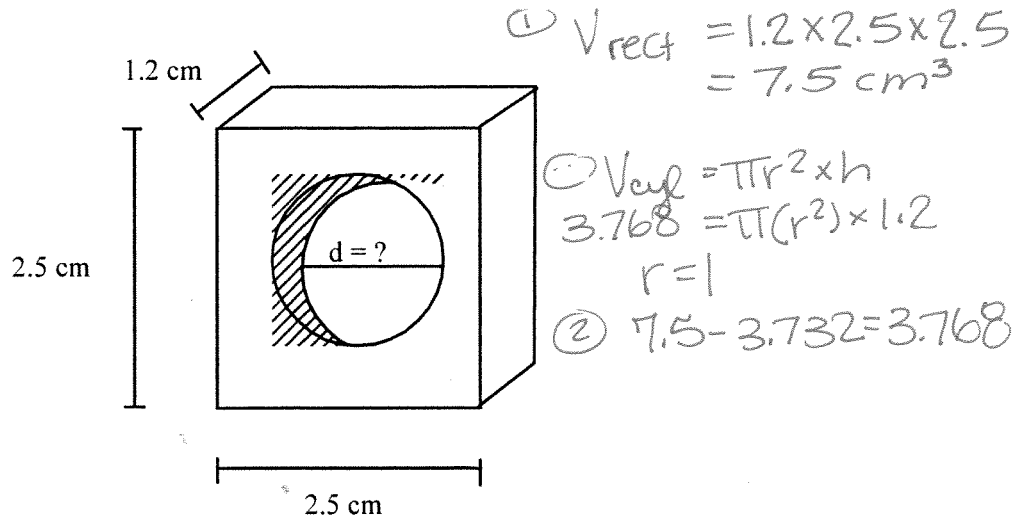
③ $V_{\text{pudding}} = \pi r^2 h$
 $3617.28 = \pi(10)^2 h$

④ Total depth
 $h = 11.52 \text{ cm}$
 $11.52 + 3 = 14.52 \text{ cm}$

What was the depth of the saucepan if 3 cm of space had to be left above the pudding so that it did not spill during the cooking process?

10

A machine makes steel pieces according to the following diagram. The designer forgot to give the diameter of the hole. He did indicate, however, that the piece is made out of 3.732 cm^3 of steel.



What is the diameter of the steel piece? $d = 2$

11

The cost of buying wedding invitation cards consists of a basic price and a fixed amount for each card printed.

Several examples of wedding invitation card prices are shown in the table below.

Number of cards printed	Cost (\$)
100 x_1	80 y_1
125 x_2	98.75 y_2
275	211.25

① $a = \frac{98.75 - 80}{125 - 100} = \frac{18.75}{25} = 0.75 \text{ \$/card}$

② $y = 0.75x + b$
 $80 = 0.75(100) + b$
 $b = 5$
 $y = 0.75x + 5$

③ $168.50 = 0.75x + 5$
 $x = 218 \text{ cards}$

A customer paid \$168.50 for wedding invitation cards.

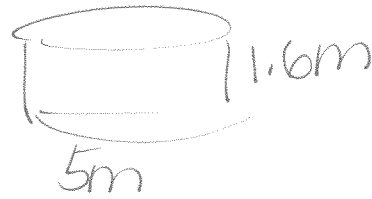
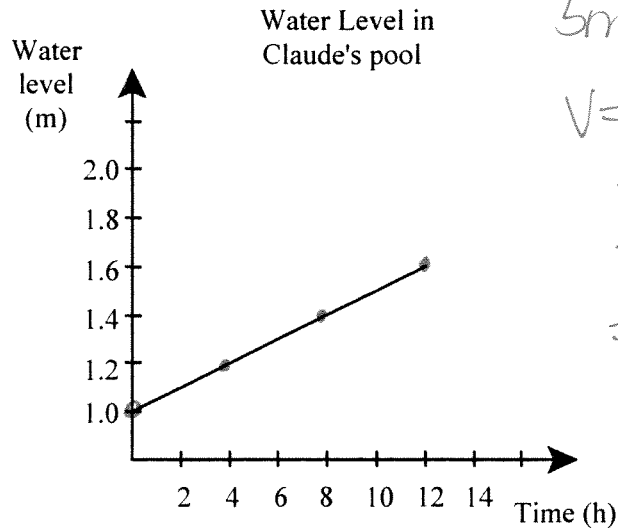
How many cards did the customer buy?

12

Claude added water to his circular pool whose diameter is 5 m.

It took 12 hours to complete the task.

The relation between the pool's water level and the elapsed time is represented by the graph below.



$$\begin{aligned}
 V &= \pi r^2 h \\
 &= \pi (2.5)^2 (1.6) \\
 &= 31.4 \text{ m}^3 \\
 &= 31.4 \text{ KL}
 \end{aligned}$$

$$1 \text{ L} = \text{dm}^3$$

How many kilolitres of water did Claude add to his pool?

13

Which of the following expressions is equivalent to

$$\frac{2^3 \times 3^5 \times 2^{-1} \times 3^2}{2^4} ?$$

$$2^{-2} \cdot 3^7$$

A) $\frac{6^9}{2^4}$

C) $\frac{3^7}{2^2}$

B) $\frac{9^7}{2^2}$

D) 18^5

14

A tool-rental company charges a basic fee to rent tools. An additional amount is added to this fee for each day that the tool is rented.

It costs \$24 to rent a particular tool for 2 days. For 5 days, the rental cost is \$45.

(2,24)

(5,45)

How much would it cost to rent this tool for 8 days?

$$\textcircled{1} a = \frac{21}{3} = 7$$

$$y = 7x + B$$

$$\textcircled{2} 24 = 7(2) + B$$

$$y = 7x + 10$$

$$\textcircled{3} y = 7(8) + 10 = 66\$$$

15

Mark has to photocopy a document. He compares the prices at two companies.

Copyplus charges \$0.05 a page and \$40 to collate the document.

$$y = 0.05x + 40$$

Teprocop charges \$0.07 a page but does not charge for collating. $y = 0.07x$

How many pages must the document comprise in order for the photocopying price to be the same at each of the two companies?

$$0.05x + 40 = 0.07x$$

$$x = 2000$$

A) 140 pages

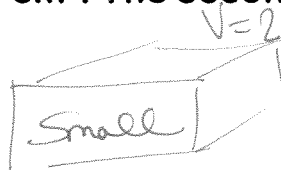
C) 2000 pages

B) 333 pages

D) 5860 pages

16

George has determined that two solids are similar. One solid is 9 cm in height and has a volume of 810 cm^3 . The second solid has a volume of 240 cm^3 .



$$K^3 = \frac{240}{810} = \frac{8}{27}$$

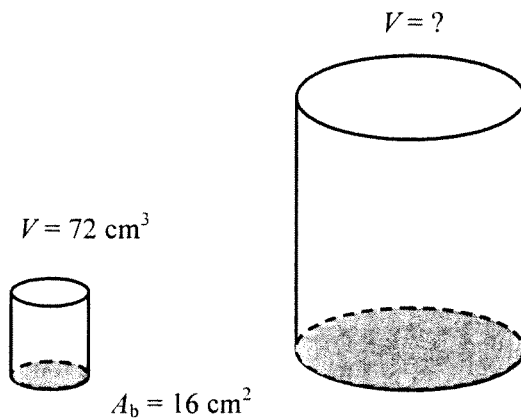
$$\textcircled{2} K = \frac{2}{3}$$

$$\textcircled{3} \frac{2}{3} = \frac{x}{9} \quad x = 6 \text{ cm}$$

What is the height of the second solid?

17

The cylinders below are similar solids.



$$K^2 = \frac{16}{144}$$

$$K = \frac{4}{12} = \frac{1}{3}$$

$$K^3 = \frac{1}{27}$$

$$\frac{1}{27} = \frac{72}{x}$$

$$x = 1944 \text{ cm}^3$$

The area of the base of the smaller cylinder is 16 cm^2 , and its volume is 72 cm^3 .

The area of the base of the larger cylinder is 144 cm^2 .

What is the volume of the larger cylinder to the nearest cubic centimetre?

18

Two prisms are similar. The volume of prism A is 27 times greater than the volume of prism B.

Given the following statements:

$$k^3 = \frac{1}{27} \quad k = \frac{1}{3} \quad k^2 = \frac{1}{9}$$

1. The height of prism A is 3 times the height of prism B. \bar{T}
2. The perimeter of the base of prism A is 6 times the perimeter of the base of prism B. NO
3. The lateral area of prism A is 9 times the lateral area of prism B. \bar{T}

Which of the statements are TRUE?

- | | |
|------------------------|-----------------|
| A) 1 and 2 only | C) 2 and 3 only |
| B) 1 and 3 only | D) 1, 2 and 3 |

19

Which of the following expressions is NOT equivalent to 10^{16} ?

A) $\frac{10^{12} + 10^8}{10^4}$

C) $10^{16} \div 10^0$
 10^{16}

B) $\frac{10^{15} \times 10^5}{10^4}$ $\frac{10^{20}}{10^4}$

D) $10^4(10^4 \times 10^8)$
 $10^4(10^{12})$
 10^{16}

The automobile insurance board of Québec wants drivers to reduce their driving speed. Fines have been set for those who exceed the speed limits.

therefore linear
 Each driver caught speeding must pay a basic fine plus an additional amount determined by the number of kilometres per hour (km/h) over the legal speed limit. Administration charges are also included in the fine.

The fines paid by three drivers are given in the following table.

Name	Number of km/h over the legal speed limit	Fine paid (\$)
Mark	30	145
Robert	40	185
Lucy	60	265

Steve has to pay a fine of \$105 for driving at 70 km/h.

How many km/h over the legal speed limit was Steve driving when he was stopped?

*X: # of km over
 y: fine*

$$a = \frac{185 - 145}{40 - 30} = \frac{40}{10} = 4$$

$$y = 4x + B$$

$$145 = 4(30) + B$$

$$B = 25$$

$$y = 4x + 25$$

$$105 = 4x + 25$$

$$x = 20 \text{ km/h over limit.}$$