

*Before we begin, are there any questions from last day's work?*

## Today's Learning Goal(s):

By the end of the class, I will be able to:

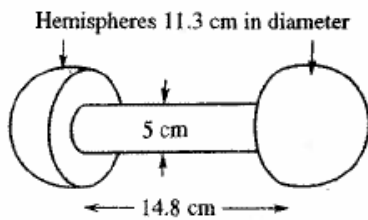
- a) solve problems involving properties of circles.

**Project Renovation assignment past due.**

**Cake Decorating assignment past due.**

6.5.1

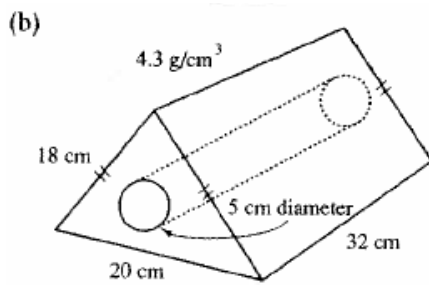
12. An "Executive Exerciser" has the dimensions shown.



If the exerciser is silver-plated at a cost of  $\$2.75/\text{cm}^2$ , determine the cost of the plating, to the nearest dollar.

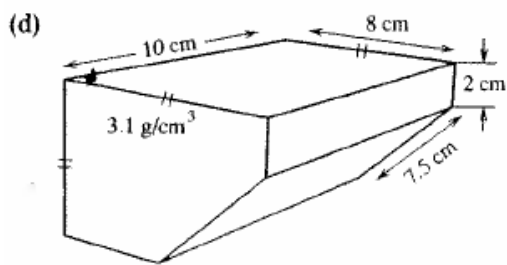
6.5.2

4. Determine the mass of each casting, to the nearest 0.1 kg.



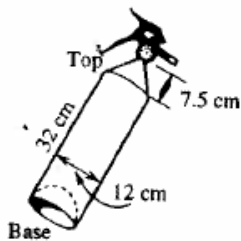
6.5.2

4. Determine the mass of each casting, to the nearest 0.1 kg.



## 6.5.2

9. A fire extinguisher is in the form of a cylinder with a concave hemispherical base and a conical top, as shown.



- (a) Determine the volume of chemical the extinguisher will hold.
- (b) What area of heavy-gauge sheet metal is needed to form the extinguisher? Neglect the thickness of the metal. Give both answers correct to the nearest whole number.

### 6.10.1 Four Corners Student Questions

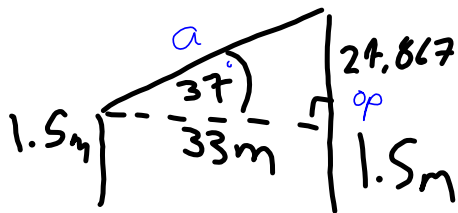
1. A surveyor, 33 m from a building, uses a transit to measure the angle of elevation to the top of a building. The angle of elevation is  $37^\circ$ . The transit is set at a height of 1.5 m.
  - a) Calculate the distance from the transit to the top of the building. (to 3 decimal places)
  - b) Calculate the height of the building. (to 3 decimal places)

$$\textcircled{1} \tan 37^\circ = \frac{OP}{33}$$

$$24.867 = OP$$

$$\textcircled{2} a^2 = 33^2 + 24.867^2$$

$$a = 41.32$$



$$\text{a) } D = 41.32 \text{ m}$$

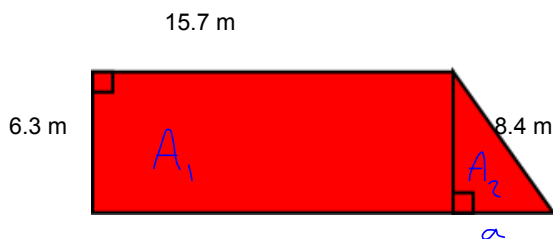
$$\text{b) } h = 26.367 \text{ m}$$

$$\text{or } \cos 37^\circ = \frac{33}{a}$$

$$a = \frac{33}{\cos 37^\circ}$$

$$= 41.32 \text{ m}$$

2. The diagram below shows the layout of Rita's backyard.



If Rita wishes to put new sod down throughout the backyard, calculate the amount of sod she will need to purchase. (to the nearest  $\text{m}^2$ )

$$A_1 = lw$$

$$= (15.7)(6.3)$$

$$= 98.91 \text{ m}^2$$

$$a^2 = c^2 - b^2$$

$$a = \sqrt{8.4^2 - 6.3^2}$$

$$= 5.6 \text{ m}$$

$$A_2 = \frac{bh}{2}$$

$$= \frac{(5.6)(6.3)}{2}$$

$$= 17.64 \text{ m}^2$$

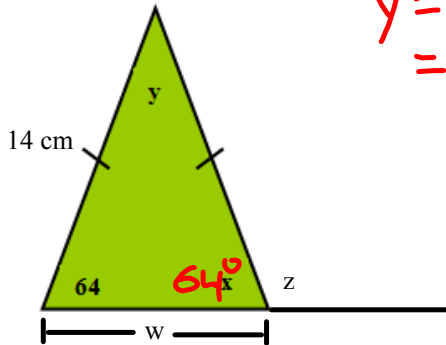
$$A_{\text{TOTAL}} = A_1 + A_2$$

$$= 98.91 + 17.64$$

$$= 116.55 \text{ m}^2$$

$$\approx 117 \text{ m}^2$$

3. Solve for the values of w, x, y and z below.



$$y = 180^\circ - 128^\circ = 52^\circ \quad z = 180^\circ - 64^\circ = 116^\circ$$

$$\frac{w}{\sin 52} = \frac{14}{\sin 64}$$

$$w = \frac{14 \sin 52}{\sin 64}$$

$$w = 12.2743$$

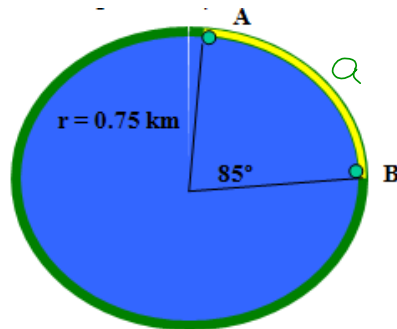
$$w = 12.274 \text{ cm}$$

4. The diagram below shows the view from above a lake.

The arc formed between points A and B represents a path walked on a trail that is part of the lake. Using the information provided below calculate the length of the path

$$\widehat{AB} = \frac{85^\circ}{360^\circ} \times 2\pi(0.75)$$

$$= 1.113 \text{ km}$$



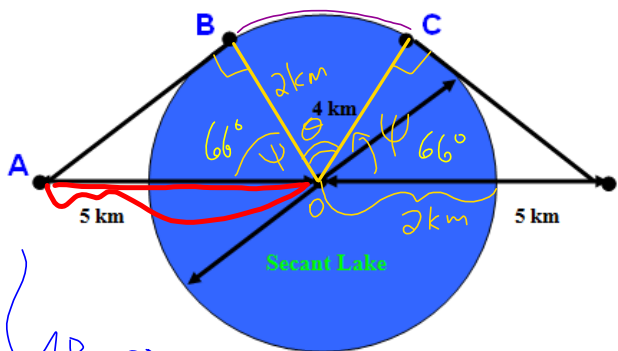
### 6.10.3 Bicycle Race

You have decided to take part in this year's *Secant Lake* bicycle race. The race is run every year to raise money to preserve the wildlife in the area. You are able to raise \$10 for every kilometre travelled on your bike and you hope to travel the course 3 times.



*Secant Lake* is a circular lake that has a diameter of 4 km, as shown in the diagram below. Points *A* and *D* are the opposite sides of *Secant Lake* and lie on a straight line through the centre of the lake, with each point 5 km from the centre. The course of the race is *ABCD*, where *AB* and *CD* are tangents to the lake and *BC* is an arc along the shore of the *Secant Lake*.

- Using your knowledge of circle geometry and trigonometry determine:
- the length of the route and
  - the amount of money you can raise



$$\cos \phi = \frac{2}{5}$$

$$\phi = \cos^{-1}\left(\frac{2}{5}\right) \approx 66$$

$$\theta = (180^\circ - 2(66^\circ)) = 48^\circ$$



a) route distance

$$= AB + BC + CD$$

$$\approx 4.583 + 1.68 + 4.583$$

$$\approx 10.85 \text{ km}$$

$AB = CD$

$$AB^2 = 5^2 - 2^2$$

$$AB = \sqrt{25 - 4}$$

$$= \sqrt{21}$$

$$\approx 4.583 \text{ km}$$

$$\widehat{BC} = \frac{\theta}{360} \cdot 2\pi r$$

$$= \frac{48^\circ}{360} \cdot 2\pi(2)$$

$$\approx 1.67$$

b) total biking  
 $= 3 \times 10.85$   
 $\approx 32.55$

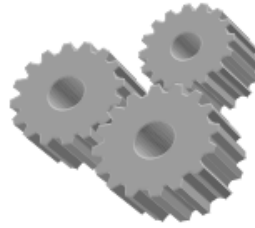
$$\text{Money Raised} = \$10 \times 32.55$$

$$= \$325.50$$



### 6.10.4 Investigating Circle Geometry

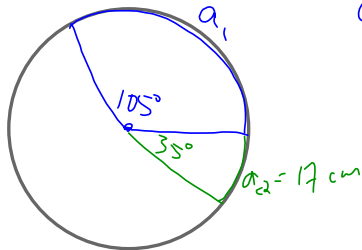
Complete the following problems using the concepts and strategies discussed in class.



- Find the arc length to the nearest centimetre, of the sector of a circle with radius;
  - 7 m, if the sector angle is  $120^\circ$
  - 90 cm, if the sector angle is  $225^\circ$

- If an arc length of 14.2 cm has a sector angle of  $74^\circ$ , determine the radius (to 1 decimal place).

- Two sectors of a circle have sector angles of  $35^\circ$  and  $105^\circ$  respectively. The arc length of the smaller sector is 17 cm. Determine the arc length of the larger sector.

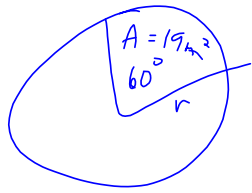


$$\begin{aligned}
 a_1 &= \frac{105^\circ}{360^\circ} (2\pi r) \\
 &= \frac{105^\circ}{360^\circ} (2\pi (27.829)) \\
 &\approx 50.9993 \\
 &\approx 50.999 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 a_2 &= \frac{35^\circ}{360^\circ} (2\pi r) \\
 17 &= \frac{35^\circ}{360^\circ} (2\pi r) \\
 \frac{17}{\frac{35^\circ}{360^\circ} \cdot 2\pi} &= r \\
 r &\approx 27.8293 \\
 &\approx 27.829
 \end{aligned}$$

$$\left. \begin{aligned}
 &= r \\
 &= \frac{\frac{360^\circ}{35^\circ} (17)}{2\pi} = r \\
 &= \frac{360^\circ (17)}{35 (2\pi)}
 \end{aligned} \right\}$$

4. Determine the entire area of a circle given that a  $60^\circ$  sector of the circle has an area of  $19 \text{ m}^2$ .

$$A = \pi r^2$$


$$A_{\text{Sector}} = \frac{\theta}{360^\circ} \pi r^2$$

$$19 = \frac{60^\circ}{360^\circ} \pi r^2$$

$$19 = \frac{1}{6} \pi r^2$$

$$6(19) = \pi r^2$$

$$114 = \pi r^2$$

$$\therefore A_{\text{Total}} = 114 \text{ m}^2$$

$\Rightarrow r = \sqrt{\frac{114}{\pi}}$

5. You are working at a pizza delivery store and your math teacher places a special order: a large (15 inches in diameter) pizza with pepperoni on just a 36-degree slice of the pizza. Determine the area of the pizza that will have pepperoni on it.

$$A_{\text{Sector}} = \frac{36^\circ}{360^\circ} \pi (7.5)^2$$

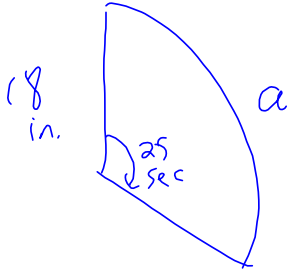
if  $d = 15$   
 $\therefore r = 7.5$

$$\text{sq. in.} \quad = 17.6714$$

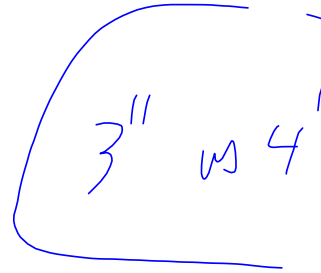
$$= 17.671 \text{ inches}^2$$

6. The sector angle in a given circle is  $40^\circ$ , and the area of the sector is  $20 \text{ cm}^2$ . Determine the arc length of the sector (to 2 decimal places).

7. The second hand of a clock is 18 inches long.  
How far does the tip of the second hand travel in 25 seconds? (round to 1 decimal place)



$$\begin{aligned} a &= \frac{\theta}{360^\circ} 2\pi r \\ &= \frac{25}{60} 2\pi(18) \\ &= 47.12 \text{ inches} \\ &= 47.1'' \end{aligned}$$



8. If a sector has an area of 942 cm<sup>2</sup> and an arc length of 62.8cm determine the radius of the circle.

$$A_{\text{Sector}} = \frac{\theta}{360} (\pi r^2) \quad a = \frac{\theta}{360} (2\pi r)$$

$$942 = \frac{\theta}{360} \pi r^2 \quad 62.8 = \frac{\theta}{360} (2\pi r)$$

$$\frac{942}{\pi r^2} = \frac{\theta}{360} \quad \frac{62.8}{2\pi r} = \frac{\theta}{360}$$

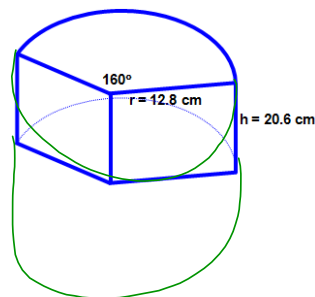
$$\frac{942}{\pi r^2} = \frac{62.8}{2\pi r}$$

$$\frac{942(2\pi r)}{2\pi r^2} = \frac{62.8 \cancel{\pi r^2}}{\cancel{\pi r^2} r}$$

$$\frac{942(2\cancel{\pi})}{62.8 \cancel{\pi}} = r$$

$$r = 30 \text{ cm}$$

9. A metal casting is in the form of a sector of a circle, as shown.
- Determine the mass of the casting (to 1 decimal place), if the density of the material is  $4.5 \text{ g/cm}^3$ .
  - If a tin of paint costs \$4.95 and covers  $150 \text{ cm}^2$ , determine the cost to paint the casting with 2 coats.

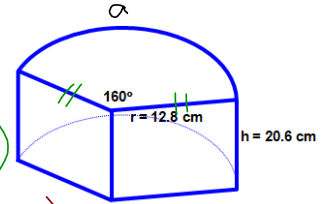


$$\begin{aligned}
 \text{a) } V_{\text{casting}} &= \frac{160^\circ}{360^\circ} V_{\text{cyl.}} \\
 &= \frac{160^\circ}{360^\circ} \pi r^2 h \\
 &= \frac{160^\circ}{360^\circ} \pi (12.8)^2 (20.6) \\
 &= 4712.53 \\
 &= 4712.5 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 M &= DV \\
 &= 4.5 (4712.5) \\
 &= 21206.25 \\
 &= 21206 \text{ g} \\
 &= 21.206 \text{ kg}
 \end{aligned}$$

9. A metal casting is in the form of a sector of a circle, as shown.

- a) Determine the mass of the casting (to 1 decimal place), if the density of the material is  $4.5 \text{ g/cm}^3$ .  
 b) If a tin of paint costs \$4.95 and covers  $150 \text{ cm}^2$ , determine the cost to paint the casting with 2 coats.



$$b) SA = 2 A_{\text{sector (top+bottom)}} + 2 A_{\text{rect}} + A_{\text{lateral (back)}}$$

$$\doteq 2 \left( \frac{160^\circ}{360^\circ} \pi (12.8)^2 \right) + 2(12.8)(20.6) + (35.74)(20.6)$$

$$\doteq 1721.1 \text{ cm}^2$$

$$2 \text{ Coats} = 2(1721.1)$$

$$= 3442.2$$

$$\# \text{ tins} = \frac{3442.2}{150}$$

$$= 22.9$$

$$= 23 \text{ tins}$$

$$\therefore \text{Cost} = 23 \times 4.95$$

$$= \$113.85$$

$$\left\{ \begin{array}{l} a = \frac{160}{360} 2\pi(12.8) \\ \doteq 35.74 \end{array} \right.$$