

# FOM & PRE-CALC 10

---

## Final Exam



BOOK 1:

- MEASUREMENT
- TRIGONOMETRY

NAME: KEY

BLOCK: \_\_\_\_\_

# Study Checklist

---

This review booklet is by no means a "practice final". It is a collection of practice questions on each unit, meant to guide your final exam studying and prepare you for the types of questions you will see. DO NOT treat this booklet as a practice test. DO NOT go straight to the answer key when you come across a question you cannot remember how to do. Difficult questions SHOULD guide your study! Always look up a concept in your class notes if you are stuck, then attempt the question again.

## **BEFORE beginning this booklet you should:**

- read through your class notes booklet on *each topic*
- make your own "quick summary page" of important formulas & key concepts for the unit
- review quizzes & tests from the unit to recall strengths & weaknesses (*a great study method would be to re-do old quizzes & tests on a separate piece of paper*)

## **WHILE working through this booklet you should:**

- look up concepts & example problems in your class notes when you come across a problem you are stuck on
- make a list of "questions to ask my teacher" so you can come to class and use your time efficiently.

## **Questions I'm having difficulty with:**

Page	Question Number #	Topic

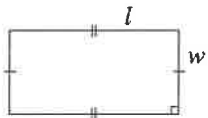
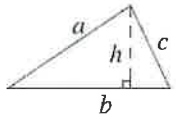
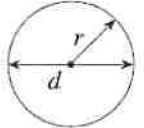
# UNIT 1: MEASUREMENT FORMULA SHEET

## Unit Conversions


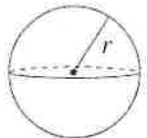

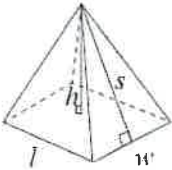
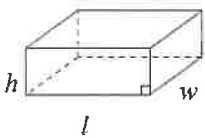
	Common Imperial	Imperial and Metric	Metric
<b>Length</b>	1 mile = 1760 yards 1 mile = 5280 feet 1 yard = 3 feet 1 yard = 36 inches 1 foot = 12 inches	1 mile $\approx$ 1.609 km 1 yard $\approx$ 0.9144 m 1 foot $\approx$ 0.3048 m 1 inch $\approx$ 2.54 cm	1 km = 1000 m 1 m = 100 cm 1 cm = 10 mm

## Geometric Formulae

Key Legend	
$l$ = length	$P$ = perimeter
$w$ = width	$C$ = circumference
$b$ = base	$A$ = area
$h$ = height	$SA$ = surface area
$s$ = slant height	$V$ = volume
$r$ = radius	
$d$ = diameter	

Geometric Figure	Perimeter	Area
Rectangle 	$P = 2l + 2w$ or $P = 2(l + w)$	$A = lw$
Triangle 	$P = a + b + c$	$A = \frac{bh}{2}$
Circle 	$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$

**NOTE:** Use the value of  $\pi$  programmed in your calculator rather than the approximation of 3.14.

Geometric Solid	Surface Area	Volume
Cylinder 	$A_{top} = \pi r^2$ $A_{base} = \pi r^2$ $A_{side} = 2\pi r h$ $SA = 2\pi r^2 + 2\pi r h$	$V = (\text{area of base}) \times h$ $V = \pi r^2 \times h$
Sphere 	$SA = 4\pi r^2$ <b>or</b> $SA = \pi d^2$	$V = \frac{4}{3} \pi r^3$
Cone 	$A_{side} = \pi r s$ $A_{base} = \pi r^2$ $SA = \pi r^2 + \pi r s$	$V = \frac{1}{3} \times (\text{area of base}) \times h$ $V = \frac{1}{3} \times \pi r^2 \times h$
Pyramid 	$A_{triangle} = \frac{1}{2} b s$ (for each triangle) $A_{base} = l \times w$ $SA = \frac{1}{2} s \times \text{perimeter of base} + \text{base area}$	$V = \frac{1}{3} \times (\text{area of base}) \times h$ $V = \frac{1}{3} \times l \times w \times h$
Rectangular Prism 	$SA = wh + wh + lw + lw + lh + lh$ <b>or</b> $SA = 2(wh + lw + lh)$	$V = (\text{area of base}) \times h$ $V = l \times w \times h$
General Right Prism	$SA = \text{the sum of the areas of all the faces}$	$V = (\text{area of base}) \times h$
General Right Pyramid	$SA = \text{the sum of the areas of all the faces}$	$V = \frac{1}{3} \times (\text{area of base}) \times h$

# UNIT 1: MEASUREMENT

MY NOTES AND THINGS TO REMEMBER...

\* OMIT WRITTEN RESPONSE #7 & #8

# UNIT 1: Measurement Multiple Choice

1. A road sign says to turn right in 1000 feet. Approximately how far is this distance in kilometres?

- A. 0.3 km
- B. 0.6 km
- C. 1 km
- D. 1.5 km

① ft → m:

$$1000 \cancel{\text{ft}} \times \frac{0.3048 \text{ m}}{1 \cancel{\text{ft}}} = 304.8 \text{ m}$$

② m → km:

$$304.8 \cancel{\text{m}} \times \frac{1 \text{ km}}{1000 \cancel{\text{m}}} = 0.3048 \text{ km}$$

2. Which of the following calculations converts 4 yards into centimetres?

A.  $4 \text{ yd} \times \frac{2.54 \text{ cm}}{1 \text{ in}}$

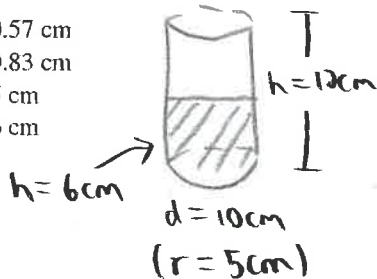
B.  $4 \text{ yd} \times \frac{3 \cancel{\text{ft}}}{1 \cancel{\text{yd}}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{ft}}}$

C.  $4 \text{ yd} \times \frac{3 \cancel{\text{ft}}}{1 \cancel{\text{yd}}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in}}}$

D.  $4 \text{ yd} \times \frac{1 \cancel{\text{ft}}}{3 \cancel{\text{yd}}} \times \frac{1 \cancel{\text{in}}}{12 \cancel{\text{ft}}} \times \frac{1 \text{ cm}}{2.54 \cancel{\text{in}}}$

3. A cylinder with a diameter of 10 cm and a height of 12 cm is half full of water. A sphere with a diameter of 5 cm is dropped into the cylinder. How far will the water level rise once the sphere is completely under the water?

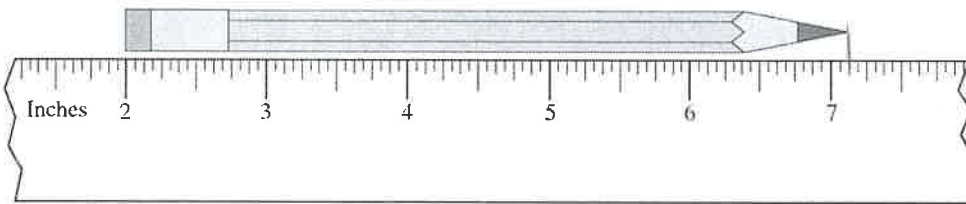
- A. 0.57 cm
- B. 0.83 cm
- C. 5 cm
- D. 6 cm



①  $V_{\text{sphere}} = \frac{4}{3} \pi r^3$   
 $= \frac{4}{3} \pi \times 5^3$   
 $= 523.598 \dots \text{cm}^3$   
 ↑  
 will be the volume of cylinder

②  $V_{\text{cylinder}} = \pi r^2 h$   
 $523.598 = \pi \times 5^2 \times h$   
 $h = \frac{523.598}{\pi \times 25}$   
 $h = 6.66 \text{ cm}$

4. Using the ruler below, determine the length of the pencil.



$7 \frac{2}{16} \text{ in.}$   
 $= 7 \frac{1}{8} \text{ in.}$

- A.  $5 \frac{1}{8} \text{''}$
- B.  $5.2 \text{''}$
- C.  $5 \frac{1}{4} \text{''}$
- D.  $7 \frac{1}{8} \text{''}$

5. Jung was told to plant trees two steps apart. Which of the following estimates is closest to "two steps apart"?

- A. 6 ft
- B. 3 m
- C. 60 cm
- D. 30 in

6. Which distance below is the longest?

0.6 mi, 1000 yd, 1 km, 900 m

$$1000 \cancel{\text{yd}} \times \frac{0.9144 \text{ m}}{1 \cancel{\text{yd}}} = 914.4 \text{ m}$$

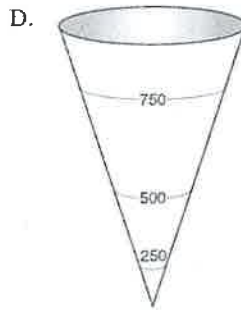
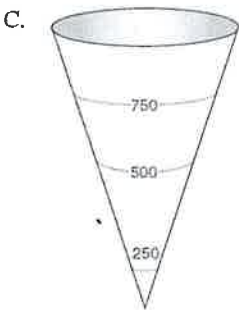
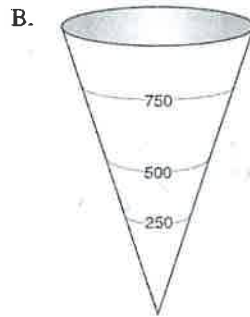
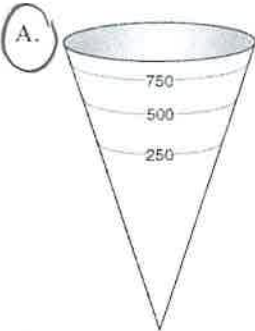
- A. 0.6 mi
- B. 1000 yd
- C. 1 km
- D. 900 m

$$0.6 \cancel{\text{mi}} \times \frac{1.609 \text{ km}}{1 \cancel{\text{mi}}} = 0.9654 \text{ km}$$

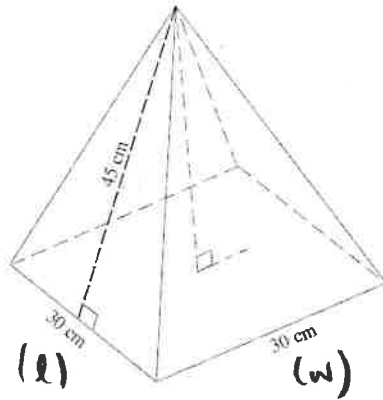
$$1 \cancel{\text{km}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} = 1000 \text{ m}$$

$$0.9654 \cancel{\text{km}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} = 965.4 \text{ m}$$

7. A cone-shaped water tank has a volume of 1000 litres. Which diagram best represents the 250 L, 500 L and 750 L marks outside of the water tank?



8. The slant height of the pyramid below is 45 cm. Calculate its volume.

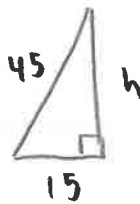


$$V = \frac{1}{3} \times l \times w \times h$$

$$= \frac{1}{3} \times 30 \times 30 \times 42.4264$$

$$= 12727.92206 \text{ cm}^3$$

- A. 10 062 cm<sup>3</sup>  
 B. 12 728 cm<sup>3</sup>  
 C. 13 500 cm<sup>3</sup>  
 D. 40 500 cm<sup>3</sup>



$$h^2 + 15^2 = 45^2$$

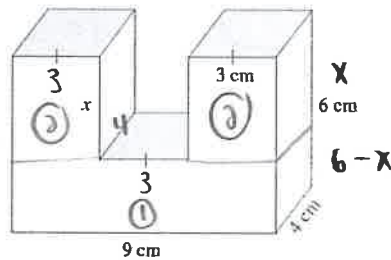
$$h^2 + 225 = 2025$$

$$-225 \quad -225$$

$$\sqrt{h^2} = \sqrt{1800}$$

$$h = 42.4264 \dots$$

9. The volume of the object below is 186 cm<sup>3</sup>. Calculate the length of x.



$$V = (9)(4)(6-x) + 2 \cdot (3)(x)(4)$$

$$= 36(6-x) + 24x$$

$$= 216 - 36x + 24x$$

$$= 216 - 12x$$

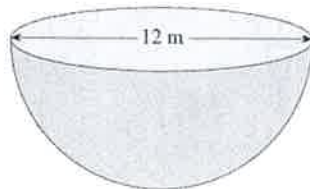
- A. 3.1 cm  
 B. 2.5 cm  
 C. 1.75 cm  
 D. 1.25 cm

$$186 = 216 - 12x$$

$$-216 \quad -216$$

$$\frac{-30}{-12} = \frac{-12x}{-12} \Rightarrow x = 2.5 \text{ cm}$$

10. Calculate the surface area of the solid hemisphere below. Answer to the nearest square metre.



$$SA = \frac{\pi d^2}{2} + \pi r^2$$

$$= \frac{\pi (12)^2}{2} + \pi (6)^2$$

$$= 226.19467 \dots + 113.097335 \dots = 339 \text{ m}^2$$



11.

A baker gets his muffin boxes from the United States. The tallest muffins he bakes are 11 cm. Estimate the height of the smallest box in which the muffins will fit.

- A. 30 inches tall
- B. 10 inches tall
- C. 5 inches tall
- D. 4 inches tall

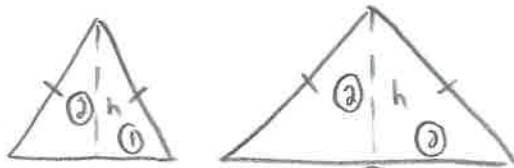
$$11 \text{ cm} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 4.3307... \text{ in}$$

12. As an estimation strategy, what could be used to best approximate one centimetre?

- A. the length of your foot
- B. the width of your hand
- C. the width of your finger
- D. the width of a pencil lead

13. Two isosceles triangles have the same height. The slopes of the sides of triangle A are double the slopes of the corresponding sides of triangle B. How do the lengths of their bases compare?

- A. The base of A is quadruple that of B.
- B. The base of A is double that of B.
- C. The base of A is half that of B.
- D. The base of A is one quarter that of B.



(A) slope = 2      (B) slope = 1

14. A cylinder has a surface area of  $402 \text{ cm}^2$ . The height is three times greater than the radius. What is the height of the cylinder?

- A. 8.00 cm
- B. 10.48 cm
- C. 12.00 cm
- D. 16.97 cm

$$SA = 2\pi r^2 + 2\pi r h$$

$$402 = 2\pi r^2 + 2\pi r (3r)$$

$$402 = 2\pi r^2 + 6\pi r^2$$

$$\hookrightarrow h = 3r$$

$$402 = 8\pi r^2$$

$$\frac{402}{8\pi} = r^2$$

$$r^2 = 16$$

$$r = 4$$

$$\Rightarrow h = 3r = 12 \text{ cm}$$

15. A bowling ball measures 264 cm in circumference. What is the volume of the smallest cube that will hold this ball?

- A. approximately 75 000  $\text{cm}^3$
- B. approximately 311 000  $\text{cm}^3$
- C. approximately 594 000  $\text{cm}^3$
- D. approximately 2 300 000  $\text{cm}^3$

$$V = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \pi (42.0169...)^3$$

$$= 310713 \text{ cm}^3$$

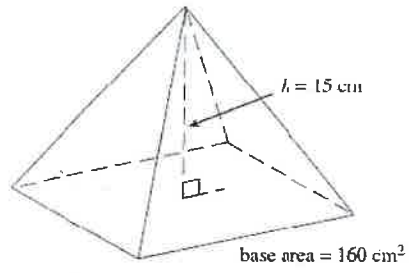
$$C = 2\pi r$$

$$264 = 2\pi r$$

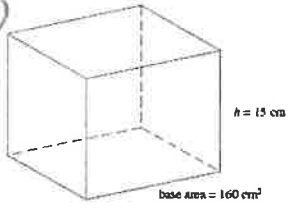
$$\frac{264}{2\pi} = r$$

$$r = 42.0169...$$

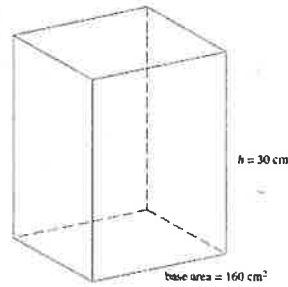
16. Which of the following shapes has a volume three times larger than the pyramid below?



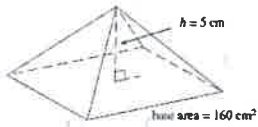
A.



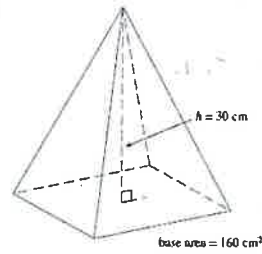
B.



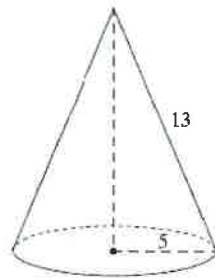
C.



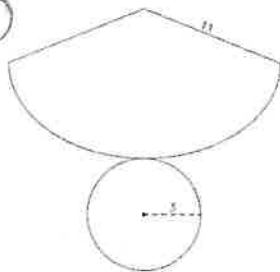
D.



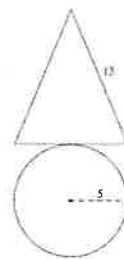
17. Which of the following net diagrams best constructs the cone below?



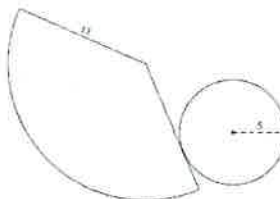
A.



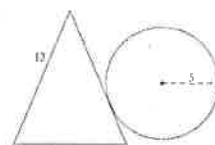
B.



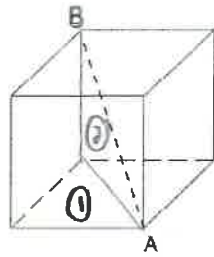
C.



D.



18. Polar Company has designed an ice block in the shape of a cube. The volume of the cube is  $15\,625\text{ cm}^3$ . Which of the following dimensions is the smallest opening of an ice dispenser that will accommodate length AB?

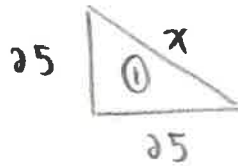


$$V = s^3$$

$$\sqrt[3]{15625} = \sqrt[3]{5^3}$$

$$s = 25$$

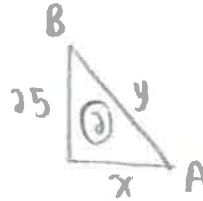
- A. 25 cm wide
- B. 40 cm wide
- C. 45 cm wide
- D. over 50 cm wide



$$25^2 + 25^2 = x^2$$

$$\sqrt{1250} = \sqrt{x^2}$$

$$x = 35.355... \text{ cm}$$



$$25^2 + x^2 = y^2$$

$$25^2 + (35.355...)^2 = y^2$$

$$\sqrt{1875} = \sqrt{y^2}$$

$$y = 43.301... \text{ cm}$$

## UNIT 1: Measurement Written Response

1. Convert from Metric to Imperial units. (Answers to three decimal places.)

a) 5.3 km = 3.294 mi

$$5.3 \cancel{\text{ km}} \times \frac{1 \text{ mi}}{1.609 \cancel{\text{ km}}}$$

b) 63 cm = 24.803 in

$$63 \cancel{\text{ cm}} \times \frac{1 \text{ in}}{2.54 \cancel{\text{ cm}}}$$

c) 345 mm = 13.583 in

$$345 \cancel{\text{ mm}} \times \frac{1 \cancel{\text{ cm}}}{10 \cancel{\text{ mm}}} \times \frac{1 \text{ in}}{2.54 \cancel{\text{ cm}}}$$

d) 82 m = 269.029 ft

$$82 \cancel{\text{ m}} \times \frac{1 \text{ ft}}{0.3048 \cancel{\text{ m}}}$$

e) 0.28 km = 306.2117 yd

$$0.28 \cancel{\text{ km}} \times \frac{1000 \cancel{\text{ m}}}{1 \cancel{\text{ km}}} \times \frac{1 \text{ yd}}{0.9144 \cancel{\text{ m}}}$$

f) 74 m = 80.927 yd

$$74 \cancel{\text{ m}} \times \frac{1 \text{ yd}}{0.9144 \cancel{\text{ m}}}$$

g) 436 cm = 14.304 ft

$$436 \cancel{\text{ cm}} \times \frac{1 \cancel{\text{ m}}}{100 \cancel{\text{ cm}}} \times \frac{1 \text{ ft}}{0.3048 \cancel{\text{ m}}}$$

h) 428 000 mm = 0.266 mi

$$428\,000 \cancel{\text{ mm}} \times \frac{1 \cancel{\text{ m}}}{10 \cancel{\text{ mm}}} \times \frac{1 \cancel{\text{ km}}}{100 \cancel{\text{ m}}} \times \frac{1 \cancel{\text{ km}}}{1000 \cancel{\text{ m}}} \times \frac{1 \text{ mi}}{1.609 \cancel{\text{ km}}}$$

2. Convert from Imperial to Metric units. (Answers to three decimal places.)

a) 5.3 mi = 8.528 km

$$5.3 \cancel{\text{ mi}} \times \frac{1.609 \cancel{\text{ km}}}{1 \cancel{\text{ mi}}}$$

b) 63 in = 160.02 cm

$$63 \cancel{\text{ in}} \times \frac{2.54 \cancel{\text{ cm}}}{1 \cancel{\text{ in}}} =$$

c) 345 in = 8763 mm

$$345 \cancel{\text{ in}} \times \frac{2.54 \cancel{\text{ cm}}}{1 \cancel{\text{ in}}} \times \frac{10 \text{ mm}}{1 \cancel{\text{ cm}}}$$

d) 82 ft = 24.994 m

$$82 \cancel{\text{ ft}} \times \frac{0.3048 \cancel{\text{ m}}}{1 \cancel{\text{ ft}}}$$

e) 280 yd = 0.256 km

$$280 \cancel{\text{ yd}} \times \frac{0.9144 \cancel{\text{ m}}}{1 \cancel{\text{ yd}}} \times \frac{1 \cancel{\text{ km}}}{1000 \cancel{\text{ m}}}$$

f) 74 yd = 67.666 m

$$74 \cancel{\text{ yd}} \times \frac{0.9144 \cancel{\text{ m}}}{1 \cancel{\text{ yd}}}$$

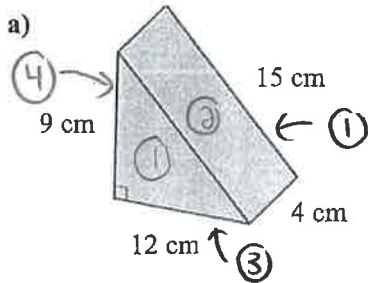
g) 4.36 ft = 132.893 cm

$$4.36 \cancel{\text{ ft}} \times \frac{12 \cancel{\text{ in}}}{1 \cancel{\text{ ft}}} \times \frac{2.54 \cancel{\text{ cm}}}{1 \cancel{\text{ in}}}$$

h) 0.0428 mi = 68865.2 mm

$$0.0428 \cancel{\text{ mi}} \times \frac{1.609 \cancel{\text{ km}}}{1 \cancel{\text{ mi}}} \times \frac{1000 \cancel{\text{ m}}}{1 \cancel{\text{ km}}} \times \frac{100 \cancel{\text{ cm}}}{1 \cancel{\text{ m}}} \times \frac{10 \text{ mm}}{1 \cancel{\text{ cm}}}$$

3. Determine the surface area and volume of the right prisms.



$$SA = 2 \times ① + ② + ③ + ④$$

$$= 2 \times \left( \frac{9 \times 4}{2} \right) + (4 \times 15) + (12 \times 4) + (9 \times 4)$$

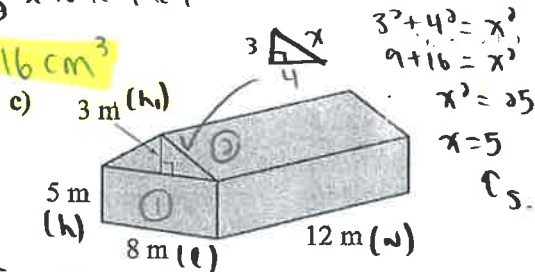
$$= 108 + 60 + 48 + 36$$

**SA = 252 cm<sup>2</sup>**

$$V = \frac{1}{2} l \times w \times h \quad \left( \frac{1}{2} \text{ of a box} \right)$$

$$= \frac{1}{2} \times 12 \times 4 \times 9$$

**V = 216 cm<sup>3</sup>**



$$SA = ① + ② - \text{overlap}$$

$$= 2(wl + lh + wh) + 2 \left( \frac{l \times h}{2} \right) + 2lw \times s - lw$$

$$= 2(12 \times 5 + 8 \times 12 + 8 \times 5) + 8 \times 3 + 2 \times 12 \times 5 - 8 \times 12$$

$$= 392 + 24 + 120 - 96$$

**SA = 440 m<sup>2</sup>**

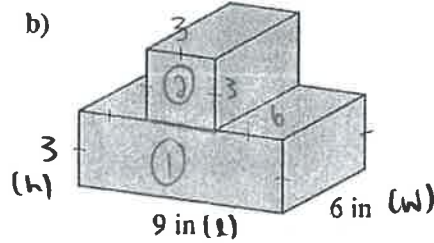
$$V = ① + ②$$

$$= l \times w \times h + \frac{1}{2} s \times s \times w$$

$$= 8 \times 12 \times 5 + \frac{1}{2} \times 5 \times 5 \times 12$$

$$= 480 + 150$$

**V = 630 m<sup>3</sup>**



$$SA = ① + ② - \text{overlap}$$

$$= 2(wh + lw + lh) + 2(wh + lw + lh) - 2lw$$

$$= 2(6 \times 3 + 9 \times 6 + 9 \times 3) + 2(6 \times 3 + 3 \times 6 + 3 \times 3) - 2 \times 3 \times 6$$

$$= 198 + 90 - 36$$

**SA = 252 in<sup>2</sup>**

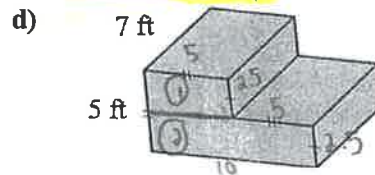
$$V = ① + ②$$

$$= l \times w \times h + l \times w \times h$$

$$= 9 \times 6 \times 3 + 3 \times 6 \times 3$$

$$= 162 + 54$$

**V = 216 in<sup>3</sup>**



$$SA = ① + ② - \text{overlap}$$

$$= 2l \times w \times h + 2l \times w \times h - 2 \times l \times w$$

$$= 5 \times 7 \times 2.5 + 10 \times 7 \times 2.5 - 2 \times 5 \times 7$$

$$= 87.5 + 175 - 70$$

**SA = 192.5 ft<sup>2</sup>**

$$V = ① + ②$$

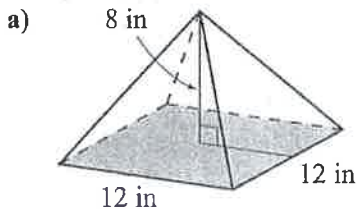
$$= l \times w \times h + l \times w \times h$$

$$= 5 \times 7 \times 2.5 + 10 \times 7 \times 2.5$$

$$= 87.5 + 175$$

**V = 262.5 ft<sup>3</sup>**

4. Determine the surface area and volume of the pyramids.



$$SA = \frac{1}{3} \times 4 \times l + l^2$$

$$= \frac{1}{3} \times 4 \times 12 + 12^2$$

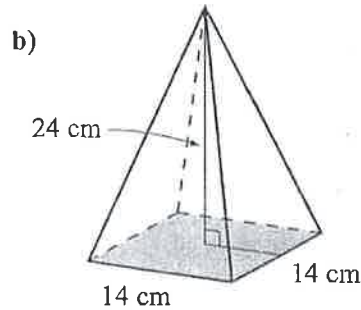
$$= 16 + 144$$

$$SA = 160 \text{ in}^2$$

$$V = \frac{1}{3} \times l \times w \times h$$

$$= \frac{1}{3} \times 12 \times 12 \times 8$$

$$V = 384 \text{ in}^3$$



$$SA = \frac{1}{3} \times 4 \times l + l^2$$

$$= \frac{1}{3} \times 4 \times 14 + 14^2$$

$$= 18.666... + 196$$

$$SA = 214.6 \text{ cm}^2$$

$$V = \frac{1}{3} \times l \times w \times h$$

$$= \frac{1}{3} \times 14 \times 14 \times 24$$

$$V = 1568 \text{ cm}^3$$

5. A pyramid and a prism both have the same base and height. Determine the ratio of the volumes.

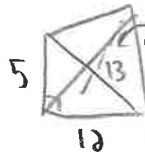
$$V_{\text{prism}} = l \times w \times h$$

$$V_{\text{pyr}} = \frac{1}{3} \times l \times w \times h$$

$$\frac{V_{\text{prism}}}{V_{\text{pyr}}} = \frac{l \times w \times h}{\frac{1}{3} \times l \times w \times h} = \frac{1}{\frac{1}{3}} = 3$$

6. A pyramid has a right triangular base with sides 5 cm, 12 cm and 13 cm long. Determine the height of the pyramid if the volume is 120 cm<sup>3</sup>.

$$V = \frac{1}{3} (\text{area of base}) \times h$$



$$= \frac{1}{3} \times \frac{l \times w}{2} \times h$$

$$120 = \frac{1}{3} \times \frac{5 \times 12}{2} \times h$$

$$120 = \frac{60}{6} \times h$$

$$\frac{120}{10} = \frac{10}{10} \times h \Rightarrow h = 12 \text{ cm}$$

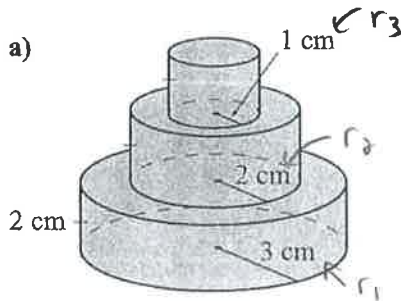
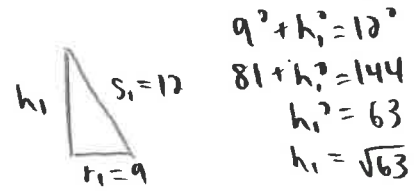
7. Two pyramids are similar. The volume of the larger pyramid is 500 cm<sup>3</sup> and the ratio of the base areas of the pyramids is 9 to 25. What is the ratio of the heights of the pyramids?

OMIT.

8. Two pyramids are similar. The volume of the larger pyramid is 500 cm<sup>3</sup> and the ratio of the base areas of the pyramids is 9 to 25. What is the volume of the smaller pyramid?

OMIT.

9. Determine the surface area and volume of the solids.



$$SA = 2\pi r_1^2 + 2\pi r_1 x h + 2\pi r_2^2 + 2\pi r_2 x h + 2\pi r_3^2 + 2\pi r_3 x h - 2\pi r_2^2 - 2\pi r_3^2$$

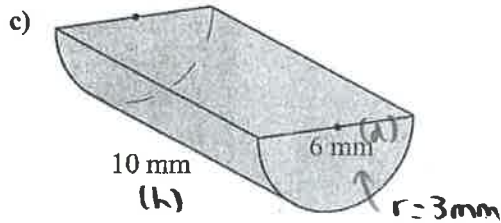
$$= 2\pi \times 3^2 + 2\pi \times 3 \times 2 + 2\pi \times 2^2 + 2\pi \times 2 \times 2 + 2\pi \times 1^2 + 2\pi \times 1 \times 2 - 2\pi \times 2^2 - 2\pi \times 1^2$$

$$SA = 131.95 \text{ cm}^2$$

$$V = \pi r_1^2 h + \pi r_2^2 h + \pi r_3^2 h$$

$$= \pi \times 3^2 \times 2 + \pi \times 2^2 \times 2 + \pi \times 1^2 \times 2$$

$$V = 87.96 \text{ cm}^3$$



$$SA = \frac{2\pi r^2}{2} + 2\pi r h + d \times h$$

$$= \pi r^2 + \pi r h + d \times h$$

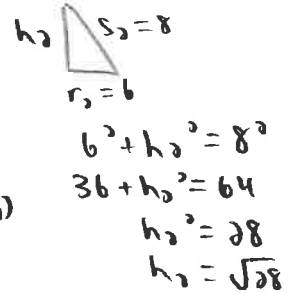
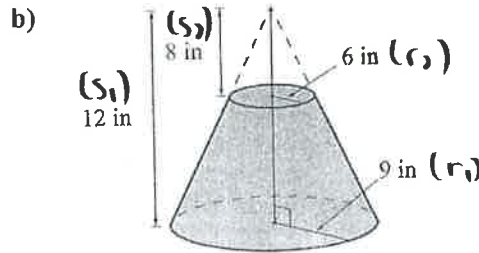
$$= \pi \times 3^2 + \pi \times 3 \times 10 + 6 \times 10$$

$$SA = 182.52 \text{ mm}^2$$

$$V = \frac{\pi r^2 \times h}{2}$$

$$= \frac{\pi \times 3^2 \times 10}{2}$$

$$V = 141.37 \text{ mm}^3$$



$$SA = \pi r_1^2 + \pi r_1 s_1 - \pi r_2 s_2 + \pi r_2^2$$

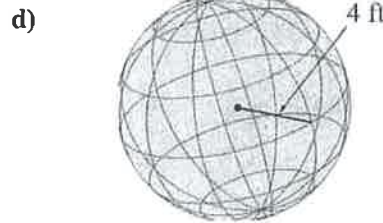
$$= \pi \times 9^2 + \pi \times 9 \times 12 - \pi \times 6 \times 8 + \pi \times 6^2$$

$$SA = 556.06 \text{ in}^2$$

$$V = \frac{1}{3} \pi r_1^2 \times h_1 - \frac{1}{3} \pi r_2^2 \times h_2$$

$$= \frac{1}{3} \pi \times 9^2 \times \sqrt{63} - \frac{1}{3} \pi \times 6^2 \times \sqrt{28}$$

$$V = 473.78 \text{ in}^3$$



$$SA = 4\pi r^2$$

$$= 4\pi \times 4^2$$

$$SA = 201.06 \text{ ft}^2$$

$$V = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \pi \times 4^3$$

$$V = 268.08 \text{ ft}^3$$

# UNIT 2: TRIGONOMETRY

MY NOTES AND THINGS TO REMEMBER...

\* WRITTEN RESPONSE # 7 IS A BONUS.

\* OMIT WRITTEN RESPONSE # 8 & # 9 & # 10

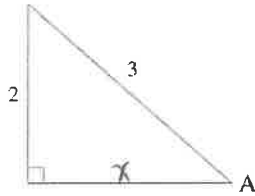


UNIT 2: Trigonometry Multiple Choice

\* MAKE SURE CALCULATOR IS IN "DEGREES"

1. Determine the ratio of  $\cos A$ .

SOH CAH TOA



$$\begin{aligned} 2^2 + x^2 &= 3^2 \\ 4 + x^2 &= 9 \\ x^2 &= 5 \\ x &= \sqrt{5} \end{aligned}$$

A.  $\cos A = \frac{2}{3}$

B.  $\cos A = \frac{\sqrt{5}}{3}$

C.  $\cos A = \frac{\sqrt{13}}{3}$

D.  $\cos A = \frac{3}{\sqrt{5}}$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\cos A = \frac{\sqrt{5}}{3}$$

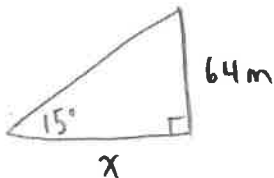
2. The angle of elevation of the sun is  $15^\circ$ . How long is the shadow of a 64 m tall building?

A. 17 m

B. 66 m

C. 239 m

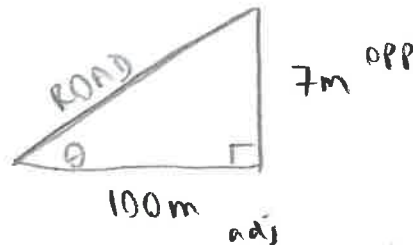
D. 247 m



$$\begin{aligned} \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \tan 15^\circ &= \frac{64}{x} \end{aligned}$$

$$\begin{aligned} x \cdot \tan 15^\circ &= \frac{64}{\tan 15^\circ} \\ x &= 238.85 \end{aligned}$$

3. As Tracey is driving, she sees a sign telling her the road has a 7% grade (i.e., a rise of 7 metres for a horizontal change of 100 m). Which of the following expressions will calculate the angle between the road and the horizontal?



A.  $\tan\left(\frac{7}{100}\right)$

B.  $\sin\left(\frac{7}{100}\right)$

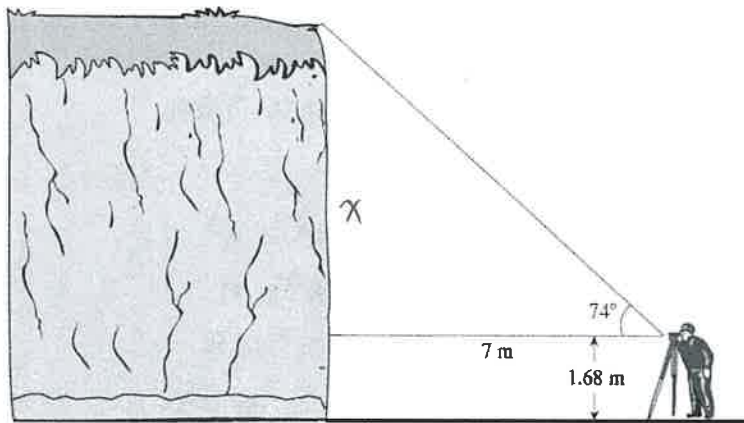
C.  $\tan^{-1}\left(\frac{7}{100}\right)$

D.  $\sin^{-1}\left(\frac{7}{100}\right)$

$$\tan \theta = \frac{7}{100}$$

$$\theta = \tan^{-1}\left(\frac{7}{100}\right)$$

4. Mission's outdoor club collected the following data to determine the height of a cliff.



Calculate the height of the cliff.

- A. 3.7 m  
 B. 8.4 m  
 C. 24.4 m  
 D. 26.1 m

$$\tan 74^\circ = \frac{x}{7}$$

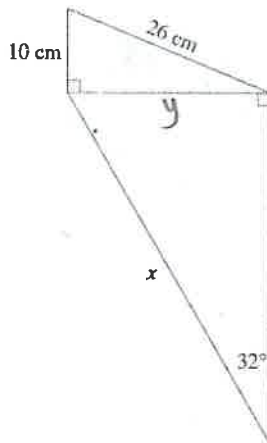
$$7 \cdot \tan 74^\circ = x$$

$$x = 24.4$$

$$\text{Height} = 1.68 + 24.4$$

$$= 26.1 \text{ m}$$

5. Calculate the length of side  $x$  on the diagram below. Answer to the nearest centimetre.



$$\textcircled{1} \quad 10^2 + y^2 = 26^2$$

$$100 + y^2 = 676$$

$$y^2 = 576$$

$$y = \sqrt{576}$$

$$y = 24 \text{ cm}$$

$$\textcircled{2} \quad \sin 32^\circ = \frac{y}{x}$$

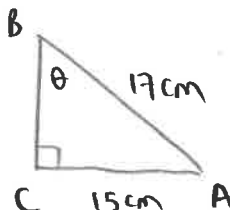
$$\sin 32^\circ = \frac{24}{x}$$

$$\cancel{x \cdot \sin 32^\circ} = \frac{24}{\cancel{\sin 32^\circ}}$$

$$\Rightarrow x = 46 \text{ cm}$$

6. In  $\triangle ABC$ ,  $\angle C = 90^\circ$ ,  $AB = 17 \text{ cm}$  and  $AC = 15 \text{ cm}$ . Calculate the measure of  $\angle ABC$ .

- A.  $28^\circ$   
 B.  $41^\circ$   
 C.  $49^\circ$   
 D.  $62^\circ$

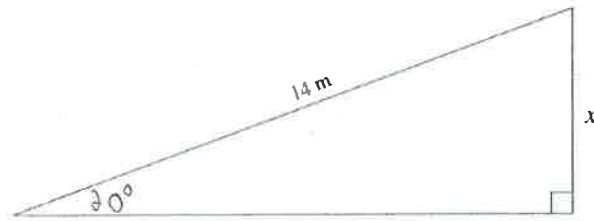


$$\sin \theta = \frac{15}{17}$$

$$\theta = \sin^{-1} \left( \frac{15}{17} \right)$$

$$\theta = 62^\circ$$

7. Using a protractor, measure one of the unknown angles and determine the length of side  $x$ .



Note: This diagram is drawn to scale.

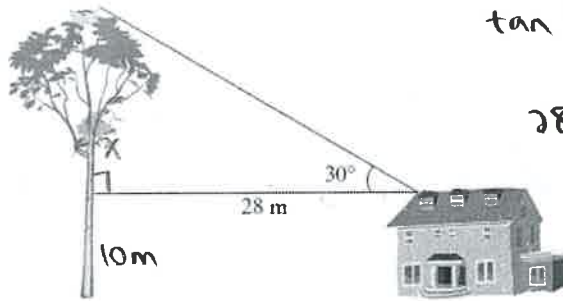
$$\sin 20^\circ = \frac{x}{14}$$

$$x = 14 \cdot \sin 20^\circ$$

$$x = 4.78$$

- A. 3.5 m
- B. 4.8 m
- C. 5.1 m
- D. 13.2 m

8. A 10 metre tall farmhouse is located 28.0 m away from a tree with an eagle's nest. The angle of elevation from the roof of the farmhouse to the eagle's nest is  $30^\circ$ .



$$\tan 30^\circ = \frac{x}{28}$$

$$28 \cdot \tan 30^\circ = x$$

$$x = 16.16$$

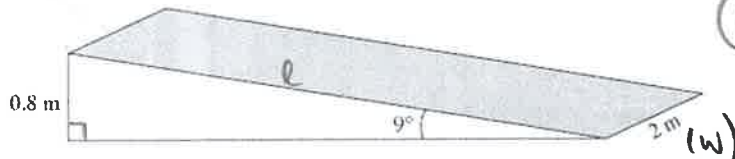
What is the height of the eagle's nest?

$$\text{Height} = 10 + 16.16$$

$$= 26 \text{ m}$$

- A. 16 m
- B. 24 m
- C. 26 m
- D. 48 m

9. A ramp is set up using a rectangular piece of plywood (shaded region) as shown below.



$$\sin 9^\circ = \frac{0.8}{l}$$

$$l \cdot \sin 9^\circ = 0.8$$

$$l = \frac{0.8}{\sin 9^\circ}$$

$$l = 5.11396\dots$$

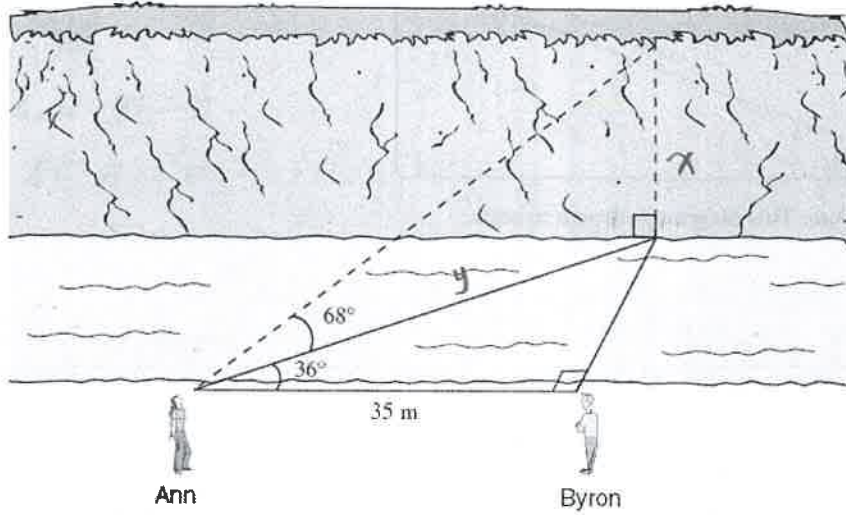
Calculate the area of the plywood. Answer in square metres to one decimal place.

$$\textcircled{2} A = l \times w$$

$$= (5.11396\dots)(2)$$

$$= 10.2 \text{ m}^2$$

10. Ann and Byron positioned themselves 35 m apart on one side of a stream. Ann measured the angles, as shown below.



Calculate the height of the cliff on the other side of the stream.

- A. 17.5 m
- B. 62.9 m
- C. 70.1 m
- D. 107.1 m

$$\textcircled{1} \cos 36 = \frac{35}{y}$$

$$\frac{y \cdot \cancel{\cos 36}}{\cancel{\cos 36}} = \frac{35}{\cos 36}$$

$$y = 43.26\dots$$

$$\textcircled{2} \tan 68 = \frac{x}{y}$$

$$\tan 68 = \frac{x}{43.26\dots}$$

$$x = 43.26 \cdot \tan 68$$

$$x = 107.08$$

## UNIT 2: Trigonometry Written Response

1. Find each ratio to four decimal places using a calculator.

a)  $\sin 63^\circ$

0.8910

b)  $\cos 63^\circ$

0.4540

c)  $\tan 63^\circ$

1.9626

d)  $\sin 27^\circ$

0.4540

e)  $\cos 27^\circ$

0.8910

f)  $\tan 27^\circ$

0.5095

2. Find the measure of the acute angle  $\theta$  to one decimal place.

a)  $\sin \theta = 0.1348$

$7.7^\circ$

b)  $\cos \theta = 0.1348$

$82.3^\circ$

c)  $\tan \theta = 0.1348$

$7.7^\circ$

d)  $\sin \theta = 0.6213$

$38.4^\circ$

e)  $\cos \theta = 0.6213$

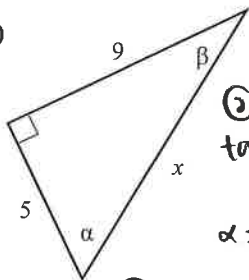
$51.6^\circ$

f)  $\tan \theta = 0.6213$

$31.9^\circ$

3. Solve the triangle.

a)



①  $5^2 + 9^2 = x^2$   
 $25 + 81 = x^2$   
 $106 = x^2$   
 $x = \sqrt{106}$

②  $\tan \alpha = \frac{9}{5}$   
 $\alpha = \tan^{-1}\left(\frac{9}{5}\right)$

$x = 10.3$

$\alpha = 60.9^\circ$

$\beta = 29.1^\circ$

③  $\beta = 180^\circ - 90^\circ - 60.9^\circ$

①  $\cos 32^\circ = \frac{6}{*}$

b)  $* = \frac{6}{\cos 32^\circ}$

$* = 7.1$

$\cos 51.3^\circ = \frac{6}{z}$

$z = \frac{6}{\cos 51.3^\circ} = 9.6$

$\tan 32^\circ = \frac{z}{12}$

$z = 12 \times \tan 32^\circ = 7.5$

②  $\cos 32^\circ = \frac{12}{* + x}$

$* + x = \frac{12}{\cos 32^\circ} = 14.2$

$x = 7.1$

$y = 9.6$

$\theta = 51.3^\circ$

④  $\tan \theta = \frac{7.5}{6}$   
 $\theta = 51.3^\circ$

4. Find the value of each of the two remaining trigonometric functions of the acute angle  $\theta$ .

a)  $\sin \theta = \frac{3}{4}$  opp hyp

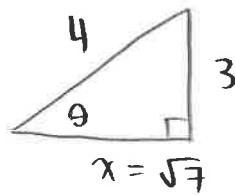
$\cos \theta = \frac{\sqrt{7}}{4}$

b)  $\cos \theta = \frac{12}{13}$

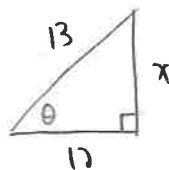
$\sin \theta = \frac{5}{13}$

$\tan \theta = \frac{3}{\sqrt{7}}$

$\tan \theta = \frac{5}{12}$



$x^2 + 3^2 = 4^2$   
 $x^2 + 9 = 16$   
 $x^2 = 7$   
 $x = \sqrt{7}$



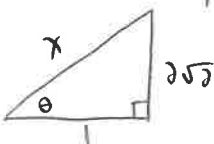
$12^2 + x^2 = 13^2$   
 $144 + x^2 = 169$   
 $x^2 = 25$   
 $x = 5$

c)  $\tan \theta = \frac{2\sqrt{2}}{1}$

$\sin \theta = \frac{2\sqrt{2}}{3}$

d)  $\sin \theta = 0.2561$

$\cos \theta = 0.9667$



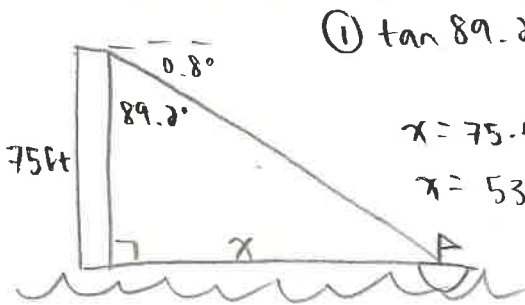
$1^2 + (2\sqrt{2})^2 = x^2$   
 $1 + 4 \times 2 = x^2$   
 $9 = x^2 \Rightarrow x = 3$

$\cos \theta = \frac{1}{3}$

$\theta = \sin^{-1}(0.2561)$   
 $= 14.84^\circ$

$\tan \theta = 86.1446$

5. The angle of depression from the top of a lighthouse 75 ft above the surface of the water to a distant ship is  $0.8^\circ$ . How many miles is the ship from the base of the lighthouse? (1 mile = 5280 ft)



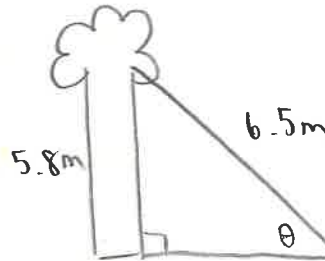
$$\textcircled{1} \tan 89.2 = \frac{x}{75}$$

$$x = 75 \cdot \tan 89.2$$

$$x = 5371.13 \text{ ft}$$

$$\textcircled{2} 5371.13 \text{ ft} \times \frac{1 \text{ mi}}{5280 \text{ ft}} = 1.02 \text{ mi}$$

6. A cat is on a tree branch 5.8 m above the ground. If a ladder 6.5 metres long is placed on the branch, what angle does the ladder make with the ground?



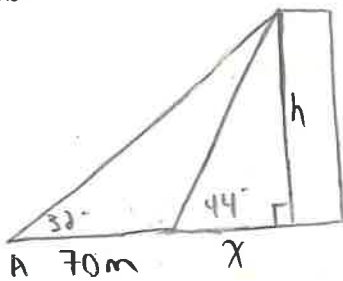
$$\sin \theta = \frac{5.8}{6.5}$$

$$\theta = \sin^{-1}\left(\frac{5.8}{6.5}\right)$$

$$\theta = 63.2^\circ$$

- \* 7. From point A, the angle of elevation to the top of a building is  $32^\circ$ . Walking 70 m closer, the angle changes to  $44^\circ$ . How high is the building?

BONUS



$$\textcircled{1} \tan 32 = \frac{h}{70+x}$$

$$h = (70+x) \tan 32$$

$$h = 70 \tan 32 + x \tan 32$$

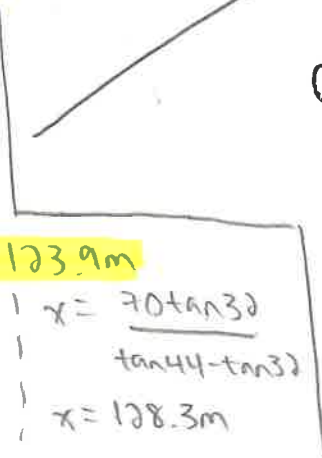
$$\textcircled{2} \tan 44 = \frac{h}{x}$$

$$h = x \tan 44 \Rightarrow h = 123.9 \text{ m}$$

SUBSTITUTION:  $x \tan 44 = 70 \tan 32 + x \tan 32$

$$x \tan 44 - x \tan 32 = 70 \tan 32$$

$$x (\tan 44 - \tan 32) = 70 \tan 32$$



OMIT

$$x = \frac{70 \tan 32}{\tan 44 - \tan 32}$$

$$x = 128.3 \text{ m}$$

9. A ship sails from port 100 km due west, then turns and sails 40 km at a heading of  $N 70^\circ W$ . Find the bearing, and the distance of the ship from port.

OMIT

10. The three sides of a triangle are 10 m, 15 m and 20 m. What is the measure of the smallest angle of the triangle? What is the area of the triangle?

OMIT