




## Foundations of Mathematics and Pre-Calculus 10

### Sample Questions for Measurement

#### Instructions

1. You may require a protractor and a ruler (metric and imperial) for paper versions of the questions.
2. You may use math tiles.
3. When using your calculator (scientific or approved graphing calculator):
  - use the programmed value of  $\pi$  rather than the approximation of 3.14.
  - round only in the final step of the solution.
4. Diagrams are not necessarily drawn to scale.
5. For questions marked with , do not use your calculator.

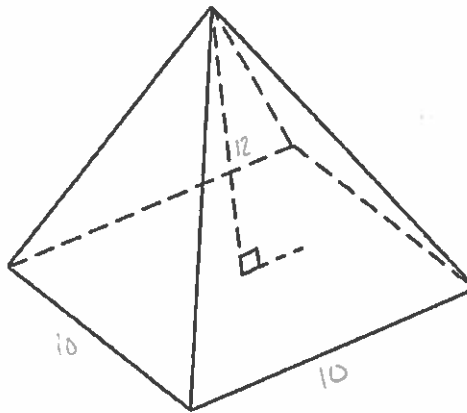
**PART A: MULTIPLE-CHOICE QUESTIONS**



1. Which of the following examples is the best referent for one millimetre?

- A. diameter of a penny
- B. thickness of a fingernail
- C. length of a five-dollar bill
- D. distance from the floor to a door knob

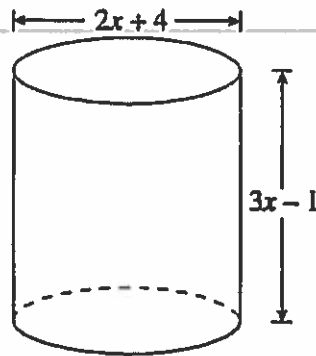
2. Which expression could be used to calculate the surface area of the right square-based pyramid with a base length of 10 cm and a height of 12 cm?



$$\begin{aligned}h^2 &= a^2 + b^2 \\ &= 5^2 + 12^2 \\ &= 25 + 144 \\ h^2 &= 169 \\ \boxed{h} &= 13\end{aligned}$$

- A.  ~~$SA = 2(10)(12) + (10)^2$~~
- B.  ~~$SA = 2(10)(12) + (12)^2$~~
- C.  $SA = 2(10)(13) + (10)^2$
- D.  ~~$SA = 2(10)(13) + (13)^2$~~

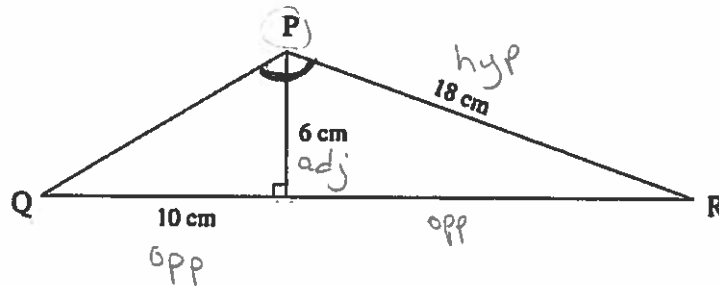
3. Which of the following expressions represents the volume of the cylinder below?



$$\begin{aligned}
 V &= \pi r^2 h \\
 &= \pi (x + 2)^2 (3x - 1) \\
 &= \pi (x^2 + 4x + 4)(3x - 1) \\
 &= \pi (3x^3 - x^2 + 12x^2 - 4x + 12x - 4) \\
 &= \pi (3x^3 + 11x^2 + 8x - 4)
 \end{aligned}$$

- A.  $V = \pi(6x^2 + 10x - 4)$
- B.  $V = \pi(3x^3 - x^2 + 12x - 4)$
- C.  $V = \pi(3x^3 + 11x^2 + 8x - 4)$
- D.  $V = \pi(12x^3 + 32x - 16)$

4. Determine the measure of  $\angle QPR$ .



- A.  $59^\circ$
- B.  $71^\circ$
- C.  $102^\circ$
- D.  $130^\circ$

$$\tan P = \frac{\text{opp}}{\text{adj}}$$

$$\tan P = \frac{10}{6}$$

$$P = \tan^{-1}\left(\frac{10}{6}\right)$$

$$P = 59.04$$

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

$$\cos P = \frac{6}{18}$$

$$P = \cos^{-1}\left(\frac{6}{18}\right)$$

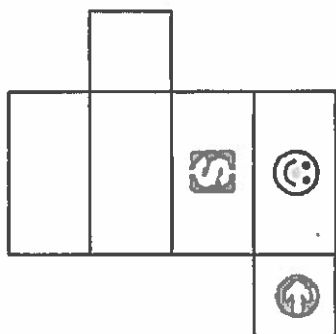
$$P = 70.5^\circ$$

$$P = 129.5^\circ$$

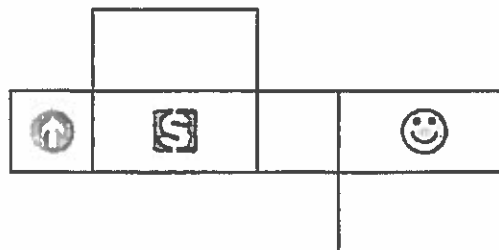
5. Which net diagram represents the prism below?



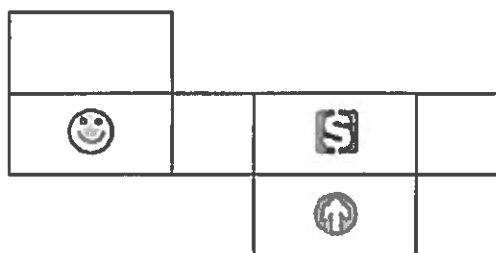
A.



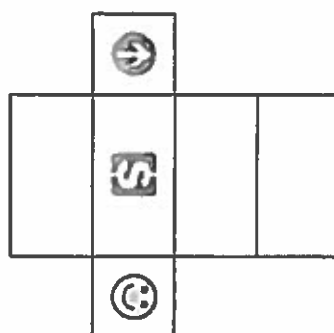
B.



C.



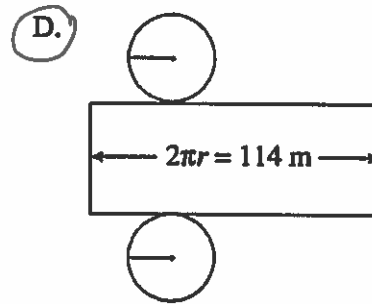
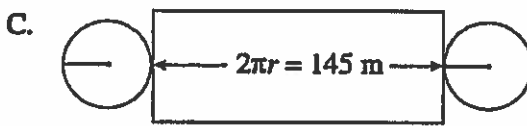
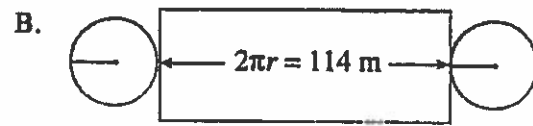
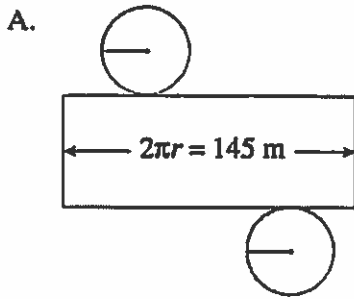
D.



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

Top - Bottom
side

6. Raj was asked to make a cylindrical tank with a lateral surface area of  $2622 \text{ m}^2$  and a height of 23 m. Which net diagram below would be correct for this cylinder?



$$LA = 2\pi r h$$

$$2622 = 2\pi r (23)$$

$$2\pi r = \frac{2622}{23} \quad 2\pi r = 114 \text{ m}$$

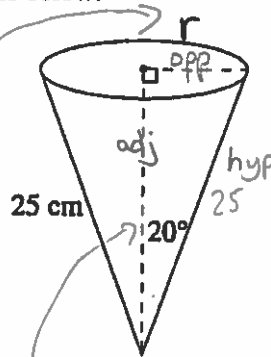
7. Calculate the volume of the right cone below.

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 20^\circ = \frac{\text{opp}}{25 \text{ cm}}$$

$$25 \sin 20^\circ = \text{opp}$$

$$8.5505 = \text{opp}$$



$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi (8.5505)^2 (23.4923)$$

$$V = 1798.6107 \text{ cm}^3$$

$$\approx 1799 \text{ cm}^3$$

- A.  $210 \text{ cm}^3$
- B.  $1799 \text{ cm}^3$
- C.  $1914 \text{ cm}^3$
- D.  $2168 \text{ cm}^3$

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

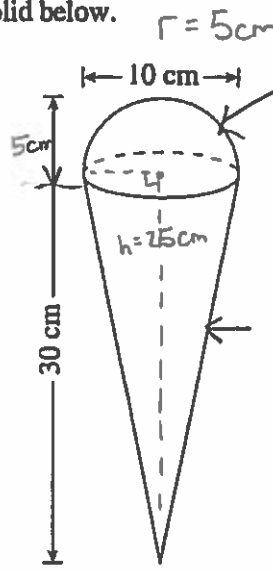
$$\cos 20^\circ = \frac{\text{adj}}{25}$$

$$25 \cos 20^\circ = \text{adj}$$

$$23.4923 = \text{adj}$$

8. Determine the surface area of the solid below.

slant height  
 $h^2 = a^2 + b^2$   
 $= 5^2 + 25^2$   
 $= 650$   
 $h = \sqrt{650}$   
 $= 25.4951 \text{ cm}$



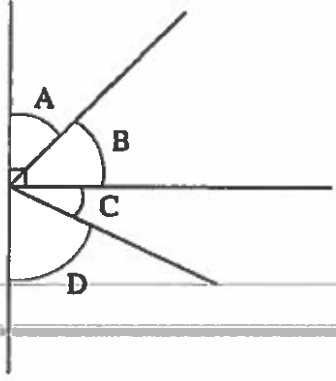
$r = 5 \text{ cm}$   
 SA of sphere  $SA = 4\pi r^2$   
 but only need half  
 and no "extra face"  
 so  $SA = 2\pi r^2$

Top (not needed)  
 Cone SA =  $\pi r^2 + \pi r s$   
 So ... SA =  $\pi r s$

Total SA =  $\pi r s + 2\pi r^2$   
 $= \pi(5)(25.4951) + 2\pi(5^2)$   
 $= 557.5557 \text{ cm}^2$

- A. 481 cm<sup>2</sup>
- B. 558 cm<sup>2</sup>
- C. 1414 cm<sup>2</sup>
- D. 2199 cm<sup>2</sup>

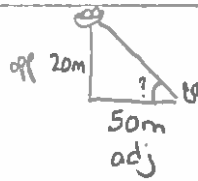
9. Which of the following angles is an angle of depression?



- A. A
- B. B
- C. C
- D. D

10. A cat on the ground is 50 m away from the base of a pole. An osprey's nest is on the top of the pole, which is 20 m tall. What is the measure of the angle of inclination from the cat to the osprey's nest?

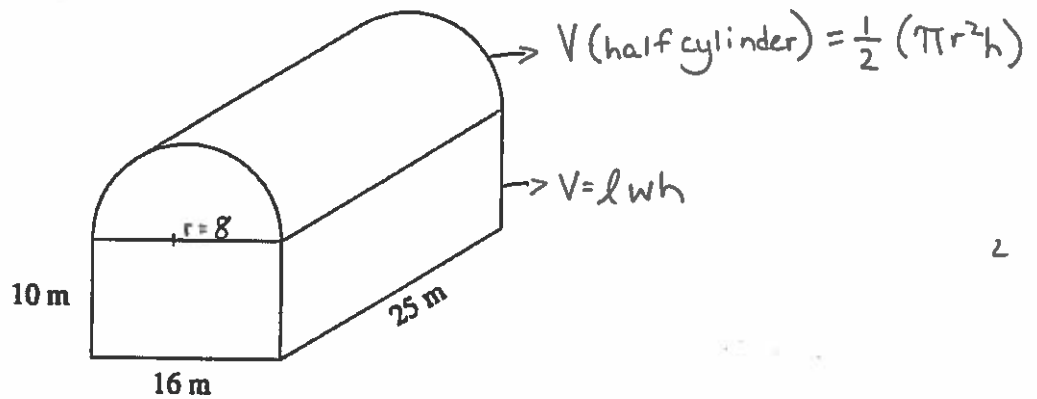
- A.  $22^\circ$   
 B.  $24^\circ$   
 C.  $66^\circ$   
 D.  $68^\circ$



$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{20}{50}$$

$$\theta = \tan^{-1}\left(\frac{20}{50}\right) \\ = 21.8^\circ$$

11. Calculate the volume of the shape below.

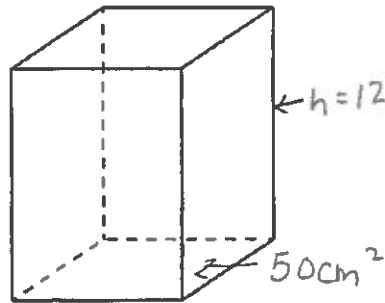


- A.  $6\,513 \text{ m}^3$   
 B.  $9\,027 \text{ m}^3$   
 C.  $14\,053 \text{ m}^3$   
 D.  $24\,106 \text{ m}^3$

$$V = \frac{1}{2}(\pi(8)^2(25)) + (10)(16)(25) \\ = 6513.2741 \text{ m}^3$$

12. A wooden block is a square-based prism, as shown below:

$$\text{edge of base} = \sqrt{50}$$



Given the base area is  $50 \text{ cm}^2$  and the height is  $12 \text{ cm}$ , what is its surface area?

- A.  $339 \text{ cm}^2$
- B.  $439 \text{ cm}^2$
- C.  $600 \text{ cm}^2$
- D.  $1300 \text{ cm}^2$

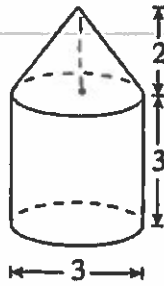
$$\begin{aligned} \text{Top + bottom} &= 50 + 50 \\ &= 100 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} 4 \text{ equal rectangle sides} &= 4(\sqrt{50} \cdot 12) \\ &= 339.4113 \end{aligned}$$

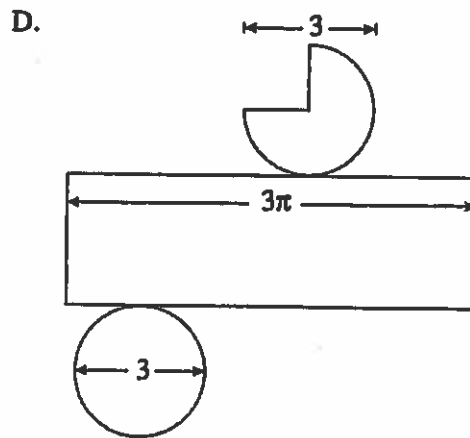
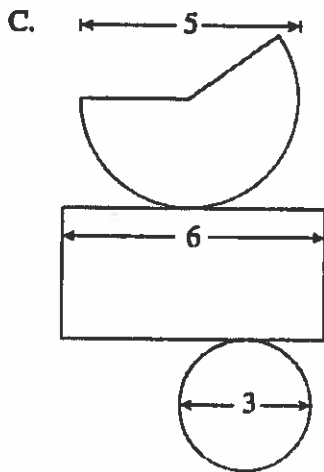
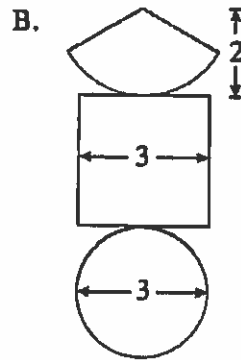
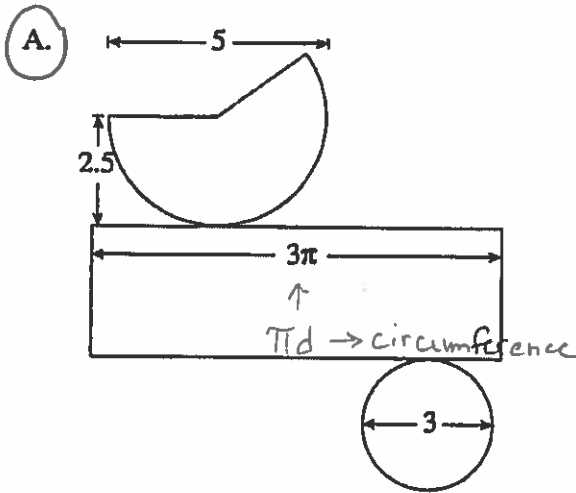
$$\begin{aligned} 339.4113 \text{ cm}^2 + 100 \text{ cm}^2 \\ = 439.4113 \text{ cm}^2 \end{aligned}$$



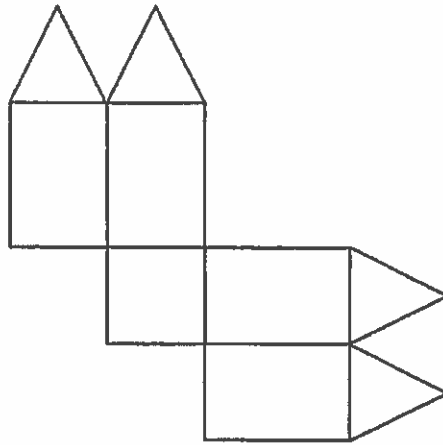
13. Which of the following net diagrams represents the figure below? Note: all diagrams drawn to scale.



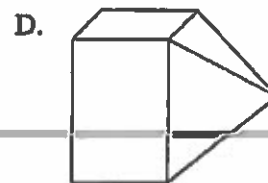
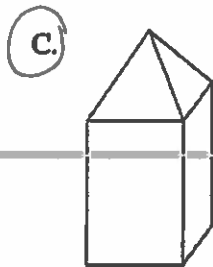
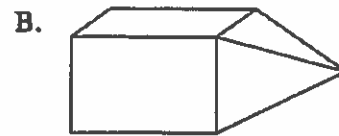
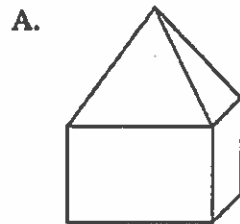
$$\begin{aligned}
 h^2 &= a^2 + b^2 \\
 &= 2^2 + 1.5^2 \\
 &= 6.25 \\
 h &= \sqrt{6.25} \\
 h &= 2.5
 \end{aligned}$$



14. Which prism can be formed by the net below? Note: all diagrams drawn to scale.



Note: all diagrams drawn to scale.



**PART B: NUMERIC-RESPONSE QUESTIONS**

15. The lateral surface area of a cylinder is  $1106 \text{ cm}^2$ . Given that the height is 11 cm, calculate the radius. Answer to the nearest cm.

Record your answer neatly on the Answer Sheet.

cylinder

$$LA = 1106 \text{ cm}^2 \quad h = 11 \text{ cm} \quad r = ?$$
$$\text{SA of cylinder} = \overset{\text{Top}}{\downarrow} 2\pi r^2 + \overset{\text{Bottom}}{\downarrow} 2\pi r h$$

$$\text{Lateral SA} = 2\pi r h$$

$$1106 = 2\pi r(11)$$

$$\frac{1106}{2\pi(11)} = r$$

$$16.0023 \text{ cm} = r$$

$$16 \text{ cm} = r$$

