Carlingford High School

2015

Year 10 5.3 Term One Examination

Time allowed 55 minutes

Name: .....

Teacher: (Please Circle)

10M1 (Mr Wilson) 10MA2 (Mr Gong)

10M3 (Mr Cheng) 10MA4 (Mrs Lego)

- Marks may be deducted for careless or badly arranged work
- Only calculators approved by the Board of Studies may be used
- All answers are to be completed in blue or black pen except graphs and diagrams
- No lending or borrowing

	Non-linear relationships	Surface Area & Volume	Total
	/29	/22	/51
Extension	/2	/3	/5
	/31	/25	/56

Non-linear Relationships

1. The increase in length (x cm) of a spring varies directly to the applied force F. When $x = 3$, $F = 100$.

   A. Write a variation equation for x 1

   B. Find x when $F = 200$ 1

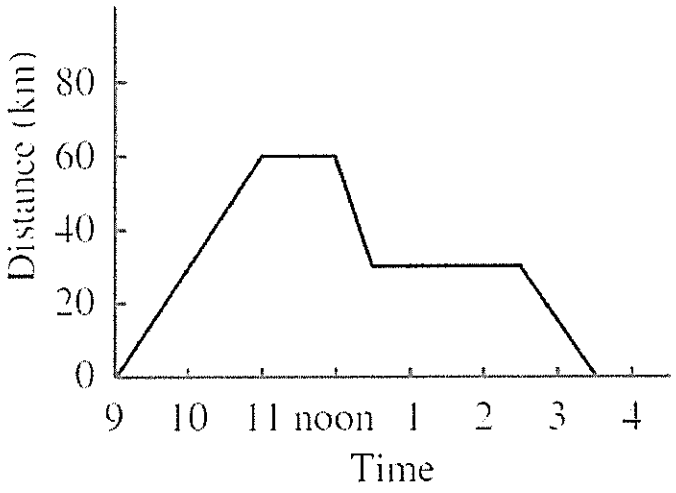
2. Consider the gas trapped inside an airtight cylinder. For a given mass of gas, kept at a constant temperature, the volume varies inversely to the pressure. When V = 10 cm^3, the pressure is 40 units. Find:

   A. the equation connecting the V and P 1

   B. the pressure when the volume is 20 cm^3 1

3. Michelle lives on a farm 60 km from Gunnedah. She left home at 9 am and drove into town at a speed of 30 km/h. She shopped for 1 hour, then drove back towards home. Having driven for 30 minutes at 60 km/h, Michelle arrived at her parents' house, where she stayed for 2 hours. At 2.30 pm she left and drove home, arriving 1 hour later.

Travel graph showing Michelle's journey.



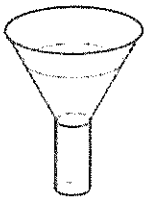
A. How long did it take her to drive into town in the morning? 1

B. At what time did she reach her parents' house? 1

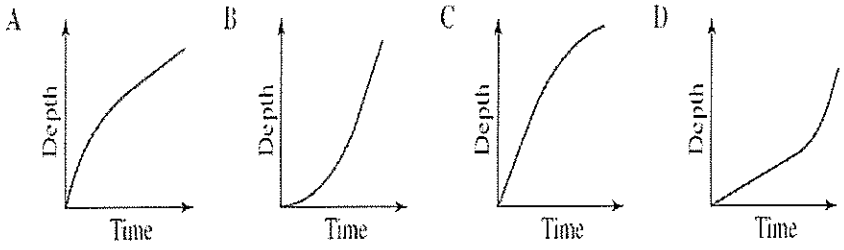
D. How fast did Michelle drive between her parents' house and home? 1

E. How far did Michelle drive altogether during the day? 1

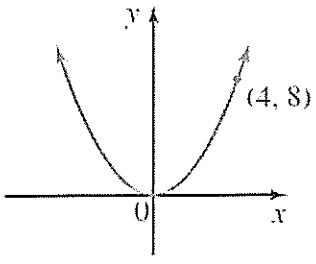
4. A funnel was closed at the base with a stopper, then filled with water at a constant rate. Which graph best shows the change in depth against time? 1



Answer _____



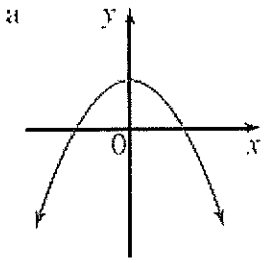
5. The curve below is a parabola with equation of the form $y = ax^2$, where a is a constant. Find the value of a and hence determine its equation. 2



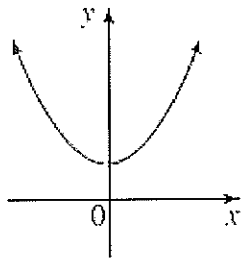
6. Match each of these equations with one of the graphs below. 2

$y = x^2 + 3$ _____ $y = 3 - x^2$ _____

a



b

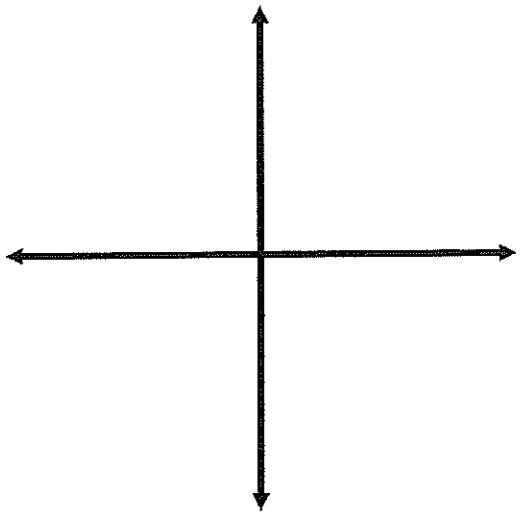


7. a. Graph the parabola, $y = 2(x+1)^2$ clearly showing the vertex and y-intercept 2

b. What is the equation of the axis of symmetry?

_____

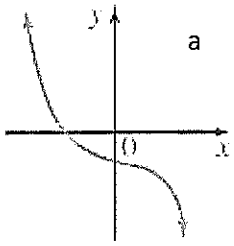
c. Prove the parabola passes through the point (4,50) 3



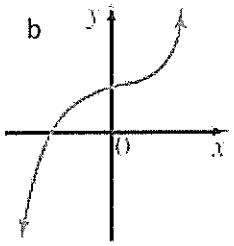
8. Match each of these equations with one of the graphs below. 2

$y = x^3 + 2$ _____ $y = -x^3 - 2$ _____

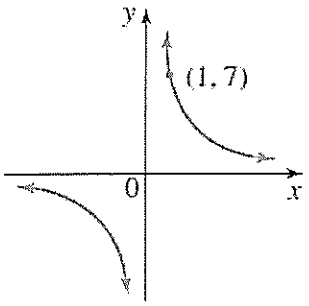
a



b



9. Find the equation of the hyperbola 2



10. Select one description from the list to explain how each of these curves differs from $y = x^4$
(***concave down***, ***moved to the left***, ***moved to the right***)

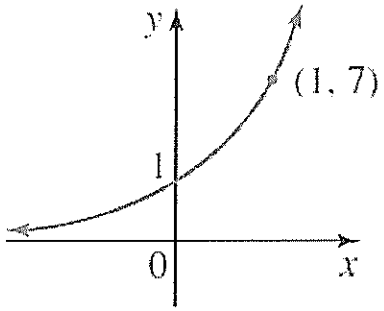
a. $y = -x^4$ _____

2

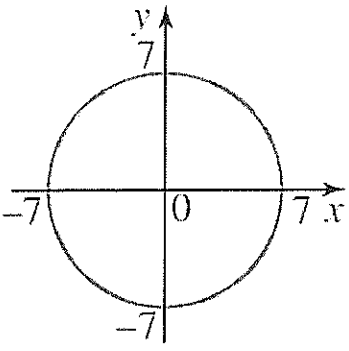
b. $y = (x+3)^4$ _____

11. Do all exponential curves with equations of the form $y = a^x$ (a > 0) have the same y-intercept? **Select:** *Yes* or *No* **Justify/Explain** your answer. 2

12. Find the equation of each curve in the form $y = a^x$, where ***a*** is an integer. 2



13. State the equation of the circle. 1

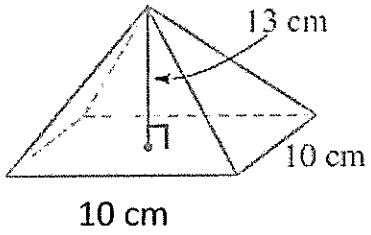


*14. Find the centre and the radius of the circle given in the equation. 2

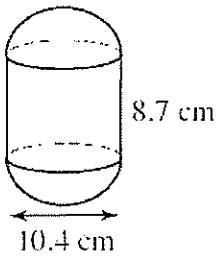
$$4(x-3)^2 + 4(y+1)^2 = \frac{1}{4}$$

Surface area and volume

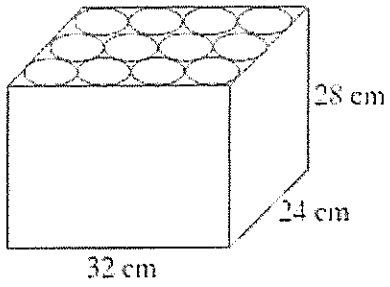
15. Find the surface area of the pyramid to 1 dp. 3



16. Find the surface area to 2 dp. 3



17. A box contains 24 cans of Cola. There are 2 layers of cans and each layer holds 3 rows of 4 cans. The box is 32 cm long, 24 cm wide and 28 cm high.

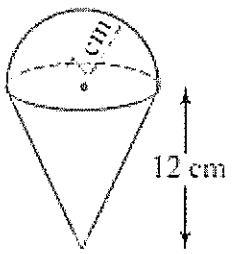


a. Find the height and radius of the cans. 2

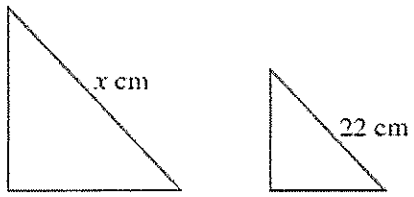
b. Find the total volume of Cola in the box. Answer correct to the nearest cm^3. 2

c. How many litres of Cola are in the box? Answer correct to 1 decimal place. 2

18. Find the volume of the solid to 2dp. 2



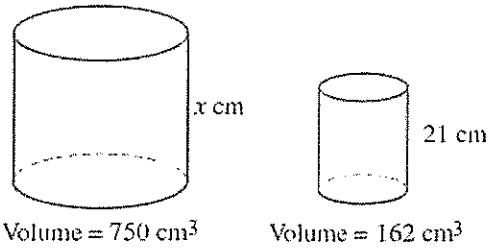
19. Two similar triangles have areas of 108 cm^2 and 48 cm^2.The hypotenuse of the smaller triangle is 22 cm.



a. Find the ratio of the matching sides. 2

b. Hence, find the value of x. 2

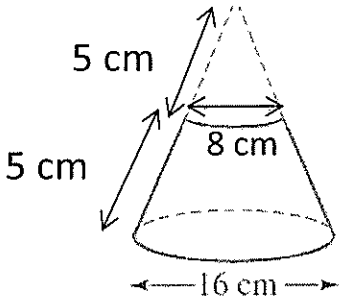
20. Two similar cylinders have volumes of 750 cm^3 and 162 cm^3.



a. Find the ratio of the corresponding heights. 2

b. Hence, find the value of x. 2

*21. Find the surface area to 1dp. 3



End of test

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Name: .....

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10M1 (Mr Wilson) Q 18-21 | 10MA2 (Mr Gong) Q 1-6

10M3 (Mr Cheng) Q 7-13 | 10MA4 (Mrs Lego) Q 14-17

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	Non-linear relationships	Surface Area & Volume	Total
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Extension	/2	/3	/5
	/31	/25	/56

Non-linear Relationships

Gong Q1 ~ 6

1. The increase in length (x cm) of a spring varies directly to the applied force F. When $x = 3$, $F = 100$.

   A. Write a variation equation for x $x \propto F$ $\therefore x = kF$ 1

   B. Find x when $F = 200$ $3 = k(100) \therefore k = \frac{3}{100}$ 1

   when $F = 200$ $x = \frac{3}{100} \times 200$

   $= 6$ cm.

2. Consider the gas trapped inside an airtight cylinder. For a given mass of gas, kept at a constant temperature, the volume varies inversely to the pressure. When V = 10 cm^3, the pressure is 40 units. Find:

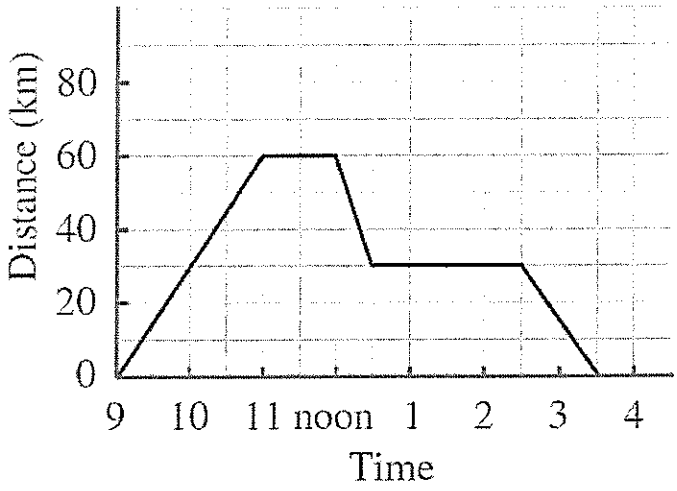
   A. the equation connecting the V and P $V \propto \frac{1}{P} \Rightarrow V = \frac{k}{P}$ 1

   B. the pressure when the volume is 20 cm^3 $20 \times 10 = \frac{k}{40}$, $k = 400$ 1

   $20 = \frac{400}{P}$ $P = 20$ units

3. Michelle lives on a farm 60 km from Gunnedah. She left home at 9 am and drove into town at a speed of 30 km/h. She shopped for 1 hour, then drove back towards home. Having driven for 30 minutes at 60 km/h, Michelle arrived at her parents' house, where she stayed for 2 hours. At 2.30 pm she left and drove home, arriving 1 hour later.

Travel graph showing Michelle's journey.



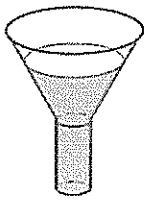
A. How long did it take her to drive into town in the morning? 2 hrs. 1

B. At what time did she reach her parents' house? 12.30 pm. 1

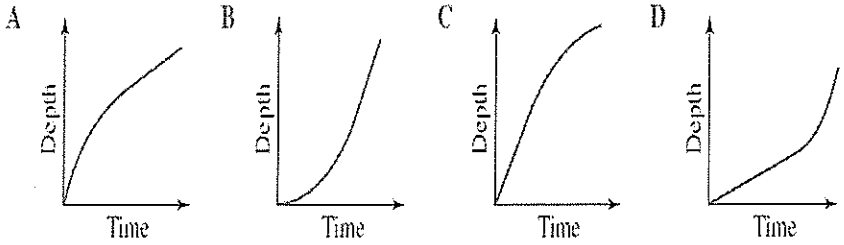
D. How fast did Michelle drive between her parents' house and home? 30 km/h. 1

E. How far did Michelle drive altogether during the day? 120 km. 1

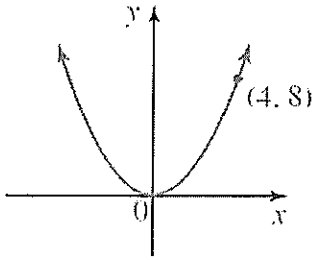
4. A funnel was closed at the base with a stopper, then filled with water at a constant rate. Which graph best shows the change in depth against time? 1



Answer C



5. The curve below is a parabola with equation of the form $y = ax^2$, where a is a constant. Find the value of a and hence determine its equation. 2



$8 = a \times 4^2$

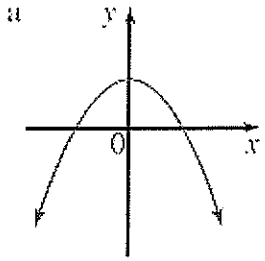
$a = \frac{8}{16}$

$= \frac{1}{2}$ ✓ $\therefore y = \frac{1}{2}x^2$ ✓ or $y = \frac{x^2}{2}$

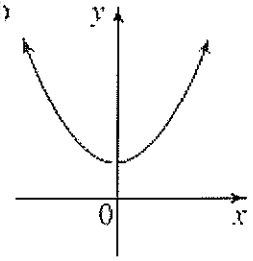
6. Match each of these equations with one of the graphs below. 2

$y = x^2 + 3$ b $y = 3 - x^2$ a

a



b



Cheng Q7-13

7. a. Graph the parabola, $y = 2(x+1)^2$ clearly showing the vertex and y-intercept 2

b. What is the equation of the axis of symmetry?

$x = -1$

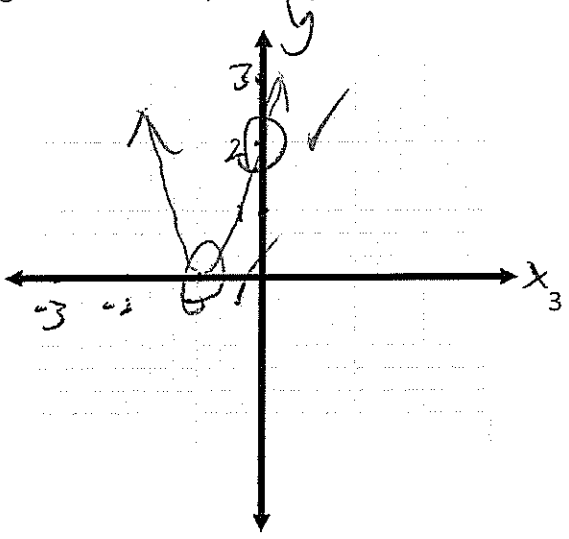
c. Prove the parabola passes through the point (4,50)

$50 = 2(4+1)^2$ ✓

$50 = 2 \times 5^2$

$50 = 50$ ✓

∴ LHS = RHS.



8. Match each of these equations with one of the graphs below. 2

$y = x^3 + 2$ b $y = -x^3 - 2$ a

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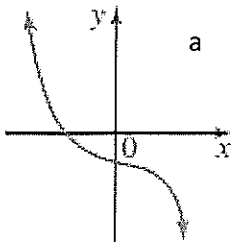
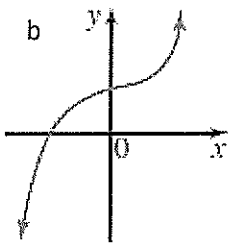
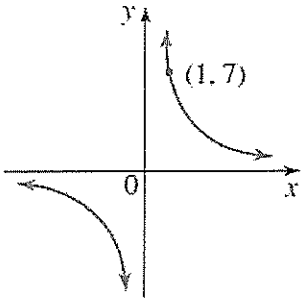


b



9. Find the equation of the hyperbola 2



$y = \frac{k}{x}$ $(1, 7)$

$7 = \frac{k}{1}$

$\therefore k = 7$ ✓

$y = \frac{7}{x}$ ✓

10. Select one description from the list to explain how each of these curves differs from $y = x^4$ 2
(***concave down***, ***moved to the left***, ***moved to the right***)

a. $y = -x^4$ Concave down

b. $y = (x+3)^4$ moved to the left.

11. Do all exponential curves with equations of the form $y = a^x$ (a > 0) have the same 2
y-intercept? **Select:** Yes or No **Justify/Explain** your answer.

anything to the power of zero is always one.

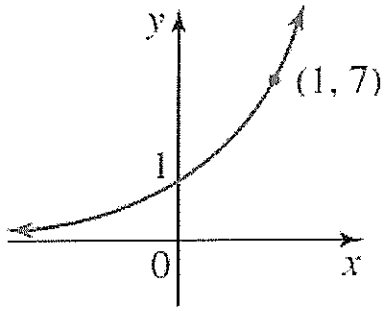
12. Find the equation of each curve in the form $y = a^x$, where ***a*** is an integer. 2

Sub (1, 7) in $y = a^x$

$7 = a^1$ ✓

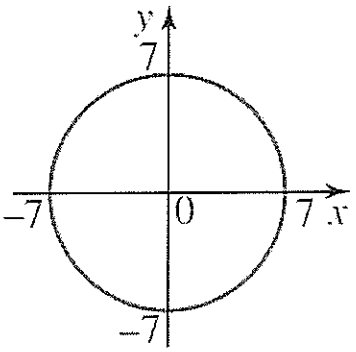
$\therefore a = 7$

So equation is $y = 7^x$ ✓



13. State the equation of the circle. 1

$x^2 + y^2 = 49$



Lego Q14-17

*14. Find the centre and the radius of the circle given in the equation. 2

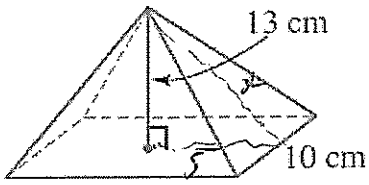
$$4(x-3)^2 + 4(y+1)^2 = \frac{1}{4}$$

$(x-3)^2 + (y+1)^2 = \frac{1}{16}$ ✓

centre $(3, -1)$ ✓ radius $= \frac{1}{4}$ ✓

Surface area and volume

15. Find the surface area of the pyramid to 1 dp. 3



$x^2 = 13^2 + 5^2$ ✓

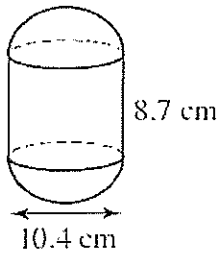
$x = \sqrt{194}$ ✓

$SA = 10^2 + 4 \times \frac{1}{2} \times 10 \times \sqrt{194}$ ✓

$= 100 + 20\sqrt{194}$

$= 378.6\ cm^2$ ✓

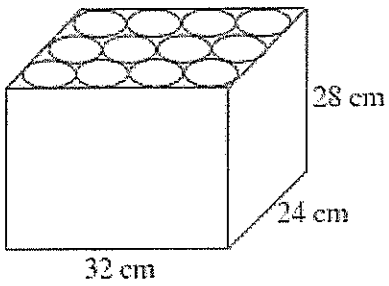
16. Find the surface area to 2 dp. 3



$SA = 4 \times \pi \times 5.2^2 + \pi \times 10.4 \times 8.7$ ✓

$= 624.05\ cm^2$ ✓

17. A box contains 24 cans of Cola. There are 2 layers of cans and each layer holds 3 rows of 4 cans. The box is 32 cm long, 24 cm wide and 28 cm high.



a. Find the height and radius of the cans. 2

$h = 14cm$ $r = 4cm$.

b. Find the total volume of Cola in the box. Answer correct to the nearest cm^3. 2

$V = 24 \times \pi \times 4^2 \times 14$ ✓

$\doteq 16889\ cm^3$ ✓

c. How many litres of Cola are in the box? Answer correct to 1 decimal place. 2

Capacity $= 16889.202\ ml$ ✓

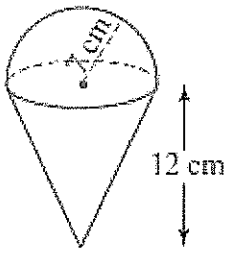
$\doteq 16.9\ L$. ✓

Wilson Q18-21

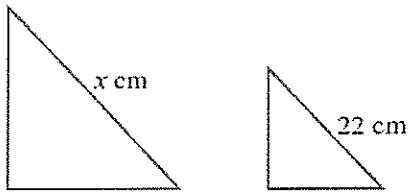
18. Find the volume of the solid to 2dp. 2

$\frac{1}{2} \times \frac{4}{3}\pi \times 7^3 + \frac{1}{3} \times \pi \times 7^2 \times 12$ ✓

$= 1334.13 cm^3$ ✓



19. Two similar triangles have areas of 108 cm^2 and 48 cm^2. The hypotenuse of the smaller triangle is 22 cm.



a. Find the ratio of the matching sides. 2

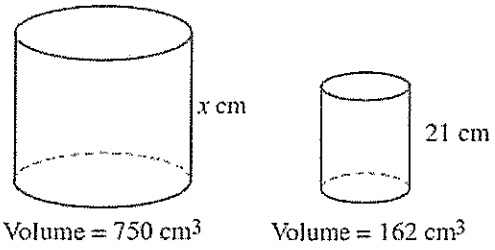
$\frac{L_1}{L_2} = \sqrt{\frac{108}{48}} = \frac{3}{2}$ or 3:2

b. Hence, find the value of x. 2

$x = \sqrt{\frac{108}{48}} \times 22^2$

$x = 33$

20. Two similar cylinders have volumes of 750 cm^3 and 162 cm^3.



a. Find the ratio of the corresponding heights. 2

$\frac{h_1}{h_2} = \sqrt[3]{\frac{750}{162}} = \frac{5}{3}$ or 5:3

b. Hence, find the value of x. 2

$\frac{x^3}{21^3} = \frac{750}{162}$, $x = \sqrt[3]{\frac{750}{162}} \times 21^3$

$= 35 cm$

*21. Find the surface area to 1dp. 3

sides $\pi \times 8 \times 10 - \pi \times 4 \times 5 = 60\pi$ ✓

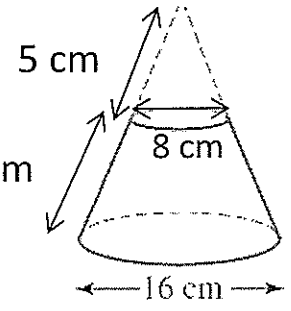
base ~~64π~~ top 16π ✓

$\therefore 60\pi + 64\pi + 16\pi = 439.8 cm^2$ ✓

or

$60\pi + 64\pi = 389.6 cm^2$

accept either as many asked if it had a top.



End of test