

# St Catherine's School Waverley

Year: 10

Pathway: ABC

Time Allowed: 55 mins

Date: May 2008

Name: \_\_\_\_\_

Teacher : \_\_\_\_\_

### Directions to students:

- All questions are to be attempted.
- Not all questions are of equal value.
- All necessary working must be shown in every question.
- Full marks may not be awarded for careless or badly arranged work.
- Answer questions in the space provided.
- Approved calculators may be used.

<b>Q1</b>	/11
<b>Q2</b>	/11
<b>Q3</b>	/8
<b>Q4</b>	/9
<b>Q5</b>	/8
<b>Q6</b>	/13

**TOTAL /60**

QUESTION 1	11 <sup>pts</sup>
<p>a) Kathleen wants to buy a car costing \$21000. She needs to pay 8% deposit.</p> <p>i) How much money is required for the deposit?</p> <p>ii) What is the balance owing after the deposit is paid?</p>	<p>2</p> <p>1</p>
<p>b) Samantha takes a loan for \$4000. The simple interest rate is 12% pa. How much interest must she pay if she repays the loan</p> <p>i) After 3 years?</p> <p>ii) After 4 months?</p>	<p>2</p> <p>2</p>
<p>c) Julia was charged 7.5% pa interest on a loan for \$15000 which she repaid completely in equal monthly instalments over 3 years. What was the amount of each monthly instalment (to nearest cent).</p>	<p>4</p>

<b>QUESTION 2</b>	11
<p>a) Celia invests \$5000 at 7% <b>compound interest</b> for 3 years. Interest is paid at the end of each year.</p> <p>i) What is the investment worth at the end of 3 years?</p> <p>ii) How much interest did she earn in the 3 years?</p>	4
<p>b) Kathleen also invests \$5000 at 7% <b>compound interest</b> for 3 years. Interest is paid at the end of each month.</p> <p>i) What is the investment worth at the end of 3 years?</p> <p>ii) How much interest did Kathleen earn in the 3 years?</p>	4
<p>c) A computer costing \$2500 depreciates at 30% p.a. What is it worth at the end of 2 years?</p>	3

**QUESTION 3**

8

a) Helena is buying a car for \$23000.  
She is required to pay a 20% deposit and then pay \$460 per month  
for 4 years.

i) What is the total amount paid for the car?

2

ii) How much interest has been charged?

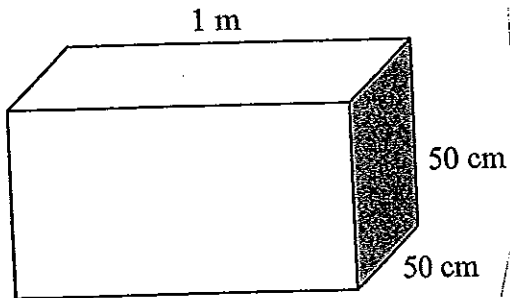
2

iii) What is the flat rate interest on the loan? Express your answer  
as a percentage, to 1 decimal place.

4

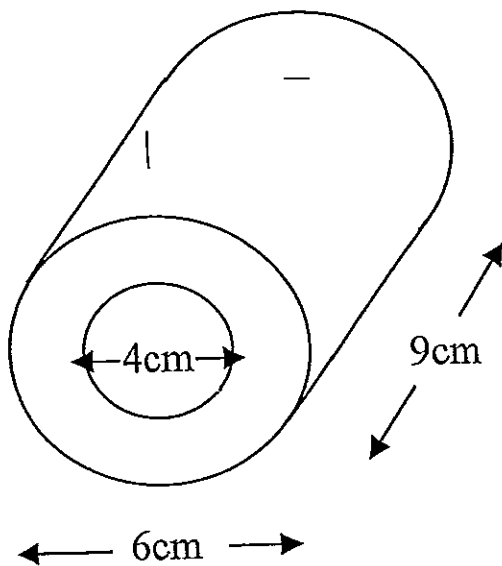
### QUESTION 4

a) Find the surface area of this rectangular prism in  $\text{cm}^2$



3

b) Find the surface area of this pipe. It has an external diameter of 6 cm, an internal diameter of 4 cm, and it is 9 cm long. Answer correct to 1 decimal place.

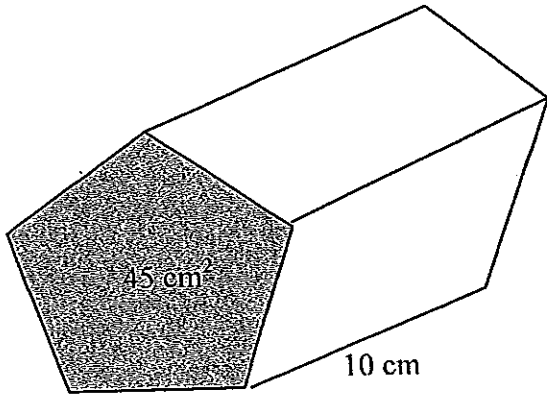


6

QUESTION 5

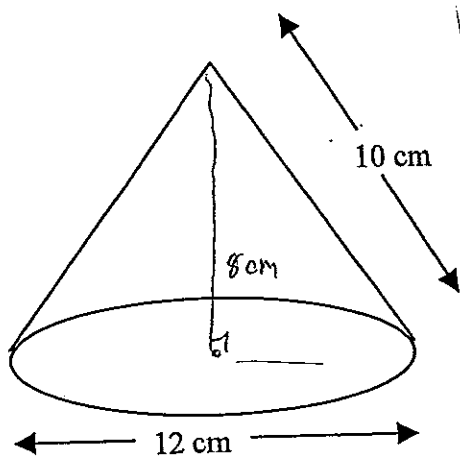
8

a) Find the volume of this pentagonal prism.



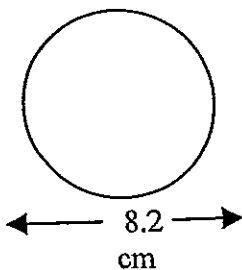
b) Find the volume of this cone. You will need to calculate the height first.

4



c) Find the volume of this sphere, which has diameter  $8.2 \text{ cm}$ , using  $V = \frac{4}{3}\pi r^3$   
(Answer to 1 decimal place.)

2

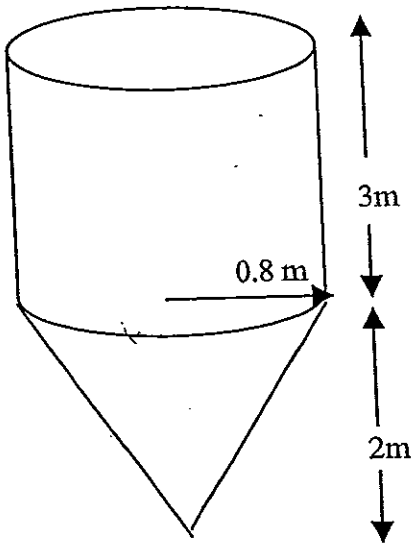


**QUESTION 6 Show careful working.**

The Mrs McCookie Biscuit Company's best seller is the Honey Crunchy. Thousands are sold each day, so the company uses lots of honey. The honey is stored in a dispenser called a hopper.

This hopper consists of a cylinder 3 m high and an inverted cone 2 m high. The cylinder and the cone both have a radius of 0.8 m.

- a) Find its volume in  $\text{m}^3$  (to 1 decimal place)



- b) There is 2000 L of honey in the hopper. How do we know that the conical section is full of honey?
- c) With 2000 L of honey in the hopper, the cylindrical section is part filled with honey. To the nearest cm, calculate how far the level of the honey is from the *top* of the hopper.

d) The hopper needs to be coated on the outside with enamel paint.  
How many square metres need to be painted? (to 1 decimal place)  
NB the top is closed.

6.5

EXTRA WORKING SPACE (If you want this marked, write the number of the question clearly)



SOLUTIONS

**QUESTION 1**

		II
a) Kathleen wants to buy a car costing \$21000. She needs to pay 8% deposit.		11
i) How much money is required for the deposit?	$\begin{aligned} & \$7.04 \times \$21000 \\ & 0.08 \times 21000 \\ & = \$1680 \end{aligned}$	2
ii) What is the balance owing after the deposit is paid?	$\begin{aligned} & 21000 - 1680 \\ & = \$19320 \end{aligned}$	1
b) Samantha takes a loan for \$4000. The simple interest rate is 12% pa. How much interest must she pay if she repays the loan		
i) After 3 years?	$\begin{aligned} I &= 0.12 \times 3 \times 4000 \\ I &= \$1440 \end{aligned}$	2
ii) After 4 months?	$\begin{aligned} I &= 0.04 \times 4000 \times 4 \\ & = \$640 \end{aligned}$	2
c) Julia was charged 7.5% pa interest on a loan for \$15000 which she repaid completely in equal monthly instalments over 3 years. What was the amount of each monthly instalment (to nearest cent)?	<p>Interest = <math>0.075 \times 15000 \times 3</math> = \$3375</p> <p>Total amount = <math>15000 + 3375</math> <u>18375</u></p> <p>Number of monthly repayments = <math>3 \times 12</math> = 36</p> <p>∴ amount of each monthly instalment = <math>18375 \div 36</math> = \$510.42 (nearest cent)</p> <p style="text-align: center; font-size: 2em;">3</p>	4

**QUESTION 2**

		II
a) Celia invests \$5000 at 7% <b>compound interest</b> for 3 years. Interest is paid at the end of each year.		4
i) What is the investment worth at the end of 3 years?	$\begin{aligned} A &= 5000 \times (1 + 0.07)^3 \\ &= \$6125.215 \end{aligned}$	4
ii) How much interest did she earn in the 3 years?	$\begin{aligned} & 6125.215 - 5000 \\ & = \$1125.22 \end{aligned}$	4
b) Kathleen also invests \$5000 at 7% <b>compound interest</b> for 3 years. Interest is paid at the end of each month.		
i) What is the investment worth at the end of 3 years?	$\begin{aligned} A &= 5000 \times \left(1 + \frac{0.07}{12}\right)^{36} \\ & = \$6164.63 \end{aligned}$	4
ii) How much interest did Kathleen earn in the 3 years?	$\begin{aligned} & 6164.63 - 5000 \\ & = \$1164.63 \end{aligned}$	3
c) A computer costing \$2500 depreciates at 30% p.a. What is it worth at the end of 2 years?	$\begin{aligned} A &= 2500 \times (1 - 0.3)^2 \\ & = \$1225 \end{aligned}$	3

**QUESTION 3**

a) Helena is buying a car for \$23000. She is required to pay a 20% deposit and then pay \$460 per month for 4 years.

i) What is the total amount paid for the car?

$$\begin{aligned} \text{Total amount} &= (0.2 \times 23000) + (460 \times 48) \\ &= 4600 + 22080 \\ &= \$26680 \end{aligned}$$

ii) How much interest has been charged?

$$\begin{aligned} 22080 - (23000 - 4600) \\ = \$3680 \end{aligned}$$

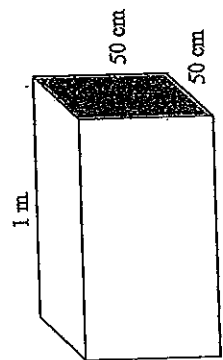
iii) What is the flat rate interest on the loan? Express your answer as a percentage, to 1 decimal place.

$$\begin{aligned} I &= Prt \\ 3680 &= 18400 \times r \times 4 \\ 3680 &= 73600r \\ r &= \frac{3680}{73600} \\ &= 0.05 \end{aligned}$$

$\therefore$  The flat rate interest was 5.0% (1 d.p)

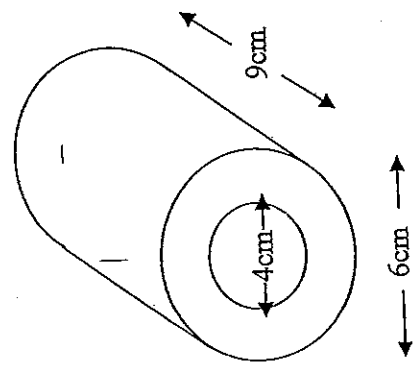
**QUESTION 4**

a) Find the surface area of this rectangular prism in  $\text{cm}^2$



$$\begin{aligned} SA &= 2(A_1 + A_2 + A_3) \\ A_1 &= 50 \times 50 \\ &= 2500 \text{ cm}^2 \\ A_2 &= 100 \times 50 \\ &= 5000 \text{ cm}^2 \\ A_3 &= 5000 \text{ cm}^2 \\ \therefore SA &= 2(2500 + 5000 + 5000) \\ &= 25000 \text{ cm}^2 \end{aligned}$$

b) Find the surface area of this pipe. It has an external diameter of 6 cm, an internal diameter of 4 cm, and it is 9 cm long. Answer correct to 1 decimal place.

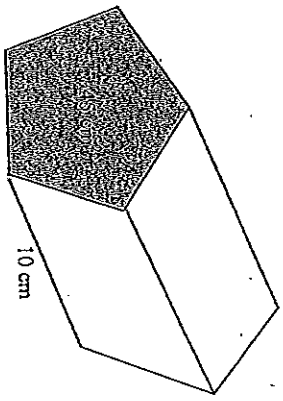


$$\begin{aligned} SA &= A_1 + 2A_2 + A_3 \\ A_1 &= 9 \times (\pi \times 6) \\ &= 9 \times 6\pi \\ &= 54\pi \\ A_2 &= (\pi \times 3^2) - (\pi \times 2^2) \\ &= 9\pi - 4\pi \\ &= 5\pi \\ A_3 &= 9 \times (\pi \times 4) \\ &= 36\pi \\ \therefore SA &= 54\pi + (2 \times 5\pi) + 36\pi \\ &= 54\pi + 10\pi + 36\pi \\ &= 100\pi \\ &= 314.2 \text{ cm}^2 \text{ (1 d.p)} \end{aligned}$$

**QUESTION 5**

8

a) Find the volume of this pentagonal prism.



$$V = Alh$$

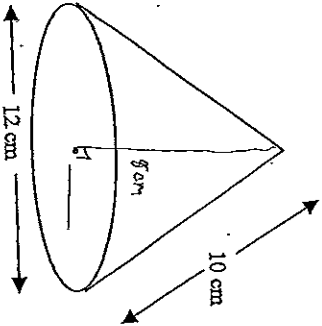
$$A = 45 \text{ cm}^2$$

$$\therefore V = 45 \times 10$$

$$= 450 \text{ cm}^3$$

2

b) Find the volume of this cone. You will need to calculate the height first.



$$h^2 + 6^2 = 10^2$$

$$h^2 = 10^2 - 6^2$$

$$= 64$$

$$\therefore h = 8 \text{ cm}$$

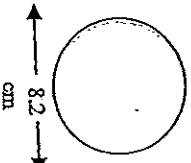
$$V = \frac{1}{3} \times \pi \times 6^2 \times 8$$

$$= 96\pi$$

$$= 301.59 \text{ cm}^3 \text{ (2 d.p.)}$$

4

c) Find the volume of this sphere, which has diameter 8.2 cm, using  $V = \frac{4}{3}\pi r^3$  (Answer to 1 decimal place.)



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

$$= \frac{4 \times \pi \times 4.1^3}{3}$$

$$= \frac{4 \times \pi \times 68.81}{3}$$

$$= \frac{86.75 \pi}{3}$$

$$= 288.7 \text{ cm}^3 \text{ (1 d.p.)}$$

1

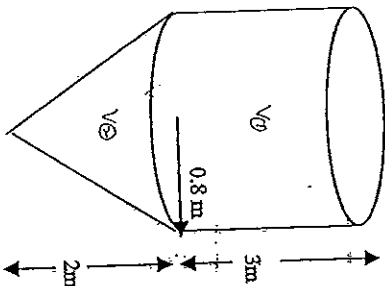
7

**QUESTION 6 Show careful working.**

13

The Mrs McCookie Biscuit Company's best seller is the Honey Crunchy. Thousands are sold each day, so the company uses lots of honey. The honey is stored in a dispenser called a hopper. This hopper consists of a cylinder 3 m high and an inverted cone 2 m high. The cylinder and the cone both have a radius of 0.8 m.

a) Find its volume in  $\text{m}^3$  (to 1 decimal place)



$$V = V_0 + V_1$$

$$V_0 = \pi r^2 h$$

$$= \pi \times 0.8^2 \times 3$$

$$= 1.92\pi$$

$$V_1 = \frac{1}{3}\pi r^2 h$$

$$= \frac{\pi \times 0.8^2 \times 2}{3}$$

$$= 0.64\pi$$

$$\therefore V = 1.92\pi + 0.64\pi$$

$$= 2.56\pi$$

$$= 8.0 \text{ m}^3 \text{ (1 d.p.)}$$

13

b) There is 2000 L of honey in the hopper. How do we know that the conical section is full of honey?

Because the volume of the cone is 2.016  $\text{m}^3$  (2 d.p.) which can hold 2011 L of honey and is therefore full.

c) With 2000 L of honey in the hopper, the cylindrical section is part filled with honey. To the nearest cm, calculate how far the level of the honey is from the top of the hopper.

The amount that the cone can hold is 2011 L, which means that it rises 11 cm above the cone.

$$V = \pi r^2 h$$

$$0.011 = \pi \times 0.8^2 \times h$$

$$0.011 = 0.64\pi h$$

$$h = \frac{0.011}{0.64\pi}$$

$$= 0.0172 \text{ m (2 d.p.)}$$

Because it rises 0.0172 m above the cone, then the distance from the top of the hopper is

$$3 - 0.0172$$

$$= 2.98 \text{ m (2 d.p.)}$$

14

2/3

d) The hopper needs to be coated on the outside with enamel paint.  
How many square metres need to be painted? (to 1 decimal place)  
NB the top is closed.

$$SA = A_0 + A_2 + A_3$$

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

$$SA = \pi \times 0.8^2 + 2\pi \times 0.8 \times 3 + \pi \times 0.8^2$$

$$SA = 0.64\pi + 9.6\pi + 0.64\pi$$

$$SA = 20.88\pi$$

$$SA = 65.6$$

$$\therefore SA = 0.64\pi + 9.6\pi + 0.64\pi$$

$$= 21.7\pi \text{ (1 d.p.)}$$

$$\therefore 21.7\pi^2 \text{ (1 d.p.) needs to be painted.}$$

$$r^2 = 2^2 - 0.8^2$$

$$r^2 = 3.36$$

$$r = \sqrt{3.36}$$

$$r = 1.832$$

$$\therefore A_0 = \pi \times 0.8^2$$

$$= 4.6069... \text{ (4 d.p.)}$$

EXTRA WORKING SPACE (If you want this marked, write the number of the question clearly)