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.

Q1		/11
Q2		/11
Q3		/8
Q4		/9
Q5		/8
Q6		/13

TOTAL **/60**

QUESTION 1

a) Kathleen wants to buy a car costing $21000. She needs to pay 8% deposit.

i) How much money is required for the deposit?

2

ii)What is the balance owing after the deposit is paid?

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?

2

ii) After 4 months?

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).

4

QUESTION 2

11

a) Celia invests $5000 at 7% **compound interest** 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?

ii)   How much interest did she earn in the 3 years?

b) Kathleen also invests $5000 at 7% **compound interest** for 3 years. Interest is paid at the end of each month.

4

i) What is the investment worth at the end of 3 years?

ii)   How much interest did Kathleen earn in the 3 years?

3

c) A computer costing $2500 depreciates at 30% p.a. What is it worth at the end of 2 years?

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?
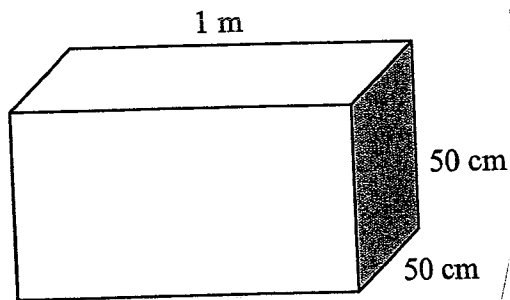
2

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.
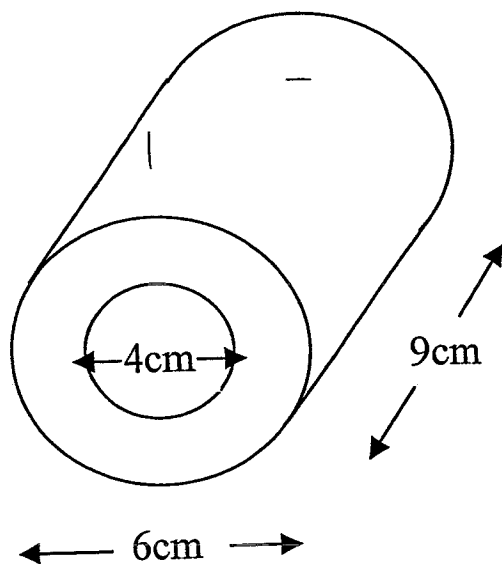
4

8

QUESTION 4

3

a) Find the surface area of this rectangular prism in cm^2

1 m

50 cm

50 cm

6

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.
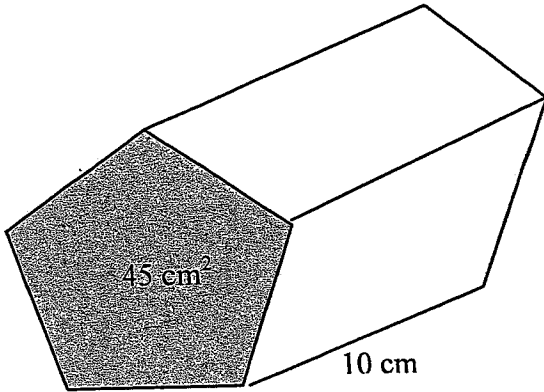

—4cm—

9cm
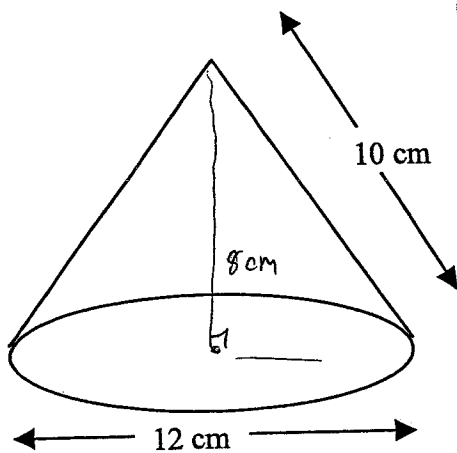
6cm

QUESTION 5

a) Find the volume of this pentagonal prism.

45 cm²

10 cm

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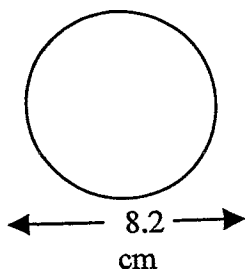
10 cm

8 cm

12 cm

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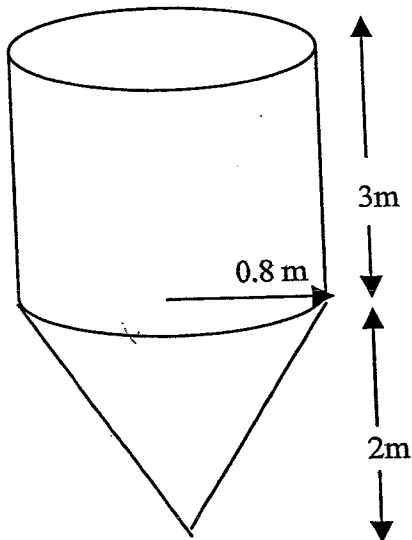
(Answer to 1 decimal place.)

8.2 cm

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 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.

QUESTION 1

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? | 2

8% of $21000

0.08 × 21000

= $1680

ii) What is the balance owing after the deposit is paid? | 1

21000 − 1680

= $19320

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 | 2

i) After 3 years?

$I = 0.12 × 3 × 4000$

$I = 1440

ii) After 4 months? | 2

$I = 0.04 × 4000 × \frac{4}{12}$

= $640

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). | 4

Interest = 0.075 × 15000 × 3

= $3375

Total amount = 15000 + 3375

= $18375

$\frac{15000 +}{3375}$

$\frac{18375}{}$

Number of monthly repayments = 3 × 12

= 36

∴ amount of each monthly instalment = 18375 ÷ 36

= $510.42 (nearest cent)

③

QUESTION 2

a) Celia invests $5000 at 7% **compound interest** for 3 years. Interest is paid at the end of each year. | 11

i) What is the investment worth at the end of 3 years? | 4

$A = 5000 × (1+0.07)^3$

= $6125.215

ii) How much interest did she earn in the 3 years? | 4

6125.215 − 5000

= $1125.22 (2d.p)

b) Kathleen also invests $5000 at 7% **compound interest** for 3 years. Interest is paid at the end of each month. | 4

i) What is the investment worth at the end of 3 years?

$A = 5000 × (1+\frac{7÷12}{100})^{36}$

= $6164.63 (2d.p)

ii) How much interest did Kathleen earn in the 3 years? | 3

6164.63 − 5000

= $1164.63 (2d.p)

c) A computer costing $2500 depreciates at 30% p.a. What is it worth at the end of 2 years? | 3

$A = 2500 × (1−0.3)^2$

= $1225

③

QUESTION 4

a) Find the surface area of this rectangular prism in cm²

1 m
50 cm
50 cm

$SA = 2(A_① + A_② + A_③)$

$A_① = 50×50$
$= 2500 \text{ cm}^2$

$A_② = 100×50$
$= 5000 \text{ cm}^2$
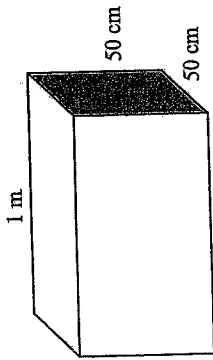
$A_③ = 5000 \text{ cm}^2$

$\therefore SA = 2(2500+5000+5000)$
$= 25000 \text{ cm}^2$ ✓

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.

9cm
4cm
6cm

$SA = A_① + 2×A_② + A_③$

$A_① = 9×(π6)$
$= 9×6π$
$= 54π$

$A_② = (π×3^2) - (π×2^2)$
$= 9π - 4π$
$= 5π$

$A_③ = 9×(4π)$
$= 36π$

$\therefore SA = 54π + (2×5π) + 36π$
$= 54π+10π+36π$
$= 100π$
$= 314.2 \text{ cm}^2$ (1 d.p.) ✓

6

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?

Total amount $= (0.2×23000) + (460×48)$
$= 4600+22080$
$= \$26680$ ✓

2

ii) How much interest has been charged?

$26680 - (23000-4600)$
$= \$3680$ ✓

2

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

$I = Prt$

$I = \$3680$
$P = 18400$
$t = 4$

$3680 = 18400×r×4$

$3680 = 73600$

$r = \dfrac{3680}{73600}$

$= 0.05$

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

4
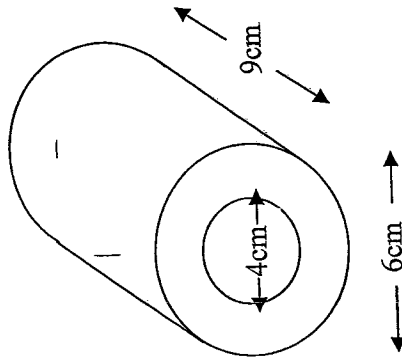
QUESTION 5

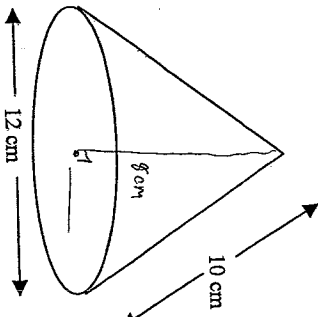a) Find the volume of this pentagonal prism.
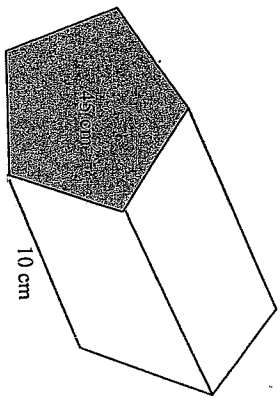
$$V = ah$$
$$a = 45 \, cm^2$$
$$\therefore V = 45 \times 10$$
$$= 450 \, cm^3$$

10 cm

2

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

8 cm

10 cm

12 cm

$$h^2 + 6^2 = 10^2$$
$$h^2 = 10^2 - 6^2$$
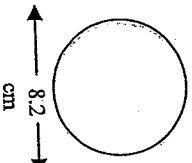$$= 64$$
$$\therefore h = 8 \, cm$$

$$V = \frac{1}{3} \times \pi \times 6^2 \times 8$$
$$= 96\pi$$
$$= 301.59 \, cm^3 \quad (2 \, d.p.)$$

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.)

8.2 cm

$$V = \frac{4\pi r^3}{3}$$
$$= \frac{4 \times \pi \times 4.1^3}{3}$$
$$= \frac{70.4 \, cm^3}{3}$$
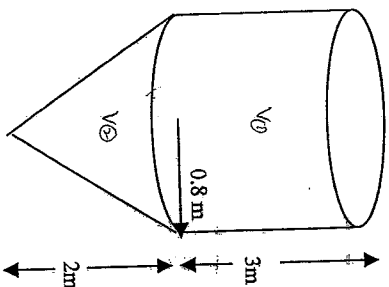$$= 288.7 \, cm^3 \quad (1 \, d.p.)$$

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 m³ (to 1 decimal place)

V①

V②

0.8 m

3 m

2 m

$$V = V① + V②$$
$$V① = \pi r^2 h$$
$$= \pi \times 0.8^2 \times 3$$
$$= 1.92\pi$$
$$V② = \frac{\pi r^2 h}{3}$$
$$= \frac{\pi \times 0.8^2 \times 2}{3}$$
$$= 0.64\pi$$

$$\therefore V = 1.92\pi + 0.64\pi$$
$$= 2.56\pi$$
$$= 8.0 \, m^3 \quad (1 \, d.p.)$$

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 2.0106 m³ (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 L above the cone.

$$V = \pi r^2 h$$
$$0.011 = \pi \times 0.8^2 \times h$$
$$0.011 = 0.64h\pi$$
$$h = \frac{0.011}{0.64\pi}$$
$$= 0.0172 \, m \quad (4 \, d.p.)$$

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

$$3 - 0.0172$$
$$= 2.98 \, m \quad (2 \, d.p.)$$

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.

$SA = A_① + A_② + A_③$

$\therefore SA = 0.64\pi + 4.8\pi + 4.6069$

$= 21.7 m^2 \quad (1 d.p)$

$A_① = \pi r^2$
$= \pi \times 0.8^2$ ✓

$= 0.64\pi$

$A_② = 2\pi r \lambda$
$= 2 \times \pi \times 0.8 \times 3$

$= 4.8\pi$

$\therefore 21.7 m^2 (1 d.p)$ needs to be painted.

$A_③ = \pi r \ell$

$\ell^2 + 0.8^2 = 2^2$
$\ell^2 = 2^2 - 0.8^2$
$\ell^2 = 3.36$
$\ell = \sqrt{3.36}$
$\ell = \sqrt{3.36}$
$\therefore A_③ = \pi \times 0.8 \times \sqrt{3.36}$

$= 4.6069... (4 d.p)$

$\ell^2 = 2^2 + 0.8^2$
$\ell = 2.154$

2/3

3