



St Stephen's School Carramar

SEMESTER 1 2007

Year 10 Mathematics Foundations – PART A

Name: Solutions Teacher: _____

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 5 minutes
Working time for paper: 70 minutes
Marks available: 80 marks

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

Two Question Papers: PART A – Questions 1 to 6 (40 marks)
PART B – Questions 7 to 11 (40 marks)

TO BE PROVIDED BY THE CANDIDATE

Standard Items: pens, pencils, eraser, ruler
Special Items: Drawing instruments, templates and a maximum of 2
graphics calculators satisfying the conditions set by the
Curriculum Council.
One A4 size pages of notes.

INSTRUCTIONS TO CANDIDATES

All questions must be attempted to gain full marks.
All working should be completed with a blue pen and diagrams in pencil.
Marks are allocated for working so show ALL your working.
Enjoy, may you achieve mathematical XTC.

IMPORTANT NOTE TO CANDIDATES

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1. (4 marks)

Hydrogen has a diameter of 1×10^{-8} cm.

(a) Write this measurement as an ordinary number.

0.00000001 cm. ✓

[1]

(b) There are approximately 31000000 seconds in 1 year, write this number in scientific notation.

3.1×10^7 ✓

[1]

(c) Calculate the answer to the following. Leave your answers in scientific notation:

$$(5.4 \times 10^{17}) \div (1.2 \times 10^5)$$

4.5×10^{12}
✓ ✓

[2]

2. (3 marks)

Liquid adhesive is made by mixing components A and B in the ratio 1:20. If 12.6ml of adhesive is required for a small job, find the amount of each component that needs to be used.

A : B

1 : 20

$$20 + 1 = 21 \text{ shares } \checkmark$$

$$12.6 \div 21 = 0.6 \quad \checkmark$$

$$\therefore A = 1 \times 0.6 \rightarrow 0.6 \quad \checkmark$$

$$B = 20 \times 0.6$$

[3]

3. (10 marks)

Louise wishes to invest \$8300 for 5 years. Determine the TOTAL amount of money Louise will have after 5 years with each of the following three options.

(a) OPTION 1: Simple interest at 16% p.a.

$$\begin{aligned} SI &= \frac{PRT}{100} \\ &= \frac{8300 \times 16 \times 5}{100} \checkmark \\ &= \$6640 \checkmark \\ \therefore \text{TOTAL} &= \$14940. \checkmark \end{aligned}$$

[3]

(b) OPTION 2: Compound interest at 14% p.a. compounded annually

$$\begin{aligned} A &= P \left(1 + \frac{R}{100n} \right)^{nt} \checkmark \\ A &= 8300 \left(1 + \frac{14}{100 \times 1} \right)^{1 \times 5} \checkmark \\ A &= \$15980.94. \checkmark \end{aligned}$$

[3]

(c) OPTION 3: Compound interest at 12 % p.a. compounded quarterly

$$\begin{aligned} A &= P \left(1 + \frac{R}{100n} \right)^{nt} \checkmark \\ A &= 8300 \left(1 + \frac{12}{100 \times 4} \right)^{4 \times 5} \checkmark \\ A &= 14990.72 \checkmark \end{aligned}$$

[3]

(d) Which of these three is the better option?

OPTION 2 $\checkmark$

[1]

4. (7 marks)

Expand and simplify (where necessary) the following:

(a) $5h(2h + 4)$

$$10h^2 + 20h \quad \checkmark$$

[1]

(b) $-4g(g - 5) + 6(2g - 8)$

$$\begin{aligned} & \checkmark \quad \checkmark \\ & -4g^2 + 20g + 12g - 48 \\ & -4g^2 + 32g - 48 \quad \checkmark \end{aligned}$$

[3]

(c) $(d + 7)(4d - 9)$

$$\begin{aligned} & 4d^2 + 28d - 9d - 63 \quad \checkmark \checkmark \\ & 4d^2 + 19d - 63 \quad \checkmark \end{aligned}$$

[3]

5. (7 marks)

Find the highest common factor of the following groups of terms:

(a) $10, 12 = 2 \quad \checkmark$

(b) $9a, 21 = 3 \quad \checkmark$

(c) $18x, 2x^2 = 2x \quad \checkmark$

[1, 1, 1]

Factorise the following expressions fully:

(d) $16p^2 - 20p$

$$\checkmark \quad \checkmark \quad 4p(4p - 5)$$

[2]

(e) $40mn - 4m^2 - 12mn^2 + 2m$

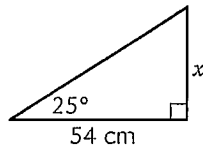
$$\checkmark \quad \checkmark \quad 2m(20n - 2m - 6n^2 + 1)$$

[2]

6. (9 marks)

Calculate the value of the side marked x in each of these triangles. Give your answers to 2 decimal places.

(a)

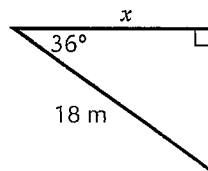


$$\tan 25^\circ = \frac{x}{54} \checkmark$$

$$x = 54 \tan 25^\circ \checkmark$$

$$x = 25.18 \text{ cm} \checkmark$$

(b)

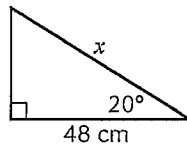


$$\cos 36^\circ = \frac{x}{18} \checkmark$$

$$x = 18 \cos 36^\circ \checkmark$$

$$x = 14.56 \text{ m} \checkmark$$

(c)



$$\cos 20^\circ = \frac{48}{x} \checkmark$$

$$x = \frac{48}{\cos 20^\circ} \checkmark$$

$$x = 51.08 \text{ cm} \checkmark$$

[3, 3, 3]



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Name: Marking Key Teacher: _____

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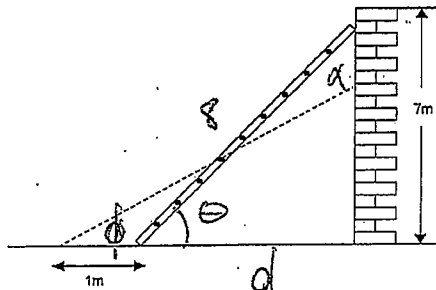
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7. (13 marks)

An 8 metre ladder is placed with its foot on horizontal ground and its top just reaching the top of a vertical wall of height 7 metres.



- (a) Use Pythagoras' Theorem to calculate the distance from the foot of the ladder to the wall, giving your answer to 2 d.p.

$$d^2 = 8^2 - 7^2$$

$$= 64 - 49$$

$$= 15$$

$$d = 3.87\text{m}$$

- (b) Using trigonometry calculate the angle the ladder makes with the ground to the nearest degree.

$$\sin \theta = \frac{7}{8}$$

$$\theta = \sin^{-1} \frac{7}{8}$$

$$= 61^\circ$$

$$\theta = \cos^{-1} \frac{3.87}{8}$$

$$= 61^\circ$$

$$\theta = \tan^{-1} \frac{7}{3.87}$$

$$= 61^\circ$$

- (c) Using trigonometry calculate the angle the ladder makes with the wall to the nearest degree.

$$\sin d = \frac{3.87}{8}$$

$$\cos d = \frac{7}{8}$$

$$\tan d = \frac{3.87}{7}$$

$$d = 29^\circ$$

- (d) With the ladder remaining in contact with both the wall and the ground, the base of the ladder is pulled a further 1 metre from the wall. How far does this action cause the top of the ladder to move down the wall? (give your answer to 2 d.p.)

$$\cos \phi = \frac{4.87}{8}$$

$$\phi = 52.5^\circ$$

$$h = 8 \sin 52.5$$

$$= 6.35\text{m}$$

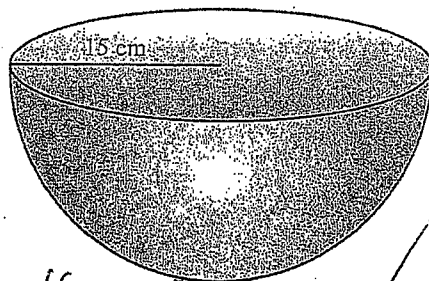
The ladder comes down 0.65m.

8. (5 marks)

The volume of a sphere is given by the following formula:

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

Find the capacity in both millilitres and litres of this fish bowl, giving your answer to the nearest millilitre.



$$V = \frac{1}{2} \times \frac{4}{3} \pi r^3$$

$$= \frac{2}{3} \pi \times 15^3$$

$$= 7069 \text{ cm}^3$$

$$\text{Capacity} = 7.069 \text{ L}$$

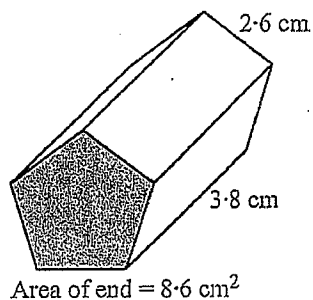
$$= 7069 \text{ mL}$$

[5]

9. (7 marks)

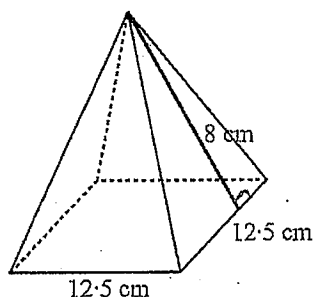
Calculate the total surface areas of these solids expressed to one decimal place:

(a)



$$\begin{aligned} \text{TSA} &= 8.6 \times 2 + 2.6 \times 3.8 \times 5 \\ &= 66.6 \text{ cm}^2 \end{aligned}$$

(b)



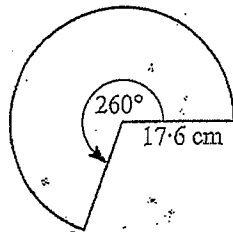
$$\begin{aligned} \text{TSA} &= 12.5^2 + 4 \times \frac{1}{2} \times 12.5 \times 8 \\ &= 356.25 \text{ cm}^2 \\ &\approx 356.3 \text{ cm}^2 \end{aligned}$$

[4]

10. (8 marks)

Work out the perimeter of the shapes below

(a)

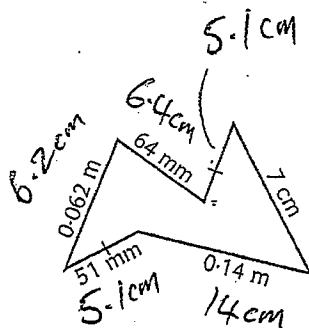


$$P = \frac{260}{360} \times 2 \times \pi \times 17.6 + 2 \times 17.6$$

$$= 115.07 \text{ cm}$$

[5]

(b)



$$P = 43.8 \text{ cm}$$

[3]

11. (7 marks)

A jet ski travels for 1500m at a speed of 5m/s, and then, to conserve fuel, travels 2500m at a speed of 4 m/s.

(a) Calculate the time taken for the whole journey

$$\sqrt{\frac{1500}{5}} = 300s \quad \checkmark$$

$$\sqrt{\frac{2500}{4}} = 625s \quad \checkmark$$

$$\text{Total time} = 925s \quad \checkmark$$

$$\text{or } 15 \text{ min } 25s$$

[5]

(b) Calculate the average speed for the journey

$$\begin{aligned} \text{Total distance} &= 1500 + 2500 \\ &= 4000 \text{ m} \end{aligned}$$

$$S = \frac{d}{t}$$

$$= \frac{4000}{925} \quad \checkmark$$

[2]

$$= 4.32 \text{ m/s} \quad \checkmark$$

END OF EXAMINATION