



St Stephen's School Carramar

SEMESTER 1 2005

Year 10 Foundations of Mathematics

Name: Solutions

Teacher: _____

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 10 minutes
Working time for paper: 2 hours
Marks available 100 marks

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

One Question Paper: – Questions 1 to 15 – 100 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.
Two A4 size page 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

No other items may be taken into the examination room.
It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor BEFORE reading any further

1. [4 marks]

Robert and Debbie own a business where the profits are distributed in the ratio of 3 : 5. How should the profit of \$ 21 360 be shared?

\$8010 for Robert

\$13350 for Debbie.

2. [4 marks]

Calculate the speed in metres per second (m/s) for the following:

a) A jogger who runs 2 km in 20 minutes.

$$= 2000 \text{ m} / 20 \text{ min}$$

$$= 100 \text{ m} / \text{min}$$

$$= 1.6 \text{ m/sec.}$$

b) A stone that falls 120 centimetres in 1.5 seconds.

$$= 80 \text{ cm/sec}$$

$$= 0.8 \text{ m/sec.}$$

3. [4 marks]

a) The distance of the planet Pluto from the Sun is 5 900 000 000 km. Write this in scientific notation.

$$5.9 \times 10^9$$

b) Write the diameter of an atom, which is 0.000 023 millimetres in scientific notation.

$$2.3 \times 10^{-5}$$

4. [6 marks]

a) Tim decides to invest \$ 5 000 at 12.5% over 6 years. How much money will Tim have altogether after this time?

$$SI = \frac{PRT}{100}$$

$$SI = \frac{5000 \times 12.5 \times 6}{100}$$

$$SI = \$3750$$

$$\text{Total} = \$\underline{\underline{8750}}$$

b) Mr Moneybags invested \$ 145 000 over 3 years and received a total of \$ 26 100 in simple interest. What annual interest rate was he receiving?

$$26\ 100 = 145\ 000 \times 3 \times r$$

$$26\ 100 = 435\ 000 r$$

$$\frac{26\ 100}{435\ 000} = r$$

$$0.06 = r$$

$$r = \underline{\underline{6\%}}$$

5. [12 marks]

Ben has a holiday job in 2004 picking fruit for 6 weeks. The amounts earned each week are \$150, \$200, \$245, \$150, \$130 and \$290.

- a) How much did he earn in total?

1

$$\$ 1165$$

- b) He used 25% of this total for FUN and the remainder he will save towards a car. How much will he save during this period?

1

$$\$ 873.75$$

- c) During the next holidays (2005) he would expect to earn 5% extra with inflation. How much will he expect to receive then in total ?

2

$$\$ 1223.25$$

- d) Ben invested his savings (from 2004) in a term deposit earning 4.9% pa compounded yearly for 4 years. How much will he have in this account after the 4 years?

$$A = P \left(1 + \frac{r}{100n} \right)^{nt}$$

3

$$A = 873.75 \left(1 + \frac{4.9}{100 \times 1} \right)^4$$

How much interest will he have received?

$$A = \underline{\underline{\$ 1058.01}}$$

1

$$I = \underline{\underline{\$ 184.26}}$$

- e) Ben's dad suggested instead of a term deposit he loan his savings (from 2004) to his brother John who will pay him 6% pa simple interest for the 4 years. How much interest would Ben receive from his brother?

$$I = \frac{PRT}{100}$$

2

$$I = \frac{873.75 \times 6 \times 4}{100}$$

$$I = \underline{\underline{\$ 209.70}}$$

- f) What would be the better investment (d) or (e)? and why?

2 e) more money (\$25.44 more)

6. [10 marks]

Judith wishes to invest \$5700 for 6 years. Determine the TOTAL amount Judith will have after 6 years with each of the following three options.

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

$$I = \frac{PRT}{100}$$

$$\text{Total} = \$ \underline{\underline{11172}}$$

$$I = \frac{5700 \times 16 \times 6}{100}$$

$$I = \$ 5472$$

2

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

$$A = P \left(1 + \frac{r}{100n} \right)^{nt}$$

$$A = 5700 \left(1 + \frac{14}{100 \times 1} \right)^{1 \times 6}$$

$$A = \$ \underline{\underline{12511.34}}$$

3

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

$$A = P \left(1 + \frac{r}{100n} \right)^{nt}$$

$$A = 5700 \left(1 + \frac{12}{100 \times 4} \right)^{4 \times 6}$$

$$A = \$ \underline{\underline{11586.93}}$$

4

d) Which of these three is the best option.

~~c) or 3.~~ 2.

1

7. [10 marks]

For the following shape,

a. Find the perimeter (accurate to 1 decimal place)

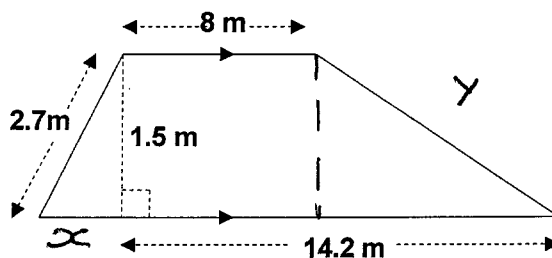
$$x^2 = 2.7^2 - 1.5^2$$

$$x = 2.24 \quad (3)$$

$$y^2 = 1.5^2 + 6.2^2$$

$$y = 6.38 \quad (3)$$

$$\text{perimeter} = \underline{\underline{33.5 \text{ m}}} \quad (2)$$



b. Find the area (accurate to 1 decimal place)

$$A = \frac{1}{2} h (a + b)$$

$$A = \frac{1}{2} \times 1.5 (8 + 16.44)$$

$$A = \underline{\underline{18.33 \text{ m}^2}} \quad 2$$

8. [4 marks]

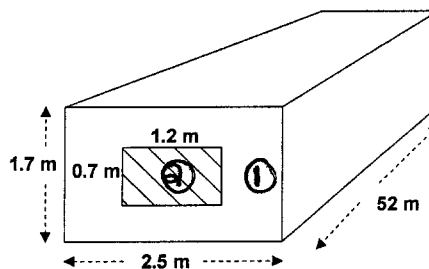
The following rectangular pipe is constructed of cement and has a hollow rectangular centre. Find the volume of cement required to make it. (accurate to 2 decimal places)

$$\textcircled{1} \quad V = L \times W \times H$$

$$V = 221 \text{ m}^3$$

$$\textcircled{2} \quad V = 43.68 \text{ m}^3$$

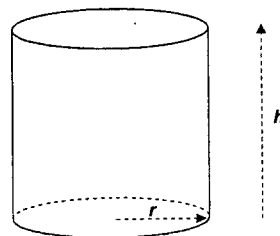
$$\text{Volume} = \underline{\underline{177.32 \text{ m}^3}} \quad 4$$



9. [6 marks]

The formula for the surface area of a cylinder is given as:

$$A = 2\pi r^2 + 2\pi r \times h$$



- a. Calculate the height of a cylinder that has a total surface area of 170 m^2 and radius of 3 m . (accurate to 2 decimal places)

$$170 = 2\pi 3^2 + 2\pi \times 3 \times h$$

$$170 = 56.549 + 18.849 h$$

$$170 - 56.549 = 18.849 h$$

$$113.451 = 18.849 h$$

$$6.02 = h = \underline{\underline{6.02 \text{ m}}}$$

3

- b. i) Transpose the following formula to make m the subject:

$$V = u + mt$$

$$V - u = mt$$

$$\frac{V - u}{t} = m$$

2

- ii) Using this transposed formula determine m if $v = 25$, $u = 5$ and $t = 10$.

$$\frac{25 - 5}{10} = m$$

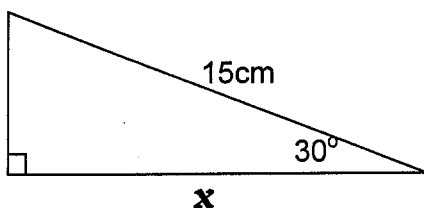
$$\underline{\underline{2}} = m$$

1

10. [4 marks]

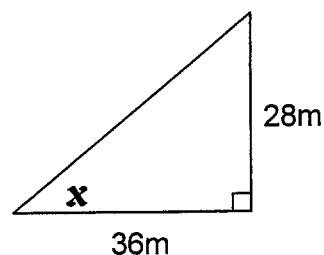
Determine the value of the unknown x accurate to one decimal place in each of the triangles shown below. *Note that neither of the triangles is drawn to scale.*

(a)



$$\cos 30^\circ = \frac{x}{15}$$

(b)



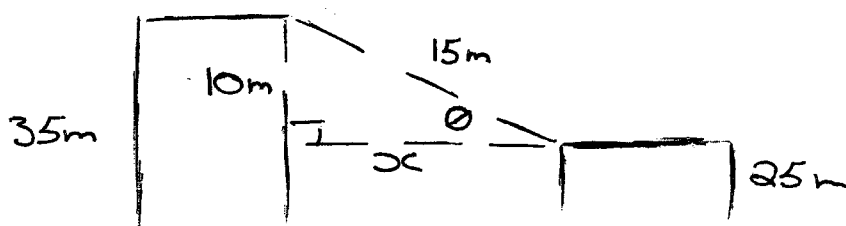
$$\tan \theta = \frac{28}{36}$$

(a) $x = \underline{13.0 \text{ cm.}}$

(b) $x = \underline{37.9^\circ}$

11. [6 marks]

Members of a stunt team wish to make a daring climb along a rope, one end of which has been attached to the top of a 25m building. The other end has been attached to the top of an adjacent building 35m high. If 15m of rope is used to span the gap between the two attachment points, first how far apart are the two buildings. Second, calculate the angle that the rope makes to the horizontal. Express all answers accurate to 3 significant figures. *[Drawing a sketch might be a good starting point to help solve this problem]*



$$15^2 - 10^2 = x^2$$

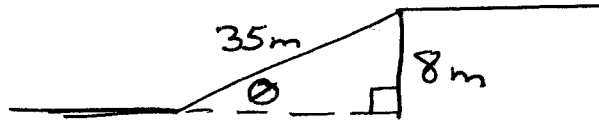
$$x = \underline{\underline{11.2 \text{ m}}}$$

$$\sin \theta = \frac{10}{15}$$

$$\theta = \underline{\underline{41.8^\circ}}$$

12. [4 marks]

A city council hired an architect to draw plans for a roof top car park to service a shopping area. The ground floor is to be kept for the use of local shops and offices. The roof top car park is to be 8.0 m above the street level. If the length of the entrance ramp to this level is to be 35 m, at what angle to the street must the architect place the ramp?



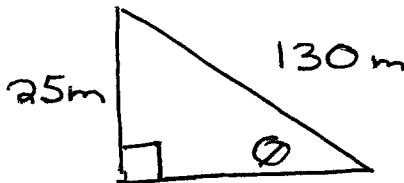
$$\sin \theta = \frac{8}{35}$$

$$\theta = \underline{\underline{13.2^\circ}}$$

13. [6 marks]

Glen flies a kite on a string that is 130 metres long. Find the angle of elevation the string makes when the kite is:

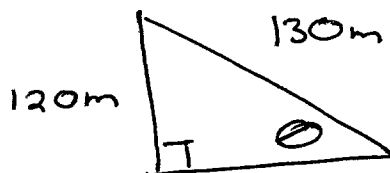
a) 25 metres above the ground.



$$\sin \theta = \frac{25}{130}$$

$$\theta = \underline{\underline{11.1^\circ}}$$

b) 120 metres above the ground.



$$\sin \theta = \frac{120}{130}$$

$$\theta = \underline{\underline{67.4^\circ}}$$

14. [8 marks]

Solve the following equations:

1. a) $3y - 14 = 7$

$$3y = 7 + 14$$

$$3y = 21$$

$$y = \frac{21}{3}$$

$$y = \underline{\underline{7}}$$

b) $40 - 5c = 55$

$$-5c = 55 - 40$$

$$-5c = 15$$

$$c = \frac{15}{-5}$$

$$c = \underline{\underline{-3}}$$

c) $3(2x + 5) = 33$

$$6x + 15 = 33$$

$$6x = 33 - 15$$

$$6x = 18$$

$$x = \frac{18}{6}$$

$$x = \underline{\underline{3}}$$

d) $-7(a - 2) = 20$

$$-7a + 14 = 20$$

$$-7a = 6$$

$$a = \underline{\underline{-0.857}}$$

15. [12 marks]

Solve the following equations

a) $\frac{2(x-3)}{7} + 5 = 9$

$$\frac{2(x-3)}{7} = 9 - 5$$

$$\frac{2x-6}{7} = 4$$

$$2x - 6 = 28$$

$$2x = 34$$

$$x = \underline{\underline{17}}$$

b) $\frac{5}{20} \left(\frac{3x}{4} \right) + \frac{4}{20} \left(\frac{2x}{5} \right) = \frac{20}{46}$

$$5(3x) + 4(2x) = 920$$

$$15x + 8x = 920$$

$$23x = 920$$

$$x = \frac{920}{23}$$

$$x = \underline{\underline{40}}$$

c) $\frac{3x-5}{1} = \frac{10x-1}{3}$

$$3(3x-5) = 1(10x-1)$$

$$9x - 15 = 10x - 1$$

$$\underline{\underline{-14}} = x$$

d) $\frac{3}{9} \left(\frac{7x+2}{3} \right) - \frac{1}{9} \left(\frac{5x-4}{3} \right) = \frac{9}{10}$

$$3(7x+2) - 1(5x-4) = 90$$

$$21x + 6 - 5x + 4 = 90$$

$$16x = 80$$

$$x = \frac{80}{16}$$

$$x = \underline{\underline{5}}$$

END OF EXAMINATION