OUR LADY OF THE SACRED HEART COLLEGE

KENSINGTON

STUDENT – NAME ... MASTER COPY PARTIAL SOLUTIONS

MATHEMATICS TEACHER ...

2010

Year 10

5.3 Mathematics

Time Allowed: 30 mins

Assessed Outcomes

- **NS5.1.2** Solves consumer arithmetic problems involving earning & spending money
- **NS5.2.2** Solves consumer arithmetic problems involving compound interest, depreciation & successive discounts
- **MS5.2.2** Applies formulae to find the surface area of right cylinders and volume or right pyramids, cones and spheres and calculates the surface area and volume of composite solids
- **MS5.2.3** Applies trigonometry to solve problems including those involving bearings
- **MS 5.3.1** Applies formulae to find the surface area of pyramids, right cones and spheres.

Instructions to Candidates:

- Write your name, student number and teacher's name at the top of the cover page.
- Board of Studies approved calculators may be used.
- Formulae sheet may be used.
- Show all necessary working. Marks may be deducted for careless or badly arranged work.
- Good luck!

5.3 Section (30 marks)

Attempt Questions 14 - 17
Allow approximately 30 minutes for this section
Answer each question on the paper provided
All necessary working should be shown in every question.
ROUND OFF to 2 decimal places (if necessary).

Question 14 (6 marks) Start a new page

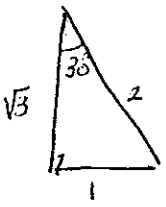
Marks

(a) Evaluate

$23\tan 79 - 5\cos 35$ 114.23 ✓ **1**

(b) Find the exact value of

$\cos 30°$ $\frac{\sqrt{3}}{2}$ **1**



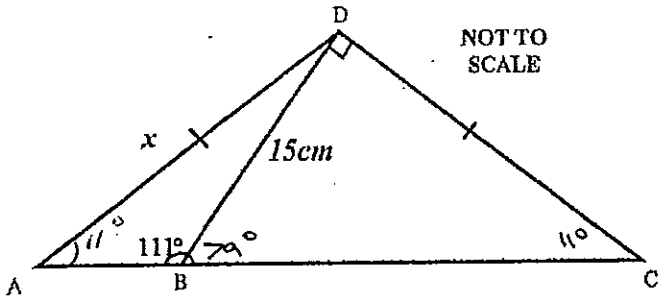
(c) Find θ if

$\sin\theta = 1$ $\theta = \sin^{-1} 1$ **1**

$\theta = 90°$ ✓

(b) In the Diagram below ΔADC is an isosceles triangle and ΔBDC is a right angle triangle.

BD is 15cm. Find:



(i) $\angle$ CBD, **giving reasons** $\angle CBD = 79°$ (angles add to 180° straight line.) ✓ ✓ **1**

(ii) Find the length of x Use Sine Rule **2**

Question 15 (7 marks) Start a new page **Marks**

The table shows the value of an investment of $1 compounded annually at varying rates of interest.

Use this table to find (a) and (b)

Years	5% pa	6% pa	7% pa	8% pa
1	1.0500	1.0600	1.0700	1.0800
2	1.1025	1.1236	1.1449	1.1664
3	1.1576	1.1910	1.2250	1.2597
4	1.2155	1.2625	1.3108	1.3605
5	1.2763	1.3382	1.4026	1.4693
6	1.3401	1.4185	1.5007	1.5869
7	1.4071	1.5036	1.6058	1.7138
8	1.4775	1.5939	1.7182	1.8509
9	1.5513	1.6895	1.8385	1.9990
10	1.6289	1.7909	1.9672	2.1589
11	1.7103	1.8983	2.1049	2.3316
12	1.7959	2.0122	2.2522	2.5182

(a) What is the value of $1 compounded annually at 8% per annum for 7 years? **1**

$1.7138 ✓

(b) Georgia won $1500 and decides to invest it for 5 years. She has 2 options:

Option A: 6% pa compounded annually

Option B: 7% pa simple interest

$= 1500\left(1+\frac{0.06}{1}\right)^5$ = 2007.34 ✓

(i) If she chooses Option A to invest her money, how much interest will she earn? **1**

(ii) Show, by calculation, which option gives her more interest and by how much?

Simple by $6011.66 − $2025 − 2007.34 = $17.66

$S.I = 1500 \times 5 \times \frac{7}{100} = 525$

Total Add $1500 + 525 = $2025

(c) Peter's car depreciated at a rate of 15% p.a.

He bought this car 6 years ago and he sold it for $5000 this year.

$A = P\left(1-\frac{r}{n}\right)^{t \times n}$ ✓

(i) Write the general formula of depreciation. **1**

$A = 5000\left(1-\frac{0.15}{1}\right)^6$

(ii) Find the price of Peter's car when he bought 6 years ago. **2**

$A = \$1885.75$

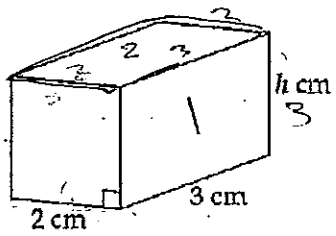
$5000 = P(1-0.15)^6$

Solve for P

Question 16 (8 marks) Start a new page

Marks

(a) The volume of this rectangular prism is 18 cm^3. Find:



NOT TO SCALE

(i) The value of h — 1

3cm ✓

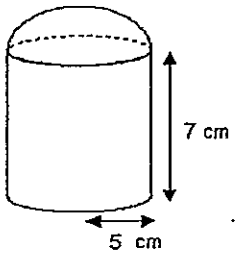
(ii) The total surface area of the prism. — 1

$(2\times3)+2(3\times3)$

$= 24 + 18$ ✓

$= 42$

(b) A solid consists of a cylinder topped by a hemisphere, with a radius 5cm and a height 7 cm.



Calculate the volume of the solid — 2

$(\pi\times5^2)\times7 = 549.78$ ✓

261.80

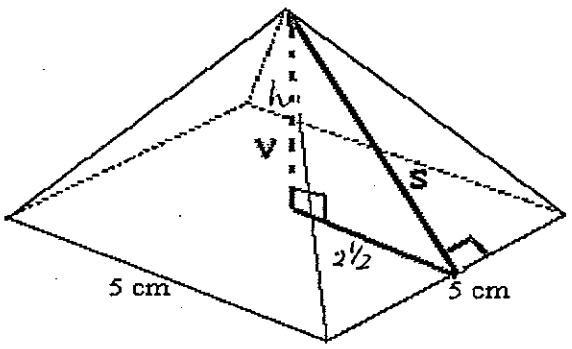
$\frac{4}{3}\pi\times5^3 \div 2 = 1047.20\ cm^3 \div 2$

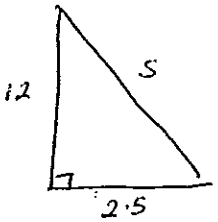
Total = $811.58\ cm^3$

(c) A **square-based** pyramid has a base of edge 5 cm.

The vertex of the pyramid is directly over the midpoint of the base.

The volume of the pyramid is 100cm^3. Using the formula below the picture, find:





Volume of a pyramid = $\frac{1}{3}$ × base area × height.

(i) The vertical height (v) of the pyramid. — 1

$100 = \frac{1}{3}\times b\times h$

$300 = b\times h$

25

(ii) The slant height (s) of the pyramid (Use Pyth. Formula) — 1

(iii) The total surface area of the pyramid — 2

Please ask me!

$\therefore h = \frac{300}{25}$

$= 12$ cm

Turn to next page

Question 17 (9 marks) Start a new page

Marks

(a) Expand and simplify: **2**

(i) $(5m+2)(5m-2)$ $25m^2-4$ ✓

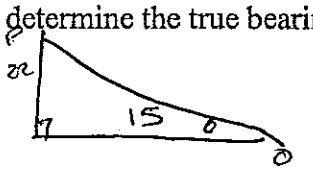
(ii) $(x+3)^2$ x^2+6x+9 ✓

(b) Factorise: **2**

(i) $20x^2-5mx+10m^2x$ $5x(4x-m+2m^2)$ ✓

(ii) y^2+4y+3 ~~$3+y(y+4)$~~ Quadratic using product = 3 sum = 4.

(c) David starts at point O and travels 15km due east. He then turns and travels 22km due north to a Point P. Draw a diagram and determine the true bearing of P from O. **2**

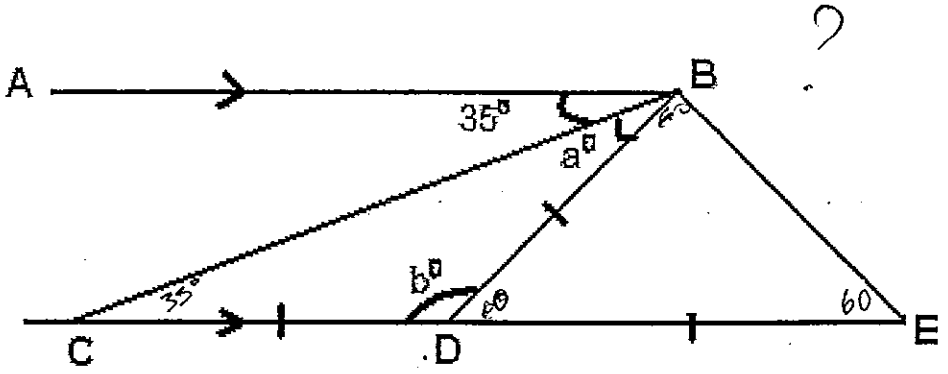


$\tan\theta = \frac{22}{15}$ ✓

$\theta = \tan^{-1}\left(\frac{22}{15}\right)$

$\theta = 55°43'$ ✓

(d) In the figure, find *a and b*, **giving reasons** **3**



End of 5.3 Section