

QUESTION 1 (20 marks)

Marks

a) Simplify $(5\sqrt{3})^2$ (1)

b) Solve
 i) $3(2m-5)=11$ (2)
 ii) $-5p \leq 20$ (1)

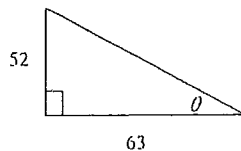
c) Make y the subject of the formula $ay^2 = x$ (1)

d) A bag contains 3 white, 3 blue and 2 yellow marbles. (1)
 What is the probability that if one marble is drawn at random that it will be yellow?

e) The area of a rhombus is 82.8 cm^2 . Given the length of one diagonal is 12 cm find the length of the other diagonal of the rhombus. (2)

f) Simplify $\frac{4x^2 + 5x - 6}{x + 2}$ (2)

g) Find the size of θ to the nearest degree (2)



h) Find the simple interest earned on \$8400 at 17% p.a. for 9 months. (2)

i) Factorise $9x^2 - 1$ (1)

j) Solve $8^x = 4$ (2)

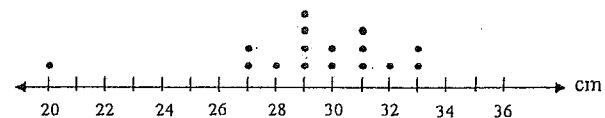
k) If $(2x+3)(x-4) = 2x^2 + bx + c$, find b . (1)

l) Find the height of a cone whose volume is numerically equal to the area of its base. (2)

QUESTION 2 (20 marks)

Marks

a) The lengths of 16 fish caught were measured. The results are shown on this dot plot.



What is the: i) mode? (1)
 ii) range? (1)
 iii) median? (1)
 iv) outlier? (1)

b) Sketch the graph of $y = 16 - x^2$ showing x and y intercepts. (2)

c) Find the exact volume of a square pyramid with base length 10 cm and height 5 cm . (2)

d) Solve i) $x = \frac{2x+8}{x}$ (2)

ii) $3x^2 + 2x - 2 = 0$ (3)

e) Find the size of the largest angle in the triangle having sides of length 10 cm , 12 cm and 15 cm . (3)
 Express your answer correct to the nearest degree.

f) To repay a loan of \$12 500 over 10 years at 14% p.a. interest (reducible). Helen will pay \$194.15 per month. (1)
 Find: i) the total amount Helen pays over the 10 years. (1)
 ii) the amount of interest she pays. (1)
 iii) the equivalent flat rate of interest she is charged per annum. (2)

QUESTION 3 (20 marks)

Marks

a) Given $P(x) = x^3 + 2x^2 - 4x + 1$ and $Q(x) = x^3 + 3x - 1$

Find: i) $P(1)$

ii) $P(x) + Q(x)$

(1)

(1)

b) Machinery valued at \$140 000 depreciates at a rate of 16% p.a.
Find the value of the machinery after 3 years.

(3)

c) Simplify and evaluate each of the following

i) $\log_8 2 + \log_8 4$

(2)

ii) $\frac{1}{2} \log_4 25 - 2 \log_4 \sqrt{20}$

(2)

d) A family has three children.

i) Draw a tree diagram to show the sample space

(1)

ii) Find the probability of: α) 2 boys and a girl

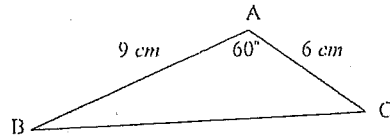
(1)

β) at least one girl

(1)

e) Find the area of $\triangle ABC$ correct to two decimal places.

(2)



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M.A.
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f) Consider the two sets of scores of class tests:

Test 1 has a mean of 65% and a standard deviation of 8.

Test 2 has a mean of 70% and a standard deviation of 4.

Jane obtained a mark of 80% in Test 1 and 79% in Test 2.

In which test did she do better relative to the students in her class and give a reason for your answer.

(2)

g) Solve for x : $(2^x)^2 - 12(2^x) + 32 = 0$

(4)

QUESTION 4 (20 marks)

Marks

a) From the set of scores 1, 5, 7, 9, 11, 2, 2, 10, 11, 11, 11, 10.

Find the inter-quartile range.

(2)

b) On a separate number plane, draw a neat sketch of each of the following showing all relevant features.

i) $x + 3y = 6$

(2)

ii) $x^2 + y^2 = 16$

(1)

iii) $xy = -2$

(2)

iv) $y = 2^{-x}$

(1)

c) Find the compound interest earned if \$9 000 is invested for 3 years at 13% p.a if interest is compounded yearly to the nearest cent.

(3)

d) Solve: i) $\log_8 \sqrt{2} = x$

(2)

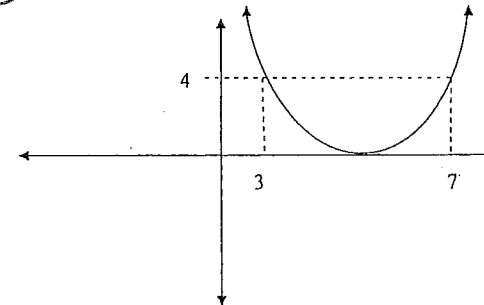
ii) $5^x = 2$

(2)

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e) Find the equation of the parabola

(2)



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f) Two cubes have their surface areas in the ratio 25 : 36.
If the volume of the smaller cube is 250 cm^3 , find the volume of the larger cube.

(3)

QUESTION 5 (20 marks)

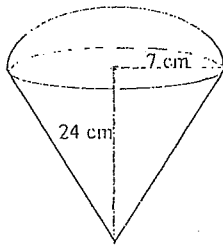
Marks

a) In $\triangle ABC$, $\angle B = 32^\circ 17'$, $b = 10.7 \text{ cm}$ and $a = 12.1 \text{ cm}$.

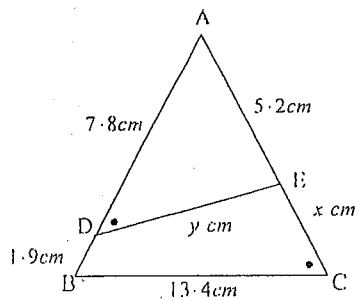
(i) Draw a diagram and label all the information given
(ii) Find $\angle A$

b) Determine the quotient and remainder if $(2x^6 + 2x^4 - 3x^2 + 4) \div (x-1)$

c) Calculate the surface area of the figure, correct to the nearest cm^2 .



d) In the diagram shown, $\angle ADE = \angle ACB$



i) Prove $\triangle ABC \sim \triangle AED$ (3)

ii) Find the values of x and y. (5)

The End

Question 1

a) $(5\sqrt{3})^2 = 75$

b) i) $3(2m-5) = 11$

$$6m - 15 = 11$$

$$6m = 26$$

$$m = 4\frac{1}{3}$$

ii) $-5p \leq 20$

$$p \geq -4$$

c) $ay^2 = x$

$$y^2 = \frac{x}{a}$$

$$y = \pm \sqrt{\frac{x}{a}}$$

d) $P(\text{yellow}) = \frac{2}{8}$

$$= \frac{1}{4}$$

e) $A = \frac{1}{2}xy$

$$82.8 = \frac{1}{2}(12)y$$

$$82.8 = 6y$$

$$\therefore y = 13.8 \text{ cm}$$

f) $\frac{4x^2 + 5x - 6}{x+2} = \frac{(4x-3)(x+2)}{(x+2)}$

$$= 4x - 3$$

g) $\tan \theta = \frac{52}{63}$

$$\therefore \theta = 40^\circ \text{ (nearest degree)}$$

h) $S.I = \frac{P \cdot t}{100}$

$$= \frac{8400 \times 17 \times 12}{100}$$

$$= \$1071$$

i) $9x^2 - 1 = (3x-1)(3x+1)$

j) $8^x = 4$

$$2^{3x} = 2^2$$

$$\therefore 3x = 2$$

$$x = \frac{2}{3}$$

k) $(2x+3)(x-4) = 2x^2 + bx + c$

$$\therefore b = -5$$

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

$$\frac{1}{3}h = 1$$

$$\therefore h = 3$$

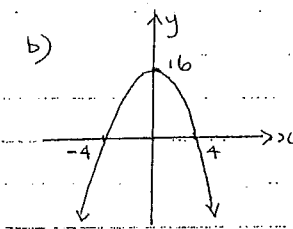
Question 2

a) i) mode = 29

ii) Range = $33 - 20 = 13$

iii) Median = 29.5

iv) Outlier = 20



c) $V = \frac{1}{3}Ah$

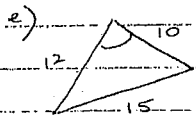
$$= \frac{1}{3}(10)^2(5)$$

$$= 166\frac{2}{3} \text{ cm}^3$$

Question 2 (cont.)

2 d) i) $x^2 = 2x + 8$
 $x^2 - 2x - 8 = 0$
 $(x-4)(x+2) = 0$
 $x = 4$ or $x = -2$

ii) $3x^2 + 2x - 2 = 0$
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
 $x = \frac{-2 \pm \sqrt{4 + 24}}{6}$
 $= \frac{-2 \pm \sqrt{28}}{6}$
 $= \frac{-2 \pm 2\sqrt{7}}{6}$
 $= \frac{-1 \pm \sqrt{7}}{3}$



$$\cos \theta = \frac{12^2 + 10^2 - 15^2}{2(12)(10)}$$

$$\cos \theta = \frac{19}{240}$$

$$\theta = 85.27336$$

$$\theta = 85^\circ \text{ (to the nearest degree)}$$

f) i) Total = $194.15 \times 10 \times 12$
 $= \$23\,298$

ii) Interest = $23\,298 - 12\,500$
 $= \$10\,798$

iii) $S.I = \frac{Prt}{100}$

$$10\,798 = \frac{12\,500 \times r \times 10}{100}$$

$$\therefore r = \frac{10\,798 \times 100}{12\,500 \times 10}$$

$$r = 8.6\% \text{ p.a.}$$

Question 3

a) i) $P(1) = 1^3 + 2(1)^2 - 4(1) + 1$
 $P(1) = 0$

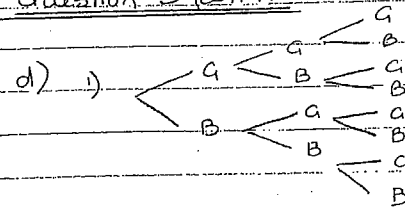
ii) $P(x) + Q(x) = 2x^3 + 2x^2 - x$

b) $A = p(1-r)^n$
 $A = 140\,000 \left(1 - \frac{16}{100}\right)^3$
 $A = \$82\,978.56$

c) i) $\log_8 2 + \log_8 4 = \log_8 8$
 $= 1$

ii) $\frac{1}{2} \log_4 25 - 2 \log_4 \sqrt{20}$
 $= \log_4 5 - \log_4 20$
 $= \log_4 \frac{5}{20}$
 $= \log_4 \frac{1}{4}$
 $= -1$

Question 3 (cont.)



ii) a) $P(B, B, A) = \frac{3}{8}$
 b) $P(\text{at least one girl}) = \frac{7}{8}$

e) $A = \frac{1}{2} ab \sin C$
 $= \frac{1}{2} (6)(9) \sin 60^\circ$
 $= 23.38 \text{ cm}^2$

f) - For Test 1, 80% is just under 2 SD above mean
 - For Test 2, 79% is just above 2 SD above mean
 \therefore Jane did better in Test 2

g) let $m = 2^x$
 $m^2 - 12m + 32 = 0$
 $(m-8)(m-4) = 0$
 $m = 8$ or $m = 4$
 $2^x = 8$ $2^x = 4$
 $2^x = 2^3$ $2^x = 2^2$
 $\therefore x = 3$ $x = 2$

Question 4

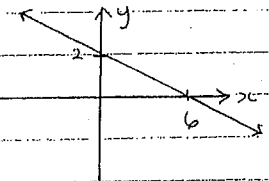
a) $1, 2, 2, 5, 7, 9, 10, 10, 11, 11, 11$

$$Q_1 = \frac{2+5}{2} = 3.5$$

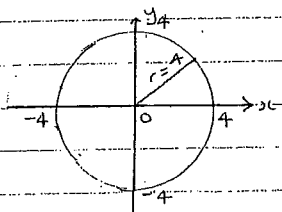
$$Q_3 = \frac{11+11}{2} = 11$$

\therefore Inter-quartile range = $Q_3 - Q_1$
 $= 11 - 3.5$
 $= 7.5$

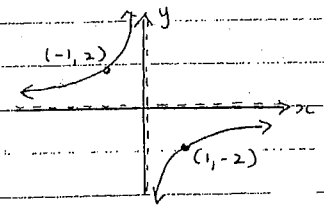
b) i) $x + 3y = 6$



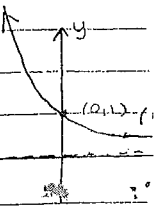
ii) $x^2 + y^2 = 16$



iii) $xy = -2$



iv) $y = 2^{-x}$



Question 4 (cont)

a) $A = P(1+r)^n$
 $= \$9000(1 + \frac{13}{100})^3$
 $= \$12986.07 - \9000
 $= \$3986.07$

d) i) $\log_8 \sqrt{2} = x$ ii) $5^x = 2$
 $\ln 5^x = \ln 2$
 $\sqrt{2} = 8^x$ $x \cdot \ln 5 = \ln 2$
 $2^{1/2} = 2^{3x}$ $x = \frac{\ln 2}{\ln 5}$
 $\frac{1}{2} = 3x$ $\therefore x = \frac{1}{6}$
 $\therefore x = 0.43$

ii) $\log 5^x = \log 2$
 $x = \frac{\log 2}{\log 5}$
 $x = 0.43$

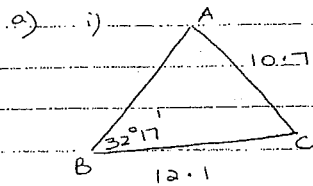
e) $y = (x-5)^2 + b$ $v(5,0)$
 $P(3,4)$
 $4 = (3-5)^2 + b$
 $4 = 4 + b$
 $\therefore b = 0$
 $y = (x-5)^2$

f) Surface Area
 $25 : 36$
 corresponding sides
 $5 : 6$

$\therefore \frac{250}{\text{Volume of large}} = \frac{5^3}{6^3}$

Volume of larger cube = $\frac{250 \times 6^3}{5^3}$
 $= 432 \text{ cm}^3$

Question 5



ii) $\frac{12.1}{\sin A} = \frac{10.7}{\sin 32^\circ 17'}$
 $12.1 \times \sin 32^\circ 17' = \sin A \cdot 10.7$

$\sin A = 0.60398$

$\therefore \angle A = 37^\circ 9'$

or $\angle A = 180 - 37^\circ 9'$
 $= 142^\circ 51'$

b) $2x^5 + 2x^4 + 4x^3 + 4x^2 + x + 5$
 $x-1 \overline{) 2x^5 + 2x^4 - 3x^2 + 4}$
 $2x^5 - 2x^5$
 $2x^5 + 2x^4 - 3x^2 + 4$
 $2x^5 - 2x^4$
 $4x^4 - 3x^2 + 4$
 $4x^4 - 4x^3$
 $4x^3 - 3x^2 + 4$
 $4x^3 - 4x^2$
 $x^2 + 4$
 $x^2 - x$
 $x + 4$
 $x - 1$
 5

\therefore Quotient = $2x^5 + 2x^4 + 4x^3 + 4x^2 + x + 5$
 Remainder = 5

Question 5 (cont)

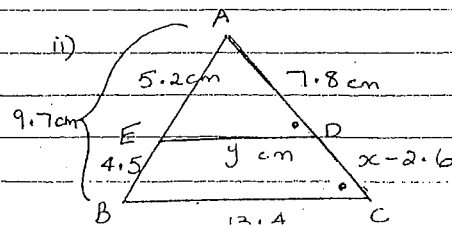
c) Surface area of hemisphere
 $= 2\pi r^2$
 $= 2\pi(7)^2$
 $= 98\pi \text{ cm}^2$

Slant height of cone
 $= \sqrt{h^2 + r^2}$
 $= \sqrt{24^2 + 7^2}$
 $= 25 \text{ cm}$

Surface area of cone
 $= \pi r s$
 $= \pi(7)(25)$
 $= 175\pi \text{ cm}^2$

\therefore Total surface area
 $= 98\pi + 175\pi$
 $= 858 \text{ cm}^2$

d) i) Proof
 In $\triangle ABC$ and $\triangle AED$
 $\angle ADE = \angle ACB$ (given)
 $\angle A$ is common
 $\therefore \triangle ABC \sim \triangle AED$
 Equiangular



$\therefore \frac{AE}{AB} = \frac{ED}{BC} = \frac{AD}{AC}$

$\frac{5.2}{9.7} = \frac{y}{13.4}$

$\therefore y = \frac{5.2 \times 13.4}{9.7}$

$\therefore y = 7.2 \text{ cm}$

$\frac{5.2}{9.7} = \frac{7.8}{x + 5.2}$

$5.2(x + 5.2) = 7.8 \times 9.7$

$5.2x + 27.04 = 75.66$

$5.2x = 48.62$

$x = 9.35$