

Year 10 Advanced Mathematics (1999)

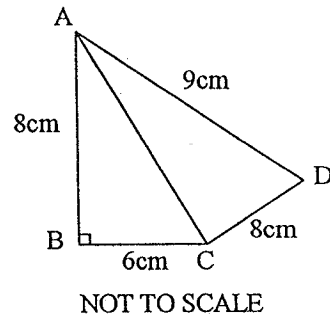
Instructions: Attempt ALL questions  
Show ALL necessary working

Geometry

Part A – Select the best answer to each of the following. There may be more than one correct answer.

Question 1 Why is the figure below not possible:

- A. BC is shorter than AB
- B. AB is the same length as CD
- C. AC is longer than AB
- D. AC is longer than AD



Question 2 An isosceles triangle which is obtuse has:

- A. Two equal sides and an angle less than  $90^\circ$
- B. Two equal sides and an angle greater than  $90^\circ$
- C. Two equal angles and two equal sides
- D. Two equal sides and no equal angles

Question 3 Find the size of one interior angle of a 20 sided figure using the formula Angle Sum of a polygon =  $180(n - 2)^\circ$ , where  $n$  is the number of sides.

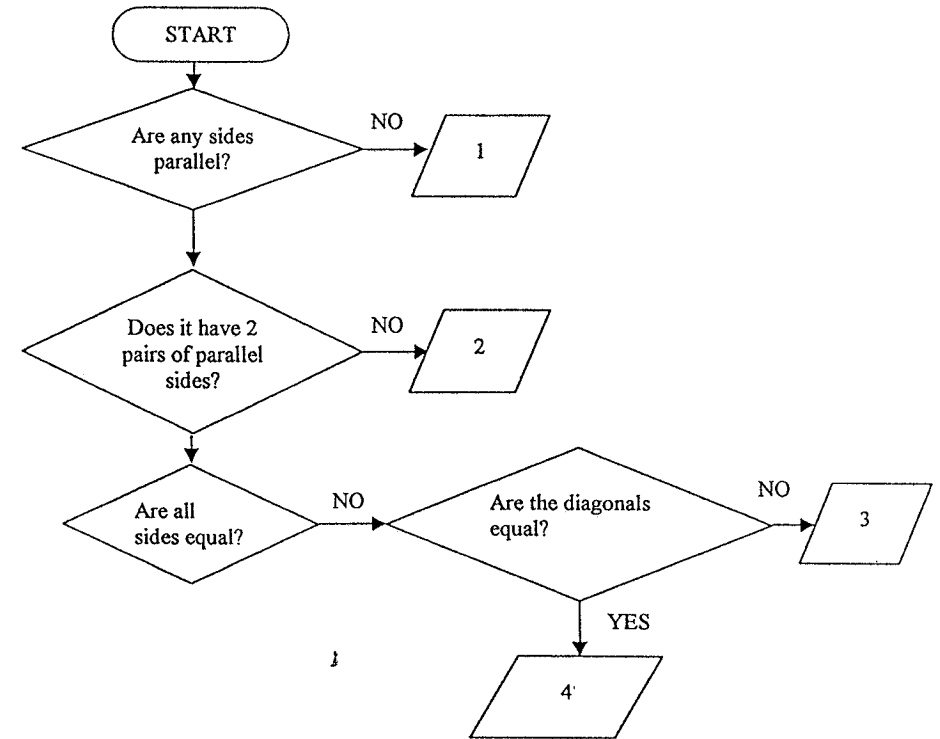
- A.  $3240^\circ$
- B.  $162^\circ$
- C.  $360^\circ$
- D.  $180^\circ$

Yr 10 . 2, 3, 4, 5, 7, 8, 9, 10

Yr 9 Prob  
Yr 9 Stat

Geometry – Part A continued

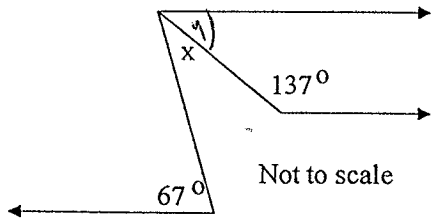
Question 4 Follow the chart below shape number 4 from the list below.



- A. Square
- B. Rectangle
- C. Rhombus
- D. Parallelogram

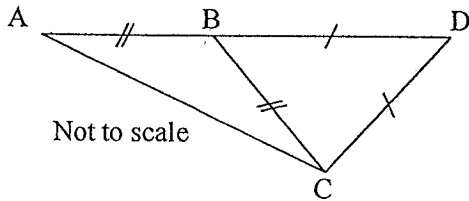
**Geometry – Part B**

**Question 1** Find the value of  $x$  in the diagram below, giving reasons.



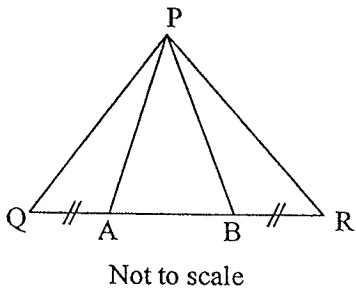
$$\begin{aligned} \angle y &= 180 - 137 \text{ (co-interior } \angle = 180^\circ) \\ &= 43^\circ \\ \therefore \angle x &= 67 - 43 \text{ (alt. } \angle \text{ are equal)} \\ &= 24^\circ \end{aligned}$$

**Question 2**  $\triangle ABC$  and  $\triangle BDC$  are isosceles. Prove that  $\angle BCD = 2x \angle BCA$ .



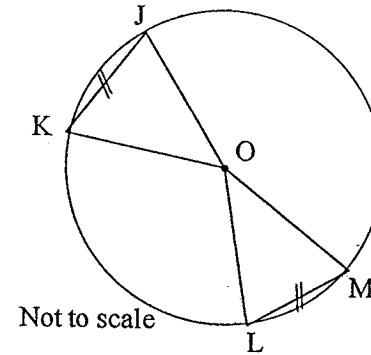
**Question 3** What are the four possible conditions for triangles to be congruent? *SSS, SAS, RHS, SAA*

**Question 4** PQR is an isosceles triangle.  $PQ = PR$  and  $QA = BR$ . Prove  $\triangle PAB$  is isosceles.



**Geometry – Part B continued**

**Question 5** Prove that  $\triangle JOK \cong \triangle LOM$ . O is the centre of the circle.



### Consumer Arithmetic

Instructions: Attempt ALL questions  
Show ALL necessary working

Part A – Select the best answer to each of the following. There may be more than one correct answer.

Question 1 Use the Simple Interest formula,  $I = PRT$ , to find the Simple Interest on \$540 for 7 months at 4% p.a.

- A. \$12.60      B. \$151.20      C. \$1512      D. \$552.60

Question 2 Use the Compound Interest formula,  $A = P(1 + r)^n$ , to find the Compound Interest over 4 years if \$3500 is invested with an interest rate of 5.5% p.a., compounded annually.

- A. \$4335.89      B. \$835.89      C. \$770      D. \$365

Question 3 Use the Depreciation Formula,  $A = P(1 - r)^n$ , to find how much the value of an item worth \$22 000 has depreciated by at 17% each year for 2 years.

- A. \$30 115.80      B. \$15 155.80      C. \$7480      D. \$6844.20

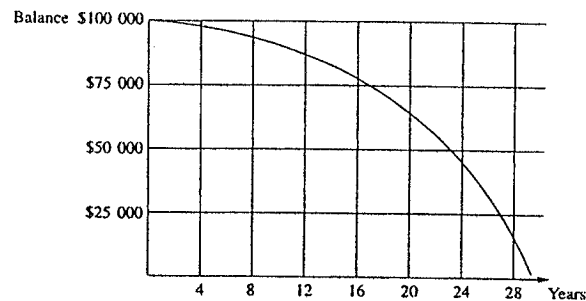
Question 4 The Effective rate of Interest can be calculated by using the formula  $E = \frac{2nR}{n+1}$ , where  $E$  is the effective rate,  $n$  is the number of payments and  $R$  is the flat rate of interest. Calculate the effective rate of interest on a loan of 18% p.a. flat rate with payment to be made in 12 instalments, one per month.

- A. 33%      B. 18%      C. 0.33%      D. 1.36%

### Consumer Arithmetic – Part B

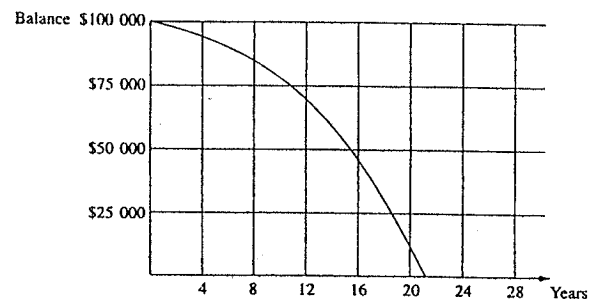
Question 1 The two graphs below show the effects of more frequent loan repayments. Each loan is for \$100 000 at 9.25% p.a. Use the graphs to answer the questions below.

Loan information for monthly repayments for 30 years



Amount financed: \$100000  
Current variable rate: 9.25% p.a.  
Repayment: \$822 per month

Loan information for fortnightly repayment for 21 years 6 months



Amount financed: \$100000  
Current variable rate: 9.25% p.a.  
Repayment: \$411 per fortnight

- Read from the graphs the time or *term* of each loan.
- How much does each borrower pay per month?
- For each loan calculate the total payments to be made.
- Using your answers to c), state in which case you, a borrower, would pay less interest. By how much?
- What are the benefits of paying off the loan fortnightly rather than monthly?

### Consumer Arithmetic – Part B continued

**Question 2** Felicity has worked out that she can afford to pay up to \$450 per month on loan repayments. What is the maximum amount of money she could borrow over 3 years if the simple interest rate is 12% p.a.

**Question 3** The formula below converts a reducible rate of interest to a flat rate of interest.

$$F = \frac{(1+R)^n(nR-1)+1}{n(1+R)^n - n}$$

where:  $F$  is the flat rate per month  
 $R$  is the reducible rate per month  
 $n$  is the number of monthly instalments

Use the formula to change a reducible rate of 24% p.a. over 2 years to an equivalent flat interest rate as a percentage per annum correct to 2 decimal places.

**Hint:** take note that some parts are monthly whereas others are per annum!

### Statistics

**Instructions:** Attempt ALL questions  
 Show ALL necessary working

**Part A –** Select the best answer to each of the following. There may be more than one correct answer.

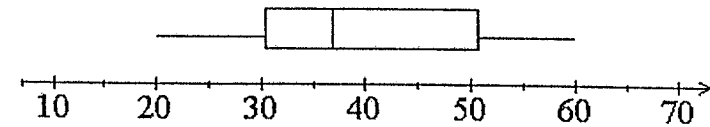
**Question 1** For the following set of scores, {5, 5, 8, 4, 5, 6, 2}, my result is 5. This score of 5 is the:

- A. Mean                      B. Median                      C. Mode                      D. Range

**Question 2** Fred scored the following results in 10 tests: 5, 8, 6, 7, 4, 9, 9, 6.5, 7, 8. Calculate the standard deviation.

- A. 6.95                      B. 5                      C. 10                      D. 1.6

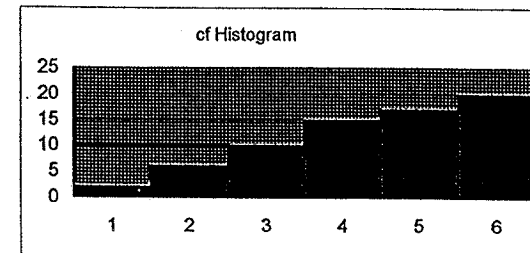
**Question 3** The value of the lower quartile in the diagram below is:



- A. 25                      B. 30                      C. 50                      D. 60%

**Question 4** Refer to the Cumulative frequency histogram below. How many 4's are there?

- A. 5                      B. 10                      C. 15                      D. 20



## Statistics – Part B

**Question 1** Find the median of this set of scores, which have been arranged in a stem-and-leaf plot:

2		7							
3		1	1	5					
4		0	6	6	8				
5		1	1	2	3	3	5	6	
6		3	8						

**Question 2** The following data shows the ages of women attending a gym:

34, 23, 40, 35, 25, 28, 18, 32, 32, 37, 29, 19, 17, 55, 36, 42, 33, 20, 25, 34.

- Display the data on a stem-and-leaf plot.
- Comment on the ages of the women attending the gym.

**Question 3** Refer to the table below:

Score (x)	Frequency (f)
0	4
1	9
2	12
3	7
4	4
5	1

- Find the mean.
- Find the standard deviation.

**Question 4** The heights (in centimetres) of 22 students has been organised into a stem-and-leaf plot shown below.

14		8	9						
15		2	4	6	6	8	9		
16		0	1	1	3	6	7	8	8
17		0	2	3	3	4			

- Find:
- the median
  - the lower and upper quartiles
  - the interquartile range
  - draw a box and whisker plot to show the heights of the students.

## Surface Area and Volumes

**Question 1** A cone has a base diameter of 20cm with a perpendicular height of 24cm.

- Draw a neat sketch to illustrate this information.
- Calculate the *slant* height of the cone.
- Calculate the surface area of the closed cone (i.e. include the circular base) to the nearest  $\text{cm}^2$ .
- Calculate the exact volume (i.e. leave your answer in terms of  $\pi$ ).

**Question 2** A solid sphere has radius  $b$  cm. If it is cut in half to form two hemispheres, what is the ratio of the surface area of the sphere compared to the surface area of one of the hemispheres? (Hint: the answer is NOT 2:1)

## Graphs

**Question 1** For the curve  $y = x^2 - 2x - 8$ ,

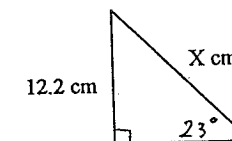
- find the y-intercept,
- find the x-intercepts,
- find the co-ordinates of the vertex,
- sketch the curve.

**Question 2** Sketch these two curves (on separate sets of axes without graph paper) showing all essential features:

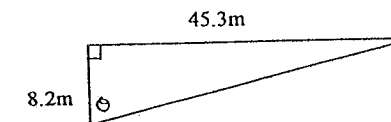
- $y = 3^x$
- $y = \frac{-2}{x}$

## Trigonometry

**Question 1** Find  $x$  correct to 2 significant figures:



**Question 2** Find  $\theta$  to the nearest minute:



**SECTION B (30 marks) : Hand up in a separate section.**

**Quadratic Equations**

**Instructions** Attempt ALL questions  
Show ALL necessary working

**Part A** – Select the correct answer for each question. There is only **ONE** correct answer.

**Question 1** The solutions of the quadratic equation  $x^2 + 5x - 6 = 0$  can be found by solving:

- A.  $(x - 3)(x + 2) = 0$       B.  $(x - 2)(x + 3) = 0$   
C.  $(x - 6)(x + 1) = 0$       D.  $(x - 1)(x + 6) = 0$

**Question 2** The solutions to  $48 = 40t - 8t^2$  are:

- A.  $t = 2$  or  $3$       B.  $t = -2$  or  $3$       C.  $t = 2$  or  $-3$       D.  $t = -2$  or  $-3$

**Question 3** Which statement is *always* true?

- A. Any quadratic equation has two solutions.  
B. Any quadratic equation has one solution.  
C. Any quadratic equation has no solutions.  
D. Any quadratic equation may have two, one or no solutions.

**Quadratic Equations - Part B**

**Question 1** Solve the following quadratic equation, giving answers correct to 2 decimal places:  $2x^2 + 4x + 1 = 0$ .

**Question 2** The width of a rectangular room is 2 metres shorter than its length.

- a) If the length is  $x$  metres, write an expression for the width.  
b) Write a *simplified* expression for the Area,  $A$ , in terms of  $x$ .  
c) If the area of the room is  $255 \text{ m}^2$ , find the dimensions of the room.

**Question 3** A right-angled triangle has lengths of  $y$  cm,  $(2y + 2)$  cm and  $(2y + 3)$  cm.

- a) Using Pythagoras' Theorem write an expression in the form of  $Ay^2 + By + C = 0$ .  
b) Find the length of the hypotenuse.

Geometry.

- 1) 1. D  
 2. B  
 3. B  
 4. B
- 2) 1.  $x = 24^\circ$   
 2.  
 ext  $\angle BAC, \angle BCA = a^\circ$   
 (=  $\angle$ s of isos  $\triangle ABC$ )  
 $\angle DBC = 2a^\circ$   
 (ext  $\angle$  of  $\triangle ABC =$   
 sum of 2 interior opp  $\angle$ s)  
 $\angle DCB = 2a^\circ$   
 (=  $\angle$ s of isos  $\triangle BDC$ )  
 $\angle BCD = 2 \times \angle BCA$

1. SSS  
 SAS  
 SAA  
 RHS

In  $\triangle PQA, \triangle PBR$   
 $PQ = PR$  given  
 $QA = BR$  given  
 $\angle PQA = \angle PRB$   
 (=  $\angle$ s of isos  $\triangle PQR$ )  
 $\triangle PQA \cong \triangle PBR$  (SAS)  
 $AP = PB$   
 (corresp sides in  
 Cong.  $\triangle$ s)  
 $\triangle APB$  is isosceles  
 (2 sides =)  
 In  $\triangle JOK, \triangle LOM$   
 $JO = LO$  (radii of  
 circle)  
 $OK = OM$  (radii of  
 circle)  
 $JK = LM$  given  
 $\triangle JOK \cong \triangle LOM$   
 SSS

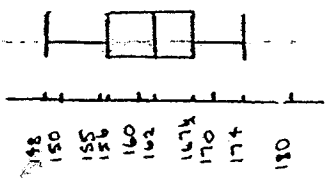
Consumer.

- (A) 1. A  
 2. B  
 3. D  
 4. A
- (B) 1. (a) 30 yrs, 21 yrs 6 months  
 (b) \$822, \$890.50  
 (c) \$295920  
 \$229749  
 (d) Loan 2.  
 866171  
 (e) -  
 2. \$3970.59  
 3. 13.45%

Statistics

- (A) 1. A, B, C  
 2. D  
 3. B  
 4. A
- (B) 1. SI
- |        |               |
|--------|---------------|
| 2(a) 1 | 7 8 9         |
| 2      | 0 3 5 5 8 9   |
| 3      | 2 3 4 4 5 6 7 |
| 4      | 0 2           |
| 5      | 5             |

- (b) mainly in their 20s, 30s.  
 3. (a) 2.03 (to 2dp)  
 (b) 1.24 (to 2dp)  
 4. (a) 162  
 (b) 156, 167½  
 (c) 11.5  
 (d)



Quad Eqns

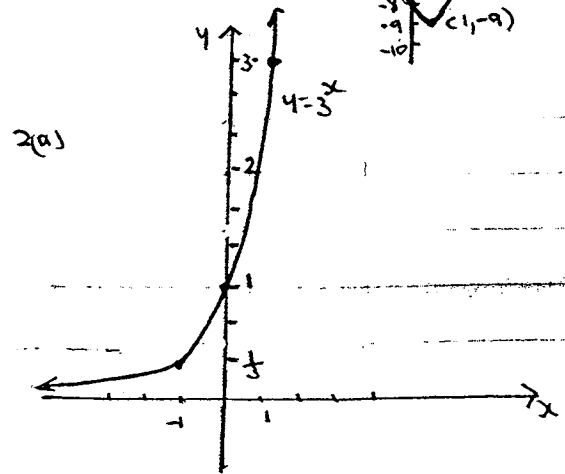
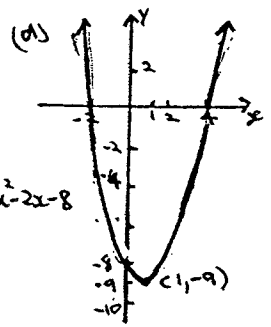
- (A) 1. D  
 2. A  
 3. D
- (B) 1.  $x = -0.29, -1.71$   
 2. (a)  $x = 2$   
 (b)  $x(x-2)$   
 (c) 17m, 15m  
 3. (a)  $y^2 - 4y - 5 = 0$   
 (b) 13cm

SA / Volume

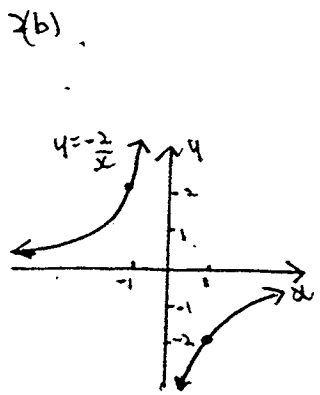
1. (a)
- 
- (b) 26cm  
 (c) 1131cm<sup>2</sup>  
 (d) 8007cm<sup>3</sup>
2. 4:3

Graphs

1. (a) -8  
 (b) 4, -2  
 (c) (1, -9)



GRAPHS



TRIG

1.  $x = 31$ cm  
 2.  $\theta = 79^\circ 44'$