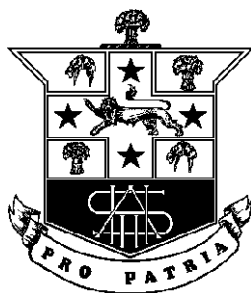# HURLSTONE AGRICULTURAL HIGH SCHOOL

GENERAL MATHEMATICS

2009

YEAR 12

HALF YEARLY EXAMINATION
(ASSESSMENT TASK 2)

Examiners ~ S Gee, S Hackett, G Rawson

GENERAL INSTRUCTIONS

- Reading Time – 5 minutes.
- Working Time – 2 hours.
- Attempt **all** questions.
- Marks may not be awarded for careless or badly arranged work.
- Board approved calculators may be used.
- This examination paper must **NOT** be removed from the examination room.

- This paper contains two sections
  - **Section 1** – 20 multiple choice questions
    Use the answer sheet provided
    (20 marks)

  - **Section 2** – 4 questions worth 15 marks each
    Show all necessary working
    Answer each question in a separate booklet
    (60 marks)

Note: You must hand in an answer booklet for each question, even if the question was not attempted.

STUDENT NAME: _____

TEACHER: _____

SECTION 1
20 questions: 1 mark each
**Use the answer sheet provided.**
(Total 20 marks)

1.   Moranbah has latitude 22°S and longitude 148°E. Mitchell is due South of Moranbah.
     Which of the following could be the latitude and longitude of Mitchell?

     A. 18°S 148°E   B. 22°S 144°E   C. 22°S 152°E   D. 26°S 148°E

2.   Kathmandu is 30° west of Perth. Using the longitude difference, what is the time in Kathmandu
     when it is noon in Perth.

     A. 10:00am   B. 11:30am   C. 12:30pm   D. 2:00pm

3.   The location of Town *A* is (25°N, 45°E). The location of Town *B* is (10°N,105°E).
     Which of the following is true?(Ignore time zones.)

     A. Town *A* is four hours behind Town *B*.   B. Town *A* is four hours ahead of Town *B*.

     C. Town *A* is one hour behind Town *B*.   D. Town *A* is one hour ahead of Town *B*.

4.   Makoua and Macapa are two towns on the equator. The longitude of Makoua is 16°E and longitude
     of Macapa is 52°W. How far apart are these two towns (to the nearest 100 km) if the radius of the of
     the Earth is approximately 6400km?

     A. 4 000km   B. 7 600km   C. 1 447 600km   D. 2 734 400km

5.   *P* and *Q* are points on the circumference of a circle with centre *O* and radius 3 cm.
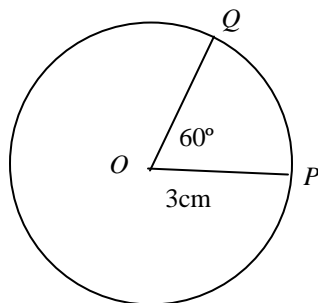
     What is the length of the arc PQ, in centimetres, correct to three significant figures?

     A. 1·57   B. 3·14   C. 4·71   D. 18·8

6. Simplify: $8a - (a - 5b)$

    A. $7a + 5b$ B. $7a - 5b$ C. $7 + 5b$ D. $7 - 5b.$

7. Given that $s = ut - \dfrac{1}{2}at^2$, find the value of s given $u = 8$, $t = 4$ and $a = 3$.

    A. 8 B. 12 C. 48 D. 60

8. The solution to the equation $6x - 4 = 4x + 12$ is

    A. $x = 16$ B. $x = 8$ C. $x = 1 \cdot 6$ D. $x = 0 \cdot 8$

9. Expand and simplify $3x^2 - 10xy - 4x(2y - 3x)$

    A. $15x^2 - 18xy$ B. $-9x^2 - 18xy$ C. $15x^2 - 2xy$ D. $-9x^2 - 2xy$

10. Simplify $\dfrac{20M^8}{4M^2}$

    A. $5M^4$ B. $5M^6$ C. $16M^4$ D. $16M^6$

11. A loan of $150 000 is repaid in monthly instalments of $1266 for 15 years.
Calculate the total interest paid.

    A. $3 990   B. $77 880   C. $131 010   D. $227 880

12. Peter buys a car stereo system for $885 on interest-free terms over 48 weeks.
If he pays 20% deposit first, calculate the size of his weekly repayments.

    A. $14·75   B. $18·44   C. $34·04   D. $36·88

13. Vanessa has a credit card with a daily interest rate of 0.0438% and no interest-free period. She bought a mobile phone for $124 on 9 May using the credit card.
Calculate the interest due on 3 June.

A. $1·25   B. $1·30   C. $1·36   D. $1·41

14. The following table shows the monthly repayments on a personal loan.

| Amount Borrowed	Rate of Interest		
	5%	6%	7%
$	$	$	$
5 000	126	89	79
10 000	252	177	158
15000	377	266	237
20 000	503	354	315

The total interest paid on a loan of $10 000 over 20 years at 6% p.a. is:

A. $2124   B. $3540   C. $32480   D. $42480

15. A loan of $5000 is taken over 3 years. The flat rate of interest is 7% p.a.
The amount of each monthly instalment is closest to:

A. $168   B. $140   C. $1189   D. $431

16. The box and whisker plots shown below compare the marks of students in two classes.
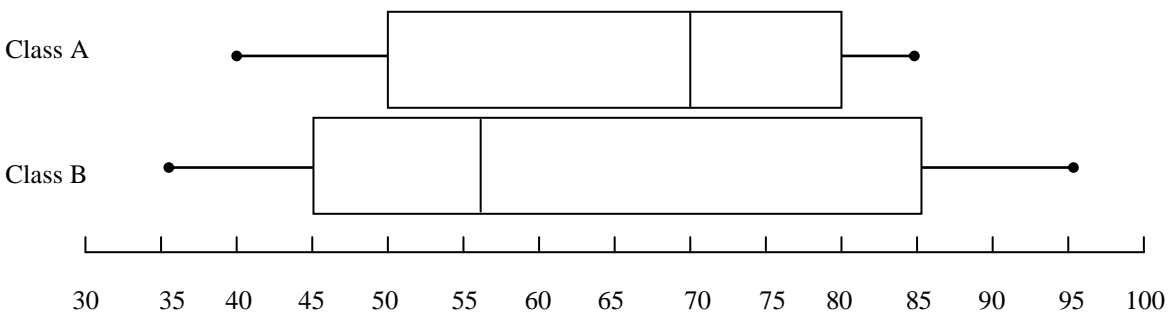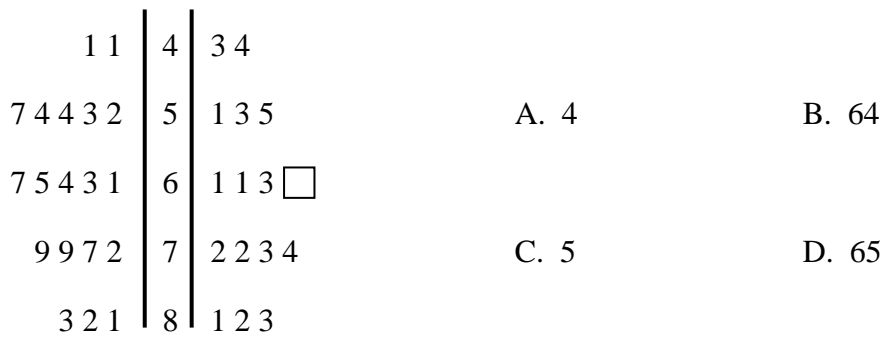

Which of the following is correct?

A. The median of Class B is greatest.   B. Class A is positively skewed

C. The range of Class B is smallest.   D. Class A is negatively skewed

17. The back to back stem-and-leaf plots have the same median.
The value of ☐ is:

```
    1 1 │ 4 │ 3 4
7 4 4 3 2 │ 5 │ 1 3 5              A. 4                    B. 64
7 5 4 3 1 │ 6 │ 1 1 3 ☐
  9 9 7 2 │ 7 │ 2 2 3 4            C. 5                    D. 65
    3 2 1 │ 8 │ 1 2 3
```
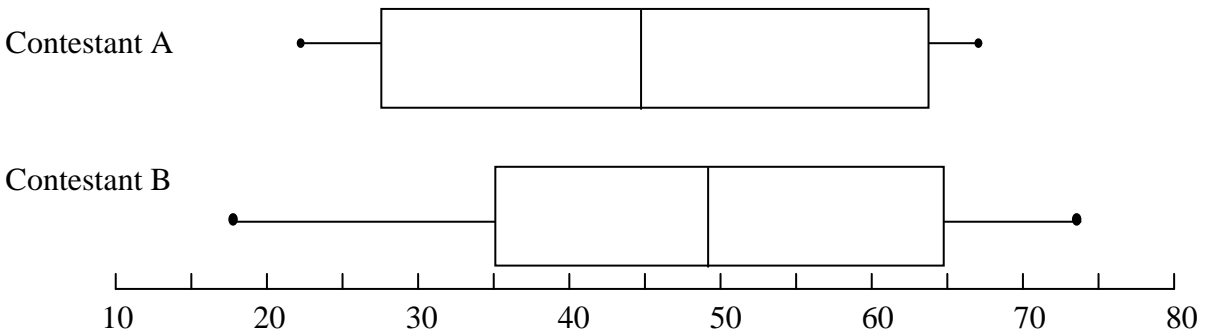
18. Which is true for the set of scores?

   1, 4, 4, 6, 9, 11, 13, 15, 15, 15

   A. The mode is 4 and the median is 9.
   B. The mode is 4 and the median is 10.
   C. The mode is 15 and the median is 9.
   D. The mode is 15 and the median is 10.

19. The scores gained by two contestants A and B, in a competition over 12 rounds are shown in two box and whisker plots.

Which of the following statements is **not** true ?
   A. Contestant B had the highest interquartile range.
   B. Contestant B had the highest median.
   C. Contestant B had the highest range.
   D. Contestant B had the highest score.

20.   The radar chart below shows the water level in two identically shaped tanks over a 24 hour period.

Water Level in Two Tanks
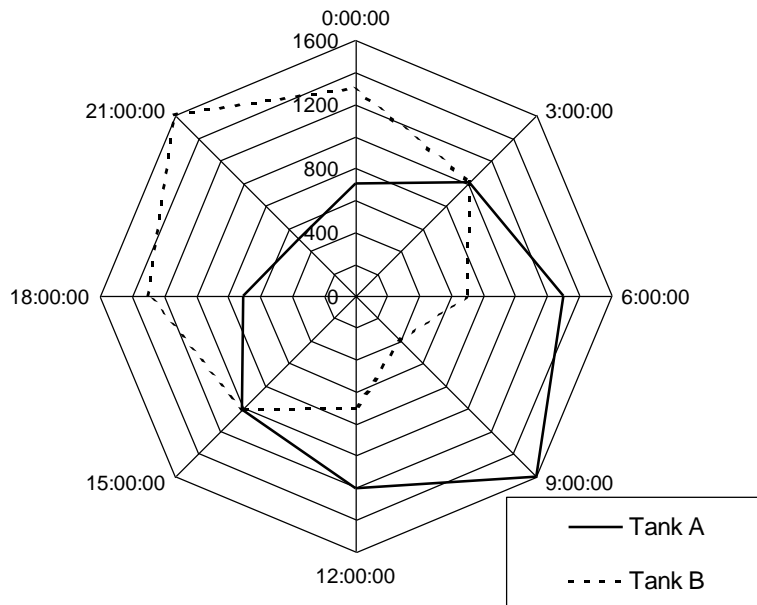
The greatest total volume of the two tanks taken together occurred at

A. 21:00:00   B. 18:00:00   C. 3:00:00   D. 15:00:00

SECTION 2

4 questions: 15 marks each
(Total 60 marks)

Question 21   (15 marks)   (***start a new booklet***)

(a) An aircraft flies directly above the equator from a longitudinal position of 030ºW to longitude 054ºE.

   (i)   Assuming that the radius of the Earth is 6400 km, find the distance of the
            aircraft's flight, correct to the nearest ten kilometres.   **2**

   (ii)   The speed of the aircraft was 650 km/h. How long did the flight last?   **1**
            (Answer to the nearest minute)

   (iii)   The wind-speed indicator in the aircraft is marked in both kilometres per hour
            and knots (1 knot = 1 nautical mile per hour).
            If 1·852 kilometres = 1 nautical mile, calculate a wind speed of 45 knots in km/h.   **1**

   (iv)   If the plane flew into a headwind of 45 knots, determine the actual speed of the plane in
            kilometres per hour and hence calculate the time now for the flight.   **2**
            (Answer to the nearest minute)

(b) Cassie flew from London (52ºN, 0ºE) to Manila (15ºN, 120ºE).
   Her plane left London at 9.30 am Monday (London time), stopped for 5 hours in Singapore and
   arrived in Manila at 4.00pm Tuesday (Manila time).

   What was the total flying time? (Ignore time zones.)   **3**

(c) In the diagram of the Earth, *O* represents the centre and G represents Greenwich. The point A lies on
   the equator. Angle $AOB = 70º$ and angle $AOC = 75º$.
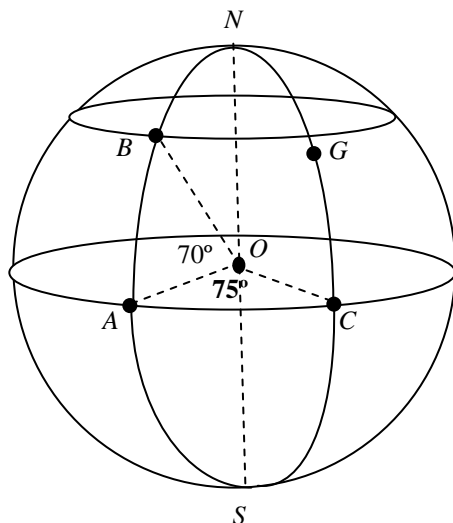
Not to scale

   (i)   If it is 12:30 am Monday in Greenwich, what time and day is it at point *A*?
            (Ignore time zones.)   **2**

   (ii)   What are the coordinates of point *B*?   **2**

   (iii)   Calculate, to the nearest kilometre, the great circle distance from point *A* to point *B*.
            (You may assume that the radius of the Earth is 6400 km, and that
            1 nautical mile = 1·852 km.)   **2**

Question 22 (15 marks)   (*start a new booklet*)

(a)   The capacity of a spherical water tank can be approximated by the formula $C = 500D^3$.
  - C is the capacity of the tank in litres
  - D is the diameter of the tank in metres.

   (i)   The spherical pressure tank on top of a bore has diameter 0·4m.
          What is its capacity?   **1**

   (ii)   A larger spherical storage tank has a capacity of 4000 litres. What is its diameter?   **1**

   (iii) How many of the bore pressure tanks could be filled from the larger storage tank?   **1**

   (iv)   Re-write the formula so that D is the subject.   **1**

   (v)   Re-write the formula so that R is the subject, where R is the radius of the tank.   **1**

(b)   Solve $\dfrac{2x - 3}{4} + 5 = 9$ **3**

(c)   The graph below shows the heights in metres of a rocket and a plane which take off at the same time,
       for the first 6 seconds of their flights.

Time after take off (seconds)
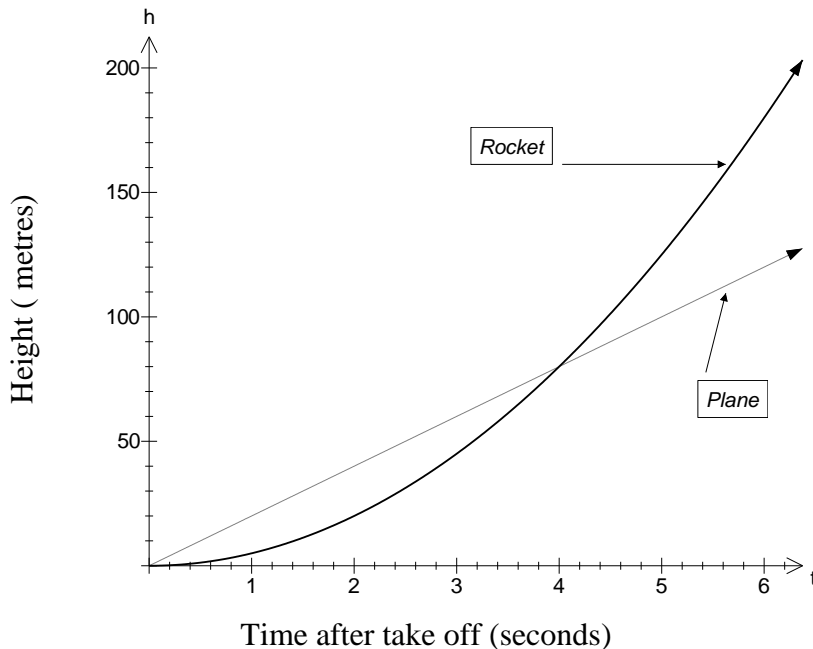
   (i) After how many seconds are the plane and the rocket at the same height,
        and what is this height?   **2**

   (ii) Which has climbed the greater distance in the first 2 seconds and in the first 6 seconds?
        What does this tell you about the speed of the rocket?   **2**

(d) Find the linear function for this table of values.   **3**

x	4	7	12	20
y	10	31	66	122

Question 23   (15 marks)   (*start a new booklet*)

(a) Miguel borrows $50 000 to buy a new truck. The interest rate is 6% p.a. and the monthly repayment is $650.

Amount borrowed	$50 000
Interest rate p.a.	6%
Monthly repayment (R)	$650

No. of months (n)	Principal (P)	Interest (I)	$P+I$	$P+I-R$
1	$50 000	$250	$50 250	$49600
2	$49600	$248	$49848	$49198
3	$49198	$246	$49444	$48794
4			$49038	$48388
5	$48388	$242		A

(i)   How much of the loan has been paid off after 4 months?   **1**

(ii)   Miguel won some money in the 5th month so he made a bigger payment of $5000 towards the loan that month. Find the value that should go in the space marked A.   **1**

(b) The table below shows the monthly repayments for loans with a term of 20 years.

Amount borrowed	5% p.a.	6% p.a.	7% p.a.	8% p.a.
$10 000	$66.00	$71.64	$77.53	$83.64
$15 000	$98.99	$107.46	$116.29	$125.47
$20 000	$131.99	$143.29	$155.06	$167.29
$25 000	$164.99	$179.11	$193.82	$209.11

Pam borrowed $25 000 at 7% p.a. over 20 years.

(i)   Calculate how much she paid in total over the term of the loan.   **2**

(ii)   Hence calculate the interest she paid.   **1**

(c) Phillip bought a $2495 computer using the deferred payment method.
There was no deposit, nothing to pay for 6 months, then 18 monthly payments of $185.
Calculate:

(i)   the total amount paid for the computer   **1**

(ii)   the interest charged   **1**

(iii) the equivalent flat rate interest rate p.a.   **1**

(d) When Mitchell borrowed $80 000 at 7.2% p.a. monthly compounding interest over 10 years, his monthly repayments were $937.13.

This table summarises his loan. All entries are correct to the nearest dollar.

Time	Total Mitchell has repaid	Total amount of interest Mitchell has paid	Balance still owing
End of the 1st year	$11 246	$5 575	$74 330
End of the 2nd year	$22 491	$10 729	$68 237
End of the 3rd year	X	$15 428	$61 692
End of the 4th year	$44 982	$19 641	$54 659
End of the 5th year	$56 228	$23 330	$47 102
End of the 6th year	$67 473	$26 457	$38 984
End of the 7th year	$78 719	$28 980	Y
End of the 8th year	$89 964	$30 854	$20 889
End of the 9th year	$101 210	$32 030	$10 820
End of the 10th year	$112 455	$32 455	$0

(i) Show that Mitchell paid $1176 interest during the 9th year. **1**

(ii) Why did he pay over $5000 more interest in the first year than he did in the 9th year? **1**

(iii) Two values in the table are missing.
What values should be in the positions marked X and Y? **2**

(iv) If interest rates increase and Mitchell leaves his repayments the same, describe how the values in the Balance still owing column will change and give a reason for your answer. **2**

(v) Is it true that even though the interest rate is only 7.2% p.a., almost 30% of Mitchell's repayments will be interest? Use a calculation to support your answer. **1**

Question 24 (12 marks)   (*start a new booklet*)

(a)   The following box and whisker plot shows the results that a class of 20 students achieved on their English test.


39   51·5   59·5   67   99

(i)   What is the range of the scores?   **1**

(ii)   Calculate the interquartile range.   **1**

The results from the same class of students on a mathematics test are displayed in the following stem and leaf plot.

```
4 | 6 9
5 | 1 5 7 9
6 | 2 3 6 8
7 | 0 2 5 7 7
8 | 1 4 7
9 | 4 7
```

(iii)   Find the median, lower quartile, upper quartile and the interquartile range for these results.   **4**

(iv)   If James scored 75 in Maths and 70 in English, which is the better mark, relative to the class results? Explain your answer.   **2**

(b)   The mean of 5, −1, 4 and x is 6. Find the value of x.   **1**

(c)   The maximum temperature in Emu Springs for each day in April is illustrated in the dot plot:

17   18   19   20   21   22

Maximum Temperature $\left(°C\right)$
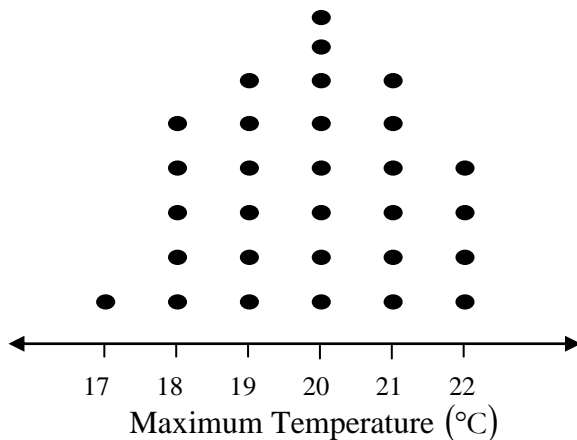
Make a five-number summary of this data set and hence construct a box-and-whisker plot.   **3**

(d)   The area chart below shows information about Australia's population

Australia's population by age groups
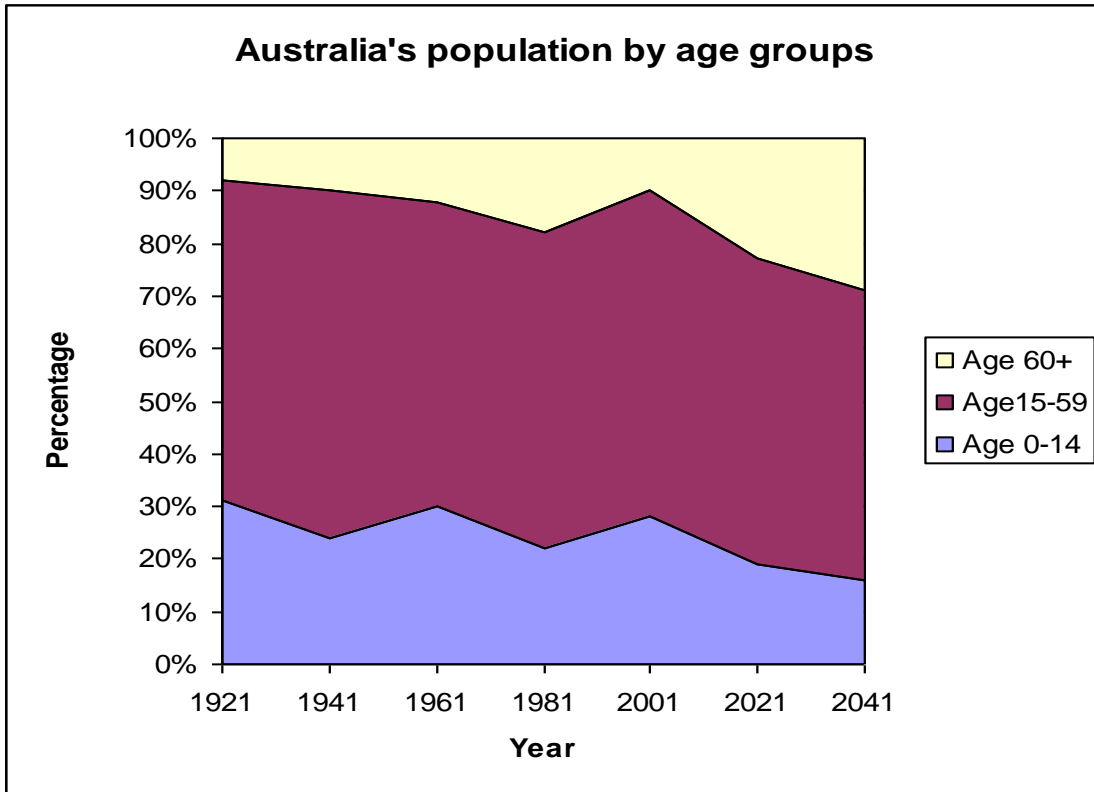
(i)   In 1961, approximately what percentage of the population was aged under 15years?   **1**

(ii)   Approximately what percentage of Australia's population is expected to be over 60
        in 2021?   **1**

(ii)   What does this area chart show about Australia's age groups in the future?   **1**

General Mathematics HSC Half Yearly Exam 2009 Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer

1. A ◯   B ◯   C ◯   D ◯

2. A ◯   B ◯   C ◯   D ◯

3. A ◯   B ◯   C ◯   D ◯

4. A ◯   B ◯   C ◯   D ◯

5. A ◯   B ◯   C ◯   D ◯

6. A ◯   B ◯   C ◯   D ◯

7. A ◯   B ◯   C ◯   D ◯

8. A ◯   B ◯   C ◯   D ◯

9. A ◯   B ◯   C ◯   D ◯

10. A ◯   B ◯   C ◯   D ◯

11. A ◯   B ◯   C ◯   D ◯

12. A ◯   B ◯   C ◯   D ◯

13. A ◯   B ◯   C ◯   D ◯

14. A ◯   B ◯   C ◯   D ◯

15. A ◯   B ◯   C ◯   D ◯

16. A ◯   B ◯   C ◯   D ◯

17. A ◯   B ◯   C ◯   D ◯

18. A ◯   B ◯   C ◯   D ◯

19. A ◯   B ◯   C ◯   D ◯

20. A ◯   B ◯   C ◯   D ◯