Student's name | Student's number | Teacher's name

_____ _____ _____

# Presbyterian Ladies' College, Sydney

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION, 2006

# General Mathematics

## General Instructions

- Reading Time- 5 minutes
- Working Time - 2½ hours
- Write using a blue or black pen
- Calculators may be used
- A Formulae Sheet is provided at the back of this paper.
- Write your student number on every sheet of writing paper.
- Hand in a separately stapled bundle for each of the 6 questions from 23 to 28, with a coloured rectangle attached to the back of each bundle.

**Total marks - 100**

Section I

**22 marks**

- Attempt Questions 1-22
- Allow about 30 minutes for this section
- Answer on the multiple choice answer sheet provided

Section II

**78 marks**

- Attempt questions 23 – 28
- Allow about 2 hours for this section
- Answer on writing paper.

| MC | 23 | 24 | 25 | 26 | 27 | 28 | Total |
|---|---|---|---|---|---|---|---|
| | | | | | | | % |

# Section I

**Total marks (22)**

**Attempt Questions 1-22**

**Allow about 30 minutes for this section**

Use the multiple choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

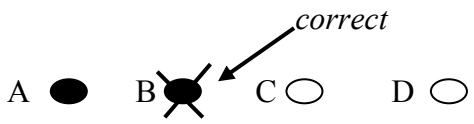
**Sample** **2 + 4 = ?** **(A) 2 (B) 6 (C) 8 (D) 9**

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:




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**1.** 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.

**2.** Solve the equation.

$$6x - 4 = 4x + 12$$

(A) $x = 16$
(B) $x = 8$
(C) $x = 1.6$
(D) $x = 0.8$

**3.** Marcus follows four teams in four different sports. Each team's recent record of wins and losses is shown below.

| Sport | Team | Record |
|---|---|---|
| Rugby League | Leopards | 14 wins from 20 games |
| Rugby Union | Banksias | 6 wins and 2 losses |
| Basketball | Emperors | A 65% success rate |
| Aussie Rules | Geese | Lost $\frac{1}{3}$ of their games |

Based on recent records, which team has the greater probability of winning their next game?

(A) Leopards
(B) Banksias
(C) Emperors
(D) Geese

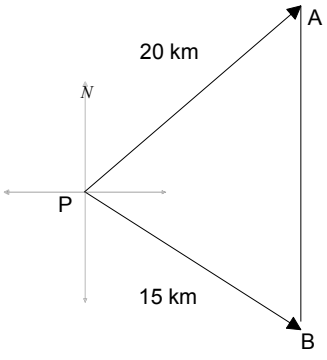
**4.** The photograph below shows a car which is 3.6 metres long.



The scale of the photograph is nearest to:

(A) 1 : 3
(B) 1: 12
(C) 1 : 30
(D) 1 : 36

**5.** Two ships sail from a port P.
Ship A sails 20 km on a bearing 049
Ship B sails 15 km on a bearing 139
The distance AB between the ships is :




(A) 12 km
(B) 5.5 km
(C) 35 km
(D) 25 km

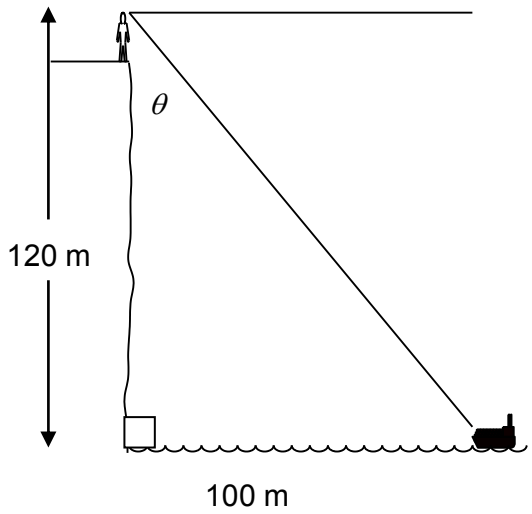
**6.** Rebecca is a salesperson and is paid a retainer of $450.00 per week plus a commission of 12% of all sales over $5 000.00. What is she paid for a week in which her sales were $7 400.00?

(A) $ 1 338
(B) $ 942
(C) $ 738
(D) $ 1050

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

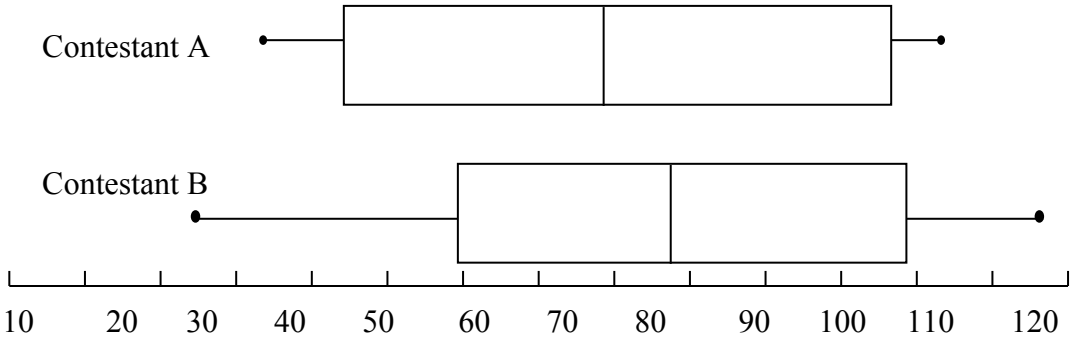
(A) $15x^2 - 18xy$
(B) $-9x^2 - 18xy$
(C) $15x^2 - 2xy$
(D) $-9x^2 - 2xy$

**8.** Find the size of the angle $\theta$ to the nearest minute.




(A) 56° 26'
(B) 39° 48'
(C) 33° 56'
(D) 50° 12'

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




Which 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.

**10.** Calculate the value, after two years, of an investment of $ 40 000 which is invested at 8% p.a. compounding quarterly.

(A) $ 46 866.38
(B) $ 46 656.00
(C) $ 41 616.00
(D) $ 46 794.34

**11.** A game uses two special dice which are both coloured red on one face, blue on two faces and green on three faces. To start the game a player must roll green with the first die and anything except red on the second die. The probability of starting on a given roll would be given by:

(A) $\frac{1}{2} \times \frac{1}{6}$
(B) $\frac{1}{2} + \frac{1}{6}$
(C) $\frac{1}{2} \times \frac{5}{6}$
(D) $\frac{1}{2} + \frac{5}{6}$

**12.** The height of a student is given as 155 cm ( to the nearest cm.) The percentage error in this measurement is:

(A) ± 0.65%
(B) ± 0.%
(C) ± 0.5%
(D) ± 0.32%

**13.** Use the table below to find the tax payable by Kristy who has a gross income of $30 000 and allowable deductions of $2 400.00

| *Taxable income* | *Tax on this income* |
|---|---|
| $0 – $6 000 | NIL |
| $6 001 – $22 000 | 16 cents for each $1 over $6 000 |
| $22 001 – $45 000 | $2 560 plus 25 cents for each $1 over $22 000 |
| $45 001 – $60 000 | $8 310 plus 40 cents for each $1 over $45 000 |
| $60 001 and over | $14 310 plus 48 cents for each $1 over $60 000 |

(A) $6 900
(B) $3 960
(C) $9 460
(D) $4 560

**14.** The distance that an object falls varies directly with the square of the time taken. An object falls 40 metres in 2 seconds. How far would the object fall in 4 seconds?

(A) 80 metres
(B) 160 metres
(C) 320 metres
(D) 120 metres

**15.** Find the present value of an annuity invested at 8% p.a. compounding annually for 4 years if it's future value is $20 000.

(A) $90 122.24
(B) $88 323.38
(C) $14 700.60
(D) $13 611.66

**16.** A survey of males and females showed their ownership of mobile phones. The results are summarised in the table below.

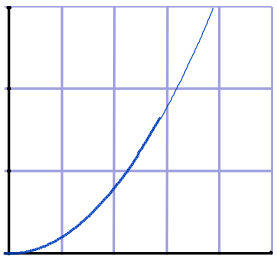
| | Males | Females |
|---|---|---|
| Own a mobile phone | 450 | 520 |
| Don't own a mobile phone | 250 | 180 |

If a person were chosen at random from this group, what is the probability that they would be a male who owned a mobile phone?

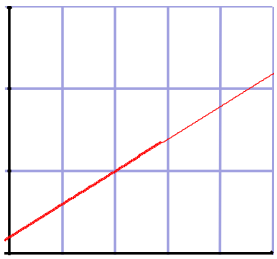
(A) $\frac{9}{28}$
(B) $\frac{5}{28}$
(C) $\frac{9}{14}$
(D) $\frac{1}{2}$

**17.** Which of the following graphs could have an equation $y = 2 - x^2$ ?

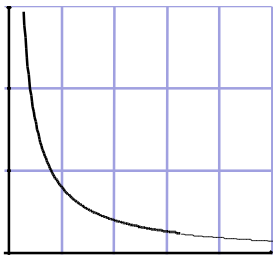
(A)



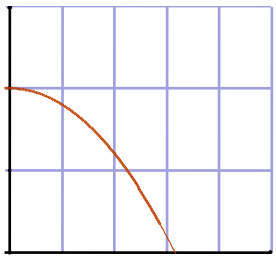
(B)



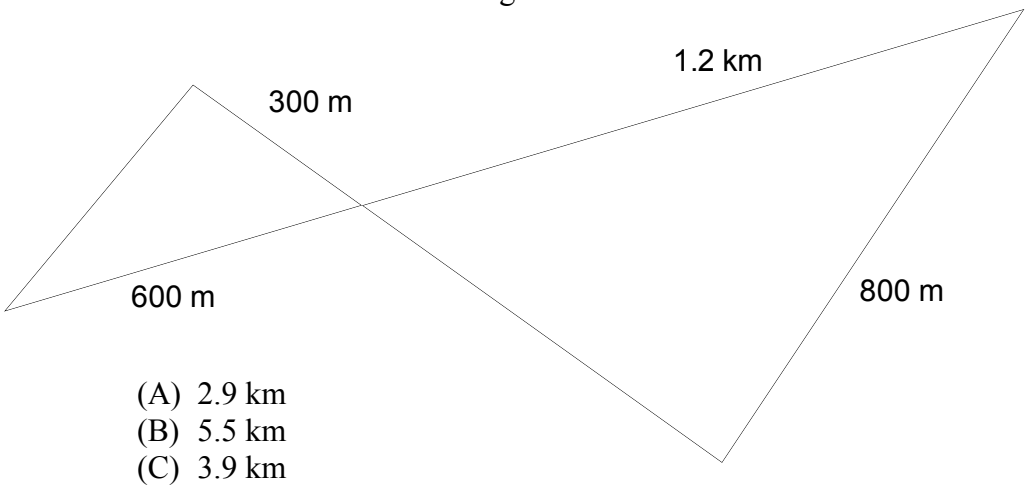
(C)



(D)



**18.** The course for a cross country race is shown below. The course is formed completely by straight lines and the two triangles are similar. What is the total length of the course?




(A) 2.9 km
(B) 5.5 km
(C) 3.9 km
(D) 3.5 km

**19.** Town A is located at $(45^\circ S, 45^\circ W)$ and Town B at $(45^\circ N, 45^\circ W)$
Which is not correct?

(A) They are on the same large circle.
(B) They have the same local time.
(C) They are on the same small circle.
(D) They are on the same meridian of longitude.

**20.** Josie tosses three coins. What is the probability that at least two of the coins show a head?

(A) $\frac{5}{8}$

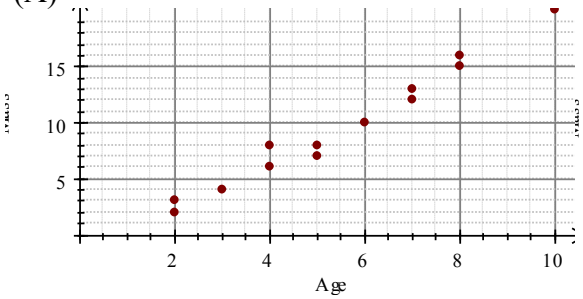
(B) $\frac{1}{2}$

(C) $\frac{3}{8}$

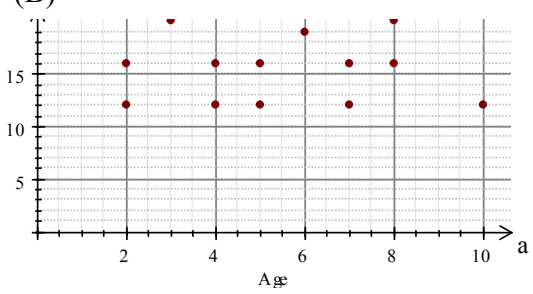
(D) $\frac{1}{8}$

**21.** Which scatter plot below shows a strong negative correlation.

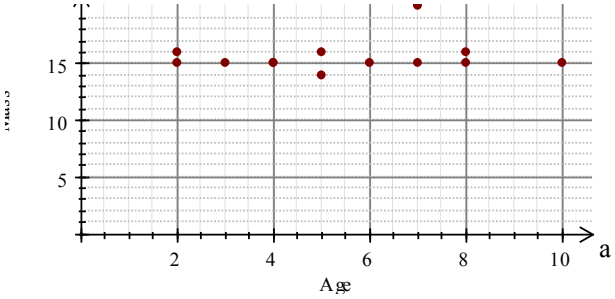
(A)



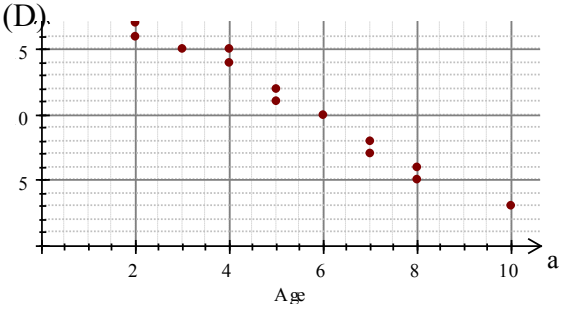

(B)



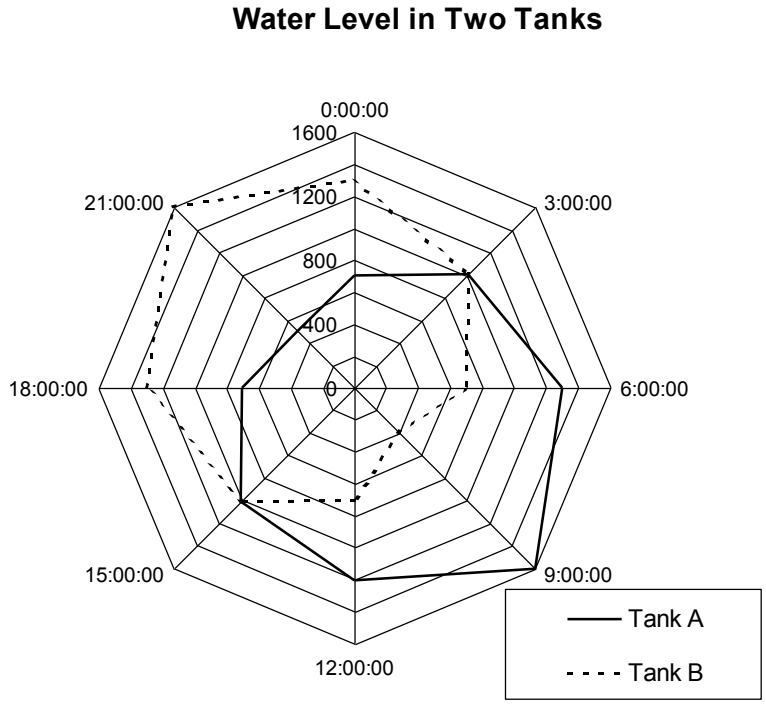

(C)




(D)



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




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 II**

**78 marks**
**Attempt Questions 23 - 28**
**Allow about 2 hours for this section.**

Answer each question on a new sheet of paper with your name and the question number at the top of the page. Do not write on the back of sheets.

All necessary working should be shown in every question.

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**Question 23** (13 marks) Start a new sheet of paper. **Marks**

(a) "Wendys Ice-Cream Shop" has 12 different flavours available and sells, single double or triple-decker cones or tubs with one, two or three flavours.
Suzie and Alex go to "Wendys Ice-Cream Shop" and each order an ice-cream.
Suzie orders a triple-decker cone and Alex orders a tub with three scoops.

i) The order that the triple-decker is arranged is important to Suzie as she will eat the top flavour first then the second and third. How many different arrangements of flavours are there from which she can choose if she wishes to have three different flavours? **1**

ii) How many different arrangements of flavours are there from which Suzie can choose if she is prepared to have the same flavour repeated twice or even three times? **1**

iii) How many different combinations of flavours can Alex choose in his tub if he wants three different flavours? The order doesn't matter as he can eat them in any succession. **2**

(b) Homer and Marjorie and their family are leaving on a holiday. The day before leaving, Marjorie bought some magazines for the children to read on the way which cost $12.50 in total and Homer filled up the petrol tank with fuel costing $1.20/litre. After leaving on the holiday they discover after travelling 25 km to Brownville, that they have left the magazines at home.

i. If the car has a consumption of 15 litres/100 km, how much fuel would be used to return home and collect the magazines and return to Brownville? **1**

ii. How much would it cost in fuel to return to get the magazines? **1**

iii. How many litres of fuel could be bought for the $12.50 cost of the magazines? (Answer correct to 2 decimal places) **1**

iv. After what distance would it be cheaper to buy new magazines, rather than go back and get the original ones? (Nearest km) **1**

**Question 23** (continued)

**Marks**

(c) In the TV quiz Program "Who Wants to be a Millionaire" a contestant, Mike, has no idea of the answer to a question for which he is given four possible answers A, B, C and D.

He is offered three "Lifelines".

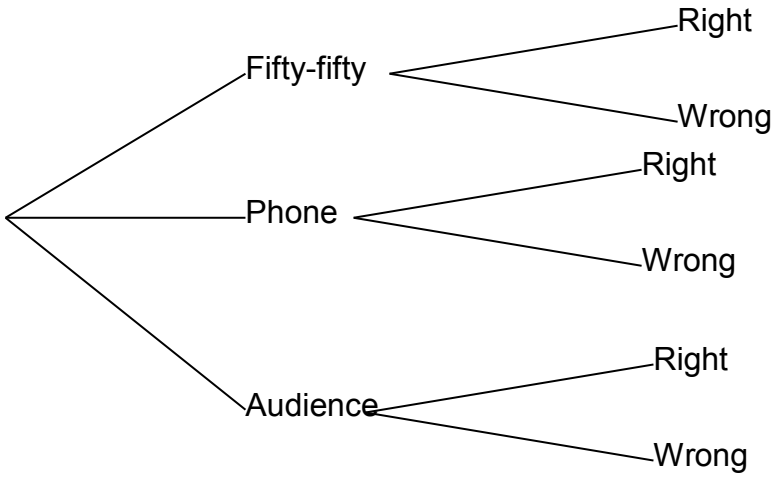
Fifty - Fifty: He can choose to have two of the incorrect answers removed allowing him to guess from the two remaining answers.

Phone a Friend : He can phone a friend who has a 70% chance of answering the question correctly.

Ask the Audience : He can ask the audience who have a 60% chance of answering the question correctly.

He decides to use the strategy of choosing one of the "Lifelines" at random. If the choice is Phone a Friend or Ask the Audience he will take the advice given, or he will guess from the remaining two answers if it is Fifty-Fifty.

i Copy and complete the tree diagram for this strategy by writing the probabilities on the branches. **1**

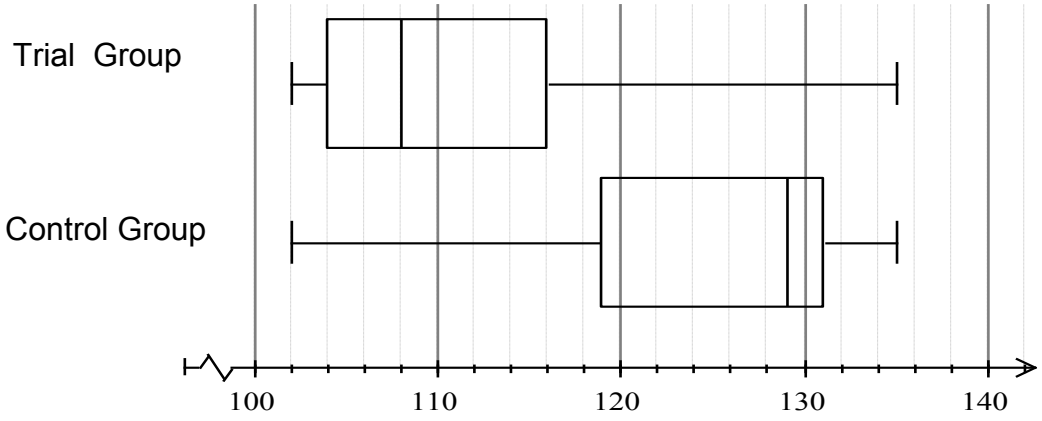



ii What is the probability that he will answer the question correctly using this strategy? **2**

iii If he didn't have the Fifty-Fifty option but used the same strategy with the other two "Lifelines" what is the probability he will get the question right? **2**

**Question 24** (13 marks) Start a new sheet of paper. **Marks**

(a) The graphs below compare the blood pressure of two groups of volunteers in a medical study. The trial group undertook a structured program of exercise and diet and the control group maintained their previous habits.




i) What is the median of each group? **1**

ii) Explain why the box and whisker plot gives a better picture of the results of the study than either the *range* or *interquartile range* on their own. **2**

iii) Comment on the skewness of the results for the two groups. **1**

(b) 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**

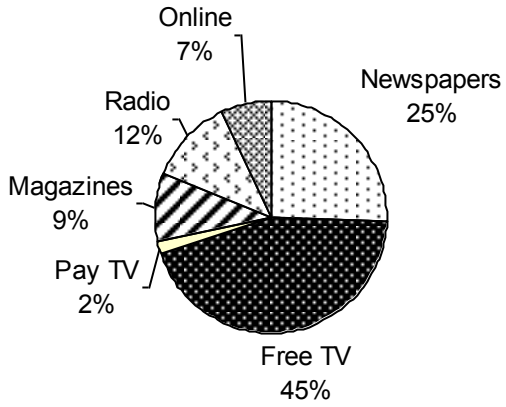
iv) Re-write the formula so that D is the subject. **1**

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

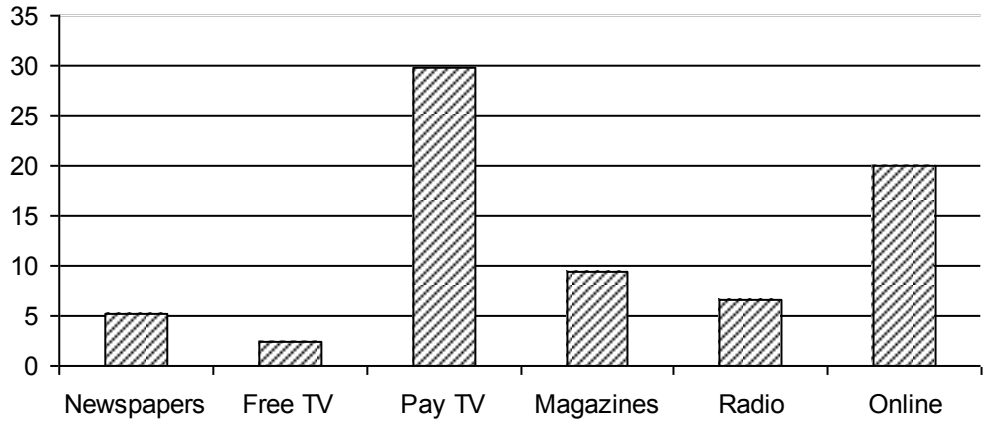
**Question 24** (continued) **Marks**

(c) The graphs below show what percentage of all money was spent on advertising in different media in 2004, and how it increased for 2005.

Money Spent on Advertising in Various Media - 2004




Percentage Increase in Money spent in 2005 compared to 2004 in Each Media




(i) If \$497 million was spent on Online advertising in 2004, how much was spent on Free TV in 2004? **1**

(ii) How much was spent on Online advertising in 2005 ? (to nearest \$ million) **1**

(iii) If \$112 million was spent on Pay TV and \$840 million on radio in 2004, which of Radio or Pay TV had the biggest actual money increase between 2004 and 2005? **2**

**Question 25** (13 marks) Start a new sheet of paper. **Marks**

(a) The table below gives the future values of an annuity of $1 invested annually for different rates of interest over periods up to six years.

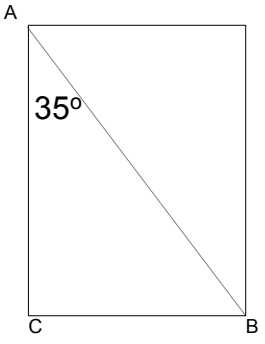
| | Interest Rate per annum. | | | |
|---|---|---|---|---|
| Years | 5% | 10% | 15% | 20% |
| 1 | 1.00000 | 1.00000 | 1.00000 | 1.00000 |
| 2 | 2.05000 | 2.10000 | 2.15000 | 2.20000 |
| 3 | 3.15250 | 3.31000 | 3.47250 | 3.64000 |
| 4 | 4.31013 | 4.64100 | 4.99338 | 5.36800 |
| 5 | 5.52563 | 6.10510 | 6.74238 | 7.44160 |
| 6 | 6.80191 | 7.71561 | 8.75374 | 9.92992 |

i) Use the above table to calculate the future value of an amount of $6000 invested annually in an annuity paying 10% pa for 4 years. (Answer to the nearest dollar.) **1**

ii) Denise wants to save up $40 000 for a house deposit in 5 years. Use the above table to find how much she would need to invest annually in an annuity paying 15% per annum to achieve this. **2**

iii) Joan has made annual payments of $4 000 into an annuity for 3 years and its value is now $13 890. What was the annual interest rate on the annuity? **2**

(b) Pietro and Dominica are out walking and they come to a rectangular park which measures 200 metres from A to C with $\angle BAC = 35^\circ$. Pietro takes the short cut along the path that runs diagonally through the park from A to B, while Dominica walks around the perimeter path that goes from A to C and then to B.




i) How far does Dominica walk to get from A to B (nearest metre). **1**

ii) How much shorter, to the nearest metre, is the distance that Pietro walks from A to B? (to nearest metre) **2**

**Question 25** (continued.) **Marks**

(c) Steve plays the following game against a dealer. On each round of the game, the dealer draws a single card from a normal pack of 52 cards. Each round of the game costs Steve $2.00. The card is returned to the pack and shuffled before the next round.

If the card is an Ace, Steve receives $4 back.
If it is a picture card ( K, Q or J), Steve receives $3 back.
If it is a 7 Steve receives his money back.
If it is any other card he loses his $2 bet.

i) If Steve plays 40 rounds of the game, how many times would you expect an Ace to be drawn? **1**

ii) What is the financial expectation of the game? **2**

iii) How could the payment for an Ace be changed to make the game fair? **2**

**Question 26** (13 marks) Start a new sheet of paper.

**Marks**

(a) Two printing machines, worth $150 000 each, are bought in December 2005. In December of each year, beginning in 2006, the value of each printing machine is depreciated.

Machine A is depreciated by 10% using the declining balance method of depreciation.
Machine B is depreciated using the straight line method of depreciation, so that its value in 2012 is $60 000.

The depreciation for Machine A has been calculated and plotted on the graph on page 25 at the end of the examination paper. Detach this page and hand it in with your answer to Question 26.

i) Plot the line showing the value of Machine B on the graph on page 25. **2**

ii) In which year after 2006 was the value of the Machines approximately the same? **1**

iii) Use the declining balance method to find the value of machine A in 2015. **1**

(b) An extract from a credit card statement is shown below **2**

Interest rate = 18% p.a. Daily rate = 0.049%

| ***Date*** | ***Credit*** | ***Debit*** | ***Balance*** |
|---|---|---|---|
| 01/03/06 | | | $750.00 |
| 12/03/06 | | $200 purchase | $950.00 |
| 18/03/06 | $300 repayment | | $650.00 |

If interest is calculated daily on the maximum daily balance, calculate the interest that will be due for the month of March.

(c) A group of employees of Super Sales Pty Ltd are measured for their pulse rate. The data is found to be normally distributed with a mean of 55 and a standard deviation of 6.

(i) Joanne has a pulse rate of 43. Convert this to a z - score. **1**

(ii) Adam has a z – score of 1. What was his pulse rate? **1**

(iii) What percentage of the employees had pulse rates between those of Joanne and Adam. **2**

**Marks**

**Question 26** (continued)

(d) Yasmin receives a lump sum of $200 000 when she retires. She uses it to purchase an annuity which pays 9% p.a. compounded monthly, to give her a monthly payment each month for the next 15 years.

(i) To find the amount of her monthly payment $M$, she substitutes into the Present value formula below. Write down the values of $N$, $r$ and $n$ which will be substituted into the formula. **1**

$$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$$

(ii) Use the Present value formula to find the amount of the monthly payment $M$ ( answer to the nearest dollar). **2**

**Question 27** (13 marks) Start a new sheet of paper.

**Marks**

(a) The points scored by the Newtown Jets in their Home and Away rugby league games are shown on the stem and leaf plot below.

| Leaf (Home Games) | Stem | Leaf (Away Games) |
|---|---|---|
| 9 8 5 | 0 | 1 4 5 |
| 5 | 1 | 1 8 9 |
| 7 3 2 | 2 | 3 6 6 9 |
| 3 0 0 | 3 | |

i) Find the mean and standard deviation of the points scored in the Home games and in the Away games (correct to one decimal place). **2**

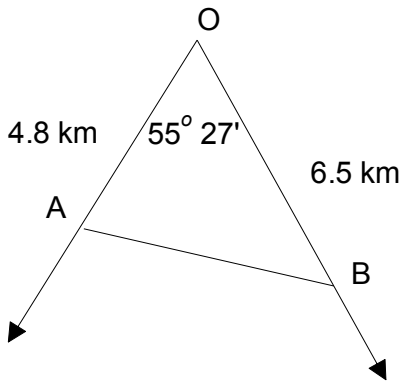
ii) What do the means and standard deviations in part i) indicate about the team's performance in Home games compared to in Away games? **2**

(b) Two ships are sailing across the Pacific Ocean. They cross the equator simultaneously, at different longitudes. Ship A is at $160^\circ$ E and Ship B is at $155^\circ$ W.
(Radius of Earth is 6400 km. 1.852 km = 1 nautical mile)

i) What is the shortest distance between the ships, to the nearest nautical mile? **2**

ii) If the local time is 6 a.m. on Saturday 29th March on Ship A,what is the local time on ship B. **2**

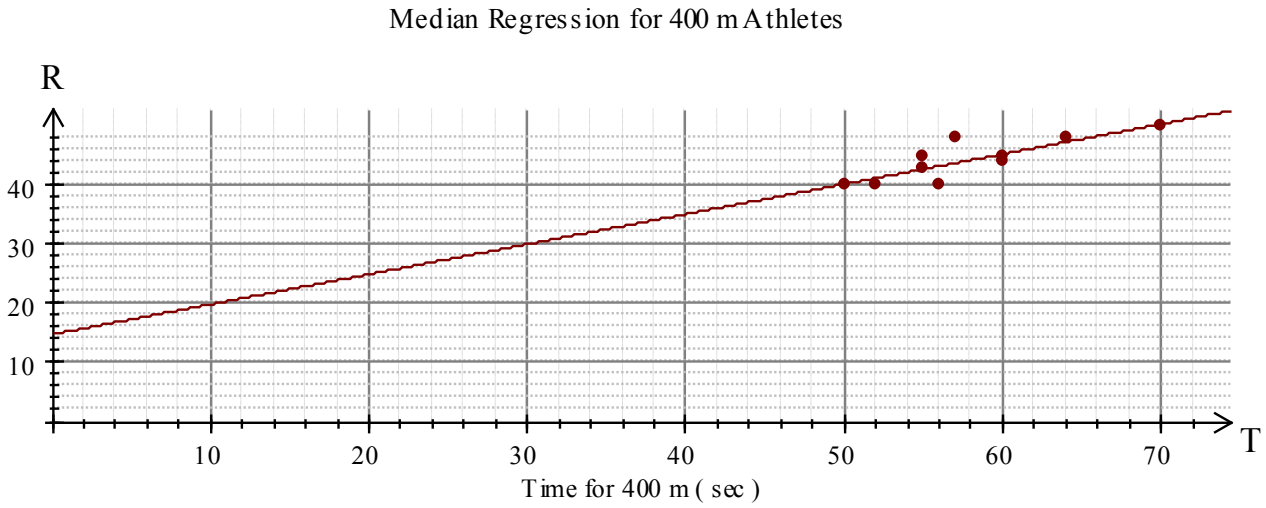
(c) A farm is surveyed using a radial survey. One triangular section AOB of the surveyed land is shown below. Find the area of the section, correct to 3 significant figures. **2**



**Question 27** (continued)

**Marks**

(d) The resting heart rate for a group of ten 400 m Athletes was compared with their most recent times for the race. The result is shown on the scatter graph below with the Median Regression line drawn.

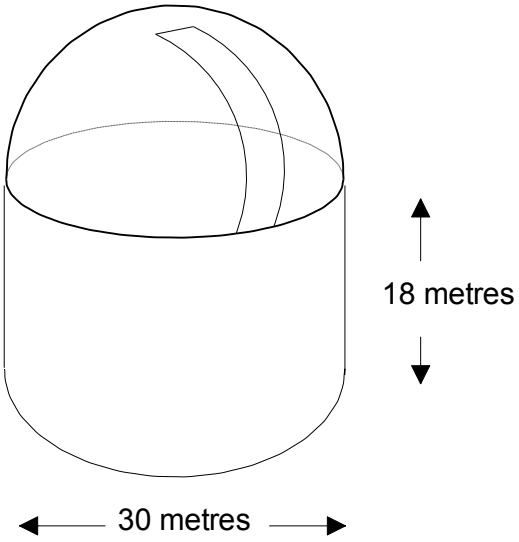



i) Give the equation of the median regression line in the form $R = mT + b$. **2**

ii) If an athlete had a 400 m time of 80 seconds, estimate his resting heart rate using this equation. **1**

**Question 28** (13 marks) Start a new sheet of paper. **Marks**

(a) An observatory is in the shape of a cylinder with a hemisphere (half of a sphere) on top as shown in the diagram below. There is a slot in the roof for the telescope to view the night sky. The outside diameter of the base is 30 metres and the height of the vertical walls is 18 metres.




i) The walls are to be constructed of solid concrete, one metre thick. Find the volume of the concrete in the walls, to the nearest cubic metre. **1**

ii) The hemispherical roof is to be tiled in ceramic tiles. If the slot removes 5% of the original surface area of the roof, find the area to be tiled, to the nearest square metre. **2**

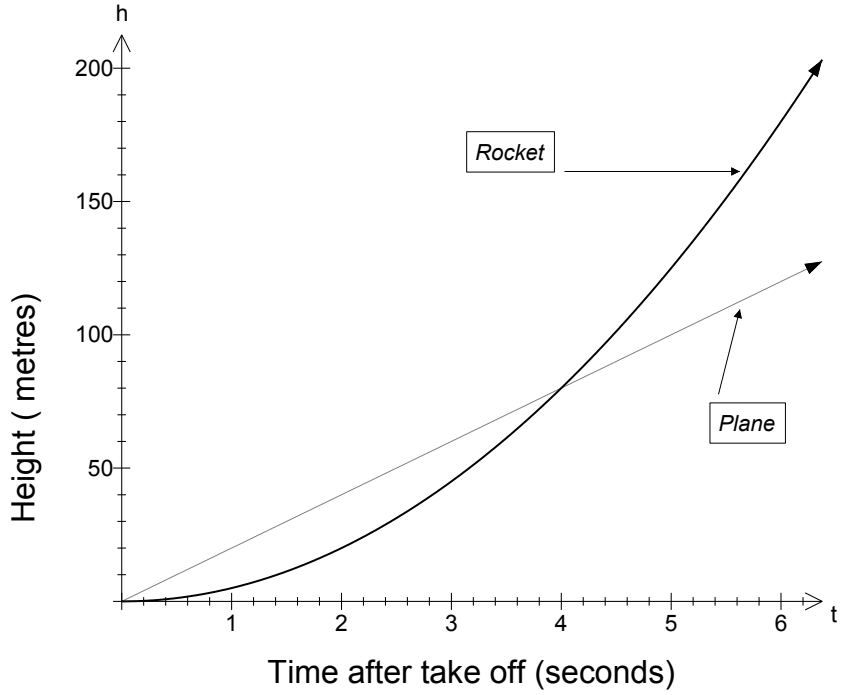
iii) The inside surface of the roof is also hemispherical and fits exactly on top of the inside edge of the walls. Find the internal volume of the observatory building, to the nearest cubic metre. **2**

iv) Internal walls, floors and equipment take up 3500 cubic metres, with the remaining volume being air. An air conditioning unit circulates 120 000 litres of air per minute. How long would it take to theoretically circulate all the air in the observatory ( to the nearest ten minutes)?
(One $m^3$ contains 1000 litres of air.) **2**

**Question 28** (continued)

**Marks**

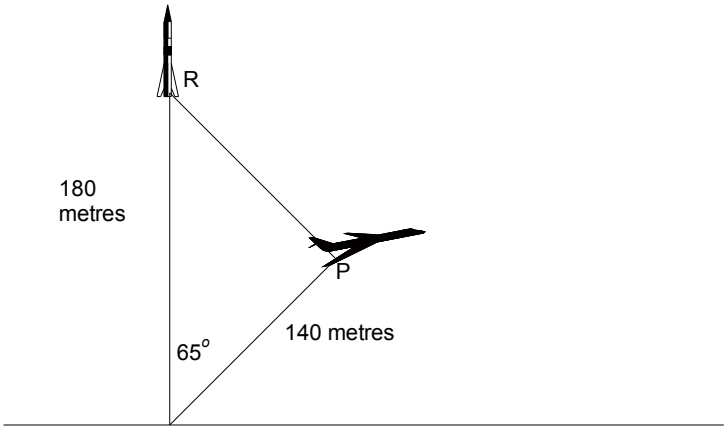
(b) The graph below shows the height in metres of a rocket and a plane which take off at the same time, for the first 6 seconds of their flight.




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**

iii) After 6 seconds the relative positions of the two are shown on the diagram below. Use the cosine rule to find the distance RP between the plane and the rocket to the nearest metre. **2**




**End of Exam**

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## FORMULAE SHEET

**Area of an annulus**

$A = \pi\left(R^2 - r^2\right)$

$R$ = radius of outer circle

$r$ = radius of inner circle

**Area of an ellipse**

$A = \pi ab$

$a$ = length of semi-major axis

$b$ = length of semi-minor axis

**Area of a sector**

$A = \dfrac{\theta}{360}\pi r^2$

$\theta$ = number of degrees in central angle

**Arc length of a circle**

$l = \dfrac{\theta}{360}2\pi r$

$\theta$ = number of degrees in central angle

**Simpson's rule for area approximation**

$A \approx \dfrac{h}{3}\left(d_f + 4d_m + d_l\right)$

$h$ = distance between successive measurements

$d_f$ = first measurement

$d_m$ = middle measurement

$d_l$ = last measurement

**Surface area**

Sphere $A = 4\pi r^2$

Closed cylinder $A = 2\pi rh + 2\pi r^2$

$r$ = radius

$h$ = perpendicular height

**Volume**

Cone $V = \dfrac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

Pyramid $V = \dfrac{1}{3}Ah$

Sphere $V = \dfrac{4}{3}\pi r^3$

$r$ = radius

$h$ = perpendicular height

$A$ = area of base

**Sine rule**

$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

**Area of a triangle**

$A = \dfrac{1}{2}ab\sin C$

**Cosine rule**

$c^2 = a^2 + b^2 - 2ab\cos C$

or

$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

# FORMULAE SHEET

**Simple interest**

$$I = Prn$$

$P$ = initial quantity
$r$ = percentage interest rate per period, expressed as a decimal
$n$ = number of periods

**Compound interest**

$$A = P(1+r)^n$$

$A$ = final balance
$P$ = initial quantity
$n$ = number of compounding periods
$r$ = percentage interest rate per compounding period, expressed as a decimal

**Future value ($A$) of an annuity**

$$A = M\left\{\frac{(1+r)^n - 1}{r}\right\}$$

$M$ = contribution per period, paid at the end of the period

**Present value ($N$) of an annuity**

$$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

**Straight-line formula for depreciation**

$$S = V_0 - Dn$$

$S$ = salvage value of asset after $n$ periods
$V_0$ = purchase price of the asset
$D$ = amount of depreciation apportioned per period
$n$ = number of periods

**Declining balance formula for depreciation**

$$S = V_0(1-r)^n$$

$S$ = salvage value of asset after $n$ periods
$r$ = percentage interest rate per period, expressed as a decimal

**Mean of a sample**

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$ = mean
$x$ = individual score
$n$ = number of scores
$f$ = frequency

**Formula for a $z$-score**

$$z = \frac{x - \bar{x}}{s}$$

$s$ = standard deviation

**Gradient of a straight line**

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

**Gradient–intercept form of a straight line**

$$y = mx + b$$

$m$ = gradient
$b$ = $y$-intercept

**Probability of an event**

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

General Mathematics Trial HSC Examination 2006

**Multiple Choice Answer Sheet**

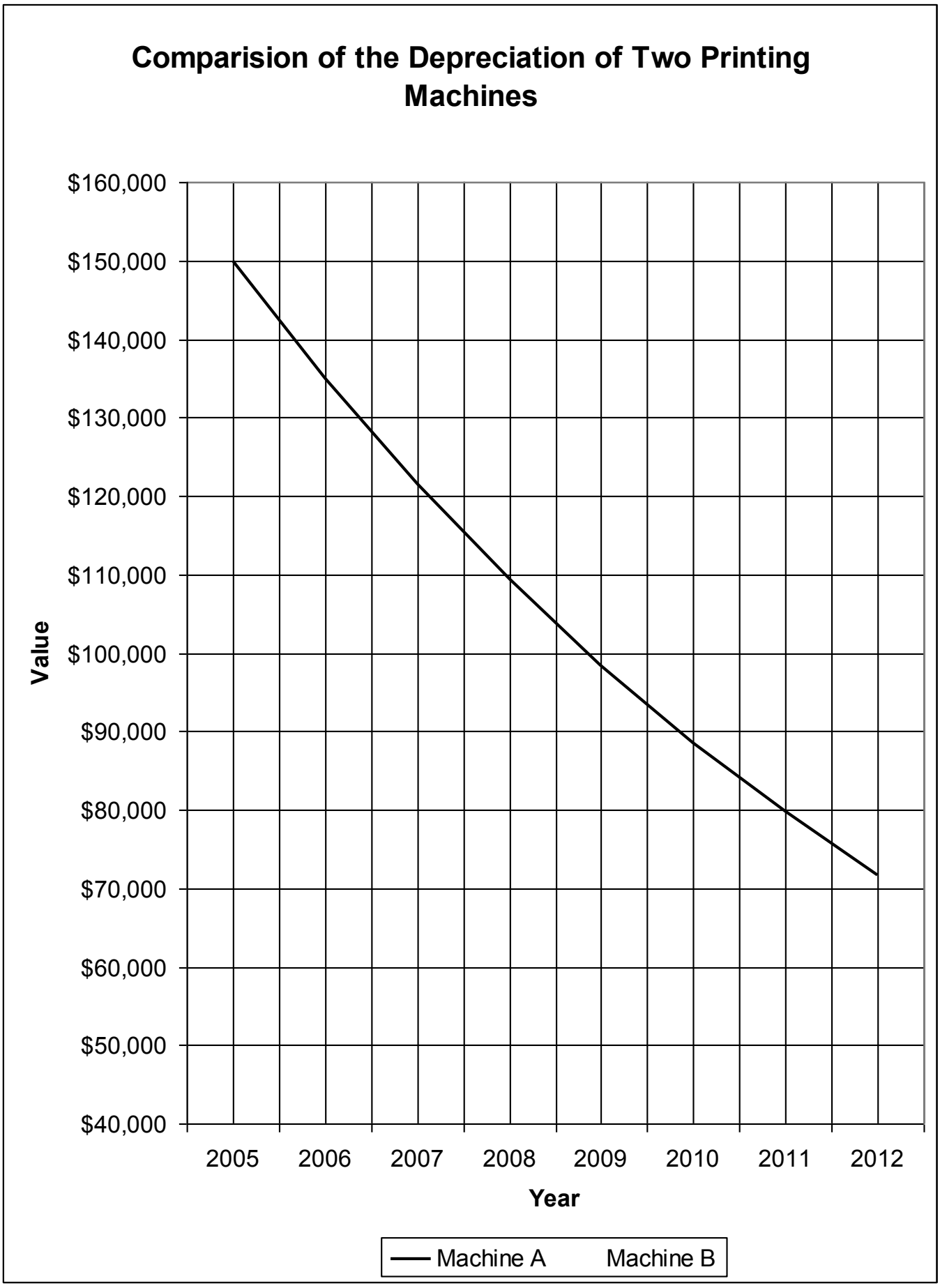
Student Number_____

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 ⬭
21. A ⬭ B ⬭ C ⬭ D ⬭
22. A ⬭ B ⬭ C ⬭ D ⬭

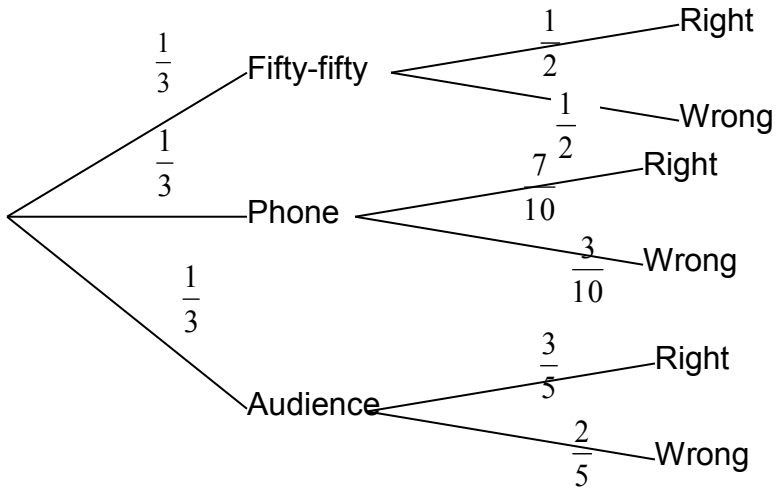
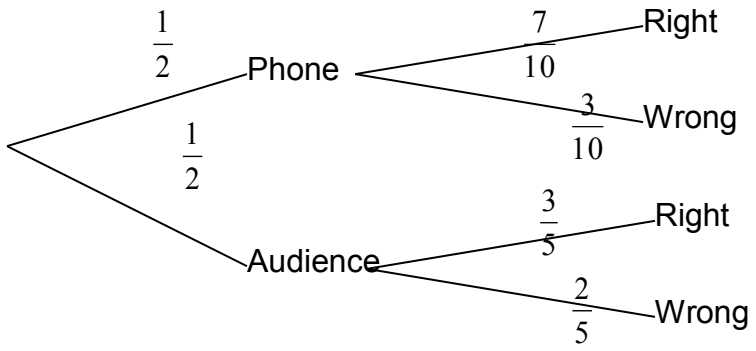
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Graph for Question 26 (a)



| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| D | B | B | C | D | C | A | B | A | A | C |
| **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** |
| D | B | B | C | A | D | C | C | B | D | A |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 23 (a) | i) Arrangements = $12 \times 11 \times 10 = 1320$ | 1 | |
| | ii) Arrangements = $12 \times 12 \times 12 = 1728$ | 1 | |
| | iii) Number of ways 3 flavours can be arranged = $3 \times 2 \times 1 = 6$<br>Combinations = $1320 \div 6 = 220$ | 2 | |
| (b) | (i) Distance home and back = 50 km.<br>15 L/100 km = 7.5 L/50 km<br>Or Number of litres = $15 \div 100 \times 50 = 7.5$ litres<br>7.5 litres would be used. | 1 | |
| | (ii) 7.5 L × \$1.20 = \$9.00 | 1 | |
| | (iii) Number of litres = \$12.50 ÷ \$1.20 = 10.42 L (2 d.p.) | 1 | |
| | (iv) Require the distance travelled with 10.42 L<br>15 L / 100 km<br>1 L / $100 \div 15 = 6.6$ km<br>10.42 L / $6.6 \times 10.42 = 69$ km ( nearest km) | 1 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 23 (c) | i)   | 1 | |
| | ii) P(Right) = $\frac{1}{3}\times\frac{1}{2}+\frac{1}{3}\times\frac{7}{10}+\frac{1}{3}\times\frac{3}{5}=\frac{1}{6}+\frac{7}{30}+\frac{1}{5}=\frac{3}{5}$ | 2 | |
| | iii)   | 2 | |
| | P(Right) = $\frac{1}{2}\times\frac{7}{10}+\frac{1}{2}\times\frac{3}{5}=\frac{7}{20}+\frac{3}{10}=\frac{13}{20}$ | | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 24. | (a) i) Trial group 108<br>Control group 129 | 1 | |
| | (ii) The range is the same for the two groups as is the interquartile range, but the location of the quartiles and median indicates that the trial group had considerably lower blood pressures on the whole. | 2 | |
| | (iii) The trial group was positively skewed and the control group was negatively skewed. | 1 | |
| | (b) i) $C = 500D^3 = 500 \times 0.4^3 = 32$ litres | 1 | |
| | ii)<br>$C = 500D^3$<br>$4000 = 500D^3$<br>$8 = D^3$<br>$D = 2$ m | 1 | |
| | iii) Number of tanks $= \frac{4000}{32}$<br>$= 125$ tanks | 1 | |
| | iv)<br>$C = 500D^3$<br>$\frac{C}{500} = D^3$<br>$D = \sqrt[3]{\frac{C}{500}}$ | 1 | |
| | v) | 1 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 24 | $D = \sqrt[3]{\frac{C}{500}}$ and $R = \frac{D}{2}$<br><br>$2R = \sqrt[3]{\frac{C}{500}}$<br><br>$R = \frac{\sqrt[3]{\frac{C}{500}}}{2}$<br><br>(c)<br>i) Amount $= \frac{497}{7} \times 45 = \$3195$ million<br>ii) Amount $= 497 \times 1.2 = \$596$ million (nearest million)<br><br>iii) Increase in Pay TV $= 112 \times .2 = \$33.6$ Million<br>Increase in Radio $= 840 \times 0.07 = \$58.8$ Million<br><br>Radio had the biggest increase. (by \$25.2million ) | 1<br><br>1<br><br>2 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 25 | | | |
| | | 1 | |
| | | 2 | |
| | | 2 | |

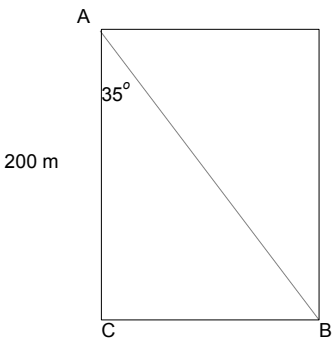
(a) i) From table 10% for 4 years gives 4.64100
For \$ 6000 amount is $4.64100 \times 6000 = \$27\,846$

ii) From table 15% for 5 years gives 6.74238
Amount to invest = $40\,000 \div 6.74238$

$= \$5933$ (nearest dolla

iii) Dollar rate = $13\,890 \div 4000 = 3.4725$
In the table on the 3 yr line 3.4725 is in the 15% column.
Interest rate was 15%

b) i)




1

2

$\tan 35^\circ = \frac{BC}{200}$

$BC = 200 \tan 35^\circ$

$= 140$ metres ( nearest m)

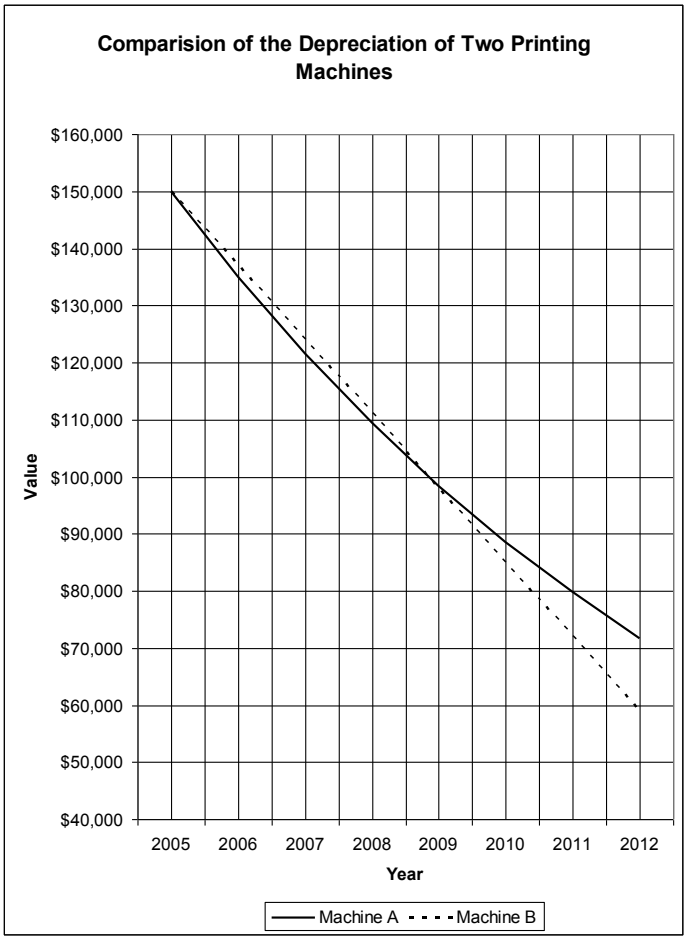
Distance walked = 140 + 200 = 340 m

ii)

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| | $AB^2 = 200^2 + AC^2$<br>$= 200^2 + 140.02^2$ Or use sin to find AB<br>$= 59611.6$<br>$AB = 244$ metres ( nearest m)<br>Dominica walks 200 + 140 = 340 metres<br>Difference = 340 - 244<br>Pietro's distance is shorter by 96 metres. | 1<br>2 | |
| | (c) i) Probability of Ace = $\frac{4}{52} = \frac{1}{13}$<br>Expected number of times = $\frac{1}{13} \times 40 = 3$ ( nearest whole no.)<br>ii) Financial expectation = $\$2 \times \frac{1}{13} + \$1 \times \frac{3}{13} + \$0 \times \frac{1}{13} - \$2 \times \frac{8}{13}$<br>$= - -\frac{11}{13} = -\$0.85$<br>iii) Financial expectation = 0<br>$\$x \times \frac{1}{13} + \$1 \times \frac{3}{13} + \$0 \times \frac{1}{13} - \$2 \times \frac{8}{13} = 0$<br>$\frac{x}{13} - 1 = 0$<br>$\frac{x}{13} = 1$<br>$x = 13$<br>Would need to pay \$13 for an Ace to make the game fair.<br>Could also be done by trial and error. | 2 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 26 | | | |

a) i)




2

1

1

2

ii) In 2009, from the graph.

iii) Value = $150000 \times 0.9^{10} = \$52\,302$ (Nearest $)

(b) Interest =

$11 \times 0.00049 \times 750 + 7 \times 0.00049 \times 950 + 13 \times 0.00049 \times 650$

$= 4.0425 + 3.2585 + 4.1405$

$= 11.4415 = \$11.44$ ( nearest cent)

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| | **Also accept**<br>$11 \times 0.00049 \times 750 + 6 \times 0.00049 \times 950 + 14 \times 0.00049 \times 650$<br>$= \$11.29$ ( nearest cent) | 1 | |
| | (c) (i) $z = \frac{x - \bar{x}}{s}$<br>$= \frac{43 - 55}{6} = -\frac{12}{6} = -2$ | 1 | |
| | (ii)<br>$z = \frac{x - \bar{x}}{s}$<br>$1 = \frac{x - 55}{6}$<br>$x - 55 = 6$<br>$x = 61$<br>Pulse rate is 61. | 2 | |
| | (iii)<br>Joanne lies on 2 sd below mean.<br>95% lie within 2 sd of mean<br>47.5% lie between 2 sd below and the mean<br>Adam lies on 1 sd above mean.<br>68% lie within 1 sd of mean<br>34% lie between 1 sd above and the mean<br>Percentage between Joanne and Adam = 34% + 47.5%<br>= 81.5% | 1 | |
| | (d) i)<br>$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$<br>N= 200 000<br>n = $15 \times 12 = 180$<br>r = $\frac{9}{12} = 0.75\% = 0.0075$<br>ii) | 2 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 27 | $200\,000 = \frac{M\left((1.0075)^{180} - 1\right)}{0.0075(1.0075)^{180}}$<br><br>$200\,000 = 98.59 \times M$<br><br>$M = \frac{200000}{98.59}$<br><br>$M = \$2028.53$<br><br>M= $ 2029 (to nearest dollar) | 2<br><br>2 | |
| | (a)<br>(i) Home Games Mean = 20.2 SD = 9.7<br><br>Away Games Mean = 16.2 SD = 9.7<br><br>(ii) The statistics indicate that the team performs consistently better in home games,with a higher mean, but same SD. | 2<br><br>2 | |
| | (b)<br>i) Angular distance = $20^\circ + 25^\circ = 45^\circ$<br>Dist in km = $2 \times \pi \times 6400 \times \frac{45}{360} = 5026.5$<br>Dist in N Miles = $\frac{5026.54}{1.852} = 2714$ M<br><br>ii) Angular distance = $20^\circ + 25^\circ = 45^\circ$<br>$15^\circ$ = 1 hour<br>$45^\circ$ = 3 hours<br>Ship B is 24-3=21 hours behind Ship A.<br>Time in ship B is 9 a.m.on Friday 28th March | 2<br><br>2<br><br>1 | |
| | (c) Area = $\frac{1}{2}ab\sin C$<br><br>$= \frac{1}{2} \times 6.5 \times 4.8 \times \sin 55^\circ 27'$<br><br>$= 12.8$ km$^2$ (3 sig fig) | | |
| | (d) i) Gradient = $\frac{15}{30} = \frac{25}{50} = \frac{1}{2}$<br>Intercept = 15<br>Equation $R = \frac{1}{2}T + 15$ | | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| 28 | ii)<br>$R = \frac{1}{2}T + 15$<br>$= \frac{1}{2} \times 80 + 15$<br>$= 55$ beat/min | 1 | |
| | a) i)<br>External radius = 15 m<br>Internal radius = 14 m<br>Height = 18 m<br>External Volume = $\pi r^2 h$<br>$= \pi \times 15^2 \times 18$<br>= 12723.5( 1 dec place)<br>Internal Volume = $\pi r^2 h$<br>$= \pi \times 14^2 \times 18$<br>= 11083.5( 1 dec place)<br>Volume of walls = 12723.5 – 11083.5<br>= 1640 ( nearest cubic metre.) | 2 | |
| | ii) Radius = 15 metres.<br>Total Surface area $= \frac{1}{2} \times 4\pi r^2 = 2 \times \pi \times 15^2$<br>= 1413.7sq metres<br>Surface area after slot = 95% of 1413.7<br>= 1343 sq metres (nearest sq metr | 2 | |
| | iii) Internal Volume cylinder = $\pi r^2 h$<br>$= \pi \times 14^2 \times 18$<br>= 11083.5( 1 dec place) | 2 | |

| | 2006 General Maths Section II | Marks | Comments |
|---|---|---|---|
| | Internal Volume hemisphere = $\frac{1}{2} \times \frac{4}{3} \pi r^3$<br><br>$= \frac{2}{3} \times \pi \times 14^3$<br><br>= 5747.0 ( 1 dec place)<br>Total internal volume = 11 083.5 + 5747.0<br>= 16 831 $m^3$ | 2 | 1 for time and 1 for height |
| | iv) Remaining volume after walls etc = 16 831 – 3500<br>= 13 331<br>Conditioner circulates 120 $m^3$ per minute.<br>Time to circulate all air = 13 331 ÷ 120<br>=111.09<br>= 111 min or 1 hrs 50 min ( to nearest ten minutes) | 2<br><br>2 | |
| | b) i) After 4 seconds at a height of 80 metres. | | |
| | ii) The plane has climbed the greater distance in the first 2 seconds, but the rocket has climbed the greater distance in the first 6 seconds. This shows that the speed of the rocket is increasing. (It is accelerating.) | | |
| | iii) Using the cosine rule<br>$RP^2 = 180^2 + 140^2 - 2 \times 180 \times 140 \times \cos 65^\circ$<br><br>$= 30700.04$<br><br>RP = 175 m (nearest metre) | | |