GENERAL MATHEMATICS
2005 HSC EXAMINATION

Section I

1 Mean $= \dfrac{3+4+5+6+6+8+8+8+15}{9}$

$= \dfrac{63}{9}$

$= 7$

1. **B**

2 $\dfrac{a-b}{4} = \dfrac{240-56}{4}$

$= \dfrac{184}{4}$

$= 46$

2. **B**

3 2AT: Probability = 0.53
2BW: Probability = 17% = 0.17
2CZ: Probability = $\frac{13}{25}$ = 0.52
2DL: Probability = 0.6
Radio 2DL reported the highest probability of rain.

3. **D**

4 Let l be the true length of the wingspan.
Measured length of wingspan is 7.5 cm.
True length of scale is 1 cm.
Measured length of scale is 2.5 cm.

$\dfrac{l}{7.5} = \dfrac{1}{2.5}$

$l = \dfrac{7.5}{2.5}$

$l = 3$

Actual wingspan is 3 cm.

4. **B**

5 The sine rule is used to calculate the distance.

5. **A**

6 Taxable income = 60000 – 5000
= \$55000
Medicare Levy = 1.5% of Taxable Income
= 0.015 × 55000
= \$825

6. **B**

7 $2m^2 \times 3mp^2 = 6m^3p^2$

7. **D**

8 $\tan\theta = 85$
$\theta = \tan^{-1}85$
$= 89°20'$

8. **D**

9 Interquartile range $= Q_3 - Q_1$
$= 80 - 45$
$= 35$

9. **C**

10 Monthly repayment for \$1000 borrowed at 8% p.a. at 15 years = \$9.56
Monthly repayment for \$70000 borrowed at 8% p.a. at 15 years $= 9.56 \times 70$
$=$ \$669.20

10. **B**

11 Sample space = {1, 2, 4, 7, 7, 9}
P(number greater than 4) $= \frac{3}{6}$
$= \frac{1}{2}$

11. **D**

12 Area $= \frac{h}{3}\left[d_f + 4d_m + d_l\right]$
$= \frac{20}{3}\left[23 + 4 \times 15 + 19\right]$
$= 680 \text{ m}^2$

12. **A**

13 Dividend Yield $= \frac{\text{Dividend}}{\text{Market Value}} \times \frac{100}{1}$
$= \frac{0.10}{2.50} \times \frac{100}{1}$
$= 4\%$

13. **A**

14 Correct working is:
$d = 5t^3 - 2$
$137 = 5t^3 - 2$
$139 = 5t^3$
Line B does not follow correctly from the previous line.

14. **B**

15 Graph D shows a graph of declining balance depreciation.

15. **D**

16

	Male viewers	*Female viewers*	*TOTAL*
Contestant X	1372	3915	5287
Contestant Y	2054	3269	5323
TOTAL	3426	7184	10610

Probability $= \frac{1372}{3426}$

16. **C**

17 Cost for n students = $2n + 5$ 17. **A**

Cost for $(n + 3)$ students $= 2(n + 3) + 5$

$= 2n + 6 + 5$

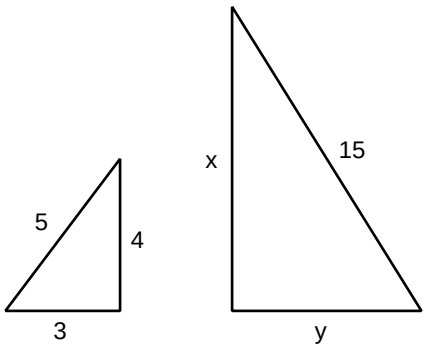
$= 2n + 11$

Additional cost $= (2n + 11) - (2n + 5)$

$= 2n + 11 - 2n - 5$

$= \$6$

18 18. **C**



For x:

$$\frac{x}{4} = \frac{15}{5}$$

$$5x = 60$$

$$x = 12$$

For y:

$$\frac{y}{3} = \frac{15}{5}$$

$$5y = 45$$

$$y = 9$$

Now area of small sail $= \frac{1}{2} \times 3 \times 4$

$= 6 \text{ m}^2$

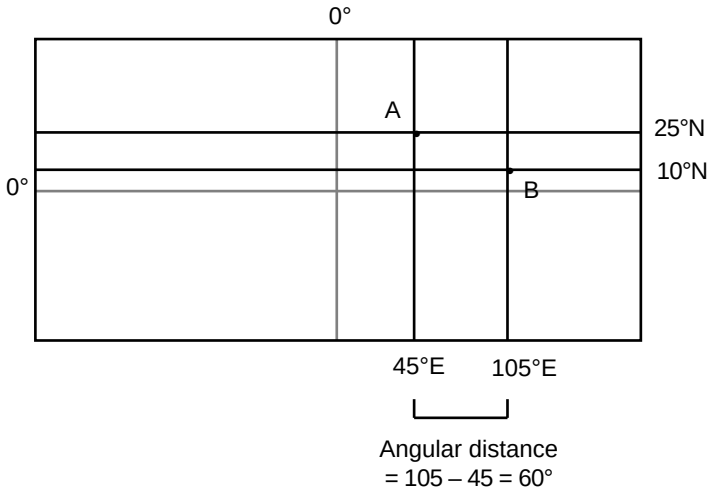
And area of large sail $= \frac{1}{2} \times 9 \times 12$

$= 54 \text{ m}^2$

Total area of sails $= 6 + 54$

$= 60 \text{ m}^2$

19 19. **A**



Tme difference $= \frac{60}{15}$
$= 4$ hours
A is behind B.
Town A is 4 hours behind Town B.

20 Number of codes at Dave's school $= 10 \times 10 \times 10 \times 10$ 20. **C**
$= 10000$
Number of codes at Juanita's school $= 10 \times 10 \times 10 \times 10 \times 10$
$= 100000$
Difference $= 100\,000 - 10\,000$
$= 90\,000$

21 Let n be the total number of kangaroos. 21. **C**

$$\frac{50}{n} = \frac{5}{200}$$
$$5n = 10000$$
$$n = 2000$$

22 Approximately 75% of people under 21 years earned less than $350 per week. 22. **B**

Section II

Question 23

(a) (i) Each of Justine's friends have a different number of tickets in the raffle. They are therefore *not* equally likely to win the raffle.

(ii) P(not Khalid or Herman) = P(Danielle, Nancy or Shani)
$= \frac{45}{100} + \frac{10}{100} + \frac{14}{100}$
$= \frac{69}{100}$

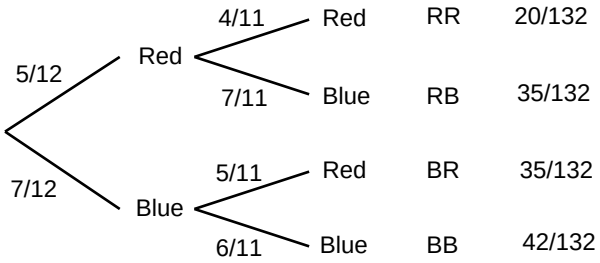
(b) (i) Volume $= lbh$
$= 21 \times 8 \times 9$
$= 1512 \text{ cm}^3$

(ii) Volume of each cylinder $= \pi r^2 h$
$= \pi \times 1.4^2 \times 8$
$= 49.26017281 \text{ cm}^3$
Volume of clay remaining $= 1512 - 3 \times 49.26017281$
$= 1364.219482$
$= 1364 \text{ cm}^3$

(iii) Percentage of clay remaining $= \frac{1364}{1512} \times \frac{100}{1}$
$= 90.2\%$
Percentage of clay removed $= 100 - 90.2$
$= 9.8\%$

(c) (i) P(red tie) $= \frac{5}{12}$

(ii)



(iii) P(same colour) = P(R,R) or P(B,B)
$= \frac{20}{132} + \frac{42}{132}$
$= \frac{31}{66}$

Question 24

(a) (i)

Stem	Leaf
1	9
2	1 3 7 7 9
3	4 5
4	5
5	8

(ii) Listed in ascending order, scores are:
19, 21, 23, 27, 27, 29, 34, 35, 45, 58
Since there are 10 scores, median $= \frac{27 + 29}{2}$
$= 28$

(iii) Distribution is positively skewed.

(b) (i) For George's dose:

$$D = \frac{2A}{15}$$
$$= \frac{2 \times 9}{15}$$
$$= 1.2 \text{ mL}$$

(ii) For Sam's age:

$$D = \frac{2A}{15}$$
$$4 = \frac{2A}{15}$$
$$2A = 60$$
$$A = 30 \text{ months}$$

Difference in ages = 30 – 9
= 21 months

(c) Solving for L:

$$T = 2\pi L^2$$
$$2\pi L^2 = T$$
$$L^2 = \frac{T}{2\pi}$$
$$L = \pm\sqrt{\frac{T}{2\pi}}$$

(d) (i) 15% of Total population = 24000
1% of Total population = 24000 ÷ 15
= 1600
100% of Toral population = 1600 × 100
= 160000
Total population = 160 000

(ii) For Northern Suburbs, 45% of 160 000 = 72 000, which is correct.
For Southern Suburbs, 30% of 160 000 = 48 000, which is correct.
For Eastern Suburbs, 15% of 160 000 = 24 000, which is correct.
For Western Suburbs, 10% of 160 000 = 16 000, which is **not** correct.
The column graph height for Western suburbs is incorrect.

Question 25

(a) (i)

$X = Prn$

$= 5000 \times 0.04 \times 1$

$= \$200$

$Y = 30 \times 52$

$= \$1560$

$Z = 48 \times 12$

$= \$576$

(ii) Income = 4680 + 200

= \$4880

Expenses = 1560 + 624 + 576

= \$2760

Savings = Income – Expenses

= 4880 – 2760

= \$2120

Reece will have saved enough money for his deposit.

(b) (i)

$AB^2 = AC^2 + BC^2$

$= 12^2 + 5^2$

$= 169$

$AB = \sqrt{169}$

$= 13$ (as required)

ΔABC is a right-angled triangle.

(ii)

$\tan \quad ABC = \frac{12}{5}$

$ABC = 67°$

(c) (i) P(win \$4) = $\frac{3}{5}$

Number of times expected = $\frac{3}{5} \times 60$
= 36

(ii)

	Prize	Probability	Expectation
Win \$4	+\$4	$\frac{3}{5}$	\$2.40
Win \$0	+\$0	$\frac{1}{5}$	\$0.00
Lose \$8	–\$8	$\frac{1}{5}$	–\$1.60
			+\$0.80

Financial expectation for this game = 80¢

(iii)

	Prize	Probability	Expectation
Win \$4	+\$4	$\frac{3}{6}$	\$2.00
Win \$0	+\$0	$\frac{2}{6}$	\$0.00
Lose \$8	–\$8	$\frac{1}{6}$	–\$1.33
			+\$0.67

Financial expectation for this game = 67¢

Robyn's claim is incorrect because the financial expectation of the game decreases by13¢. It becomes more difficult to win the \$4 prize.

Question 26

(a)

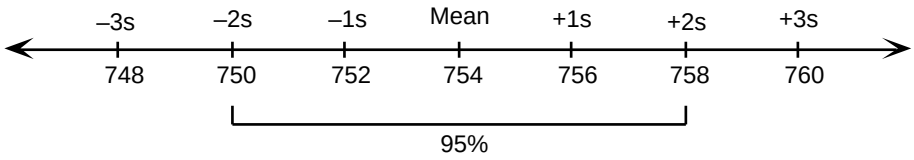
$$S = V_0(1-r)^n$$
$$120000 = 150000(1-r)^n$$
$$0.8 = 0.9^n$$
$$n = 2.11790489 \text{ years}$$

The value falls below \$120 000 after 2 years, or during the 3rd year which is 2008.

(b) (i) Future value of \$1 at 5% p.a. for 4 years = \$4.3101
Future value of \$3600 at 5% p.a. for 4 years = 4.3101 × 3600
= \$15516.36

(ii) Total amount invested = 4 × 3600
= \$14400
Interest = 15516.36 – 14400
= \$1116.36

(c)



(i) 0

(ii) 752 grams

(iii) Percentage $= \frac{1}{2}(100 - 95)$
$= 2\frac{1}{2}\%$

(d) (i) $28000 = M\left[\dfrac{(1+0.005)^{108}-1}{0.005(1+0.005)^{108}}\right]$

(ii)

$$28000 = M\left[\frac{(1+0.005)^{108}-1}{0.005(1+0.005)^{108}}\right]$$

$$M\left[\frac{(1.005)^{108}-1}{0.005(1.005)^{108}}\right] = 28000$$

$$83.29342446M = 28000$$

$$M = \$336.16$$

or using graphic calculator:

n = 108
I = 6%
PV = –28000
PMT = ?
FV = 0
P/Y = 12
C/Y = 12
PMT = $336.16

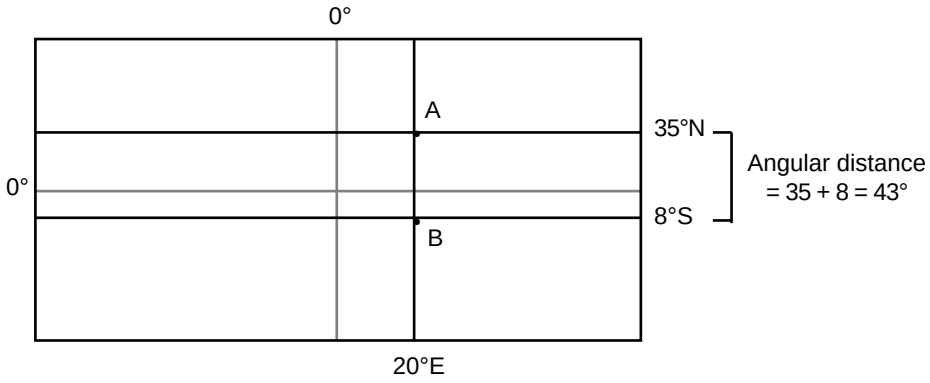
Question 27

(a) (i) Shoes sold in January = 18000 – 3000
= 15000

(ii) April

(iii) The sales of school shows appears to decrease as the year goes on. This is most likely to the large number of sales at the start of the school year compared to the rest of the year.

(b)



Distance $= 43 \times 60$
$= 2580$ nautical miles

or:

Distance $= \frac{\theta}{360} \times 2\pi r$
$= \frac{43}{360} \times 2 \times \pi \times 6400$
$= 4803.146101$ km
$= 4803.146101 \div 1.852$
$= 2593$ nautical miles

(c) (i) Bearing of C from A is 250°.
$\theta = 360 - 250$
$= 110°$

(ii)
$BC^2 = 36^2 + 15^2 - 2 \times 36 \times 15 \times \cos 110°$
$= 1890.381755$
$BC = 43.47852061$
$= 43$ km

(d) (i) $\sigma_{n-1} = 1.69$ (from calculator)

(ii) Standard deviation is a measure of the spread of a set of scores.

Question 28

(a) (i) Area of semi-circle $= \frac{1}{2}\pi r^2$
$= \frac{1}{2} \times \pi \times y^2$
$= \frac{1}{2}\pi y^2$
Area of rectangle $= lb$
$= x \times 2y$
$= 2xy$
Area of base of pool $= \frac{1}{2}\pi y^2 + 2xy + \frac{1}{2}\pi y^2$
$= \pi y^2 + 2xy$

(ii) Area of semi-circular side $= \frac{1}{2} \times 2\pi rh$
$= \frac{1}{2} \times 2 \times \pi \times y \times h$
$= \pi yh$
Area of rectangular side $= lb$
$= x \times h$
$= xh$
Total surface area = 2 semi-circular sides + 2 rectangular sides + base
$= 2\pi yh + 2xh + \pi y^2 + 2xy$

Now we know that $x = 6$, $y = 2.5$ and $h = 1.1$
Total surface area $= 2\pi yh + 2xh + \pi y^2 + 2xy$
$= 2 \times \pi \times 2.5 \times 1.1 + 2 \times 6 \times 1.1 + \pi \times 2.5^2 + 2 \times 6 \times 2.5$
$= 80.11371368$
$= 80 \text{ m}^2$

(iii) Amount of water saved per day $= 6 \times 3 \times 5$
$= 90$ litres
Amount of water saved per year $= 90 \times 365$
$= 32850$ litres
$= 32.85$ kilolitres
Cost saving per year $= 32.85 \times 1.013$
$= \$33.38$

(b) (i) $C = 400 + 300 + 12x$
$= 12x + 700$

(ii) Let I be the Income raised from ticket sales.
$I = 20x$

For break even, $C = I$.
$20x = 12x + 700$
$8x = 700$
$x = 87.5$
Approximately 88 people will be required to break even.

(iii) When $x = 150$:
$C = 12(150) + 700$
$= \$2500$
$I = 20(150)$
$= \$3000$
Profit $= 3000 - 2500$
$= \$250$

(iv) If 200 people attend the dance, then:
$C = 12(200) + 700$
$= \$3100$
If Mikey and Sue require a profit of \$1500, then:
$I = 3100 + 1500$
$= \$4600$
Therefore:
Price per ticket $= 4600 \div 200$
$= \$23$