

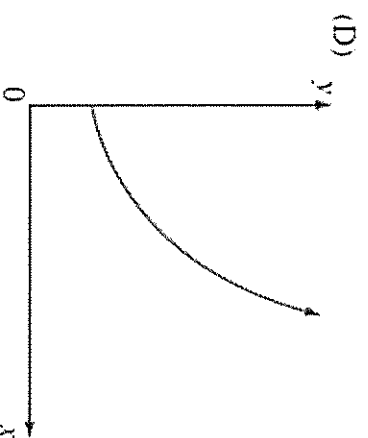
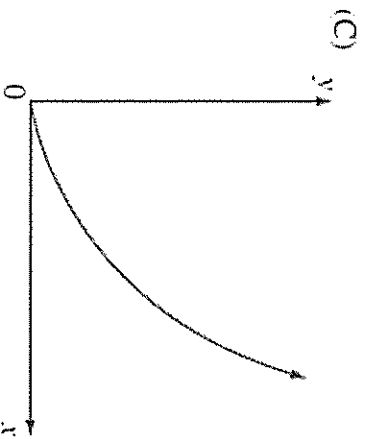
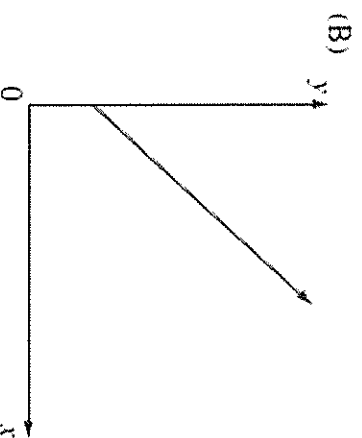
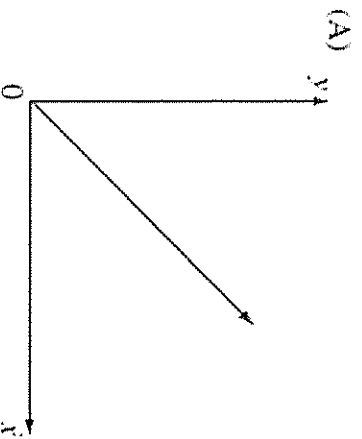
2011 HSC Exam (topics thus far)

- 5 The letters A, B and C are used to make a three-letter company name. Each letter is used only once.

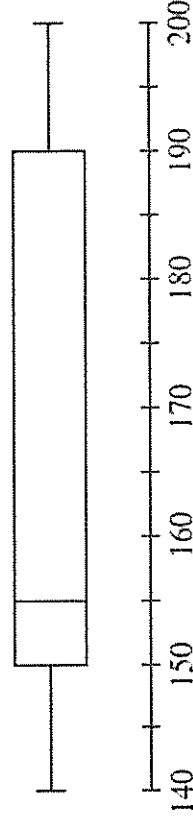
How many different company names can be made?

- (A) 3
- (B) 6
- (C) 9
- (D) 27

- 6 Which of the following graphs best represents the equation $y = a^x$, where a is a positive number greater than 1?



- 7 A set of data is displayed in this box-and-whisker plot.



Which of the following best describes this set of data?

- (A) Symmetrical
- (B) Positively skewed
- (C) Negatively skewed
- (D) Normally distributed

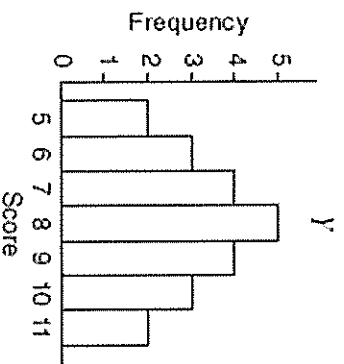
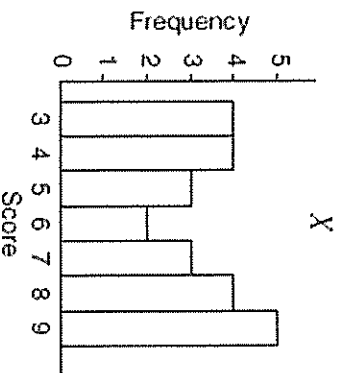
- 10 A television was purchased for \$2100 on 12 April 2011 using a credit card. Simple interest was charged at a rate of 19.74% per annum for purchases on this credit card. There were no other purchases on this credit card account.

There was no interest-free period. The period for which interest was charged included the date of purchase and the date of payment.

What amount was paid when the account was paid in full on 20 May 2011?

- (A) \$2143.16
- (B) \$2143.59
- (C) \$2144.29
- (D) \$2144.74

- 11 The sets of data X and Y , are displayed in the histograms.



Which of these statements is true?

- (A) X has a larger mode and Y has a larger range.
- (B) X has a larger mode and the ranges are the same.
- (C) The modes are the same and Y has a larger range.
- (D) The modes are the same and the ranges are the same.

- 12 Which of the following expresses $\frac{6x^2y}{3} + \frac{2y}{5}$ in its simplest form?

- (A) $5x^2$
- (B) $30x^2y$
- (C) $\frac{1}{5x^2}$
- (D) $\frac{5}{4x^2y^2}$

- 14 A data set of nine scores has a median of 7.

The scores 6, 6, 12 and 17 are added to this data set.

What is the median of the data set now?

- (A) 6
- (B) 7
- (C) 8
- (D) 9

15 An unbiased coin is tossed 10 times.

A tail is obtained on each of the first 9 tosses.

What is the probability that a tail is obtained on the 10th toss?

(A) $\frac{1}{2^{10}}$

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

(C) $\frac{1}{10}$

(D) $\frac{9}{10}$

17 The heights of the players in a basketball team were recorded as 1.8 m, 1.83 m, 1.84 m, 1.86 m and 1.92 m. When a sixth player joined the team, the average height of the players increased by 1 centimetre.

What was the height of the sixth player?

(A) 1.85 m

(B) 1.86 m

(C) 1.91 m

(D) 1.93 m

18 Which of the following correctly expresses a as the subject of $s = ut + \frac{1}{2}at^2$?

(A) $a = \frac{2(s - ut)}{t^2}$

(B) $a = \frac{2s - ut}{t^2}$

(C) $a = \frac{\frac{1}{2}(s - ut)}{t^2}$

(D) $a = \frac{\frac{1}{2}s - ut}{t^2}$

- 19 Simon is a mechanic who receives a normal rate of pay of \$22.35 per hour for a 40-hour week.

When he is needed for emergency call-outs he is paid a special allowance of \$150 for that week. Additionally, every time he is called out to an emergency he is paid for a minimum of 4 hours at double time.

In the week beginning 2 February, 2011 Simon worked 40 hours normal time and was needed for emergency call-outs. His emergency call-out log book for the week is shown.

Employee: Simon	
Week: 2/2/11 to 8/2/11	
Date	Duration of call-out
3/2/11	5 hours
5/2/11	1.5 hours

What was Simon's total pay for that week?

- (A) \$1189.28
 (B) \$1296.30
 (C) \$1334.55
 (D) \$1446.30

- 22 Ying borrowed \$250 000 to buy a house. The interest rate and monthly repayment for her loan are shown in the spreadsheet.

A	B	C	D	E	
1	Home Loan Table				
2	Amount = \$250 000			This table assumes the same number of days in each month, ie	
3	Annual Interest Rate = 7.65%			Interest = Rate/12 × Principal	
4	Monthly Repayment (R) = \$1871.94				
5					
6	Month	Principal (P)	Interest (I)	P + I	P + I - R
7	1	\$250 000.00	\$1593.75	\$251 593.75	\$249 721.81
8	2	\$249 721.81	\$1591.98	\$251 313.79	\$249 441.85
9	3	\$249 441.85	\$1590.19	\$251 032.04	
10	4				

What is the total interest charged for the first four months of this loan?

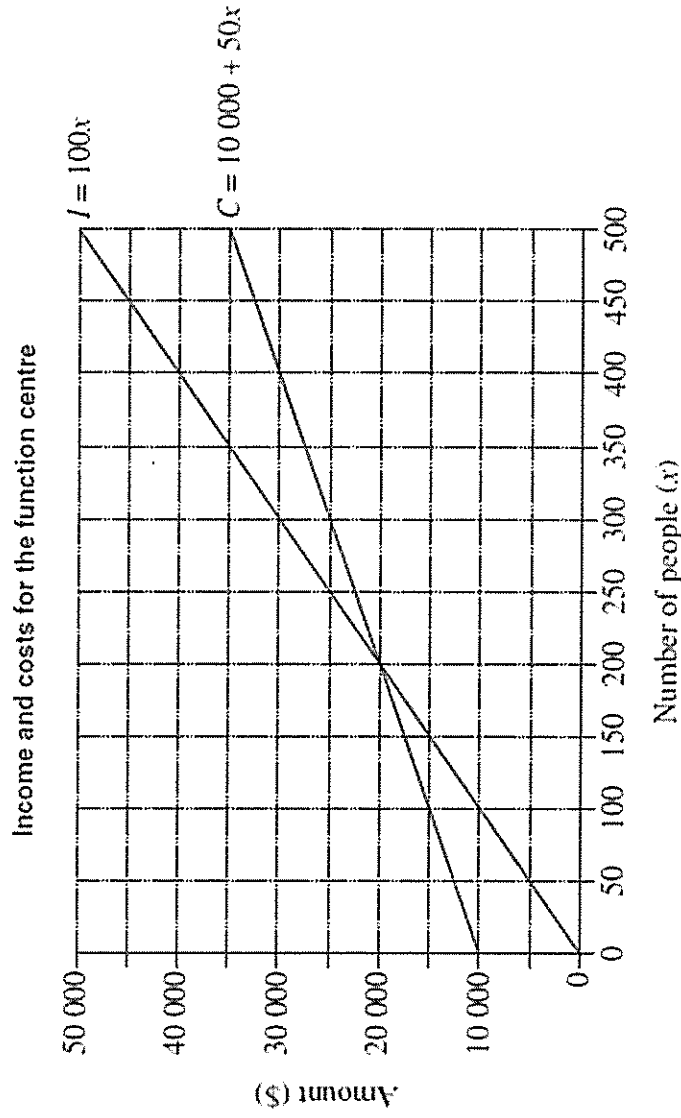
- (A) \$6364.32
 (B) \$6366.11
 (C) \$6369.67
 (D) \$6376.25

- 20 A function centre hosts events for up to 500 people. The cost C , in dollars, for the centre to host an event, where x people attend, is given by:

$$C = 10\,000 + 50x$$

The centre charges \$100 per person. Its income I , in dollars, is given by:

$$I = 100x$$



How much greater is the income of the function centre when 500 people attend an event, than its income at the breakeven point?

- (A) \$15 000
 (B) \$20 000
 (C) \$30 000
 (D) \$40 000

- 21 A train departs from Town A at 3.00 pm to travel to Town B . Its average speed for the journey is 90 km/h, and it arrives at 5.00 pm. A second train departs from Town A at 3.10 pm and arrives at Town B at 4.30 pm.

What is the average speed of the second train?

- (A) 135 km/h
 (B) 150 km/h
 (C) 216 km/h
 (D) 240 km/h

Question 23

- (a) Sri has a gross salary of \$56 350. She has tax deductions of \$350 for union fees, \$2000 in work-related expenses and \$250 in donations to charities. 3

The Medicare levy is 1.5% of her taxable income.

Calculate Sri's Medicare levy.

- (b) Sticks were used to create the following pattern.



Figure 1



Figure 2



Figure 3

, ...

The number of sticks used is recorded in the table.

Figure (F)	1	2	3
Number of sticks (N)	5	8	11

- (i) Draw Figure 4 of this pattern. 1
- (ii) How many sticks would be required for Figure 100? 1
- (iii) Is it possible to create a figure in this pattern using exactly 543 sticks? 2

Show suitable calculations to support your answer.

- (c) An amount of \$5000 is invested at 10% per annum, compounded six-monthly. 2

Compounded values of \$1

Period	Interest rate per period				
	1%	5%	10%	15%	20%
1	1.010	1.050	1.100	1.150	1.200
2	1.020	1.103	1.210	1.323	1.440
3	1.030	1.158	1.331	1.521	1.728
4	1.041	1.216	1.464	1.750	2.074
5	1.051	1.276	1.611	2.011	2.488
6	1.062	1.340	1.772	2.313	2.986

Use the table to find the value of this investment at the end of three years.

Question 24

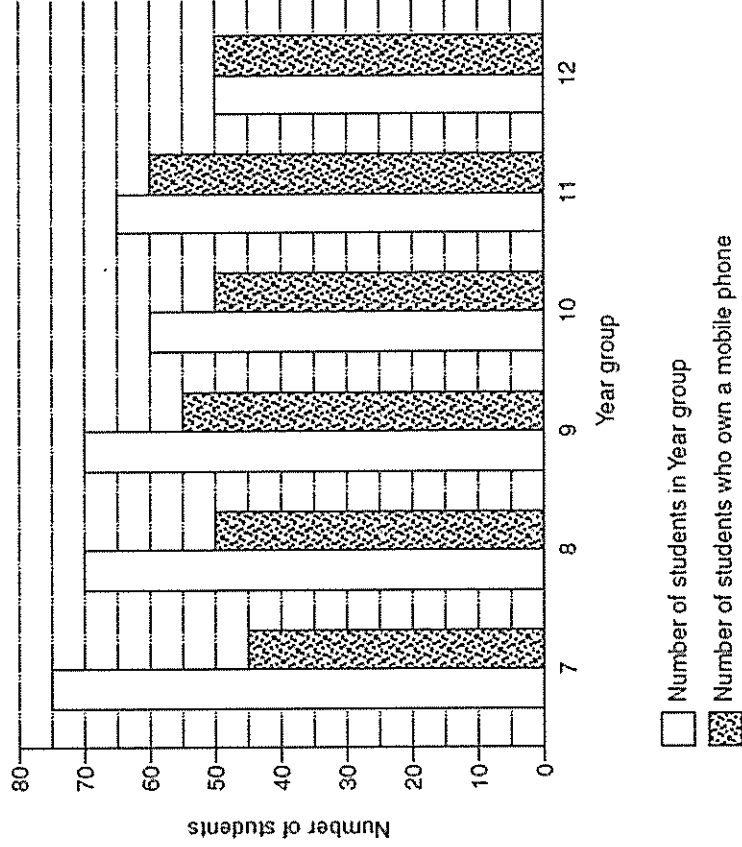
- (b) A die was rolled 72 times. The results for this experiment are shown in the table.

Number obtained	Frequency
1	16
2	11
3	A
4	8
5	12
6	15

- (i) Find the value of A. 1
- (ii) What was the relative frequency of obtaining a 4? 1
- (iii) If the die was unbiased, which number was obtained the expected number of times? 1

Question 25

- (b) The graph below displays data collected at a school on the number of students in each Year group, who own a mobile phone.



- (i) Which Year group has the highest percentage of students with mobile phones? 1
- (ii) Two students are chosen at random, one from Year 9 and one from Year 10. Which student is more likely to own a mobile phone? Justify your answer with suitable calculations. 2

- (c) At another school, students who use mobile phones were surveyed. The set of data is shown in the table.

	<i>Pre-paid</i>	<i>Plan</i>	TOTAL
<i>Female students</i>	172	147	319
<i>Male students</i>	158	103	261
TOTAL	330	250	

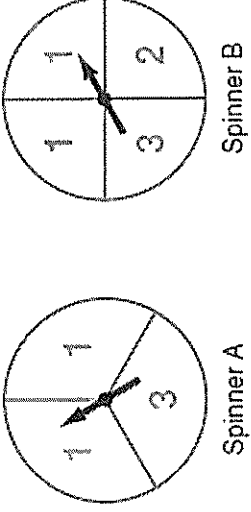
- (i) How many students were surveyed at this school? 1
- (ii) Of the female students surveyed, one is chosen at random. What is the probability that she uses pre-paid? 1
- (iii) Ten new male students are surveyed and all ten are on a plan. The set of data is updated to include this information. What percentage of the male students surveyed are now on a plan? Give your answer to the nearest per cent. 1
- (d) Data was collected from 30 students on the number of text messages they had sent in the previous 24 hours. The set of data collected is displayed.

<i>Male</i>		<i>Female</i>
9	0	8
9	1	9
8	1	1
7	0	2
6	0	5
5	0	6
5	0	8
4	0	8
2	0	8
1	2	1
1	1	7
0	4	
1	7	

- (i) What is the outlier for this set of data? 1
- (ii) What is the interquartile range of the data collected from the female students? 1

Question 26

- (a) The two spinners shown are used in a game.



Each arrow is spun once. The score is the total of the two numbers shown by the arrows.

A table is drawn up to show all scores that can be obtained in this game.

		Spinner B		
		1	2	3
Spinner A	1	2	3	4
	3	4	X	6

- (i) What is the value of X in the table? 1
- (ii) What is the probability of obtaining a score less than 4? 1
- (iii) On Spinner B, a 2 is obtained. What is the probability of obtaining a score of 3? 1
- (iv) Elise plays a game using the spinners with the following financial outcomes. 3
- Win \$12 for a score of 4
 - Win nothing for a score of less than 4
 - Lose \$3 for a score of more than 4

It costs \$5 to play this game. Will Elise expect a gain or a loss and how much will it be? Justify your answer with suitable calculations.

- (b) Jack needs to find the number of years, t , it will take for a population of bats to first exceed 18 000.

He uses a 'guess-and-check' method to estimate t in the following equation

$$5 \times 3^t = 18\,000.$$

Here is his working:

$$\text{Try } t = 9$$

$$5 \times 3^9 = 98\,415$$

Conclusion: $t = 9$ is too big.

- (i) Jack's next guess is $t = 6$. Show Jack's correct working for this guess, including the calculation and conclusion. 1
- (ii) Continue using the 'guess-and-check' method to find the number of years, t , it will take for the population to first exceed 18 000, if t is a whole number. Include the calculations and conclusions. 2
- (c) Furniture priced at \$20 000 is purchased. A deposit of 15% is paid. 4
- The balance is borrowed using a flat-rate loan at 19% per annum interest, to be repaid in equal monthly instalments over five years.

What will be the amount of each monthly instalment? Justify your answer with suitable calculations.

Question 27

Part (d) you will need to look up an appropriate future values table to solve this question.

- (d) Josephine invests \$50 000 for 15 years, at an interest rate of 6% per annum, compounded annually. 4
- Emma invests \$500 at the end of each month for 15 years, at an interest rate of 6% per annum, compounded monthly.
- Financial gain is defined as the difference between the final value of an investment and the total contributions.
- Who will have the better financial gain after 15 years? Justify your answer with suitable calculations. You must show the correct values substituted into appropriate formulas.

Question 28

(a) The air pressure, P , in a bubble varies inversely with the volume, V , of the bubble.

(i) Write an equation relating P , V and a , where a is a constant. 1

(ii) It is known that $P = 3$ when $V = 2$. 2

By finding the value of the constant, a , find the value of P when $V = 4$.

(iii) Sketch a graph to show how P varies for different values of V . 2

Use the horizontal axis to represent volume and the vertical axis to represent air pressure.

ANSWERS

Question 23 (a)

Sample answer:

$$\begin{aligned} \text{Deductions} &= \$350 + \$2000 + \$250 \\ &= \$2600 \end{aligned}$$

Question 23 (c)

Sample answer:

$$\begin{aligned} &1.340 \times 5000 \\ &= \$6700 \end{aligned}$$

$$\begin{aligned} \text{Taxable income} &= \$56\,350 - \$2600 \\ &= \$53\,750 \end{aligned}$$

Question 23 (d) (i)

$$\text{Levy} = 1.5\% \times \$53\,750$$

$$= \$806.25$$

Sample answer:

$$\frac{10\,000}{1\,000} = 10 \text{ m}^3$$

Question 23 (b) (i)

Sample answer:



Question 23 (d) (ii)

Sample answer:

$$\begin{aligned} A &= \pi \times 0.67 \times 0.75 \\ &= 1.57865 \text{ m}^2 \end{aligned}$$

Question 23 (b) (ii)

Sample answer:

$$\begin{aligned} N &= 3F + 2 \\ &= 3 \times 100 + 2 \\ &= 302 \end{aligned}$$

Question 24 (b) (i)

Sample answer:

$$\begin{aligned} 72 - (16 + 11 + 8 + 12 + 15) \\ &= 10 \end{aligned}$$

Question 23 (b) (iii)

Sample answers:

$$\begin{aligned} N &= 3F + 2 = 543 \\ 3F &= 541 \\ F &= 180.33 \dots \end{aligned}$$

Question 24 (b) (ii)

Sample answer:

$$\frac{8}{72}$$

∴ No, it will not be possible using exactly 543 sticks.

OR 180 figures can be made with one stick left over.

OR 2 more sticks will be needed to make 181 figures.

Question 24 (b) (iii)

Sample answer:

$$5$$

Question 25 (b) (i)

Sample answer:

Year 12 (has 100%)

Question 25 (b) (ii)

Sample answer:

$$\text{Year 9: } \frac{55}{70} = 79\%$$

$$\text{Year 10: } \frac{50}{60} = 83\%$$

A higher proportion of Year 10 has mobile phones.

Question 25 (b) (iii)

Sample answer:

The percentage of students in each Year group who own mobile phones increases from Year 7 through to Year 12.

Question 25 (c) (i)

Sample answer:

580

Question 25 (c) (ii)

Sample answer:

$$\frac{172}{319} = 0.54$$

Question 26 (c)

Sample answer:

$$\text{Deposit: } 15\% \text{ of } \$20\,000 = \frac{15}{100} \times \$20\,000 = \$3000$$

$$\text{Balance: } \$20\,000 - \$3000 = \$17\,000$$

$$\text{Interest: } \$17\,000 \times \frac{19}{100} \times 5 = \$16\,150$$

$$\text{Amount to be repaid: } \$17\,000 + \$16\,150 = \$33\,150$$

$$\text{Repayment: } \frac{\$33\,150}{5 \times 12} = \$552.50$$

Question 25 (c) (iii)

Sample answer:

$$\frac{113}{271} \times 100 = 41.69741697\% \\ = 42\% \text{ (correct to the nearest per cent)}$$

Question 25 (d) (i)

Sample answer:

Outlier is 71.

Question 25 (d) (ii)

Sample answer:

$$\text{Interquartile range} = 20 - 11 \\ = 9$$

Question 26 (a) (i)

Sample answer:

$$X = 5$$

Question 26 (a) (ii)

Sample answer:

$$\frac{6}{12} = \frac{1}{2}$$

Question 26 (a) (iii)

Sample answer:

$$\frac{2}{3}$$

Question 26 (a) (iv)

Sample answer:

$$\frac{4}{12} \times 12 + \frac{6}{12} \times 0 - \frac{2}{12} \times 3 = 3.50 \\ 3.50 - 5 = -1.50$$

Elise expects a loss of \$1.50.

Question 26 (b) (i)

Sample answer:

$$5 \times 3^6 = 3645$$

Conclusion: $r = 6$ is too small.

Question 26 (b) (ii)

Sample answer:

$$\text{TRY } r = 7 \quad 5 \times 3^7 = 10\,935 \quad \text{too small}$$

$$\text{TRY } r = 8 \quad 5 \times 3^8 = 32\,805 \quad \therefore \text{exceeds } 18\,000$$

$$\therefore r = 8$$

Question 27 (d)

Sample answer:

$$\begin{aligned} \text{Josephine: } A &= 50\,000(1.06)^{15} \\ &= 119\,827.9097 \\ &= 119\,827.91 \text{ (to the nearest cent)} \end{aligned}$$

$$\begin{aligned} \text{Gain} &= \$119\,827.91 - \$50\,000 \\ &= \$69\,827.91 \end{aligned}$$

$$\begin{aligned} \text{Emma: } A &= \frac{500 \left[(1.005)^{180} - 1 \right]}{0.005} \\ &= 145\,409.36 \end{aligned}$$

$$\begin{aligned} \text{Gain} &= \$145\,409.36 - 500 \times 12 \times 20 \\ &= \$55\,409.36 \end{aligned}$$

\therefore Josephine will have the better financial gain.

Question 28 (a) (i)

Sample answer:

$$P = \frac{a}{V}$$

Question 28 (a) (ii)

Sample answer:

$$P = \frac{a}{V} \qquad P = \frac{6}{V}$$

$$3 = \frac{a}{2} \qquad P = \frac{6}{4}$$

$$a = 6 \qquad = 1.5$$

Question 28 (a) (iii)

Sample answer:

