



2016 HSC Course Assessment Task 4 (Trial Examination)

Thursday, 4 August 2016

- Write your answers in the space provided.
- All necessary working should be shown in every question. Marks may be deducted for illegible or incomplete working.

[illegible]

Section I

25 marks

Attempt Question 1 to 25

Allow approximately 30 minutes for this section

Mark your answers on the answer grid provided (labelled as page 29).

Questions

Marks

1. A mobile phone plan has a monthly charge of \$44 on a two-month contract. The call rate is \$0.82 per 60-second block, plus there is a \$0.24 flagfall. 1

What is the cost of making a 5-minute call?

- (A) \$1.06 (C) \$4.1
(B) \$1.2 (D) \$4.34

2. Joshua scored 88 in an assessment task. The mean for this task was 74, with a standard deviation of 7.0. 1

What is Joshua's z -score?

- (A) -2.0 (C) 1.0
(B) -1.0 (D) 2.0

3. Fully simplify: $3y^2 \times \frac{4y^2}{5}$. 1

- (A) $\frac{12y^2}{5}$ (C) $\frac{7y}{5}$
(B) $\frac{12y^4}{5}$ (D) $\frac{7y^4}{5}$

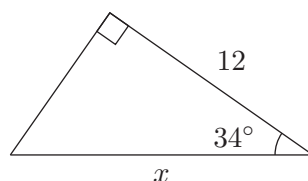
4. Handmade Christmas cards are checked for size and shape. Every 25th card is sampled. 1

Which term best describes this type of sampling?

- (A) Census (C) Stratified
(B) Random (D) Systematic

5. What is the value of
- x
- in the triangle?

1



- (A) $\frac{12}{\cos 34^\circ}$ (B) $\frac{12}{\sin 34^\circ}$ (C) $12 \times \cos 34^\circ$ (D) $12 \times \sin 34^\circ$

6. The scale on an aerial photograph is given as
- $1 \text{ mm} = 250 \text{ m}$
- .

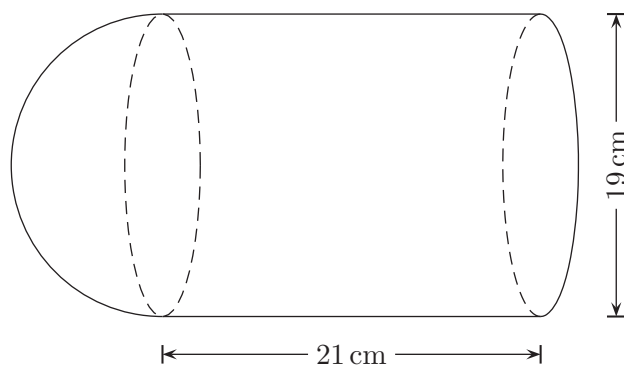
1

If the length of block of land between two points is 550 m , what is the map length between these points?

- (A) 0.20 mm (B) 0.36 mm (C) 2.2 mm (D) 2.75 mm

7. The solid shown is made of a closed cylinder and a hemisphere (half of a sphere).

1



What is the total surface area of the solid, to the nearest square centimetre?

- (A) $1\,821 \text{ cm}^2$ (B) $2\,104 \text{ cm}^2$ (C) $5\,909 \text{ cm}^2$ (D) $6\,663 \text{ cm}^2$

8. Jasmine invested some money for 3 years at
- 4%
- per annum, compounded biannually.

1

Period	Interest rate per period				
	1.00%	2.00%	3.00%	4.00%	5.00%
1	1.010	1.020	1.030	1.040	1.050
2	1.020	1.040	1.061	1.082	1.103
3	1.030	1.061	1.093	1.125	1.158
4	1.041	1.082	1.126	1.170	1.216
5	1.051	1.104	1.159	1.217	1.276
6	1.062	1.126	1.194	1.265	1.340
7	1.072	1.149	1.230	1.316	1.407
8	1.083	1.172	1.267	1.369	1.477

Which figure from the table should Jasmine use to calculate the value of her investment at the end of 3 years?

- (A) 1.061 (B) 1.125 (C) 1.126 (D) 1.265

9. What is the point of intersection of the lines $y = x + 1$ and $y = -x + 1$? 1

(A) (0, 0) (B) (0, 1) (C) (1, 0) (D) (1, 1)

10. How many megabytes are there in 2 terabytes? 1

(A) 2^{20} (B) 2^{21} (C) 2^{30} (D) 2^{31}

11. Samuel invests \$17 000 at an interest rate of 4.8% per annum compounded every 6 months. 1

What is the amount of interest earned over a period of 5 years?

(A) $\$17\,000(1.048)^5 - \$17\,000$ (C) $\$17\,000 + (1.024)^5 - \$17\,000$

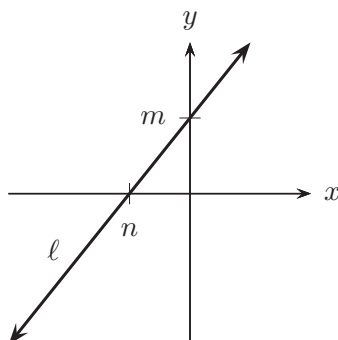
(B) $\$17\,000 + (1.024)^{10}$ (D) $\$17\,000(1.024)^{10} - \$17\,000$

12. A motor vehicle is bought for \$40 910. 1

What is the stamp duty payable if the charge is \$5 per \$200 or part \$200?

(A) \$1 020.00 (B) \$1 022.75 (C) \$1 025.00 (D) \$2 050.00

13. The line ℓ has intercepts m and n , where m and n are positive integers. 1



What is the gradient of the line ℓ ?

(A) $\frac{m}{n}$ (B) $\frac{n}{m}$ (C) $-\frac{m}{n}$ (D) $-\frac{n}{m}$

14. Three cards, 'King, Queen and Jack', are placed face down on a table. One card is selected at random and replaced. A second card is then selected at random. This experiment is repeated 45 times. 1

What is the expected number of double Queens?

(A) 1 (B) 5 (C) 9 (D) 15

15. Which of the following represents the correct expression with r^2 as the subject in the formula $V = 3r^2h + 4$? 1

(A) $r^2 = \frac{V-4}{3h}$

(C) $r^2 = \sqrt{\frac{V-3h}{4}}$

(B) $r^2 = \frac{V-3h}{4}$

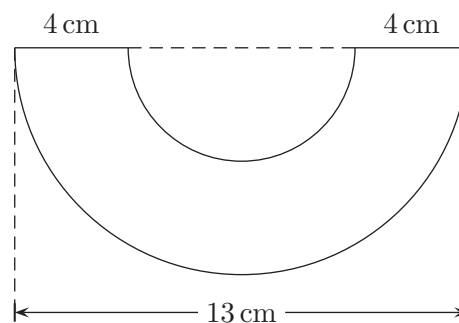
(D) $r^2 = \sqrt{\frac{V-4}{3h}}$

16. The following cumulative frequency table shows the results of a test out of 25. 1

Score (x)	Frequency (f)	Cumulative frequency (cf)
17	3	3
18	6	9
19	7	16
20	2	18
21	2	20
22	9	29
23	3	32

What is the median of this data set?

- (A) 19 (B) 19.5 (C) 20 (D) 20.5
17. A logo is designed using half of an annulus. 1



What is the area of the logo, correct to the nearest square centimetre?

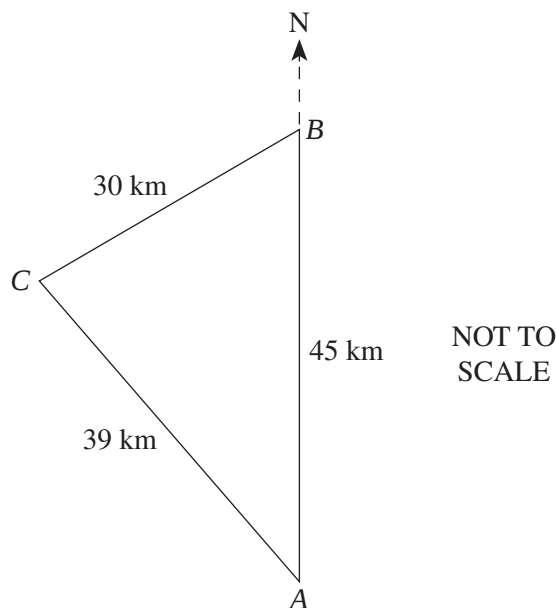
- (A) 57 cm^2 (B) 60 cm^2 (C) 217 cm^2 (D) 226 cm^2
18. The table below shows the monthly repayment of \$1 000 on a reducing balance loan. 1

Term	8.00%	8.25%	8.50%	8.75%
15 years	\$6.38	\$6.77	\$7.17	\$7.57

What is the total amount paid on a \$420 000 loan at 8.00% for 15 years?

- (A) \$2 680 (B) \$40 194 (C) \$482 328 (D) \$572 292

19. Town B is 45 km due north of town A and 30 km from town C . Town A is 39 km from town C . 1



What is the bearing of town C from town B ?

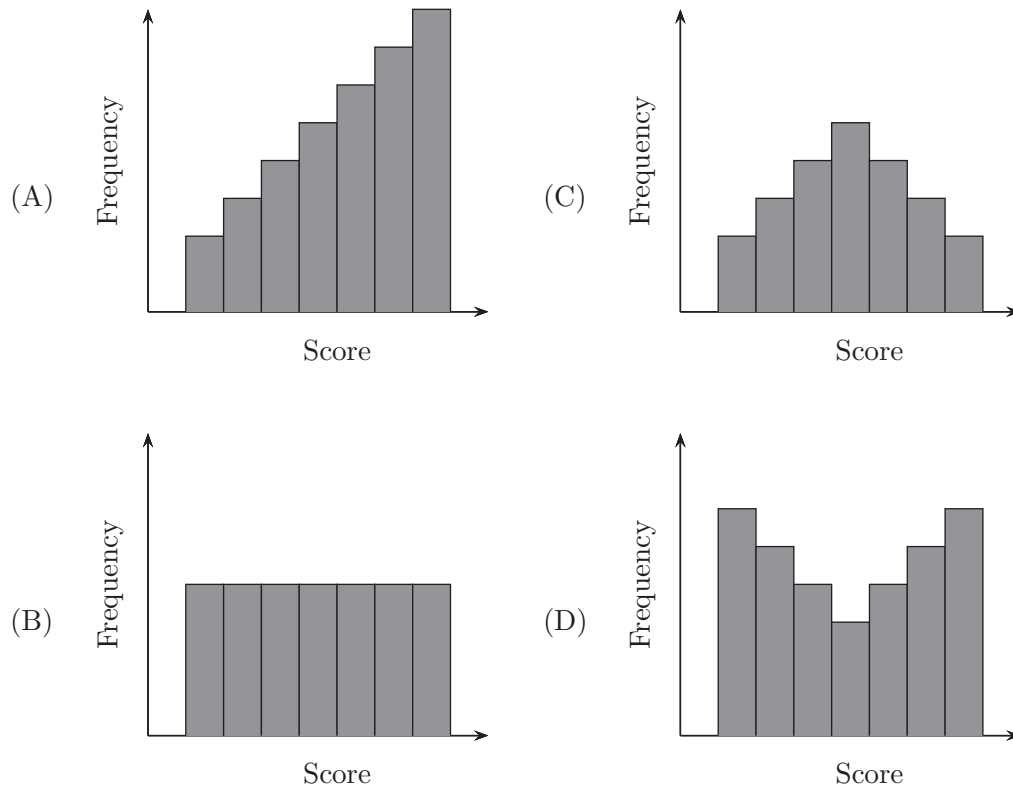
- (A) 059° (B) 121° (C) 239° (D) 301°
20. The number of residents at Winter Hill is expected to increase using the formula $N = 2\,400t^3$, where N is the number of residents and t is the time in years. 1
- What is the expected number of residents at Winter Hill after 3 years?
- (A) 7 200 (B) 19 200 (C) 21 600 (D) 64 800
21. What is the best description of the correlation between the colour of a person's hair and a Year 12 student's success in the HSC? 1
- (A) constant correlation (C) positive correlation
- (B) negative correlation (D) zero correlation
22. How long will it take a vehicle, to the nearest minute, to travel 435 km at a speed of 70 km/h? 1
- (A) 9 minutes (C) 6 hours 13 minutes
- (B) 6 hours 12 minutes (D) 6 hours 21 minutes

- 23.** The fastest '4GX' mobile handset currently available can download data at a theoretical speed of 450Mbps. **1**

What is the fastest theoretical download speed, in megabytes per second?

- (A) 56.25 MB/s (B) 3 600 MB/s (C) 7.5 MB/s (D) 45 MB/s

- 24.** Which of the following graphs shows data with the largest standard deviation? **1**



- 25.** Sanjay is located at 43°N 87°W and Harry is located at 57°N 42°W . **1**

What is the time where Harry is located, when it is 4:00 am where Sanjay is located?

- (A) 1.00 am (B) 3.13 am (C) 4.45 am (D) 7.00 am

Examination continues overleaf...

Section II

75 marks

Attempt Question 26 to 30

Allow approximately 2 hours for this section

Mark your answers in the space provided.

Question 26 (15 Marks)

Marks

- (a) A rectangular photo frame is advertised as being 16 cm by 20 cm, with each side measured to the nearest centimetre.

- i. Calculate the percentage error in the measurement of the longer side.

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- ii. Between what lower and upper limits does the actual area of the photo frame lie?

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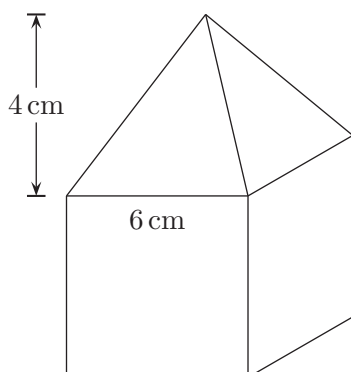
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Question 26 continued overleaf...

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- (b) A square pyramid of height 4 cm is attached to a cube of side length 6 cm.
Find the volume of the composite solid.

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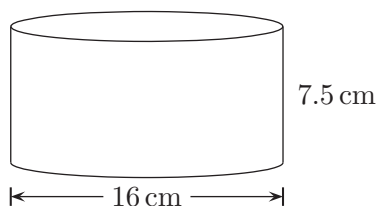
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- (c) A water tank is the shape of a closed cylinder with a diameter of 16 m and a height of 7.5 m as shown.



- i. What is the area of the curved surface of the water tank? Give your answer correct to one decimal place.

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- ii. What is the area of the top circular face of the water tank? Give your answer correct to one decimal place.

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- iii. Determine the total surface area of the water tank. Give your answer correct to one decimal place.

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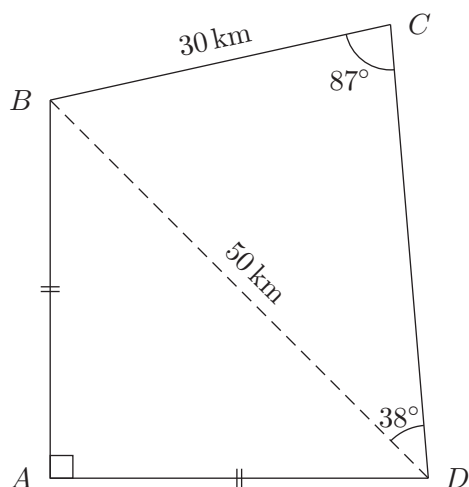
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Question 26 continued overleaf...

Question 26 continued from the previous page...

- (d) Max cycles around a course. The course starts at D , passes through C , B and A and finishes at D . The distances AB and AD are equal.



- i. What is the length of CD , to the nearest kilometre?

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- ii. What is the total distance Max cycles, to the nearest kilometre?

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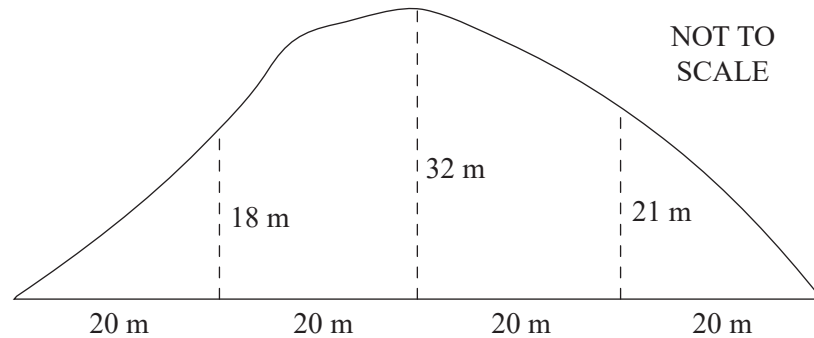
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Question 26 continued overleaf...

Question 26 continued from the previous page...

- (e) Roads and Maritime Services needs to excavate part of a hill to construct a road. The diagram shows the face of the excavation as the road passes through the hill.



- i. Use Simpson's rule twice to find an approximation to the area of the cross-section. **2**

Give your answer correct to the nearest square metre.

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- ii. The width of the road is 15 m. **1**

What is the volume of earth that has to be excavated?

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Examination continues overleaf...

Question 27 (15 Marks)**Marks**

- (a) The table shows *present value interest factors* for some monthly interest rates (r) and loan terms in months (N).

Each number in the table below is the **present value** of an annuity of \$1 at the end of each period.

Term (mths)	Monthly interest rate (as a decimal)						
	0.004	0.0045	0.005	0.0055	0.006	0.0065	0.007
106	86.26	84.15	82.12	80.16	78.26	76.43	74.66
107	86.91	84.77	82.71	80.72	78.79	76.93	75.13
108	87.56	85.39	83.29	81.27	79.32	77.43	75.60
109	88.20	86.00	83.87	81.82	79.84	77.92	76.07
110	88.85	86.61	84.45	82.37	80.35	78.41	76.53
111	89.49	87.22	85.03	82.91	80.87	78.90	77.00
112	90.13	87.82	85.60	83.45	81.38	79.38	77.45
113	90.77	88.43	86.17	83.99	81.89	79.86	77.91
114	91.40	89.03	86.73	84.53	82.40	80.34	78.36
115	92.03	89.62	87.30	85.06	82.90	80.82	78.81
116	92.66	90.22	87.86	85.59	83.40	81.29	79.25
117	93.29	90.81	88.42	86.11	83.89	81.76	79.70
118	93.91	91.40	88.97	86.64	84.39	82.22	80.13
119	94.54	91.98	89.52	87.16	84.88	82.68	80.57
120	95.16	92.57	90.07	87.68	85.37	83.14	81.00
121	95.77	93.15	90.62	88.19	85.85	83.60	81.43
122	96.39	93.72	91.16	88.70	86.33	84.05	81.86
123	97.00	94.30	91.71	89.21	86.81	84.50	82.28

Mr Anderson borrows \$65 000 for home improvements. He repays the loan with monthly repayments over 10 years. He is charged 6% p.a. interest.

- i. Calculate the amount of his monthly instalment, correct to the nearest cent. 1

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- ii. How much less interest would he pay if he took the loan over 9 years instead of 10? 2

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Question 27 continued overleaf...

Question 27 continued from the previous page...

- (b) Hannah borrowed \$100 000 at a monthly interest rate (r) of 1% to purchase an investment property. Her monthly repayments (R) are \$1 100.

Month (n)	Principal (P)	Interest (I)	$P + I$	$P + I - R$
1	100 000.00	1 000.00	101 000.00	99 900.00
2	99 900.00	999.00	100 899.00	99 799.00
3	99 799.00	997.99	100 796.99	99 696.99
4	99 696.99	996.97	100 693.96	99 593.96

(This table assumes the same number of days in each month, $I = Prn$)

- i. How much interest did Hannah pay in the fifth month?

1

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- ii. What is the amount owing after the fifth payment?

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- iii. The loan is repaid after 241 instalments.

1

Calculate the total amount of interest paid on this loan.

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(c) Dr Lawson's mobile phone plan is shown:

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\$84.00 per month plan including:

- \$1 000 worth of talk.
 - Calls charged at \$1 per minute, no flagfall, to Australian phone numbers, including 13, 18 numbers.
- Unlimited SMS/MMS
- 2.5 GB data, excess charged at \$10 per GB or part thereof. Traffic to Facebook and Niantic servers is unmetered.

Last month, Dr Lawson

- Made 17 hours and 10 minutes of phone calls
- Used 4.25 GB data, of which 0.8 GB is to Facebook and 300 MB to Niantic servers whilst playing Pokémon Go.

What was the total of Dr Lawson's phone bill for the last month?

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Question 27 continued overleaf...

Question 27 continued from the previous page...

- (d) Mr Lam used his credit card to purchase a holiday package valued at \$3 560 on 26/1/2016. He makes no further purchases on the card until the entire balance was paid off. The terms of his credit card are:

- Up to 55 days interest free period.
- Minimum payment of 2% of the balance owing on or \$25, whichever is greater.
- Simple interest is calculated daily on a period which includes the date of purchase and the date of payment.
- The interest rate for purchases is 21.49% p.a.
- The statement period for January 2016 was from 1/1/2016 to 28/1/2016, inclusive.

- i. What is the minimum repayment for this statement? **1**

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- ii. When is the minimum repayment due? **1**

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- iii. Mr Lam makes the minimum repayment only, and repays the remaining balance on 1/3/2016. **2**

How much interest was charged?

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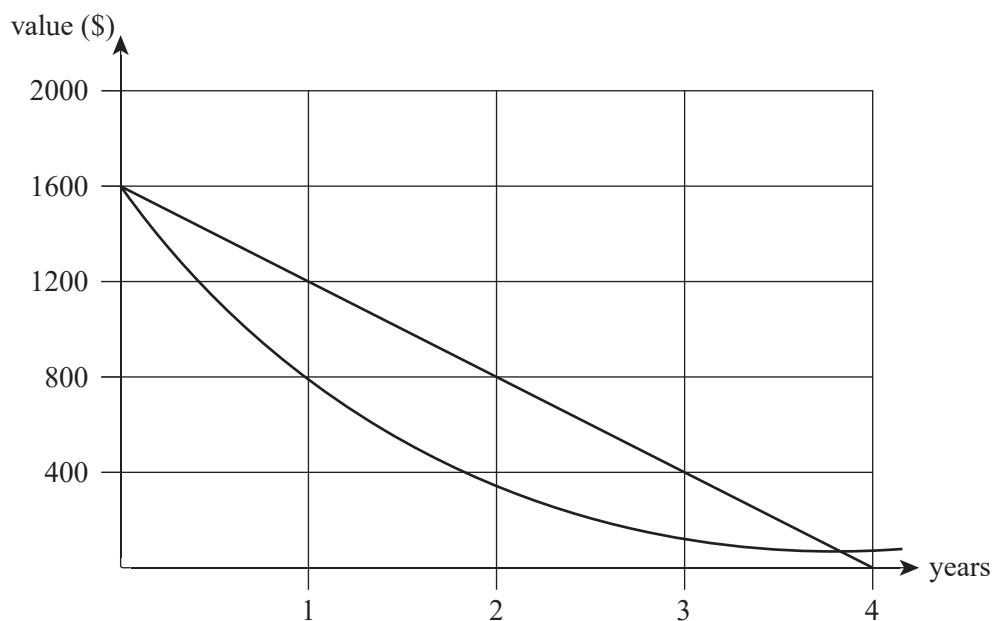
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- (e) The depreciation of a used car using both the straight-line and declining balance methods of depreciation is shown in the graph.



- i. After 1 year using the declining balance method, what is the salvage value of the used car? 1

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- ii. Which method of depreciation would provide the largest depreciation for a tax deduction if the asset is to be kept for 4 years? 1

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Examination continues overleaf...

Question 28 (15 Marks)**Marks**

- (a) Solve for y : $\frac{2y}{3} - 7 = y + 2$.

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- (b) A manufacturer sells shoes to retail outlets. The income received is calculated using the formula $I = 75n$, where n is the number of shoes sold. The costs associated with selling the shoes is calculated using

$$C = 15n + 1\,200$$

- i. What are the fixed costs if there are no shoes manufactured?

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- ii. What is the income from selling 2500 shoes to retail outlets?

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- iii. What is the cost of manufacturing 2500 shoes?

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- iv. What profit does the manufacturer make if 2500 shoes are sold?

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- v. How many shoes need to be sold to break even?

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Question 28 continued overleaf...

Question 28 continued from the previous page...

- (c) A ship sails due south from St John's, $48^\circ\text{N } 60^\circ\text{W}$, to Bridgetown, $13^\circ\text{N } 60^\circ\text{W}$. **2**

How far did the ship sail, to the nearest kilometre? (Assume that the radius of Earth is 6400 km.)

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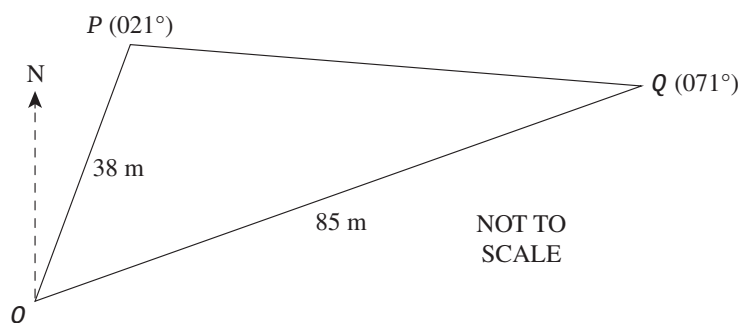
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- (d) The diagram shows a radial survey of a section of land proposed for a park. **2**



What is the area of land POQ ? Give your answer correct to the nearest square metre.

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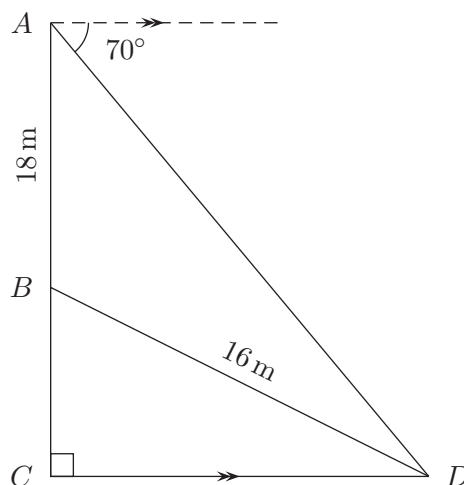
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Question 28 continued overleaf...

Question 28 continued from the previous page...

- (e) The angle of depression from A to D is 70° . The length of AB is 18 m and the length of BD is 16 m.



- i. Find the angle of elevation from D to B , giving your answer to the nearest degree. **3**

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- ii. Hence or otherwise, find the length of AC , giving your answer to the nearest metre. **2**

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Examination continues overleaf...

Question 29 (15 Marks)**Marks**

(a) Emily is 61 kg and has consumed six standard drinks in the past five hours. She is stopped by police for a random breath test.

- i. What is Emily's blood alcohol content (BAC)? Give your answer correct to two decimal places. 1

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- ii. Given that Emily has her full license, is she over the limit? Give a reason. 1

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(b) Clark's rule is used to prescribe medicine for children. The formula is:

$$\text{dosage} = \frac{\text{weight (kg)} \times \text{adult dose}}{70}$$

- i. What is the dosage for a 20 kg child if the adult dosage is 10 mL? 1

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- ii. What is the adult dosage if a 35 kg child has a dosage of 12 mL? 1

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Question 29 continued overleaf...

Question 29 continued from the previous page...

- (c) Daniel received a 60% discount as a ‘no-claim bonus’ on his car insurance. He paid \$752 to insure his car. **2**

What would Daniel have paid without the ‘no-claim bonus’?

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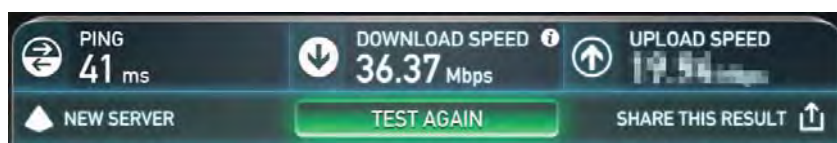
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- (d) A HFC (hybrid fibre-coaxial) network provides broadband services over “Pay TV” cables. The maximum attainable speed per household varies inversely with the number of households (H) connected. **2**



HFC cable on power poles in a suburban street

The maximum speed is 50 Mbps when there are 325 households connected.



Find the number of households connected (correct to the nearest household) if the maximum speed is 36.37 Mbps.

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Question 29 continued overleaf...

Question 29 continued from the previous page...

- (e) A bus depot requires fuel transfer pumps to be able to fill up a bus' empty tank to full in 4 minutes. **2**

The buses at the depot have a fuel tank capacity of 120 L.

How fast (in litres per hour) should the fuel transfer pumps be able to fuel up a bus?

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- (f) A truck driver has a reaction time of 1.2 seconds. When he was travelling at 70 km/h, he applied his brakes and travelled 80 m before stopping.
- i. Using the breaking distance formula $d = kv^2$ (where v is the velocity in km/h), find k correct to 4 decimal places. **2**

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- ii. Find the total stopping distance if he were travelling at 100 km/h instead. Give your answer correct to the nearest metre. **3**

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Question 30 (15 Marks)**Marks**

- (a) The table shows the mean and standard deviation of the times swam in a 100 m freestyle race. The times are normally distributed.

	Mean	Standard deviation
Female	64.1	3.6
Male	61.8	5.8

- i. Jessica swims the 100 m freestyle in 56.9 seconds. **1**

What is Jessica's z -score?

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- ii. Henry swims the 100 m freestyle in 56 seconds. **2**

What percentage of males had a lesser time than Henry?

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- iii. Which swimmer performed better in comparison to the other swimmers of their respective gender? Justify your answer. **1**

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- (b) Madison knows that her four-digit PIN contains the digits 2, 3, 5 and 9.

- i. How many different PINs are possible using these four digits? **1**

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- ii. Madison remembers that the first digit of her PIN is 3. **2**
What is the probability that her PIN is 3529?

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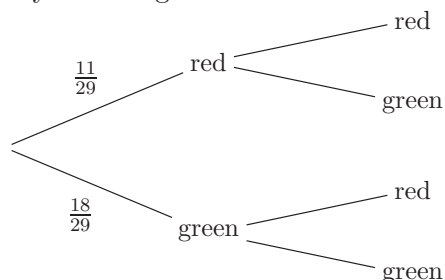
Question 30 continued overleaf...

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- (c) A box contains 29 coloured balls. There are 11 red balls and 18 green balls. Two balls are randomly drawn simultaneously.

i. Complete the probability tree diagram.

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ii. Calculate the probability of selecting two red balls.

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iii. Calculate the probability of selecting 2 balls of different colours.

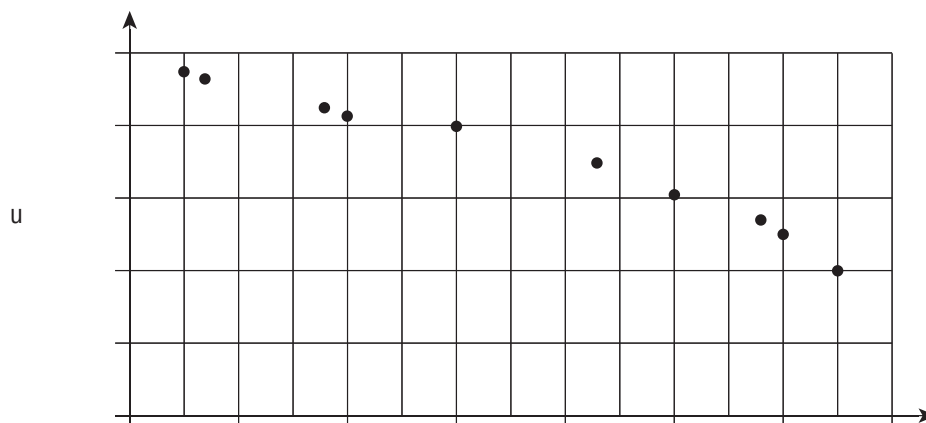
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- (d) The scatter plot shows the relationship between fitness level and pulse rate.



i. Draw the line of best fit on the scatter plot.

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ii. Describe the correlation between these quantities.

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- (e) The *capture-recapture* technique was used to estimate the population of penguins in 2016.

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- 50 penguins were caught, tagged and released.
- Later, 110 penguins were caught at random.
- 20 of these 110 penguins had been tagged.

The estimated population of the penguins in 2016 was 16% less than the estimated population for 2014.

What was the estimated population for 2014?

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End of paper.

Multiple choice Q1-25

Tuesday, 30 August 2016 5:07 PM

1. D
2. D
3. B
4. D
5. A
6. C
7. B
8. C
9. B
10. B
11. D
12. C
13. A
14. B
15. A
16. B
17. A
18. C
19. C
20. D
21. D
22. C
23. A
24. D
25. A

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127 a) i) $PVIF = 90.07$

$$\text{Monthly instalment} = \frac{65000}{90.07} = 721.66$$

ii) $721.66 \times 12 \times 10 = 86599.2$

$$\text{Monthly instalment} = \frac{65000}{83.29} = 780.41$$

$$780.41 \times 12 \times 9 = 84284.28$$

$$\text{Difference} = 86599.2 - 84284.28 = 2314.92$$

b) i) $I = 99593 \times 0.01 \times 1 = 995.94$

ii) $P + I - R = 99593.76 - 995.94 - 1100 = 99487.90$

iii) $\text{Amount paid} = 241 \times 1100 = 265100$

$$\text{Amount interest} = 265100 - 100000 = 165100$$

c) $17 \text{ hrs} = 17 \times 60 \text{ mins} = 1020 \text{ mins}$

$$1020 + 10 = 1030 \rightarrow \text{excess of } \$30$$

$$4.25 - 0.8 - 0.293 \text{ GB} = 3.157 \text{ GB used} \quad (1024 \text{ MB} = 1 \text{ GB})$$

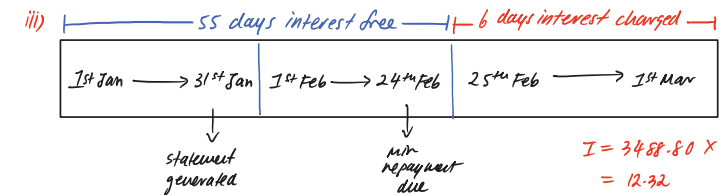
$$\hookrightarrow 0.657 \text{ GB over}$$

$$\text{so, excess } \$10$$

$$\$84 + \$30 + \$10 = \$124 \text{ bill}$$

d) i) $\text{Minimum repayment} = 3560 \times 0.02 = 71.20$

ii) 24th Feb



$$I = 3488.80 \times \frac{0.2149}{365} \times 6 \text{ days} = 12.32$$

$$\begin{array}{r} \$3560 \\ - 71.20 \\ \hline \$3488.80 \end{array} \text{ outstanding and attracts interest}$$

e) i) $\$800$

ii) straight line method

Q28 a) $\frac{2y}{3} - 7 = y + 2$

$$2y - 21 = 3y + 6$$

$$-27 = y$$

b) i) $c = 1200$

ii) $I = 75 \times 2500 = 187500$

iii) $c = 15(2500) + 1200 = 38700$

iv) $p = 148800$

v) $15n + 1200 = 75n$

$$1200 = 60n$$

$$n = 20$$

c) $48^\circ - 13^\circ = 35^\circ$

$$\frac{35^\circ}{360^\circ} \times 277 \times \frac{35^\circ}{360^\circ} \times 277 \times 6400 \text{ km}$$

$$= 3910 \text{ km}$$

d) $A = \frac{1}{2} ab \sin 50^\circ$

$$= \frac{1}{2} \times 38 \times 85 \times \sin 50^\circ$$

$$= 1237 \text{ m}^2$$

e) i) $\frac{\sin \angle ADB}{18} = \frac{\sin 20^\circ}{16}$

$$\angle ADB = \sin^{-1} \left(\frac{18 \times \sin 20^\circ}{16} \right)$$

$$= 23^\circ \text{ (to degrees)}$$

Angle of elevation from D to B

$$= 70^\circ - 23^\circ$$

$$= 47^\circ$$

ii) $\sin 47^\circ = \frac{BC}{16}$ (b/c right angled triangle)

$$BC = 16 \times \sin 47^\circ$$

$$= 12$$

$$AC = 12 + 18 = 30 \text{ m}$$

Q29 a) i) 0.07

ii) $0.07 > 0.05 \therefore$ over the legal limit

b) i) dosage = $\frac{20 \times 10 \text{ mL}}{70} = 2.86 \text{ mL}$

ii) $12 = \frac{35 \times x}{70}$

$$x = 24 \text{ mL}$$

c) $0.4x = 752$

$$x = 1880$$

d) $\text{max} = \frac{k}{H}$

$$80 = \frac{k}{325}$$

$$k = 16250$$

$$36.37 = \frac{k}{H}$$

$$= \frac{16250}{H}$$

$$H = 447$$

e) $120 \text{ L} / 4 \text{ min}$

$$30 \text{ L} / \text{min}$$

$$30 \times 60 \text{ L} / \text{hr}$$

$$1800 \text{ L} / \text{hr}$$

f) i) $80 = k(70)^2$

$$k = 0.0163$$

ii) Stopping distance = reaction + braking

$$\text{braking} = k(100)^2$$

$$\text{distance} = 0.0163 \times (100)^2$$

$$= 163 \text{ m}$$

$$100 \text{ km/h}$$

$$= 100000 \text{ m/h}$$

$$= \frac{100000}{3600} \text{ m/s}$$

$$= 27.77 \text{ m/s} \rightarrow \text{Stopping distance} = 27.77 \times 1.2 = 33.324$$

$$\therefore \text{Stopping distance} = 163 + 33.324 = 196.324 \text{ m}$$

$$= 196 \text{ m}$$

30) a) i) -2

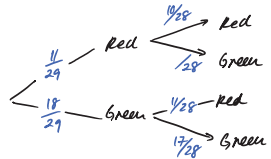
ii) $\frac{100-68}{2} = 16\%$

iii) Jessica

b) i) $4 \times 3 \times 2 \times 1 = 24$

ii) $\frac{3 \times 2 \times 1}{24} = \frac{1}{6}$

c) i)



ii) $\frac{11 \times 10}{29 \times 28} = \frac{55}{406}$

iii) $\frac{11}{29} \times \frac{18}{28} + \frac{18}{29} \times \frac{1}{28} = \frac{99}{203}$

d) i) need a reasonable, straight line of best fit (ruled)

ii) Negative strong correlation

e) $\frac{50 \times 110}{20} = 275$