Teacher Use Only	Marks
MC	/25
26	/15
27	/15
28	/15
29	/15
30	/15
Total	/100

2014
Higher School Certificate
Trial Examination

General 2 Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using black or blue pen
- Board-approved calculators may be used
- Draw diagrams using pencil
- A Formulae Sheet is provided
- Write your student number and/or name at the top of every page

Total marks – 100

Section I – Pages 2–9
25 marks
Attempt Questions 1–25
Allow about 30 minutes for this section

Section II – Pages 10–23
75 marks
Attempt Questions 26–30
All questions are of equal value
Allow about 2 hours for this section

This paper MUST NOT be removed from the examination room

NSW Department of Education and Communities (Schools)
CRICOS Provider Code: 00588M

STUDENT NUMBER: ……..

Section I

25 marks
Attempt Questions 1–25
Allow about 30 minutes for this section

1 Peta earns a casual rate of \$26.50 per hour at work.

What is her time-and-a-half rate per hour?

(A) \$13.25

(B) \$19.88

(C) \$39.75

(D) \$53.00

2 Which of the following expresses the statement: "5 less than $7p$"?

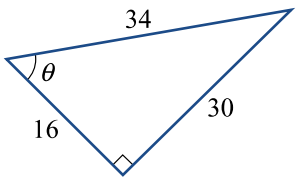
(A) $2p$

(B) $2p - 5$

(C) $5 - 7p$

(D) $7p - 5$

3 Which ratio represents $\tan\theta$ in the right-angled triangle below?



(A) $\frac{30}{34}$

(B) $\frac{30}{16}$

(C) $\frac{16}{30}$

(D) $\frac{16}{34}$

4 Sarah's car uses 8 litres of petrol to travel 100 km. Petrol costs \$1.50 per litre.

How far can she drive using \$30 worth of petrol?

(A) 200 km

(B) 250 km

(C) 150 km

(D) 300 km

5 An unbiased coin is tossed three times. On the first two tosses the result is heads. What is the probability that the result of the third toss will be a head?

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

(B) $\frac{1}{6}$

(C) $\frac{1}{4}$

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

6 The home loan table below shows the monthly repayments on loans at an annual interest rate of 8.5%.

Home loan table monthly repayments

Years	160 000	200 000	240 000	280 000	320 000	360 000	400 000
15	1575.58	1969.48	2363.38	2757.28	3151.16	3545.06	3938.96
20	1388.52	1735.64	2082.78	2429.90	2777.04	3124.16	3471.28
25	1288.36	1630.46	1932.64	2254.64	2576.72	2898.82	3260.92
30	1230.26	1537.82	1845.40	2152.96	2460.52	2768.08	3075.64

From the table, the maximum amount that can be borrowed over 25 years if you can afford monthly repayments of $2000 is:

(A) $160 000

(B) $200 000

(C) $240 000

(D) $280 000

7 If $k = 2$, what is the value of $1 - 4k^2$?

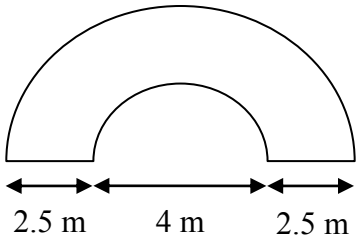
(A) –63

(B) –15

(C) 12

(D) 49

8



Which of these calculations would correctly give the area of this semicircular arch?

(A) $\frac{\pi}{2}(9^2 - 4^2)$

(B) $\pi(4.5^2 - 4^2)$

(C) $\pi(9^2 - 2^2)$

(D) $\frac{\pi}{2}(4.5^2 - 2^2)$

9 Simplify $3(x - 2) - 2(x - 1)$.

(A) $x - 1$

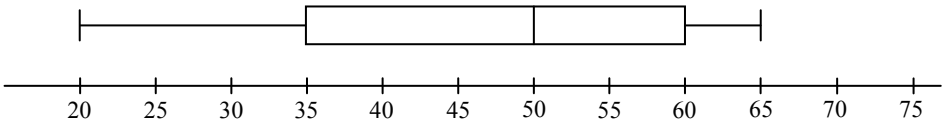
(B) $x - 3$

(C) $x - 4$

(D) $x - 5$

10 200 apples from an orchard were picked and each apple weighed for sorting into crates.

The following box and whisker plot shows the weights (in grams) recorded.



Which of these statements about the data displayed is correct?

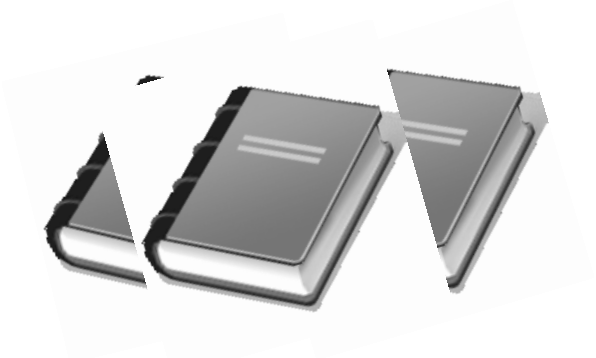
(A) The interquartile range is 45.

(B) The mean is 50 grams.

(C) 50 apples picked from the orchard weighed over 60 grams.

(D) The data shows positive skew.

11



In how many ways can these three different books be stacked on top of each other?

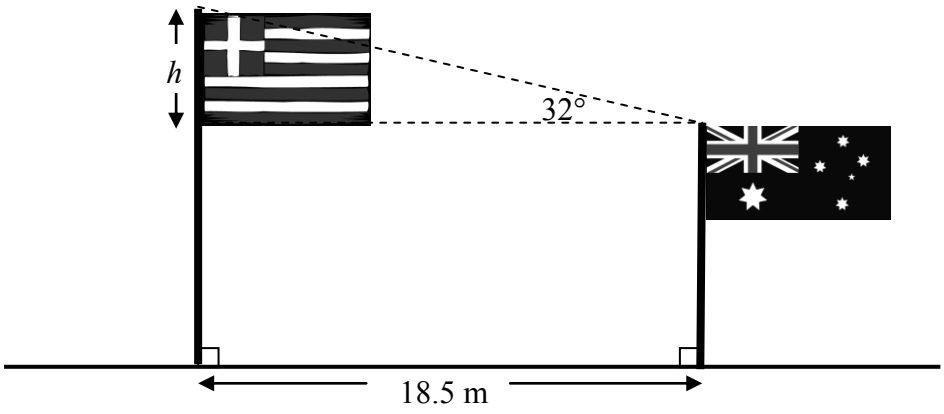
(A) 1

(B) 3

(C) 5

(D) 6

12 The flags of Greece and Australia are shown standing on level ground at the Athens Olympic Games.



The horizontal distance between the flags is 18.5 metres, and the angle of elevation between the flags is 32°, as shown.

Which of these calculations would correctly give the height (h) of the Greek flag above the Australian flag?

(A) $18.5 \times \tan 32^{o}$

(B) $\dfrac{18.5}{\tan 32^{o}}$

(C) $18.5 \times \sin 32^{o}$

(D) $18.5 \times \cos 32^{o}$

13 The number of matches in a box is approximately normally distributed with a mean of 50 and a standard deviation of 1. Approximately 95% of boxes will have between:

(A) 49 and 51 matches

(B) 48 and 52 matches

(C) 47 and 53 matches

(D) 46 and 54 matches

14 What is the value of x in the following equation?

$$\frac{\sqrt{x}}{4} = 9$$

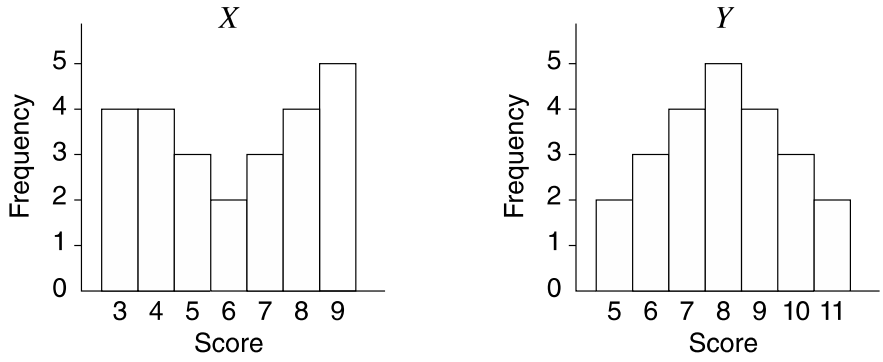
(A) 6

(B) 144

(C) 324

(D) 1 296

15 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.

16 A phone plan has a connection fee of 67 cents and 42 cents per 30-second block for calls. What is the cost of a 3 min 17 s call?

(A) $2.35

(B) $3.61

(C) $2.94

(D) $1.68

17 If $M = 2N^2$, which of the following gives N as the subject of the equation?

(A) $N = \pm 2\sqrt{M}$

(B) $N = \pm\sqrt{2M}$

(C) $N = \pm\sqrt{\frac{M}{2}}$

(D) $N = \pm\frac{\sqrt{M}}{2}$

18 Jonathon invests $6 000 at an annual flat rate of interest of 5%.

What is the value of Jonathon's investment (in dollars) after 4 years?

(A) 6 000 x 0.05 x 4

(B) 6 000 x $(1.05)^4$

(C) 6 000 + (6 000 x 0.05 x 4)

(D) 6 000 + (6 000 x 1.05^4)

19 The stamp duty charged when buying a car is 3% of the market value up to $45 000 plus 5% of the value over $45 000. The stamp duty to be paid on the purchase of a new car worth $56 000 is:

(A) $1680

(B) $2800

(C) $1900

(D) $550

20 Which statement is true when 4 is added to each score in a data set?

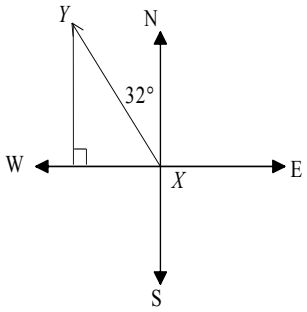
(A) The mean increases by 4 and the standard deviation increases by 4.

(B) The mean increases by 4 and the standard deviation stays the same.

(C) The mean stays the same and the standard deviation increases by 4.

(D) The mean stays the same and the standard deviation stays the same.

21 The compass bearing of *Y* from *X* is N32ºW.



What is the compass bearing of *X* from *Y*?

(A) N32ºW

(B) N58ºE

(C) S32ºE

(D) S58ºW

22 The table shows the monthly payment per $1000 on a monthly reducible loan.

Term in years	7.75%	8%	8.25%	8.5%
5	20.1570	20.2765	20.3963	20.5164
10	12.0011	12.1328	12.2653	12.3985

The monthly repayment on a loan of $15 600 at 8.25% over 10 years is:

(A) $154.25

(B) $183.98

(C) $195.76

(D) $191.34

23 Alice, Sonam, Ram and Mitchell are nominated for School Captain and Vice Captain. How many combinations of School Captain and Vice Captain are possible?

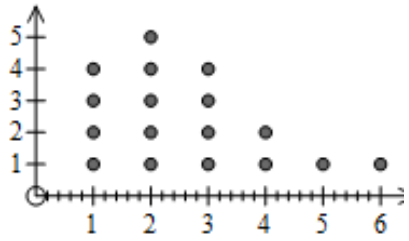
(A) 2

(B) 12

(C) 16

(D) 24

24 Which of the following best describes the dot plot?



(A) Bi-modal

(B) Negatively skewed

(C) Positively skewed

(D) Symmetrical

25 The double deck bus has 90 passengers.

There are 25% more passengers on the upper deck than on the lower deck of the bus.

How many passengers are there on the upper deck?

(A) 18

(B) 40

(C) 50

(D) 72

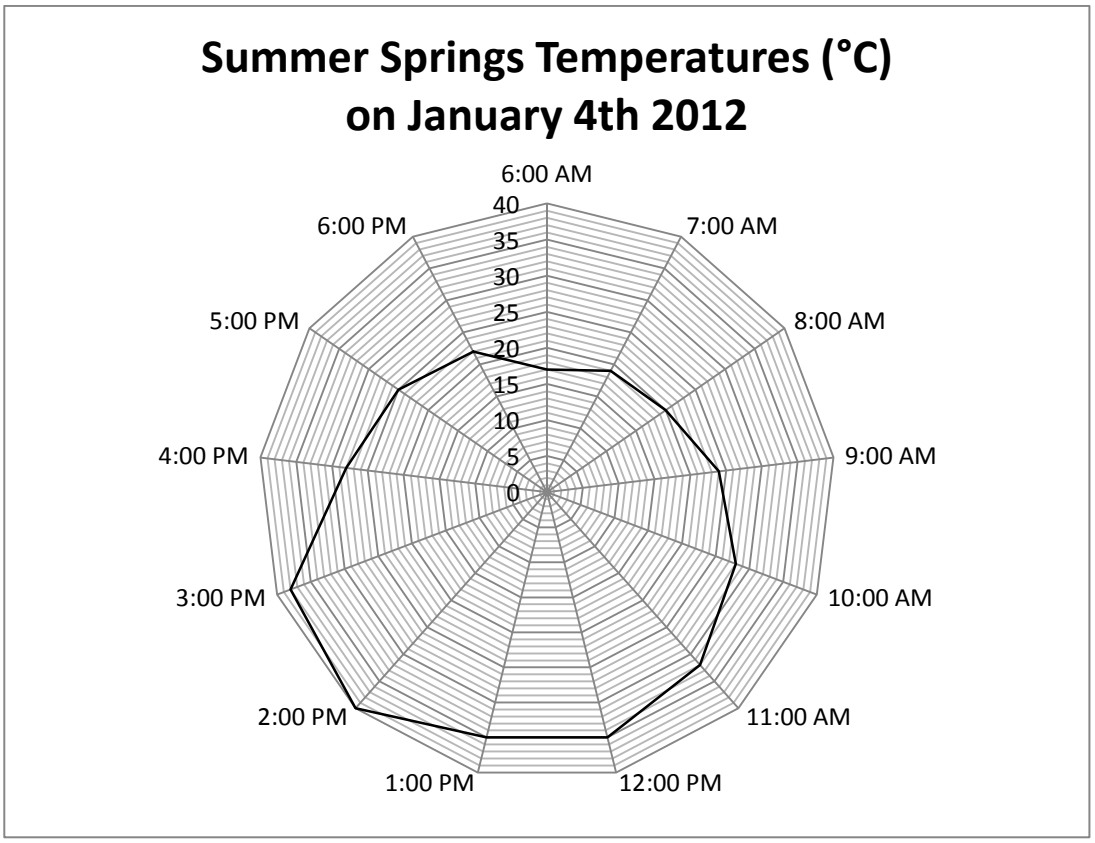
Section II (75 marks)

Attempt Questions 26–30. Allow about 2 hours for this section.

All necessary working should be shown in every question.

Question 26 (15 marks) **Marks**

(a) The radar chart below shows the temperatures over a 12 hour period during the hottest day recorded in January in the town of Summer Springs. The temperature is not recorded between 6.00pm and 6.00am.



(i) What time of day had the lowest temperature? **1**

……

(ii) What was the approximate range in temperature during the 12 hours? **1**

……

(iii) During what hourly period was the greatest drop in temperature? **1**

……

(iv) Determine the median temperature during the 12 hour period? **2**

……

Question 26 (continued) **Marks**

(b) A new test has been developed for determining whether or not people are carriers of the Gaussian virus. A two way table was used to record the results.

	Positive	***Negative***	**Totals**
Carrier	74	14	88
Not a Carrier	16	96	112
Totals	90	110	

(i) How many people were tested? **1**

.....

(ii) A person selected from the group is not a carrier of the virus.
What is the probability that the test results would show this? **2**

.....

(iii) For how many of the people tested were their test results accurate? **1**

.....

(c) From a region of a tropical forest, 60 rare birds were captured, tagged and released.

Sometime later, 80 birds were *recaptured* from the same region and it was found that 15 of these birds had previously been tagged.

Use the 'capture-recapture' method to give an estimate of the number of rare birds in this region of the forest. **2**

.....

Question 26 (continued) **Marks**

(d) Natalie borrows $5500 to buy a car. The simple interest rate is 11.5% p.a. and she takes the loan over 4 years

(i) Find the interest on the loan. **2**

……

(ii) Find the total to be repaid.. **1**

……

(iii) What is Natalie's monthly payment? **1**

……

Question 27 (15 marks) **Marks**

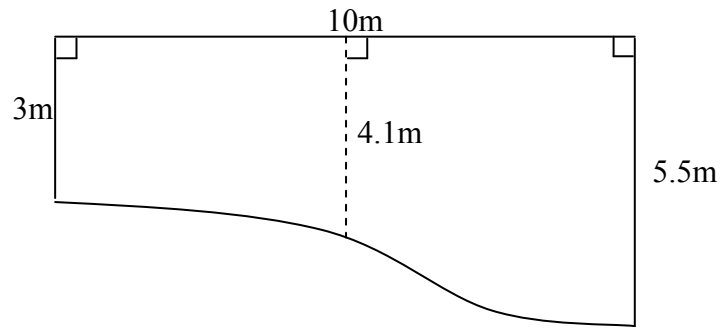
(a) Simplify the algebraic expression: **2**

$$5 - x^2 + 3x^2 + 2$$

……

Question 27 (continued) **Marks**

(b) An area of land is shown below.



(i) Determine the width of the equal parts (h) to be used in Simpson's rule. **1**

……

(ii) Use Simpson's rule to evaluate the area of the land. **2**
Answer correct to 1 decimal place.

……

(c) Solve the following pair of equations simultaneously. **2**

$$7x - 2y = -1$$
$$10x - 2y = 2$$

……

Question 27 (continued) **Marks**

(d) A new car is purchased for $29 000. It depreciates in value 21% per year.

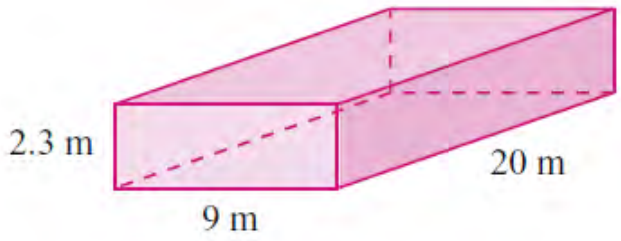
(i) Calculate the salvage value of the car after 3 years. **2**
Give your answer to the nearest dollar.

……

(ii) By what amount has the car depreciated in value over the 3 years? **1**

……

(e) The interior walls and floor of an in-ground swimming pool are to be repainted.



(i) Calculate the total surface area of the four walls and floor of the pool to the nearest square metre. **2**

……

(ii) How many cans of paint are needed if one can covers 70 m^2? **2**

……

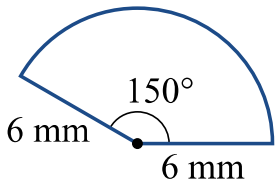
(iii) What is the cost of repainting, if each can costs $82.50? **1**

……

STUDENT NUMBER: ……..

Question 28 (15 marks) **Marks**

(a) Calculate the area of the sector below to the nearest square millimetre. **2**



.....

(b) A company owner must repay a loan of $120 000 in 5 years time.
What single amount of money must he invest now at 9% p.a., compounding monthly, in order to be able to repay the debt? Give your answer to the nearest dollar. **2**

.....

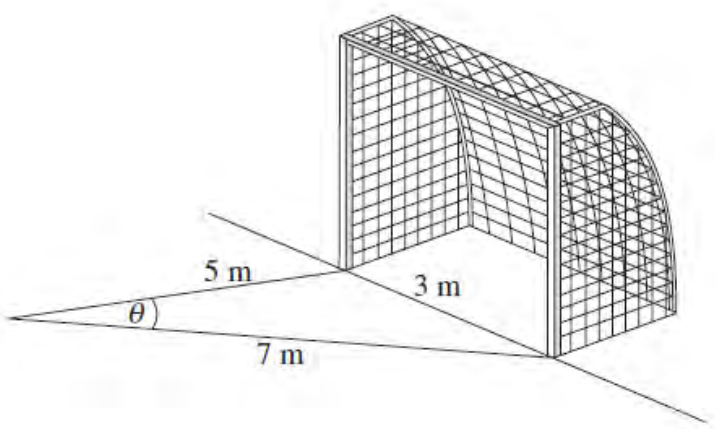
(c) Solve the following equation. **2**

$$\frac{x}{3} + \frac{x}{2} = -10$$

.....

Question 28 (continued) **Marks**

(d) A soccer goal is 3 m wide as shown below. A player shoots for goal from a position which is 5 m from one post and 7 m from the other.



Using the cosine rule, find the size of the angle θ (to the nearest degree) within which the shot must be taken to score the goal. **2**

.....

(e) The probability of being randomly breath-tested late on Friday night is 0.3.
On the next two Friday nights Liam is meeting friends and will be driving home late.

(i) What is the probability that he won't be randomly breath-tested on the first Friday night? **1**

.....

(ii) What is the probability that Liam is not randomly breath tested on the first Friday night and is randomly breath tested on the second Friday night? **2**

.....

Question 28 (continued) **Marks**

(f) Fifteen fans were randomly chosen at two football matches. The first game was at the Century stadium whilst the second game was at the Pele stadium.

The number of whole minutes each fan waited, in order to purchase a ticket at each game, was recorded in this survey.

The ordered stem-and-leaf plot displays the results.

Century stadium				**Pele stadium**					
	7	6	2	0	7				
		5	5	1	4	4	7		
9	6	2	1	2	8	9	9		
8	8	8	4	3	3	4	5	5	5
		7	3	4	4	□	6		

(i) One entry (represented by □) is missing for the Pele Stadium.
Give a possible number of minutes that this fan waited. **1**

.....

(ii) Write down the mode, in minutes, of the waiting times for the Century Stadium. **1**

.....

(iii) Calculate the median of the waiting times for the Century Stadium. **1**

.....

(iv) Determine the range of the waiting times for the Pele Stadium. **1**

.....

Question 29 (15 marks) **Marks**

(a) There are many mobile phone plans available. A company offers four BYO phone plans according to the following conditions.

Plan details

	$50 PLAN	$60 PLAN	$80 PLAN	$100 PLAN
Plan term	12 months			
Minimum monthly plan spend	$50	$60	$80	$100
Monthly included allowance for calls and MMS to standard Australian numbers	$550	$800	$1200	Unlimited
Unlimited text to standard Australian numbers	Yes			
Monthly included data allowance to use in Australia	1.5 GB	2 GB	2.5 GB	3 GB
Standard voice/video calls to standard Australian numbers (per 60-second block)	90 cents per minute plus 40 cents call connection fee			Unlimited
Text to standard Australian numbers	Unlimited			
MMS to standard Australian numbers	50 cents			Unlimited
MessageBank® connection fee (per call)	40 cents		Unlimited	
MessageBank® retrieval (per 60-second block)	90 cents		Unlimited	
Excess data usage (charged per MB)	25 cents per MB			

(i) Ruby has signed up for the $50/month plan. Determine the monthly included allowance for calls and MMS to standard Australian numbers? **1**

……

(ii) Steven makes about 200 calls per month. He averages 5 minutes per call.
He usually uses about 2.1 GB (2GB plus 100 MB) of data.
Which plan should he choose? Give reasons for your choice. **3**

……

……

……

Question 29 (continued) **Marks**

(b) Cindy obtained a mark of 78% in her Mathematics test. If the mean and standard deviation were 60% and 8% respectively:

(i) What z – score is equivalent to Cindy's mark? **1**

……

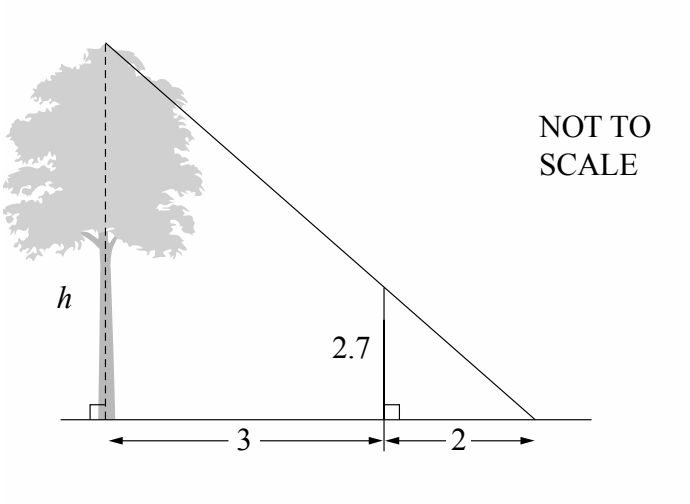
(ii) If John scored a mark of 52%, what percentage of students scored more that John on this test? **1**

……

(iii) On her next test, Cindy scored 82% this test has a mean of 65 and a standard deviation of 9%. **2**
On which test did Cindy perform the best? Give a reason for your answer.

……

(c) Calculate the height (h metres) of the tree in the diagram. All measurements are in metres. **2**



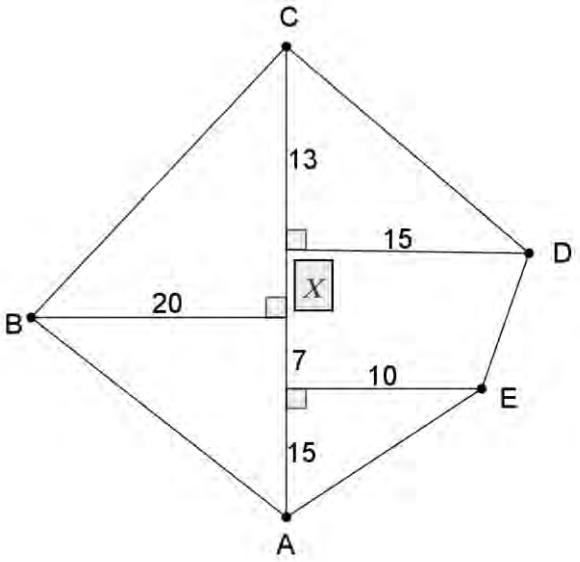
……

Question 29 (continued)
Marks

(d) The field notebook shows information about a pentagonal field ABCDE.

	C	
	40	
	27	15D
B20	22	
	15	10E
	0	
	A	

(i) Determine the missing value X in the pentagonal field ABCDE diagram below. **1**



X = ...

(ii) Find the distance AB to the nearest metre. **2**

……

(iii) Calculate the area of the triangle ABC to the nearest square metre. **2**

……

Question 30 (15 marks)

(a) This table gives monthly repayments ($) for every $1000 borrowed on a reducing-balance loan.

Interest rate (% p.a.)	Term of loan (months)				
	12	**24**	**36**	**48**	**60**
8	86.99	45.23	31.34	24.41	20.28
9	87.45	45.68	31.80	24.89	20.76
10	87.92	46.14	32.27	25.36	21.25

(i) Jenny borrowed $21 500 to buy a car. Use the table to calculate the monthly repayment on this loan at 9% p.a. over 3 years. **1**

……

(ii) What is the total amount Jenny would have repaid on this loan after 3 years? **1**

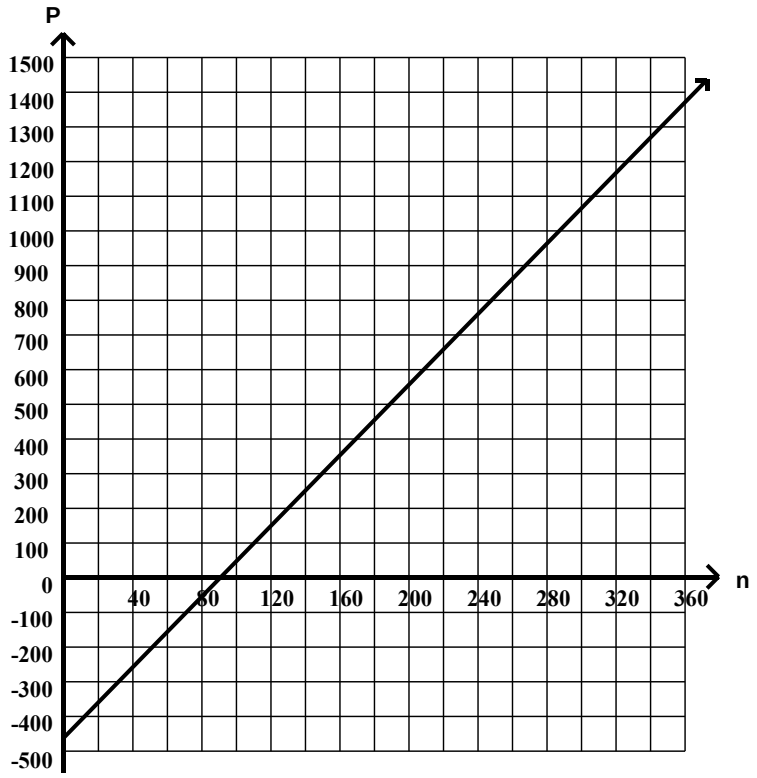
……

(iii) Jack's monthly repayment on a loan at 8% p.a. over 5 years is $334.62. Use the table above to calculate how much Jack borrowed. **2**

……

Question 30 (continued) **Marks**

(b) The graph below shows the profit made by the organisers of a school dance. Profit is represented by variable P and the number of people attending the dance is represented by n.



(i) How many people will be needed to attend the dance in order for the organisers to break even? **1**

……

(ii) The maximum number of people that can attend the dance is 360. What profit will the organisers make if this number of people attends? **1**

……

(iii) The organisers need to make a profit of at least \$2000. At what price should tickets be sold for to make this profit if 360 people will still attend? The price of the ticket must be a whole dollar amount. **2**

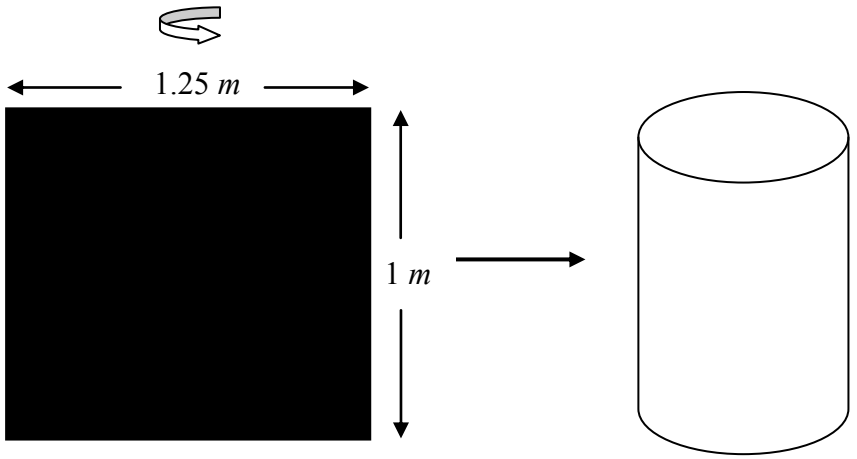
……

(iv) Write a formula that will calculate the profit P made by the dance when "n" people attend. **2**

……

Question 30 (continued) **Marks**

(c) Rectangular sheets of thin aluminium are rolled into open cylindrical drums as shown in the following diagram.



(i) Show that the drums have a radius of approximately 0.2 *m*. **2**

……

(ii) Use the radius = 0.2 *m* to calculate the volume of the drums in cubic metres. **2**

……

(iii) What is the capacity of these drums to the nearest litre? **1**

……

End of paper.

Teacher Use Only	Marks
MC	/25
26	/15
27	/15
28	/15
29	/15
30	/15
Total	/100

2014
Higher School Certificate
Trial Examination

General 2 Mathematics

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- Working time – 2½ hours
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25 marks
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Allow about 30 minutes for this section

Section II – Pages 10–23
75 marks
Attempt Questions 26–30
All questions are of equal value
Allow about 2 hours for this section

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NSW Department of Education and Communities (Schools)
CRICOS Provider Code: 00588M

STUDENT NUMBER: ……..

STUDENT NUMBER: ……..

Section I

25 marks
Attempt Questions 1–25
Allow about 30 minutes for this section

1 Peta earns a casual rate of \$26.50 per hour at work.

What is her time-and-a-half rate per hour?

(A) \$13.25

(B) \$19.88

(C) \$39.75

(D) \$53.00

2 Which of the following expresses the statement: "5 less than $7p$"?

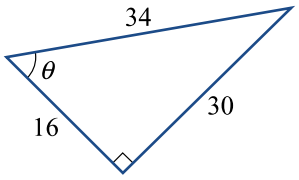
(A) $2p$

(B) $2p - 5$

(C) $5 - 7p$

(D) $7p - 5$

3 Which ratio represents $\tan\theta$ in the right-angled triangle below?



(A) $\frac{30}{34}$

(B) $\frac{30}{16}$

(C) $\frac{16}{30}$

(D) $\frac{16}{34}$

4 Sarah's car uses 8 litres of petrol to travel 100 km. Petrol costs \$1.50 per litre.

How far can she drive using \$30 worth of petrol?

(A) 200 km

(B) 250 km

(C) 150 km

(D) 300 km

5 An unbiased coin is tossed three times. On the first two tosses the result is heads. What is the probability that the result of the third toss will be a head?

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

(B) $\frac{1}{6}$

(C) $\frac{1}{4}$

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

6 The home loan table below shows the monthly repayments on loans at an annual interest rate of 8.5%.

Home loan table monthly repayments

Years	160 000	200 000	240 000	280 000	320 000	360 000	400 000
15	1575.58	1969.48	2363.38	2757.28	3151.16	3545.06	3938.96
20	1388.52	1735.64	2082.78	2429.90	2777.04	3124.16	3471.28
25	1288.36	1630.46	1932.64	2254.64	2576.72	2898.82	3260.92
30	1230.26	1537.82	1845.40	2152.96	2460.52	2768.08	3075.64

From the table, the maximum amount that can be borrowed over 25 years if you can afford monthly repayments of $2000 is:

(A) $160 000

(B) $200 000

(C) $240 000

(D) $280 000

7 If $k = 2$, what is the value of $1 - 4k^2$?

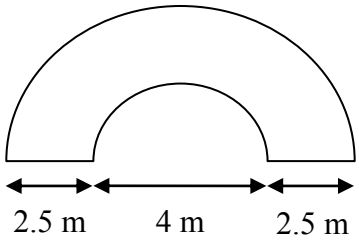
(A) –63

(B) –15

(C) 12

(D) 49

8



Which of these calculations would correctly give the area of this semicircular arch?

(A) $\frac{\pi}{2}(9^2 - 4^2)$

(B) $\pi\,(4.5^2 - 4^2)$

(C) $\pi\,(9^2 - 2^2)$

(D) $\frac{\pi}{2}(4.5^2 - 2^2)$

9 Simplify $3(x - 2) - 2(x - 1)$.

(A) $x - 1$

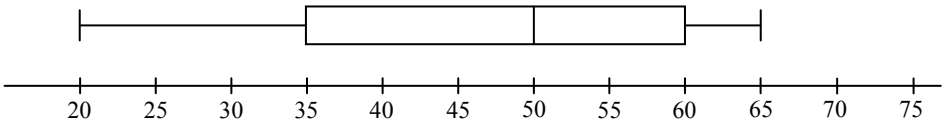
(B) $x - 3$

(C) $x - 4$

(D) $x - 5$

10 200 apples from an orchard were picked and each apple weighed for sorting into crates.

The following box and whisker plot shows the weights (in grams) recorded.



Which of these statements about the data displayed is correct?

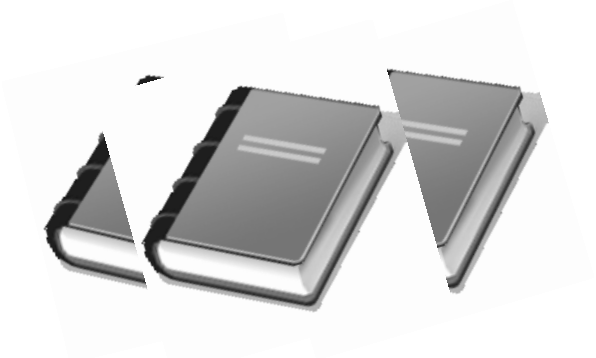
(A) The interquartile range is 45.

(B) The mean is 50 grams.

(C) 50 apples picked from the orchard weighed over 60 grams.

(D) The data shows positive skew.

11



In how many ways can these three different books be stacked on top of each other?

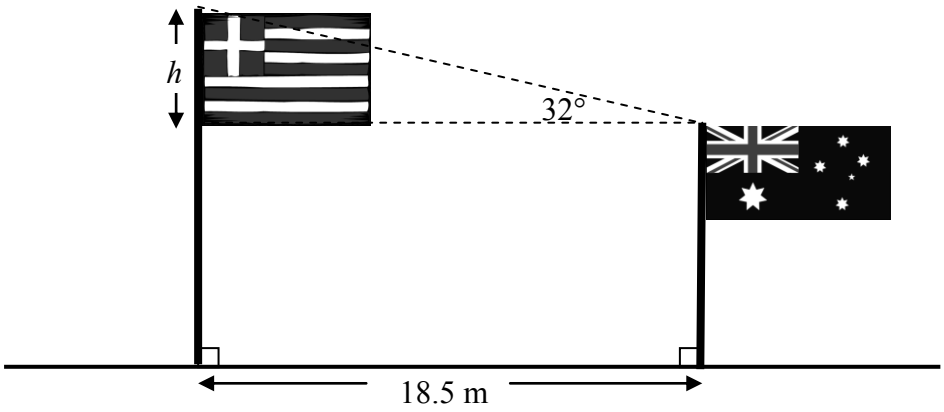
(A) 1

(B) 3

(C) 5

(D) 6

12 The flags of Greece and Australia are shown standing on level ground at the Athens Olympic Games.



The horizontal distance between the flags is 18.5 metres, and the angle of elevation between the flags is 32°, as shown.

Which of these calculations would correctly give the height (h) of the Greek flag above the Australian flag?

(A) $18.5 \times \tan 32^{o}$

(B) $\dfrac{18.5}{\tan 32^{o}}$

(C) $18.5 \times \sin 32^{o}$

(D) $18.5 \times \cos 32^{o}$

13 The number of matches in a box is approximately normally distributed with a mean of 50 and a standard deviation of 1. Approximately 95% of boxes will have between:

(A) 49 and 51 matches

(B) 48 and 52 matches

(C) 47 and 53 matches

(D) 46 and 54 matches

14 What is the value of x in the following equation?

$$\frac{\sqrt{x}}{4} = 9$$

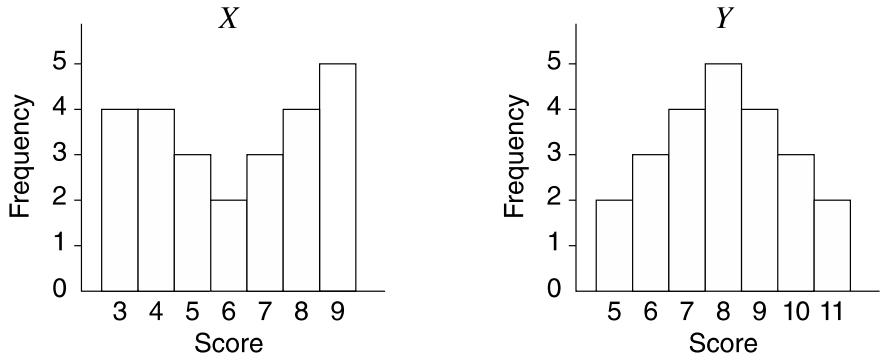
(A) 6

(B) 144

(C) 324

(D) 1 296

15 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.

16 A phone plan has a connection fee of 67 cents and 42 cents per 30-second block for calls. What is the cost of a 3 min 17 s call?

(A) $2.35

(B) $3.61

(C) $2.94

(D) $1.68

17 If $M = 2N^2$, which of the following gives N as the subject of the equation?

(A) $N = \pm 2\sqrt{M}$

(B) $N = \pm\sqrt{2M}$

(C) $N = \pm\sqrt{\frac{M}{2}}$

(D) $N = \pm\frac{\sqrt{M}}{2}$

18 Jonathon invests $6 000 at an annual flat rate of interest of 5%.

What is the value of Jonathon's investment (in dollars) after 4 years?

(A) 6 000 x 0.05 x 4

(B) 6 000 x $(1.05)^4$

(C) 6 000 + (6 000 x 0.05 x 4)

(D) 6 000 + (6 000 x 1.05^4)

19 The stamp duty charged when buying a car is 3% of the market value up to $45 000 plus 5% of the value over $45 000. The stamp duty to be paid on the purchase of a new car worth $56 000 is:

(A) $1680

(B) $2800

(C) $1900

(D) $550

20 Which statement is true when 4 is added to each score in a data set?

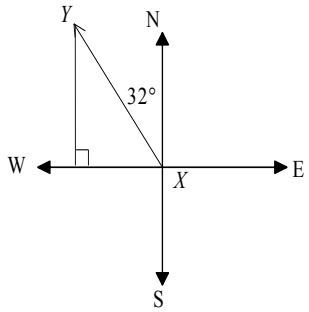
(A) The mean increases by 4 and the standard deviation increases by 4.

(B) The mean increases by 4 and the standard deviation stays the same.

(C) The mean stays the same and the standard deviation increases by 4.

(D) The mean stays the same and the standard deviation stays the same.

21 The compass bearing of *Y* from *X* is N32°W.



What is the compass bearing of *X* from *Y*?

(A) N32°W

(B) N58°E

(C) S32°E

(D) S58°W

22 The table shows the monthly payment per $1000 on a monthly reducible loan.

Term in years	7.75%	8%	8.25%	8.5%
5	20.1570	20.2765	20.3963	20.5164
10	12.0011	12.1328	12.2653	12.3985

The monthly repayment on a loan of $15 600 at 8.25% over 10 years is:

(A) $154.25

(B) $183.98

(C) $195.76

(D) $191.34

23 Alice, Sonam, Ram and Mitchell are nominated for School Captain and Vice Captain. How many combinations of School Captain and Vice Captain are possible?

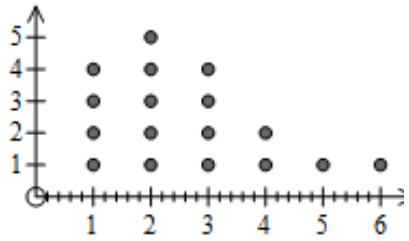
(A) 2

(B) 12

(C) 16

(D) 24

24 Which of the following best describes the dot plot?



(A) Bi-modal

(B) Negatively skewed

(C) Positively skewed

(D) Symmetrical

25 The double deck bus has 90 passengers.

There are 25% more passengers on the upper deck than on the lower deck of the bus.

How many passengers are there on the upper deck?

(A) 18

(B) 40

(C) 50

(D) 72

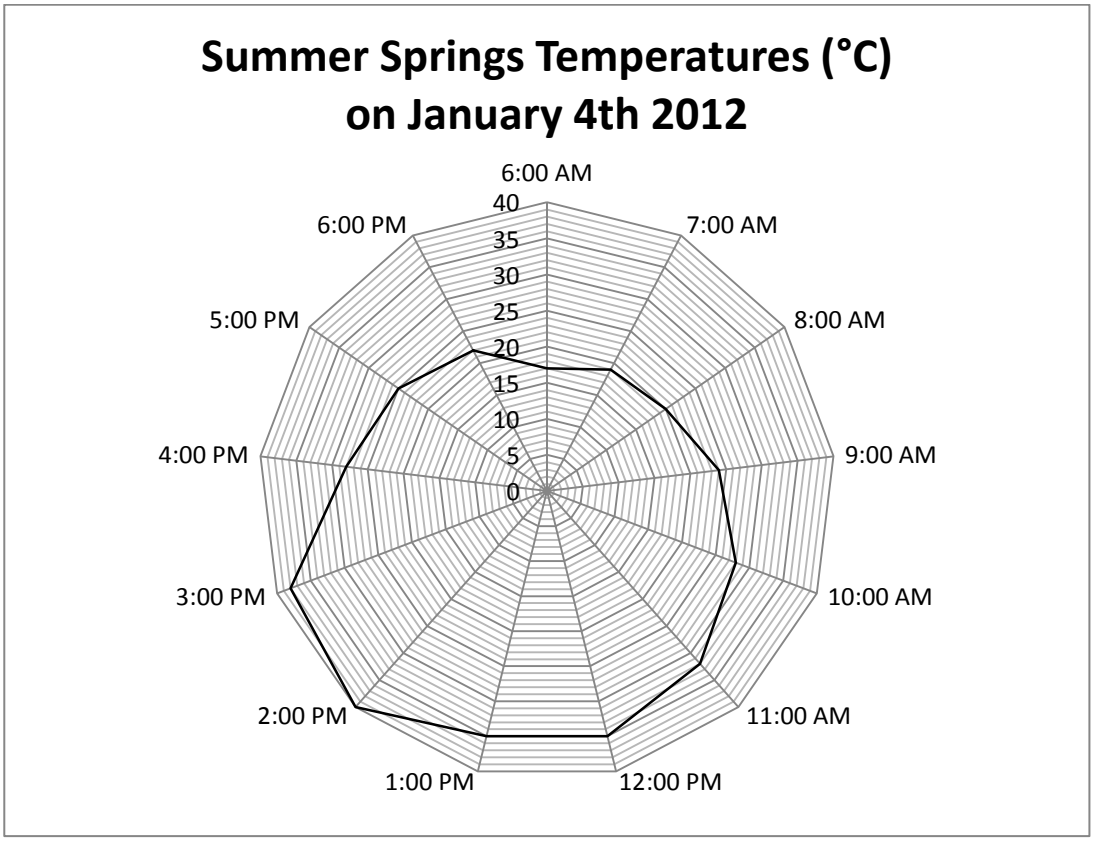
Section II (75 marks)

Attempt Questions 26–30. Allow about 2 hours for this section.

All necessary working should be shown in every question.

Question 26 (15 marks) **Marks**

(a) The radar chart below shows the temperatures over a 12 hour period during the hottest day recorded in January in the town of Summer Springs. The temperature is not recorded between 6.00pm and 6.00am.



(i) What time of day had the lowest temperature? **1**

6 am

(ii) What was the approximate range in temperature during the 12 hours? **1**

40 – 17 = 23

(iii) During what hourly period was the greatest drop in temperature? **1**

3 pm – 4 pm, 38 – 28 = 10°

(iv) Determine the median temperature during the 12 hour period? **2**

17, 19, 20, 22, 24, 25, 28, 28, 32, 35, 35, 38, 40

Median is 28.

……

Question 26 (continued) **Marks**

(b) A new test has been developed for determining whether or not people are carriers of the Gaussian virus. A two way table was used to record the results.

	Positive	***Negative***	**Totals**
Carrier	74	14	88
Not a Carrier	16	96	112
Totals	90	110	

(i) How many people were tested? **1**

90 + 110 = 200

.....

(ii) A person selected from the group is not a carrier of the virus.
What is the probability that the test results would show this? **2**

$$\frac{\mathbf{96}}{\mathbf{112}} = \frac{\mathbf{6}}{\mathbf{7}}$$

(iii) For how many of the people tested were their test results accurate? **1**

74 + 96 = 170

.....

(c) From a region of a tropical forest, 60 rare birds were captured, tagged and released.

Sometime later, 80 birds were *recaptured* from the same region and it was found that 15 of these birds had previously been tagged.

Use the 'capture-recapture' method to give an estimate of the number of rare birds in this region of the forest. **2**

$$\frac{60}{p} = \frac{15}{80}$$

$$p = \frac{60 \times 80}{15}$$

$$p = 320$$

Question 26 (continued) **Marks**

(d) Natalie borrows $5500 to buy a car. The simple interest rate is 11.5% p.a. and she takes the loan over 4 years

(i) Find the interest on the loan. **2**

$$\mathbf{I = 5500 \times \frac{11.5}{100} \times 4 = \$2530}$$

……

(ii) Find the total to be repaid.. **1**

5500 +2530 = $8030

……

(iii) What is Natalie's monthly payment? **1**

8030 ÷ 48 = $167.29

……

Question 27 (15 marks) **Marks**

(a) Simplify the algebraic expression: **2**

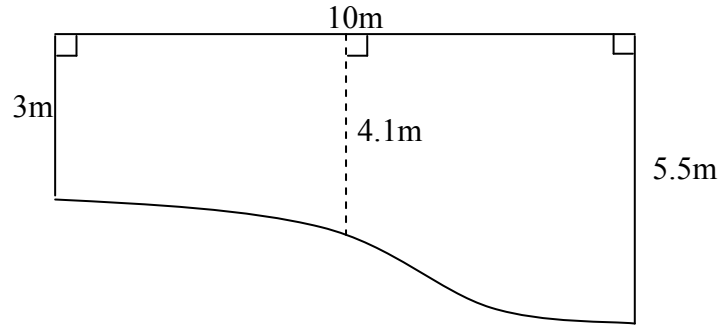
$$5 - x^2 + 3x^2 + 2$$

$$7 + 2x^2$$

……

Question 27 (continued) **Marks**

(b) An area of land is shown below.



(i) Determine the width of the equal parts (h) to be used in Simpson's rule. **1**

$$\mathbf{10 \div 2 = 5\ m}$$

……

(ii) Use Simpson's rule to evaluate the area of the land. **2**
Answer correct to 1 decimal place.

$$\mathbf{A = \frac{5}{3}\ (3 + 4\ \times 4.1 + 5.5)}$$

$$\mathbf{= 41.5\ m^2}$$

……

(c) Solve the following pair of equations simultaneously. **2**

$$7x - 2y = -1 \quad \textit{Eqn 1}$$
$$10x - 2y = 2 \quad \textit{Eqn 2}$$

Eqn 2 – Eqn 1

$$3x = 3$$
$$x = 1$$

Substitute $x = 1$ into *Eqn 1*

$$7 \times 1 - 2y = -1$$
$$-2y = -8$$
$$y = 4$$

The solution is (1, 4).

Question 27 (continued) **Marks**

(d) A new car is purchased for \$29 000. It depreciates in value 21% per year.

(i) Calculate the salvage value of the car after 3 years. **2**
Give your answer to the nearest dollar.

$$S = 29\,000(1 - 0.21)^3$$
$$= \$14\,298$$

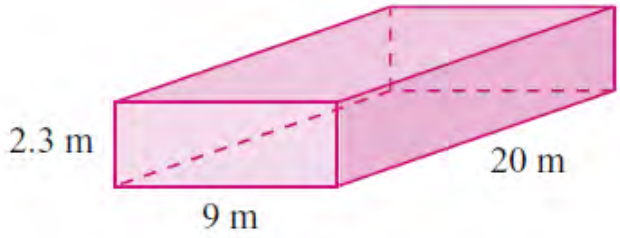
……

(ii) By what amount has the car depreciated in value over the 3 years? **1**

29 000 – 14 298 = \$14 702

……

(e) The interior walls and floor of an in-ground swimming pool are to be repainted.



(i) Calculate the total surface area of the four walls and floor of the pool to the nearest square metre. **2**

$$SA = 9 \times 20 + 2\,(2.3 \times 9) + 2(2.3 \times 20)$$
$$= 313.4 \text{ m}^2$$

(ii) How many cans of paint are needed if one can covers 70 m^2? **2**

$313 \div 70 = 4.4$
5 cans are needed

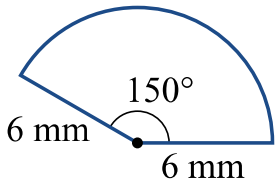
(iii) What is the cost of repainting, if each can costs \$82.50? **1**

$\$82.50 \times 5 = \$412.50$

……

Question 28 (15 marks) **Marks**

(a) Calculate the area of the sector below to the nearest square millimetre. **2**



$$\text{Area} = \frac{150}{360} \times \pi \times 6^2$$
$$= 47m\text{m}^2$$

(b) A company owner must repay a loan of $120 000 in 5 years time.
What single amount of money must he invest now at 9% p.a., compounding monthly, in order to be able to repay the debt? Give your answer to the nearest dollar. **2**

$$\mathbf{PV} = \frac{\mathbf{120\,000}}{(\mathbf{1+0.0075})^{\mathbf{60}}}$$
$$= \mathbf{\$76\,643.96}$$

.....

(c) Solve the following equation. **2**

$$\frac{x}{3} + \frac{x}{2} = -10$$

$$\frac{2x}{6} + \frac{3x}{6} = -10$$

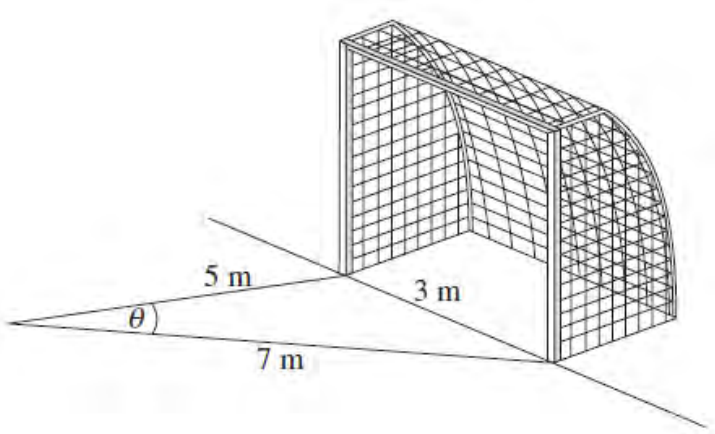
$$5x = -60$$

$$x = -12$$

.....

Question 28 (continued) **Marks**

(d) A soccer goal is 3 m wide as shown below. A player shoots for goal from a position which is 5 m from one post and 7 m from the other.



Using the cosine rule, find the size of the angle θ (to the nearest degree) within which the shot must be taken to score the goal. **2**

$$\cos\theta = \frac{5^2 + 7^2 - 3^2}{2 \times 5 \times 7}$$

$$\theta = 22°$$

.....

(e) The probability of being randomly breath-tested late on Friday night is 0.3.
On the next two Friday nights Liam is meeting friends and will be driving home late.

(i) What is the probability that he won't be randomly breath-tested on the first Friday night? **1**

0.7

.....

(ii) What is the probability that Liam is not randomly breath tested on the first Friday night and is randomly breath tested on the second Friday night? **2**

$$0.7 \times 0.3 = 0.21$$

.....

Question 28 (continued) **Marks**

(f) Fifteen fans were randomly chosen at two football matches. The first game was at the Century stadium whilst the second game was at the Pele stadium.

The number of whole minutes each fan waited, in order to purchase a ticket at each game, was recorded in this survey.

The ordered stem-and-leaf plot displays the results.

Century stadium				**Pele stadium**						
	7	6	2	0	7					
		5	5	1	4	4	7			
9	6	2	1	2	8	9	9			
8	8	8	4	3	3	4	5	5	5	
		7	3	4	4	□	6			

(i) One entry (represented by □) is missing for the Pele Stadium.
Give a possible number of minutes that this fan waited. **1**

44, 45 or 46 minutes

.....

(ii) Write down the mode, in minutes, of the waiting times for the Century Stadium. **1**

38 minutes

.....

(iii) Calculate the median of the waiting times for the Century Stadium. **1**

26 minutes

.....

(iv) Determine the range of the waiting times for the Pele Stadium. **1**

46 – 7 = 39 minutes

.....

Question 29 (15 marks) **Marks**

(a) There are many mobile phone plans available. A company offers four BYO phone plans according to the following conditions.

Plan details

	$50 PLAN	$60 PLAN	$80 PLAN	$100 PLAN
Plan term	12 months			
Minimum monthly plan spend	$50	$60	$80	$100
Monthly included allowance for calls and MMS to standard Australian numbers	$550	$800	$1200	Unlimited
Unlimited text to standard Australian numbers	Yes			
Monthly included data allowance to use in Australia	1.5 GB	2 GB	2.5 GB	3 GB
Standard voice/video calls to standard Australian numbers (per 60-second block)	90 cents per minute plus 40 cents call connection fee			Unlimited
Text to standard Australian numbers	Unlimited			
MMS to standard Australian numbers	50 cents			Unlimited
MessageBank® connection fee (per call)	40 cents		Unlimited	
MessageBank® retrieval (per 60-second block)	90 cents		Unlimited	
Excess data usage (charged per MB)	25 cents per MB			

(i) Ruby has signed up for the $50/month plan. Determine the monthly included allowance for calls and MMS to standard Australian numbers? **1**

$550

……

(ii) Steven makes about 200 calls per month. He averages 5 minutes per call.
He usually uses about 2.1 GB (2GB plus 100 MB) of data.
Which plan should he choose? Give reasons for your choice. **3**

Calls: $\mathbf{200 \times 0.40 + 200 \times 5 \times 0.90 = \$980}$
Data: $\mathbf{0.25 \times 100 = \$25}$

The $80 plan is needed to cover the extra data usage and phone calls.

……

Question 29 (continued) **Marks**

(b) Cindy obtained a mark of 78% in her Mathematics test. If the mean and standard deviation were 60% and 8% respectively:

(i) What z – score is equivalent to Cindy's mark? **1**

$$z\text{-score} = \frac{78-60}{8} = 2.25$$

(ii) If John scored a mark of 52%, what percentage of students scored more that John on this test? **1**

$$z\text{-score} = -1$$

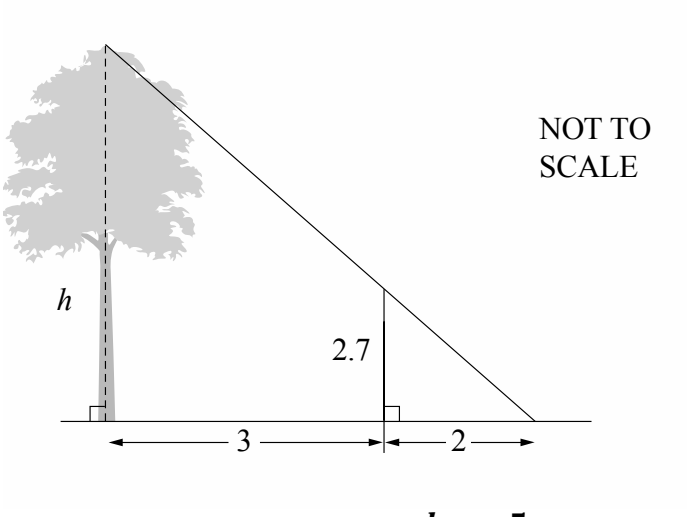
34% + 50% = 84%

(iii) On her next test, Cindy scored 82% this test has a mean of 65 and a standard deviation of 9%. On which test did Cindy perform the best? Give a reason for your answer. **2**

$$\text{Next Test } z\text{-score} = \frac{82-65}{9} = 1.89$$

Compared to the rest of the class, Cindy performed better in the first test with a higher *z*-score.

(c) Calculate the height (*h* metres) of the tree in the diagram. All measurements are in metres. **2**



$$\frac{h}{2.7} = \frac{5}{2}$$

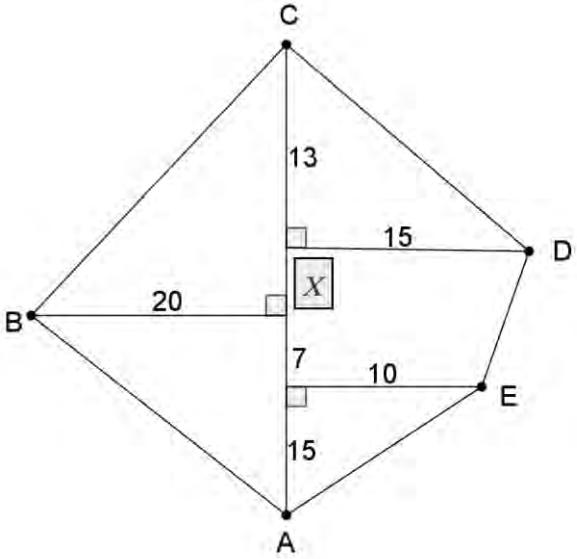
$$h = 6.75 \text{ m}$$

Question 29 (continued)
Marks

(d) The field notebook shows information about a pentagonal field ABCDE.

	C	
	40	
	27	15D
B20	22	
	15	10E
	0	
	A	

(i) Determine the missing value X in the pentagonal field ABCDE diagram below. **1**



$$\boldsymbol{X = 40 - (13 + 7 + 15) = 5}$$

(ii) Find the distance AB to the nearest metre. **2**

$$\boldsymbol{AB^2 = (7 + 15)^2 + (20)^2}$$

$$\boldsymbol{= \sqrt{22^2 + 20^2}}$$

$$\boldsymbol{= 29.73 \text{ m}}$$

$$\boldsymbol{\approx 30 \text{ m}}$$

.

(iii) Calculate the area of the triangle ABC to the nearest square metre. **2**

$$\textbf{Area} = \boldsymbol{\frac{1}{2} \times 40 \times 20}$$

$$\boldsymbol{= 400 \text{ m}^2}$$

Question 30 (15 marks)

(a) This table gives monthly repayments ($) for every $1000 borrowed on a reducing-balance loan.

Interest rate (% p.a.)	Term of loan (months)				
	12	**24**	**36**	**48**	**60**
8	86.99	45.23	31.34	24.41	20.28
9	87.45	45.68	31.80	24.89	20.76
10	87.92	46.14	32.27	25.36	21.25

(i) Jenny borrowed $21 500 to buy a car. Use the table to calculate the monthly repayment on this loan at 9% p.a. over 3 years. **1**

$$\frac{\mathbf{21\,500}}{\mathbf{1000}} \times \mathbf{31.80} = \$\mathbf{683.70}$$

……

(ii) What is the total amount Jenny would have repaid on this loan after 3 years? **1**

$$\$\mathbf{683.70} \times \mathbf{36} = \$\mathbf{24\,613.20}$$

……

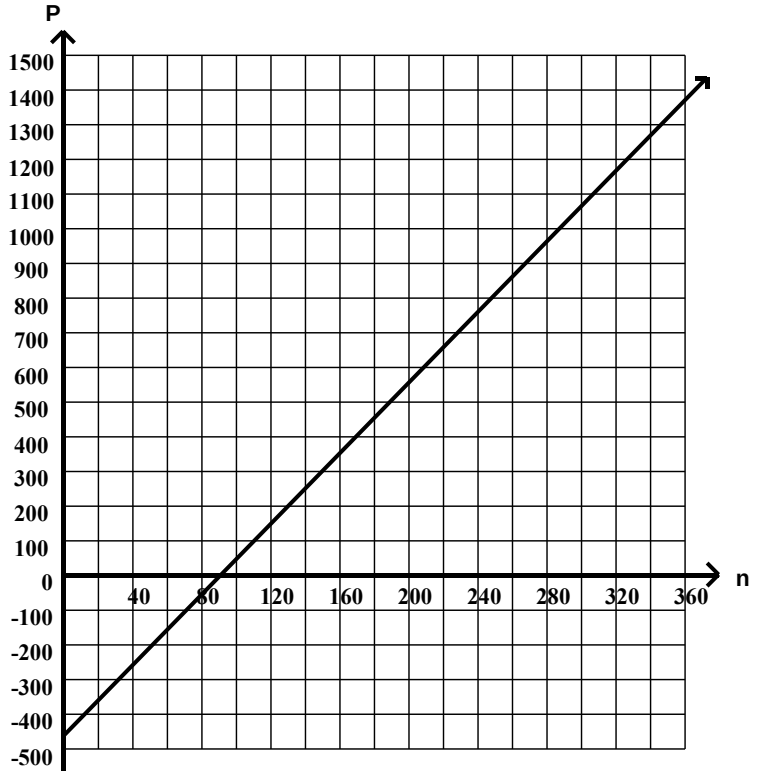
(iii) Jack's monthly repayment on a loan at 8% p.a. over 5 years is $334.62. Use the table above to calculate how much Jack borrowed. **2**

$$\frac{\mathbf{334.62}}{\mathbf{20.28}} \times \mathbf{1000} = \$\mathbf{16\,500}$$

……

Question 30 (continued) **Marks**

(b) The graph below shows the profit made by the organisers of a school dance. Profit is represented by variable *P* and the number of people attending the dance is represented by *n*.



(i) How many people will be needed to attend the dance in order for the organisers to break even? **1**

90

(ii) The maximum number of people that can attend the dance is 360. What profit will the organisers make if this number of people attends? **1**

$1360

……

(iii) The organisers need to make a profit of at least $2000. At what price should tickets be sold for to make this profit if 360 people will still attend? The price of the ticket must be a whole dollar amount. **2**

$450 + $$2000 = $2450
$2450 ÷ 360 = 6.86 Ticket Price = $7

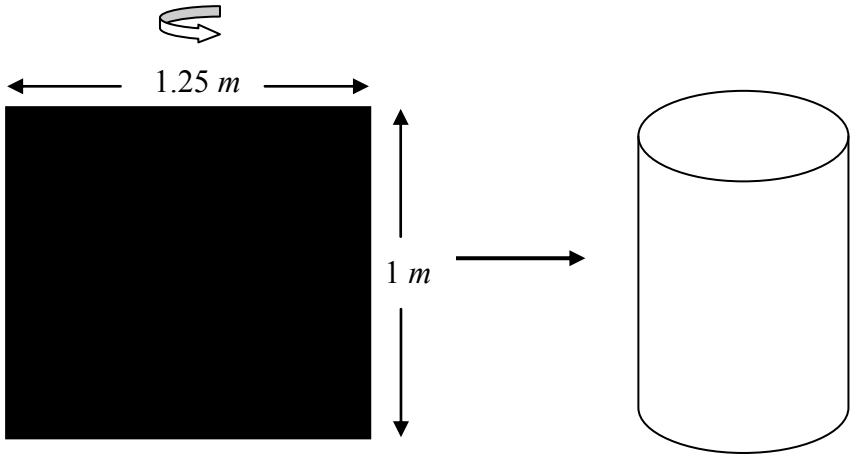
……

(iv) Write a formula that will calculate the profit *P* made by the dance when "*n*" people attend. **2**

Gradient = $\frac{450}{90} = 5$ **P = 5n - 450**

Question 30 (continued) **Marks**

(c) Rectangular sheets of thin aluminium are rolled into open cylindrical drums as shown in the following diagram.



(i) Show that the drums have a radius of approximately 0.2 *m*. **2**

$$\mathbf{C = 1.25}$$
$$\mathbf{2\pi r = 1.25}$$
$$\mathbf{r = \frac{1.25}{2\pi}}$$
$$\mathbf{r = 0.1989\ m}$$

……

(ii) Use the radius = 0.2 *m* to calculate the volume of the drums in cubic metres. **2**

$$\mathbf{V = \pi r^2 h}$$
$$\mathbf{V = \pi \times 0.2^2 \times 1}$$
$$\mathbf{= 0.12566\ m^3}$$

……

(iii) What is the capacity of these drums to the nearest litre? **1**

$$\mathbf{0.12566 \times 1000 = 125.66\ L}$$
$$\mathbf{\approx 126\ L}$$