Answer **all** the questions.

1 (a) Express 65.75 % as a fraction in its lowest term.

Answer (a) ..... [1]

(b) Write your answer to part (a) as a decimal, correct to 2 decimal places.

Answer (b) ..... [1]

---

2 Find the fraction exactly halfway between $\frac{3}{7}$ and $\frac{3}{8}$.

Answer ..... [2]

---

3 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{412.28 \times 39.001}{0.367}.$$

You **must** show your working.

Answer ..... [2]

---

4 A bowling alley contains only black, white and blue balls.
The probability of getting a black ball is 0.47.
The probability of getting a white ball is 0.35.
A bowler received a ball at random.

(a) Find the probability that the ball is black or white.

Answer (a) ..... [1]

(b) Find the probability that the ball is blue.

Answer (b) ..... [1]

---

5 On a particular day, the rate of exchange between British pounds (£) and Singapore dollars ($) was £1 = $1.50.

A tourist bought a digital camera for $1500 at a shop in Singapore. The shop charged 1% commission because the tourist paid in pounds.
What was the total cost in pounds?

Answer £ ..... [2]

---

6 **(a)** Express 1210 as a product of its prime factors.

Answer (a) ..... [1]

(b) Given that $1210k$ is a perfect square, write down the smallest integer value of k.

Answer (b) ..... [1]

(c) Find the highest common factor of 1210 and 99.

Answer (c) ..... [1]

---

7 **(a)** Given that $y = 7 - 3x$, find the value of y when $x = -2$.

Answer (a) ..... [1]

(b) Make d the subject of the formula $c = 4d + 3e$.

Answer (b) ..... [2]

---

8 **(a)** Simplify $2x - 5(4 - x)$.

Answer (a) ..... [1]

(b) Solve $\frac{7}{x+2} = 3$.

Answer (b) $x =$ ..... [2]

---

9 **(a)** Eve invested \$25000 in Bank A which offered a simple interest of 2.2% per annum. Calculate the amount that she would have in Bank A at the end of 2 years.

Answer (a) \$..... [1]

(a) Eve invested another \$5000 by opening an account in Bank B which paid a compound interest of 2.2% per annum, compounded yearly.
Find the total amount of she would have in his account at the end of 2 years.

Answer (b) \$..... [2]

---

10 The population on an island is 3.48 million people.

(a) Write this population in standard form.

Answer (a) ..... [1]

(b) It is estimated that this population will increase to 5 million in 20 years.
Calculate the percentage increase in population.

Answer (b) .....% [2]

---

11 A park's map is drawn to a scale of 1 : 5000.

(a) The length of a hiking track on the map is 27 cm.
Find the actual distance, in metres, of the track.

Answer (a) .....m [1]

(b) The area of a pond inside the park is 8200 m^2.
Calculate the area, in square centimetres, on the map.

Answer (b) ..... cm^2 [2]

---

12 Solve the simultaneous equations.

$$x + 3y = 7$$
$$2x + 4y = 9$$

Answer x = ...

y = ... [3]

---

13 **(a)** Write $\frac{a^6 \times a^8}{a^{12}}$ as a single power of a.

Answer (a) ..... [1]

(b) Given that $8^{\frac{2}{3}} = 2^x$, find x.

Answer (b) x = ... [2]

---

14 An n-sided polygon has three of its exterior angles as 50°, 55° and 80°.
The remaining exterior angles are 25° each. Find

(a) n,

Answer (a) $n =$ ..... [2]

(b) the value of the smallest interior angle.

Answer (b) .....° [1]

---

15 **(a)** Factorise $x^2 - 144$.

Answer (a) ..... [1]

(b) Simplify $\frac{3x+2}{3} - \frac{x}{2}$.

Answer (b) ..... [2]

---

16 A shop in Tampines offers a 25% discount for a second purchase of a brand of perfume. The first bottle of perfume cost $70.

(a) How much does the second bottle of perfume cost?

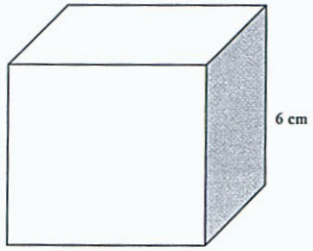
Answer (a) $..... [1]

(b) The shop also offers a 50% discount for a third purchase.
What is the overall percentage savings on the three purchases?

Answer (b) .....% [3]

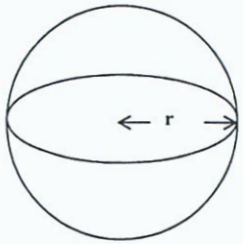
---

17 **(a)** A solid cube has side 6 cm.
Calculate its volume.



Answer (a) ..... cm^3 [1]

(b) The solid cube was then reshaped into a solid sphere.
Calculate the radius, r, of the sphere.



Answer (b) ..... cm [3]

18 **(a)** The n^{th} term of a sequence of numbers is $x^2 + 2n + 1$. Write down the first three terms of the sequence.

Answer (a) ..... , ... , ... [2]

(b) The first four terms of a different sequence are

5, 8, 11, 14.

(i) Find the n^{th} term of the sequence in terms of n.

Answer (b)(i) ..... [1]

(ii) Write the 7^{th} term of the sequence.

Answer (b)(ii) ..... [1]

---

19 A survey was carried out to find the number of electronic devices a group of 100 students have. The results are shown in the table below.

Number of electronic devices	0	1	2	3	4	5
Frequency	6	18	x	26	14	13

(a) Find the value of x.

Answer (a) $x =$ ..... [1]

(b) For the distribution, find the

(i) mean,

Answer (b)(i) ..... [1]

(ii) median,

Answer (b)(ii) ..... [1]

(iii) mode.

Answer (b)(iii) ..... [1]

---

20 A train travels 155 km at an average speed of 100 km/h.

(a) Find, in minutes, the time taken for the journey.

Answer (a) .....min [1]

(b) There are 500 passengers on the train. Each of them is given a complimentary packet drink. The drinks are in packs of 12.

(i) Find the least possible number of packs required.

Answer (b)(i)..... packs [2]

(ii) Find the number of packet drinks left over.

Answer (b)(ii)..... packet drinks [1]

---

21 **(a)** Solve the inequality $3(4+x)>15$.

Answer (a) ..... [2]

(b) Given that m is an integer, $-1.5<m\leq 2$, write down the possible values of m.

Answer (b) m =..... [2]

---

22 In triangle ABC, $AB = 10$ cm, $BC = 7$ cm and $AC = 9$ cm.

(a) Construct the triangle ABC, with AB as the base. The point A is given below. [1]

(b) Measure and write down $\angle ABC$.

(c) Construct

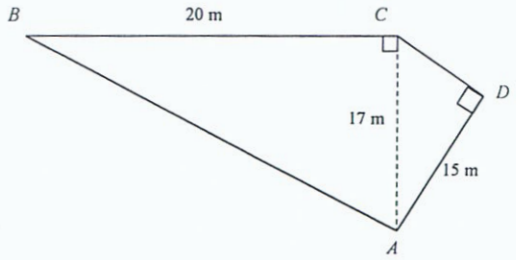
(i) the perpendicular bisector of AB, [1]
(ii) the angle bisector of $\angle CAB$. [1]

A

Answer (b) $\angle ABC$ =.....° [1]

---

23 The diagram shows an open field $ABCD$ on level ground.
Given that $AD = 15$ m, $AC = 17$ m and $BC = 20$ m.



Find

(a) angle BAC,

Answer (a) .....° [2]

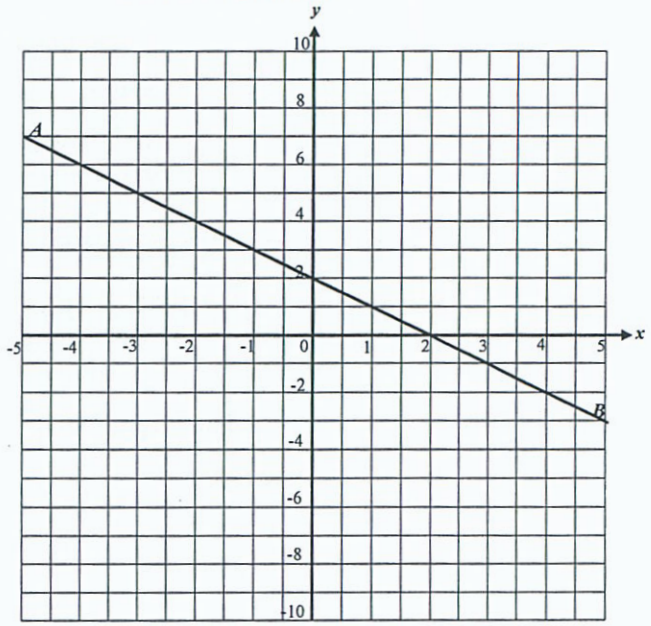
(b) the length of AB,

Answer (b) .....m [2]

(c) the perimeter of $ABCD$.

Answer (c) .....m [2]

24 The line AB is drawn on the grid below.



(a) On the grid, draw the graph of $y = 2 + 2x$. [2]

(b) Write down the coordinates of the intersection of line AB with $y = 2 + 2x$.

Answer (b) (..... , ...) [1]

(c) (i) Find the gradient of the line AB.

Answer (c)(i) ..... [1]

(i) Write down the equation of the line AB.

Answer (c)(ii) ..... [1]

(d) On the grid, draw the line passing through the point $C(-3, -2)$ and is parallel to AB. [1]

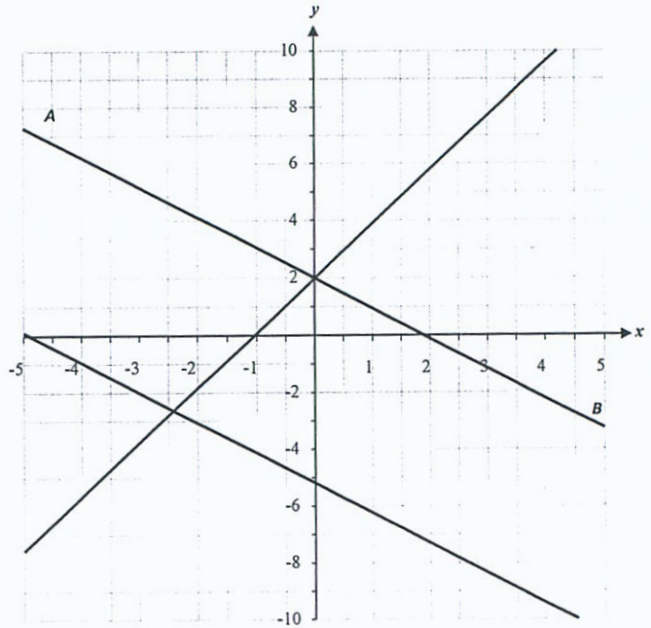
Marking Scheme for 4NA Mathematics Paper 1 (Prelim 1 Examination 2015)

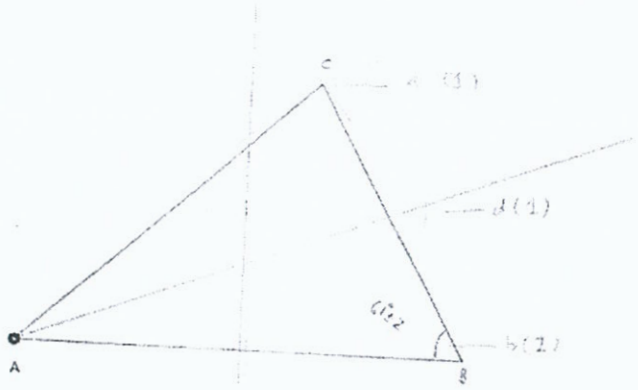
Qn	Worked Solution	Marks Allocation	Total	Remarks
1a	$\frac{263}{400}$	A1	2	
1b	0.66	A1		
2	(3/7+3/8)/2 = 45/112	M1, A1	2	
3	(400 x 40)/0.4 = 40000	M1, A1	2	
4(a)	P(B) + P(W) = 0.82	A1	2	
4(b)	1 – 0.82 = 0.18	A1		
5	\$1500 - £1000	M1	2	
	1000 X 101 / 100 = £1010	A1		
6a	11^2 X 5 X 2 or 11 X 11 X 5 X 2	A1	3	
6b	5 x 2 = 10	A1		
6c	11	A1		
7a	y = 13	A1	3	
7b	4d = c – 3e	M1		
	d = (c-3e)/4	A1		
8a	7x – 20	A1	3	
8b	7 = 3x + 6	M1		
	x = 1/3	A1		
9a	\$26100	A1	3	
9b	$5000(1+ 2.2/100)^2$	M1		
	= \$5222.42	A1		
10a	3.48×10^6	A1	3	
10b	[(5 – 3.48)/3.48] x 100 = 43.7%	M1, A1		

Qn	Worked Solution	Marks Allocation	Total	Remarks
11a	1 cm – 50 m		3	
	27 cm – 1350 m	A1		
11b	1 m^2 – 1/2500 cm^2	M1		
	8200 m^2 – 3.28 cm^2	A1		
12	x = 7 – 3y	M1	3	Accept substitution method
	x = -1/2 or -0.5	A1		
	y = 2.5 or 2 1/2	A1		
13a	a^2	A1	3	
13b	$(2^3)^{2/3} = 2^x$	M1		
	x = 2	A1		
14a	(n – 3)25 + 50 +55 + 80 = 360	M1	3	
	n = 10	A1		
14b	180 – 80 = 100°	A1		
15a	(x – 12)(x + 12)	A1	3	
15b	$\frac{6x - 4 - 3x}{6} = \frac{3x - 4}{6}$	M1, A1		
16a	\$52.50	A1	4	
16b	$\frac{17.5 + 35}{70 \times 3} \times 100 = 25\%$	M1, M1, A1		
17a	216 cm^3	A1	4	
17b	$\frac{4\pi r^3}{3} = 216$	M1		
	$r^3 = \frac{216 \times 3}{4\pi}$	M1		
	r = 3.72	A1		

Qn	Worked Solution	Marks Allocation	Total	Remarks
18a	4 , 9 , 16	A2	4	1 error – A1
18b	3n + 2	A1		2 errors - 0
18c	23	A1		
19a	23		4	
19bi	2.63			
19bii	3			
19biii	3			
20a	93 min	A1	4	
20bi	500/12 = 41 2/3 ≈ 42	M1, A1		
20bii	1/3 x 12 = 4	A1		
21a	3x > 15 – 12	M1	4	
	x > 1	A1		
21b	m = -1, 0, 1, 2	A2		1 error – A1 2 errors - 0
22			4	
23a	tan $B\hat{A}C = \frac{20}{17}$, $B\hat{A}C = 49.6°$	M1, A1	6	
	$AB^2 = 20^2 + 17^2$	M1		
23b	AB = 26.2	A1		
23c	$CD^2 = 17^2 - 15^2$	M1		
	CD = 8	A1		
	Perimeter = 69.2			

Qn	Worked Solution	Marks Allocation	Total	Remarks
24a		B2	6	Full line - B2 Half line - B1
24b	(0 , 2)	B1		
24ci	Gradient = -1	A1		
24cii	y = -x +2	A1		
24d	Draw line as shown	B1		




C
A
B

Section A (44 marks)

Answer **all** the questions in this section.

1 Calculate

(a) $4.67 + 3.1 \times 5.3$, [1]

(b) $\dfrac{5.38 + 4.17}{5.16 \times 0.81}$. [1]

---

2 A variable, y, is inversely proportional to $(x + 2)$.

(i) Given that $y = 5$ when $x = \dfrac{1}{2}$, write down an expression for y in terms of x. [2]

(ii) Find the value of x when y is 4. [1]

---

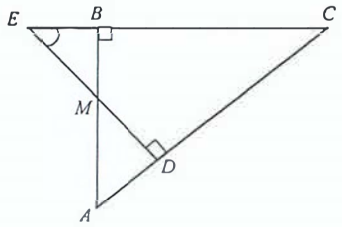
3 Rabiah was given \$96.

(a) She divided \$96 in the ratio 7 : 5.
Calculate the value of each part. [2]

(b) Rabiah then took away the same amount from each part of the money.
The ratio of the remaining money is 7 : 3.

Calculate the amount of money that Rabiah took away from each part. [2]

4



In the diagram above, angle ABC = angle CDE = 90° and $BC = DC$.

(a) Prove that triangle CBA is similar to triangle CDE. [3]

(b) If angle CED = 48°, find angle AMD. [2]

5

Susie bought this refrigerator on hire-purchase.
She pays a deposit of 10% of the cash price and then 24 monthly instalments of \$86.

Calculate the extra amount she pays as a percentage of the cash price. [5]

---

6 The length and breadth of a rectangular plot of land are $(3x + 2)$ m and $(4x - 1)$ m.

(a) Given that the area of the rectangle is 50 m^2, form an equation in x and show that it reduces to $12x^2 + 5x - 52 = 0$. [1]

(b) Hence, or otherwise, solve $12x^2 + 5x - 52 = 0$.
Give your answers correct to 2 decimal places. [3]

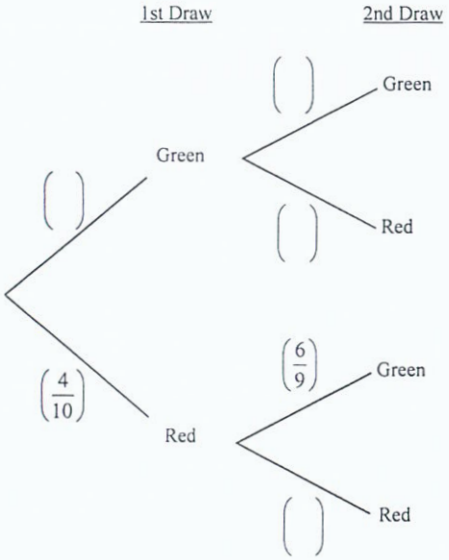
(c) Hence, find the length and breadth of the rectangle. [2]

---

7 Meili bought a bag containing 10 marbles as decorations for her house. 6 of the marbles were green and the remaining 4 were red.

(a) Two marbles are to be chosen at random, one after the other.

Copy and complete the tree diagram below. [2]



(b) Find the probability that

(i) the first marble is red and the second is green, [1]

(ii) the two marbles are of different colours, [1]

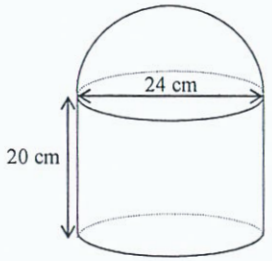
(iii) at least one marble is red. [2]

8 **(a)** Factorise completely $7x^2 - 28$. [2]

(b) Expand $(3x+2)(3x-1)$. [2]

(c) Simplify $(\frac{x-1}{3x} + \frac{2}{x})$. [2]

9



The diagram shows a solid made from a hemisphere and a cylinder.
The cylinder has a diameter of 24 cm and height 20 cm.
The hemisphere has a diameter of 24 cm.

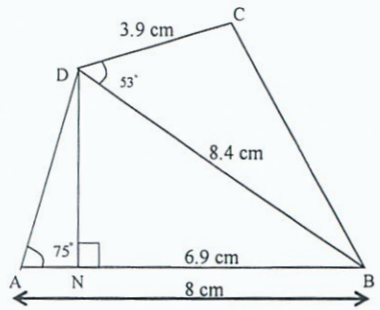
(a) Calculate the volume of the solid. [3]

(b) Calculate the total surface area of the solid. [4]

Section B (16 marks)

Answer any **two** questions from this section. Each question carries 8 marks.

10 In the diagram, point N on AB is such that DN is perpendicular to AB.
$AB = 8$ cm, $BD = 8.4$ cm, $BN = 6.9$ cm, $CD = 3.9$ cm, angle $DAB = 75°$ and angle $BDC = 53°$.



Find

(a) angle BDA, [2]

(b) the length AD, [2]

(c) the length BC, [3]

(d) the perimeter of the quadrilateral $ABCD$. [1]

---

11 **Answer the whole of this question on a single sheet of graph paper.**

The table below is for $y = -x^2 + 2x + 3$.

x	-2	-1	0	1	2	3	4
y	-5	p	q	4	3	0	-5

(a) Calculate the value of p and the value of q. [2]

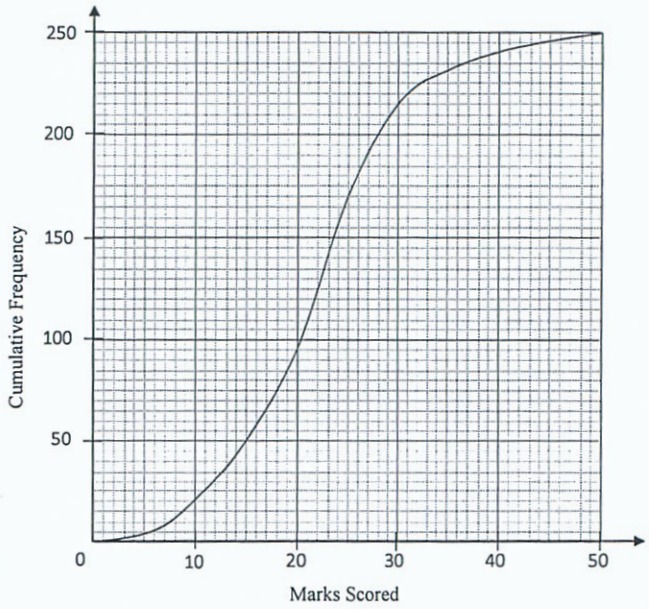
(b) Using a scale of 2 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 4$.
Using a scale of 2 cm to 1 unit, draw a vertical y-axis for $-2 \le y \le 5$.
Plot the graph of $y = -x^2 + 2x + 3$ for $-2 \le x \le 4$. [2]

(c) Find the values of x when $y = 2$. [2]

(d) By drawing a tangent, find the gradient of the curve $y = -x^2 + 2x + 3$ when $x = 1.5$. [2]

---

12 The cumulative frequency graph shows the marks scored by 250 pupils in the ITE aeronautical course aptitude test.



(a) Copy and complete the grouped frequency table of the marks obtained by the students. [2]

Marks (x)	Frequency
$0 < x \le 10$	20
$10 < x \le 20$	
$20 < x \le 30$	
$30 < x \le 40$	
$40 < x \le 50$	10

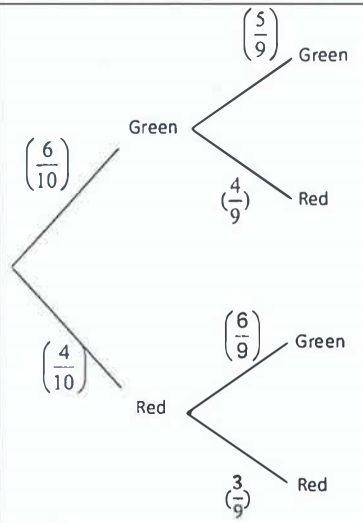
(b) Use the graph to estimate the median score. [1]

(c) Find
(i) the mean, [1]
(ii) the standard deviation of the marks scored. [2]

(d) The qualifying mark for the aeronautical course is 30. Calculate the percentage of students who qualify. [2]

Marking Scheme for 4NA Mathematics Paper 1 (Prelim 1 Examination 2015)

Qn	Worked Solution	Marks Allocation	Total
1a	21.1	A1	**2**
1b	2.28	A1	
2a	$5 = k / (1/2 + 2)$ $k = 12.5$	M1	**3**
2b	$y = \frac{12.5}{x+2} = \frac{25}{2(x+2)}$ or $\frac{25}{2x+2}$ $x = 1.125$ or $1\frac{1}{8}$	A1 A1	
3a	1 unit - \$8 7 units - \$56 5 units - \$40	A1 A1	**4**
3b	$\frac{56-x}{7} = \frac{40-x}{3}$ x = \$28	M1 A1	
4a	angle ABC = angle ADC; angle ACB = angle ECD (common angle) Since 2 corresponding angles are equal, triangle CBA is similar to triangle CDE	B1 B1 B1	**5**
4b	angle AMD = angle EMB $= 180 - 90 - 48$ $= 42°$	M1 A1	
5	10/100 x 2100 = 210 86 x 24 = 2064 2064 + 210 = \$2274 2274 – 2100 = 174 174/2100 x 100 = 8.29%	M1 M1 √M1 M1 A1	**5**
6a	$(3x + 2)(4x - 1) = 50$ $12x^2 + 5x - 2 = 50$ $12x^2 + 5x - 52 = 0$	A1	
6b	$x = \frac{-5 \pm \sqrt{5^2 - 4(12)(-52)}}{2(12)}$	M1	
6c	x = 1.88 , -2.30 7.64 m, 6.52 m	A1, A1 A1, A1	
7a		A2	**6**

Qn	Worked Solution	Marks Allocation	Total
			
7i	4 / 15	A1	
7ii	(6/10) x (4/9) + (4/10) x (6/9) = 8 / 15	A1	
7iii	1 – (6/10) x (5/9) = 2/3	M1, A1	
8a	$7x^2 - 28 = 7(x-2)(x+2)$	M1, A1	**6**
8b	$(3x+2)(3x-1) = 9x^2 - 3x + 6x - 2$ $= 9x^2 + 3x - 2$	M1 A1	
8c	$(\frac{x-1}{3x} + \frac{2}{x}) = \frac{x-1+6}{3x}$ $= \frac{x+5}{3x}$	M1 A1	
9a	$\frac{4\pi(12)^3}{2 \times 3} + \pi(12)^2(20) = 12700cm^3$	M1, M1, A1	**7**
9b	$\frac{4\pi(12)^2}{2} + \pi(12)^2 + \pi(24)(20) = 2870cm^2$	M1, M1, M1, A1	
10a	$\frac{\sin BDA}{8} = \frac{\sin 75}{8.4}$ angle BDA = 66.9°	M1 A1	**8**
10b	$\cos 75 = \frac{(8-6.9)}{AD}$	M1 A1	

Qn	Worked Solution	Marks Allocation	Total
10c	AD = 4.25007 = 4.25 cm $BC^2 = 3.9^2 + 8.4^2 - 2(3.9)(8.4)\cos 53$ BC = 6.80728 = 6.81 cm	M1, M1 A1	
10d	8+4.25007+6.80728+3.9 = 23.0 cm	A1	
11a	0 , 3		
11c	2.2 – 2.3 and -0.3 – -0.5		
11d	-1 ± 0.5		
12a	<table><tr><th>Marks (x)</th><th>Frequency</th></tr><tr><td>$0 < x \leq 10$</td><td>20</td></tr><tr><td>$10 < x \leq 20$</td><td>75</td></tr><tr><td>$20 < x \leq 30$</td><td>120</td></tr><tr><td>$30 < x \leq 40$</td><td>25</td></tr><tr><td>$40 < x \leq 50$</td><td>10</td></tr></table>	B2	
12b	median = 22	B1	**8**
12ci	mean = 22.7	A1	
12cii	sd = 8.95	A2	
12d	250 – 215 = 35 35/250 x 100 = 14%	M1 A1