Class	Index Number	Name

ANG MO KIO SECONDARY SCHOOL
FINAL EXAMINATION 2018
SECONDARY TWO EXPRESS

MATHEMATICS **4048/01**
Paper 1

Wednesday **10 October 2018** **1 hour 30 minutes**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **60**.

For Examiner's Use
60

This document consists of **14** printed pages.

Answer **all** the questions

1 5 men take 28 days to build a boat. Assuming the men work at the same rate, calculate the number of men needed to build a boat in 20 days.

Answer ..... men [2]

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2 A map is drawn to a scale of 1 : 250 000.

(a) If the actual distance between two towns is 7 km, find the distance, in centimetres, between the two towns on the map.

Answer ..... cm [2]

(b) A forest has an area of 4.5 cm^2 on the map. Calculate, in square kilometres, the actual area of the forest.

Answer ..... km^2 [2]

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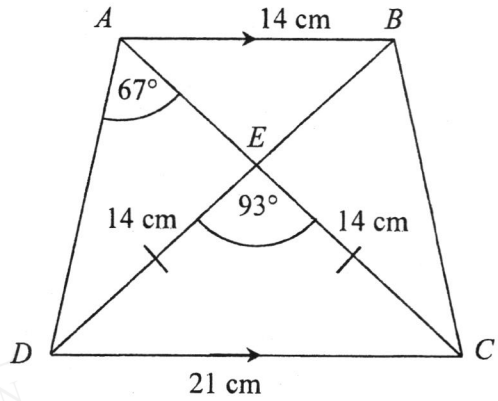
3 In the diagram, AB is parallel to DC, AC and DB meets at E, $AB = 14$ cm, $DC = 21$ cm, $DE = CE = 14$ cm, $\angle DAC = 67°$ and $\angle DEC = 93°$.



Given that ΔAED and ΔBEC are congruent and ΔABE is similar to ΔCDE,
Find

(a) $\angle BCE$,

Answer $\angle BCE =$ ..... ° [1]

(b) $\angle BAE$,

Answer $\angle BAE =$ ..... ° [2]

(c) BD.

Answer $BD =$ ..... cm [3]

4 Given that a is directly proportional to the cube of b, and $a = 24$ for a particular value of b. Find the value of a when this value of b is halved.

Answer $a =$ ..... [2]

---

5 A bag contains 30 balls of which x balls are red, 8 balls are blue and the rest are white. A ball is drawn at random from the bag.
Find the probability of picking

(a) **(i)** a blue ball,

Answer ..... [1]

(ii) a black ball.

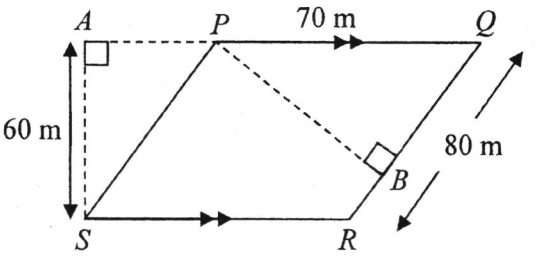
Answer ..... [1]

(b) If the probability of picking a white ball is $\frac{1}{5}$, find the value of x.

Answer $x =$ ..... [2]

---

6 The diagram shows a garden $PQRS$ in the shape of a parallelogram, where $PQ = 70$ m and $QR = 80$ m. The line PB is perpendicular to QR, while the perpendicular distance between PQ and SR is 60 m.



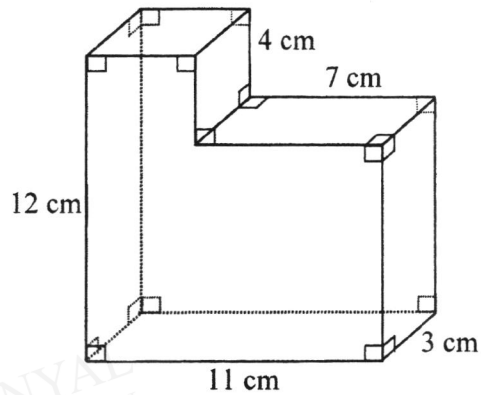
(a) Find the area of the garden $PQRS$.

Answer ..... m^2 [1]

(b) Hence, calculate the length of PB.

Answer $PB =$ ..... m [2]

7 Find the total surface area of the prism below.



Answer ..... cm^2 [3]

8 The stem-and-leaf diagram shows the test results of a class of students.

0	2					
1	8					
2	3	5	7	8		
3	1	2	4	4	4	8
4	0	5	5			

Key: 1 | 8 means 18 marks

Find

(a) **(i)** the modal mark,

Answer ..... [1]

(ii) the median mark.

Answer ..... [2]

(b) Is the mean or median, a better representation of the subject ability of the class? Explain your answer.

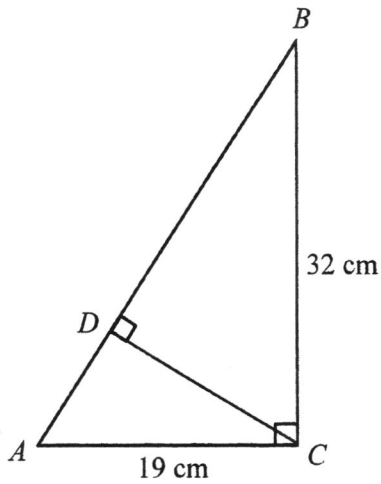
Answer The ..... would be a better representation of the subject ability of the class because .....

..... [2]

(c) A new student joined the class and took the same test. The new mean mark for the class is 30. Find the mark of the new student who joined the class.

Answer ..... [2]

9 In the diagram, ABC is a right-angled triangle and ADB is a straight line. It is given that $BC = 32$ cm, $AC = 19$ cm and $\angle BDC = 90°$.



Find

(a) $\angle DBC$,

Answer $\angle DBC =$ ..... ° [2]

(b) DC.

Answer $DC =$ ..... cm [2]

10 **(a)** Simplify

$$3-4(2x-1).$$

Answer ..... [1]

(b) Factorise completely

$$3a^2+4ab-9ax-12bx.$$

Answer ..... [2]

(c) Simplify the expression

$$\frac{24x^2y^3}{2ax}\div\frac{4y^2}{3a}.$$

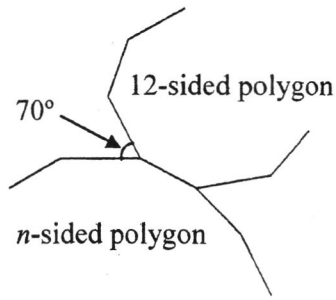
Answer ..... [2]

11 Express as a single fraction

$$\frac{5x+6}{2x^2-x-6}-\frac{2}{x-2}.$$

Answer ..... [3]

12 The diagram shows an incomplete figure made up of a regular 12-sided polygon and a regular n-sided polygon. The angle between the 2 polygons is 70°.



Calculate

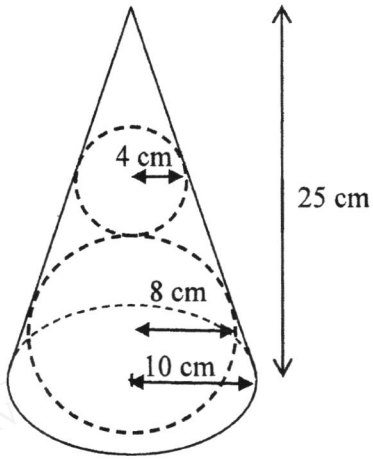
(a) the interior angle of the regular 12-sided polygon,

Answer ..... ° [2]

(b) the value n.

Answer $n =$ ..... [3]

13 **(a)** 2 spherical metal balls, of radii 8 cm and 4 cm respectively are put into a regular conical container. The radius of the cone is 10 cm and the height of the cone is 25 cm.



Calculate

(i) the volume of the 2 spherical metal balls,

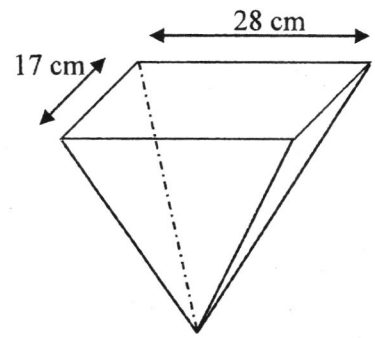
Answer ..... cm^3 [2]

(ii) the volume in the cone not occupied by the balls.

Answer ..... cm^3 [2]

Question 13(b) is on the next page.

(b) The 2 spherical metal balls are melted and recast to form a solid rectangular pyramid as shown below.

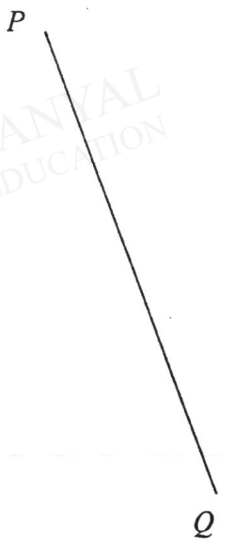


Calculate the height of the solid pyramid.

Answer ..... cm [2]

14 **(a)** Construct triangle PQR where $PR = 8$ cm and $QR = 11$ cm. PQ has already been drawn.

Answer (a), (c)



[2]

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

Answer $\angle PRQ =$ ..... ° [1]

(c) Construct

(i) the angle bisector of $\angle QPR$, [1]

(ii) the perpendicular bisector of PQ. [1]

(d) The perpendicular bisector of PQ meets the angle bisector of $\angle QPR$ at X. Mark the point X and write down the length of QX.

Answer $QX =$ ..... cm [1]

END OF PAPER

Class	Index Number	Name

ANG MO KIO SECONDARY SCHOOL
FINAL YEAR EXAMINATION 2018
SECONDARY TWO EXPRESS

MATHEMATICS **4048/02**
Paper 2

Thursday **4 October 2018** **2 hours**

Additional Materials: Answer Paper
Graph Paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **80**.

This document consists of **9** printed pages and **1** blank page.

Answer **all** the questions.

1 **(a)** Expand and simplify the expression

$$(2p-3q^2)-(p+q)^2.$$ [2]

(b) Factorise the expression completely

$$2x^3-50x.$$ [2]

(c) If $4(x-y)^2=328$ and $xy=24$, find the value of $3x^2+3y^2$. [2]

(d) Given that $k=\frac{2}{3}\sqrt{\frac{p}{x-3}}$,

(i) express x in terms of k and p, [3]

(ii) hence or otherwise, find x given that $p=2$ and $k=4$. [1]

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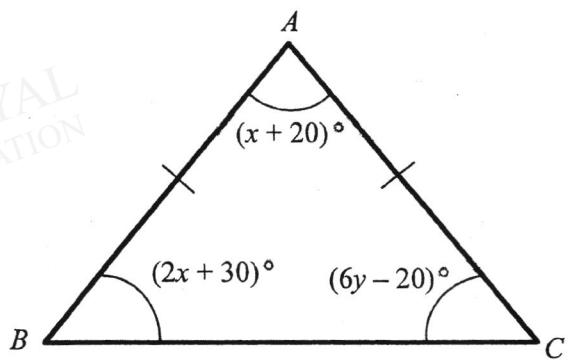
2 Triangle ABC is isosceles with $AB=AC$.
The angles are as shown in the diagram.



(a) Write down two simultaneous equations, in terms of x and y, to represent this information. [2]

(b) Solve the simultaneous equations to find the sizes of the angles of the triangle. [4]

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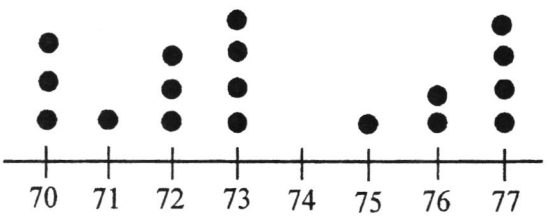
3 **(a)** The dot diagram represents the speeds, in kilometres per hour of 18 motorists travelling along the Pan Island Expressway (PIE) during peak hour.



(i) Find the modal speed. [1]

(ii) Find the median speed. [1]

(iii) What percentage of the motorists travelled at most 75 km/h? [2]

(iv) Find the mean speed of the 18 motorists. [2]

(b) Javier spends £250 on his credit card when he is in the UK. He pays a credit card fee of 1.25% of this amount. The credit card company uses an exchange rate between Singapore dollars ($) and pounds (£) of $1 = £0.57.
Calculate the total cost in Singapore dollars that Javier has to pay the credit card company. Give your answer correct to the nearest cent. [3]

(c) A salesman sells a laptop for $1300. He makes a loss of 12% on the price he paid for the laptop. Calculate the price the salesman paid for the laptop. [2]

4 The table shows the weights in kilograms (kg) of the students in Class 2A.

Weight (in kg)	$38 \leq w < 42$	$42 \leq w < 46$	$46 \leq w < 50$	$50 \leq w < 54$	$54 \leq w < 58$
Frequency	$2x + 1$	$2x + 2$	$3x + 3$	$2x - 1$	$2x - 3$

(a) Without calculating the value of x, state the modal weight of this distribution. [1]

(b) If there are 35 students in Class 2A, find the value of x. [2]

(c) Hence, calculate the estimate mean weight of the students in the class. [2]

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5 Mr Lee bought p apples for \$3.

(a) Find an expression, in terms of p, for the cost in cents, of each apple. [1]

(b) It was found that 2 of the apples were bad, and could not be sold.
Mr Lee sold each remaining apple for 10 cents more than he paid for it.
Write down an expression, in terms of p, for the total sum he received, in cents, from the sale of the apples. [1]

(c) He made a profit of 20 cents from the sale of the apples.
Write down an equation to represent this information, and show that it simplifies to $p^2 - 4p - 60 = 0$. [3]

(d) Solve the equation $p^2 - 4p - 60 = 0$. [3]

(e) Find the selling price of each apple. [2]

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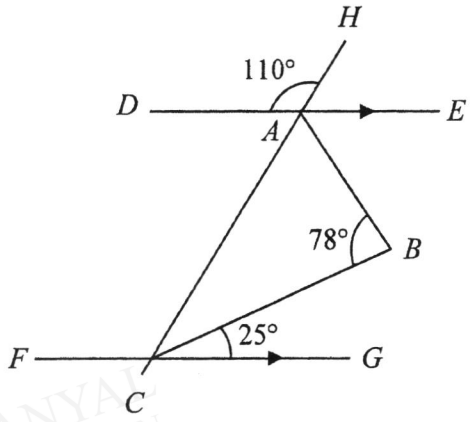
6 In the diagram, DE is parallel with FG, $\angle DAH = 110°$, $\angle ABC = 78°$ and $\angle BCG = 25°$.



Find

(a) $\angle ACB$, [2]

(b) $\angle CAB$. [1]

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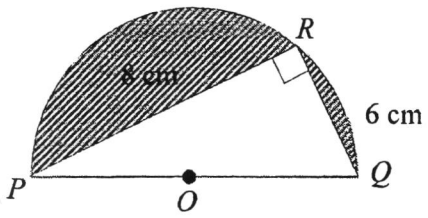
7 In the diagram, PQ is a diameter of the semicircle with centre O, $PR = 8$ cm and $QR = 6$ cm.



Find

(a) the radius of the semicircle, [2]

(b) the shaded area. [3]

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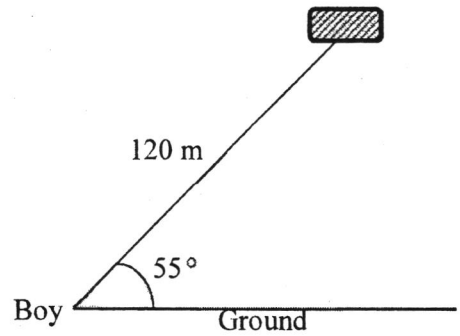
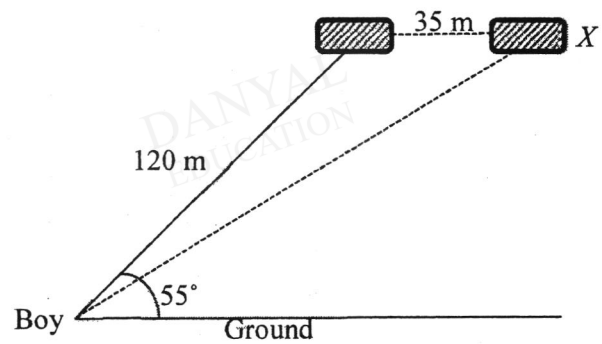
8 A boy releases 120 m of string while flying a kite. The string makes an angle of 55° with the ground. [Assume the line is taut.]



(a) Calculate the height of the kite, above the ground. [2]

(b) The wind blows stronger and the kite is carried 35 m further away from the boy, to point X as shown below.



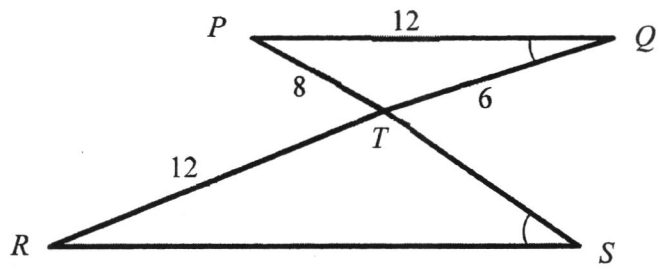
Assuming the boy releases more string and there is no change in the height of the kite above the ground, calculate

(i) the length of the string, [3]

(ii) the angle the string now makes with the ground. [2]

9 **(a)** In the diagram, triangle PQT is similar to triangle RST and $\angle PQT = \angle RST$.

All measurements are in centimetres.

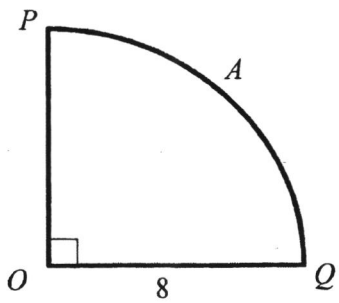


(i) Calculate RS. [1]

(ii) Calculate ST. [2]

(iii) The area of triangle RST is 49.7 cm^2. Find the perpendicular distance of T to RS. [2]

(b) The diagram below shows a quadrant POQ and OQ is 8 cm.



(i) Find the length of arc PAQ. [1]

(ii) The quadrant is formed into a cone by joining the two radii, OP and OQ, together. Find the radius of the base of the cone. [2]

(iii) Find the curved surface area of the cone. [2]

10 Answer the whole of this question on the graph paper provided.

David wants to open a hipster café selling drinks. After conducting a market research, he found that if he were to price his drinks at $\$x$, the profit, $\$y$ would be given by the formula $y = x^2 - 4x$. Some of the corresponding values of x and y are given in the following table.

x	0	1	2	3	4	5	6
y	0	-3	-4	-3	p	5	12

(a) Calculate the value of p. [1]

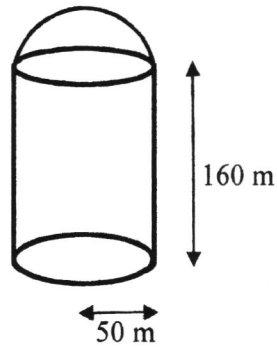
(b) Using a scale of 2 cm to represent \$1 unit, draw a horizontal x-axis for $0 \leq x \leq 6$.
Using a scale of 1 cm to represent \$2 units, draw a vertical y-axis for $-4 \leq y \leq 12$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) Use your graph to estimate

(i) the profit if the price of his drinks is at \$4.50, [1]

(ii) the range of price he should sell his drinks in order not to incur a loss. [1]

11 A new structure shown in the diagram below, has been built. It is made up of cylindrical bottom with height of 160 metres and a hemispherical top of radius 50 metres.



(a) Calculate the surface area of the hemispherical portion of the structure. [2]

(b) Find the volume of the structure. [2]

(c) The owner has set aside a budget of $350 000 to spruce up the structure that has been build. He is thinking of painting the cylindrical portion of the structure. If he is charged $7.50 per m^3 for the painting services, would he has enough budget to proceed with the painting? Show your workings and explain clearly. [3]

END OF PAPER

AMKSS 2E EM P1 FE 2018 Answer Scheme

Qn	Answers	Marking Scheme
1	$(5)(28) = 20m$ $m = (5)(28) \ / 20$ $= 7$ men	 M1 A1
2(a)	1 cm : 2.5 km $7 \div 2.5$ $= 2.8$ cm	 M1 A1
2(b)	1 cm^2 : 6.25 km^2 4.5×6.25 $= 28.125$ km^2 / 28.1 km^2 accepted	M1 A1
3(a)	$93 - 67 = 26°$	B1
3(b)	$(180 - 93) \div 2$ $= 43.5°$	M1 A1
3(c)	$\frac{BE}{14} = \frac{14}{21}$ $BE = 9\frac{1}{3}$ $BD = 9.333 + 14 = 23\frac{1}{3}$ cm	M1 M1 A1
4	$\frac{24}{b^3} = \frac{a}{(0.5b)^3}$ $\frac{24}{b^3} = \frac{a}{0.125b^3}$ $a = 3$	 M1 A1
5(a)(i)	$\frac{4}{15}$	B1
5(a)(ii)	0	B1
5(b)	$\frac{22-x}{30} = \frac{1}{5}$ $110 - 5x = 30$ $5x = 80$ $x = 16$	M1 A1

6(a)	$70 \times 60 = 4200\ m^2$	B1
6(b)	$4200 \div 80$ $= 52.5\ m$	M1 A1
7	Cross-sectional area = $(11 \times 8) + (4 \times 4)$ $= 104\ cm^2$ Lateral area = $(12+11+8+7+4+4) \times 3$ $= 138\ cm^2$ TSA = $(104 \times 2) + 138$ $= 346\ cm^2$	 M1 M1 A1
8a(i)	34	B1
8a(ii)	Position = $(15+1) \div 2 = 8$th Median = 32	M1 A1 / B2
8(b)	The median would be a better representation on the spelling ability of the class because the mean will be affected by 1 extreme value (2 marks) in the data.	B2
8(c)	$(16 \times 30) - 456$ 24	M1 A1
9(a)	$\tan \angle DBC = \frac{x}{32}$ $\angle DBC = 30.7°$	M1 A1
9(b)	$\sin 30.70 = \frac{DC}{32}$ $DC = 16.3cm$	M1 A1
10(a)	$= 3 - 8x + 4$ $= 7 - 8x$	 B1
10(b)	$= a(3a+4b) - 3x(3a+4b)$ $= (a-3x)(3a+4b)$	M1 A1

10(c)	$=\frac{24x^2y^3}{2ax}\times\frac{3a}{4y^2}$ $=9xy$	M1 A1 / B2
11	$=\frac{5x+6}{(2x+3)(x-2)}-\frac{2}{x-2}$ $=\frac{5x+6}{(2x+3)(x-2)}-\frac{4x+6}{(2x+3)(x-2)}$ $=\frac{5x+6-4x-6}{(2x+3)(x-2)}$ $=\frac{x}{(2x+3)(x-2)}$	M1 M1 A1
12(a)	Ext angle of 12-sided polygon = 360÷12=30° Int angle of 12-sided polygon = 150 °	M1 A1
OR	$\frac{(12-2)(180)}{12}$ $=150°$	M1 A1
12(b)	Int angle of n-sided polygon = 360 – 150 – 70 = 140 ° (angles at a pt.) Ext angle = 180 – 140 = 40 ° n = 360 ÷ 40 = 9	M1 M1 A1
OR	Int angle of n-sided polygon = 360 – 150 – 70 = 140 ° (angles at a pt.) $\frac{(n-2)(180)}{n}=140$ $180n-360=140n$ $40n=360$ $n=9$	M1 M1 A1
13(a)(i)	$\frac{4}{3}(3.142)(8)^3+\frac{4}{3}(3.142)(4)^3$ $=2413.056cm^2$ Allow calculator π	M1 A1
13(a)(ii)	$\frac{1}{3}(3.142)(10)^2(25)-2413.056$ $=205cm^3$	M1 A1

	Allow calculator π	
13(b)	$\frac{1}{3}(17)(28)h = 2413.056$ $h = 15.2cm$ Allow calculator π	M1 A1
14(a)	No arc – 1m	C2
14(b)	$39.5° \pm 0.5$	B1
14(c)(i)	Refer to construction	B1
14(c)(ii)	See attached	B1
14(d)	$5.1cm \pm 0.1$	B1

AMKSS Sec 2E FE 2018 Solutions

Qn	Answer	Marks
1a	$(2p-3q^2)-(p+q)^2$ $=(2p-3q^2)-(p^2+2pq+q^2)$ $=2p-3q^2-p^2-2pq-q^2$ $=2p-4q^2-p^2-2pq$	M1 A1
1b	$2x^3-50x$ $=2x(x^2-25)$ $=2x(x+5)(x-5)$	 M1 A1
1c	$(x-y)^2=82$ $x^2-2xy+y^2=82$ $x^2-48+y^2=82$ $x^2+y^2=130$ $3x^2+3y^2=390$	 M1 A1
1di	$k=\frac{2}{3}\sqrt{\frac{p}{x-3}}$ $k^2=\frac{4}{9}(\frac{p}{x-3})$ $k^2=\frac{4p}{9x-27}$ $9k^2x-27k^2=4p$ $9k^2x=4p+27k^2$ $x=\frac{4p+27k^2}{9k^2}$ *or* $x=\frac{4p}{9k^2}+3$	 M1 M1 A1
1dii	$3\frac{1}{18}$ *or* 3.06	B1
2a	$2x+30=6y-20$ $2x+30+(6y-20)+(x+20)=180$	B1 B1

2b	$2x+30=6y-20$ $2x+30+(6y-20)+(x+20)=180$ $2x+30+6y-20+x+20=180$ $2x+6y+x=150$ $3x+6y=150$ $x+2y=50$ $x=50-2y$ $100-4y+30=6y-20$ $150=10y$ $y=15$ $2x+30=6(15)-20$ $2x=90-20-30$ $2x=40$ $x=20$ $x+20=20+20=40°$ $2x+30=2(20)+30=70°$ $6y-20=90-20=70°$	M1 M1 M1 A1
3ai	73 km/h & 77 km/h	B1
3aii	73 km/h	B1
3aiii	$\frac{12}{18}\times 100$ $=66\frac{2}{3}$ *or* 66.7%	M1 A1
3aiv	$\frac{70+70+70+71+72+72+72+73+73+73+73+75+76}{18}$ $=\frac{1324}{18}$ $=73\frac{5}{9}$ $=73.6$	M1 A1
3b	$1.25\%\times 250$ $=3.125$ $250+3.125$ $=253.125$ £0.57 → \$1	M1

	£253.125 → $\frac{1}{0.57}\times 253.125$ $=\$444.08$	M1 A1
3c	$88\% \rightarrow \$1300$ $100\% \rightarrow \frac{1300}{88}\times 100$ $=\$1477.27$	M1 A1
4a	$46 \le w < 50$	B1
4b	$2x+1+2x+2+3x+3+(2x-1)+(2x-3)=35$ $11x+2=35$ $11x=33$ $x=3$	M1 A1
4c	$\frac{(40\times 7)+(44\times 8)+(48\times 12)+(52\times 5)+(56\times 3)}{35}$ $=\frac{1636}{35}$ $=46.7kg$	M1 A1
5a	$\frac{300}{p}cents$	B1
5b	$(p-2)(\frac{300}{p}+10)$ cents	B1
5c	$(p-2)(\frac{300}{p}+10)-300=20$ $300+10p-\frac{600}{p}-20-300=20$ $10p-\frac{600}{p}-20-20=0$ $10p^2-600-40p=0$ $p^2-4p-60=0$	M1 M1 A1
5d	$p^2-4p-60=0$ $(p-10)(p+6)$ $p=10$ $p=-6$	 M1 A1 A1
5e	$\$3\div 10$ $=30c$ $30c+10c=40c$	M1 A1

6a	$180° - 110° = 70°$ $p + 25° = 70°$ $p = 45°$	M1 A1
6b	$180° - 45° - 78°$ $= 57°$	B1
7a	$PQ^2 = 8^2 + 6^2$ $PQ^2 = 100$ $PQ = 10$ $radius = \frac{10}{2} = 5cm$	 M1 A1
7b	Area of Semi Circle, $= \frac{1}{2} \times \pi \times 5^2$ $= 39.269908169cm^2$ Area of Triangle, $= \frac{1}{2} \times 8 \times 6$ $= 24cm^2$ Shaded area, $39.269908169cm^2 - 24cm^2$ $= 15.269908169$ $\approx 15.3cm^2$	 M1 M1 A1
8a	$\sin 55° = \frac{opp}{120}$ $opp = 98.29824531$ $opp \approx 98.3m$	M1 A1
8bi	$\cos 55° = \frac{adj}{120}$ $adj = 68.82917236m$ $68.82917236 + 35$ $= 103.8291724$ m $x^2 = 98.29824531^2 + 103.8291724^2$ $x^2 = 20443.04206$ $x = 142.9791665$ $x \approx 143m$	 M1 M1 A1

8bii	$\tan\theta = \frac{98.29824531}{103.8291724}$ $\theta = \tan^{-1}\left(\frac{98.29824531}{103.8291724}\right)$ $\theta = 43.43257424$ $\theta = 43.4°$	M1 A1
9ai	$\frac{PT}{RT} = \frac{PQ}{RS}$ $\frac{8}{12} = \frac{12}{RS}$ $8RS = 144$ $RS = 18cm$	B1
9aii	$\frac{PT}{RT} = \frac{QT}{ST}$ $\frac{8}{12} = \frac{6}{ST}$ $8ST = 72$ $ST = 9cm$	M1 A1
9aiii	$\frac{1}{2} \times 18 \times h = 49.7$ $h = 5.52cm$	M1 A1
9bi	$\frac{1}{4} \times \pi \times d$ $= 12.56637061$ $\approx 12.6cm$	B1
9bii	$2\pi r = 12.56637061$ $r = \frac{12.56637061}{2\pi}$ $r = 2cm$	M1 A1
9biii	$\pi rl = \pi \times 2 \times 8$ $= 50.26548246$ $\approx 50.3cm^2$	M1 A1
10a	0	B1
10b	All pts plot correctly Smooth curve Labelling of axes and graph	B1 B1 B1
10ci	\$2.30 (±\$0.10)	B1
10cii	\$4 to \$6	B1
11a	$2\pi r^2 = 2 \times \pi \times 50^2$ $= 15707.96327$ $\approx 15700m^3$	M1 A1

11b	Volume of cylinder $\pi \times 50^2 \times 160$ $= 1256637.061 m^3$ Volume of hemisphere $\frac{2}{3} \times \pi \times 50^3$ $= 261799.3878 m^3$ Total Volume $1256637.061 m^3 + 261799.3878 m^3$ $= 1518436.449 m^3$ $\approx 1520000 m^3$	M1 A1
11c	$\pi \times d \times h$ $= \pi \times 100 \times 160$ $= 5026.548246 m^3$ $5026.548246 \times \$7.50$ $= \$37699.11184$ *No*	M1 M1 A1