REGENT SECONDARY SCHOOL
END OF YEAR EXAMINATION 2022
SECONDARY THREE (EXPRESS)

NAME: _____ INDEX NUMBER: _____

CLASS: _____ SETTER: MS KAREN LEE

MATHEMATICS **4052/01**

Paper 1 **07 Oct 2022**

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB 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.
The use of an approved scientific calculator is expected, 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.

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.

	TARGET
80	

This document consists of **18** printed pages.

1 **(a)** **(i)** Express 756 as a product of its prime factors.

Answer ..... [1]

(ii) Given that $756k$ is a perfect cube, write down the smallest possible value of k.

Answer ..... [1]

(iii) Find the highest common factor of 756 and 36.

Answer ..... [1]

(b) Three lighthouses flash simultaneously at 0630.
The first lighthouse flashes every 14 minutes, the second lighthouse every 20 minutes and the third lighthouse every 35 minutes.
At what time will the three lighthouses next flash together?

Answer ..... [2]

2 The population of Country A is 3.295×10^8.
There are 7.3×10^7 children.

(a) 3.295×10^8 can be written as k billion.
Find k.

Answer $k =$ ..... [1]

(b) What fraction of the whole population are children?
Give your answer in its simplest form.

Answer ..... [1]

(c) Country B has a population of 2.36×10^7.
Find how many more people live in Country A than in Country B, giving your answer in standard form.

Answer ..... [2]

---

3 **(a)** Simplify

(i) $\sqrt[3]{x} \times x^3$,

Answer ..... [1]

(ii) $25x^2 \div 5x^{-4} \times 3x^0$.

Answer ..... [2]

(b) Given that $2^p \times 3 = 48$, find p.

Answer $p =$ ..... [2]

4

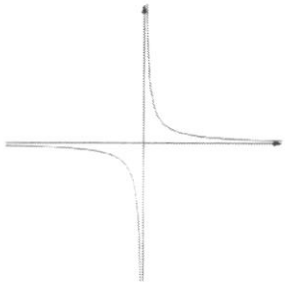


Figure 1

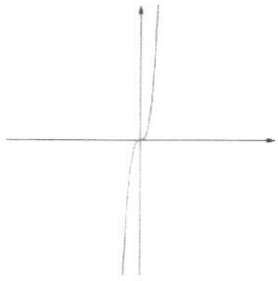


Figure 2

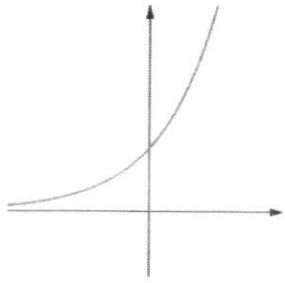


Figure 3

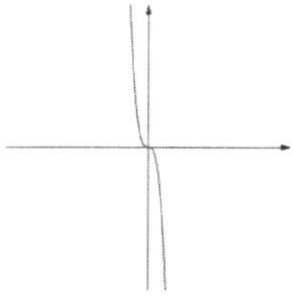


Figure 4

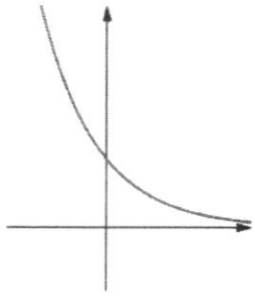


Figure 5

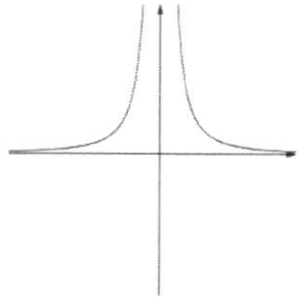


Figure 6

Which of the figures shown above could be the graph of

(a) $y = \dfrac{2}{x}$,

Answer Figure ..... [1]

(b) $y = -5x^3$,

Answer Figure ..... [1]

(c) $y = 3^x$.

Answer Figure ..... [1]

5 The line $x + 2y = 3$ crosses the x-axis at the point A.

(a) Find the coordinates of the point A.

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

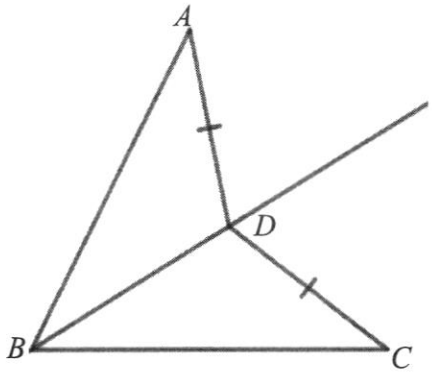
(b) Explain why the line $x + 2y = 3$ will never meet the line $y = -\frac{1}{2}x$.

Answer

.....

..... [1]

6



Given that angle ADB and angle CDB are equal, prove that BD is the angle bisector of angle ABC.

Answer

.....

.....

.....

.....

..... [3]

7 A map is drawn to a scale of 1 : 30 000.

(a) Find the actual distance, in kilometres, represented by 5 centimetres on the map.

Answer ..... km [1]

(b) A country covers an area of 45 square kilometres.
Find, in square centimetres, the area representing the country on the map.

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

---

8 Simplify

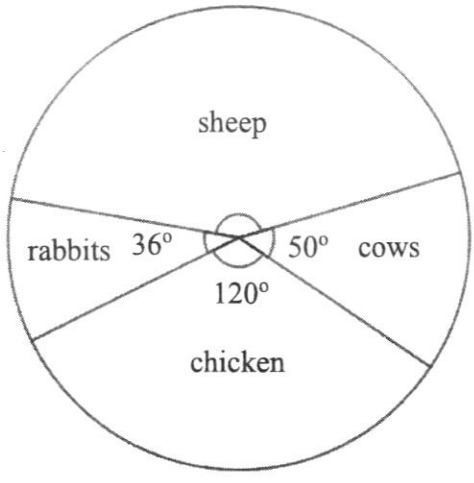
(a) $\dfrac{m^2+m}{(n-1)^2} \div \dfrac{m}{n-1}$,

Answer ..... [2]

(b) $\left(\dfrac{x}{2}\right)^{-3}$.

Answer ..... [1]

9 The pie chart shows the animals in a farm.



(a) Find the percentage of sheep in the farm.

Answer ..... % [2]

(b) Find the ratio of rabbits to cows.

Answer ..... : ..... [1]

(c) Explain why it is not possible to conclude that there are definitely 14 more cows than rabbits.

Answer

.....

.....

..... [1]

10 **(a)** **(i)** Expand $(x+8)^2$.

Answer ..... [1]

(ii) **Hence** evaluate 108^2.

Answer ..... [2]

(b) It is given that $f = m\sqrt{\frac{L}{4}}$.

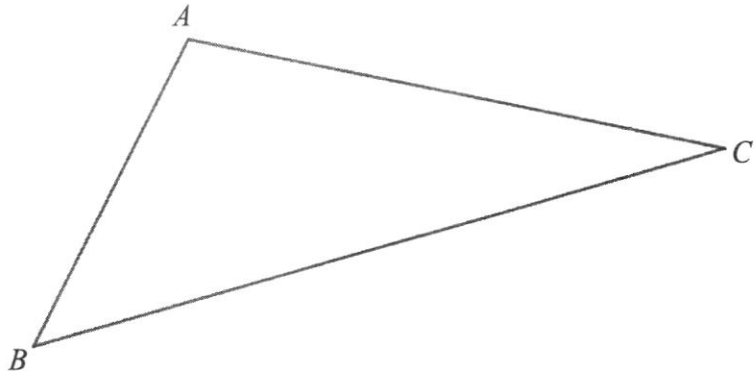
(i) Find f when $m = 2.5$ and $L = 144$.

Answer ..... [1]

(ii) Express L in terms of f and m.

Answer ..... [2]

11 Triangle ABC is drawn to scale.



(a) Construct the perpendicular bisector of BC. [1]

(b) Construct the bisector of angle ACB. [1]

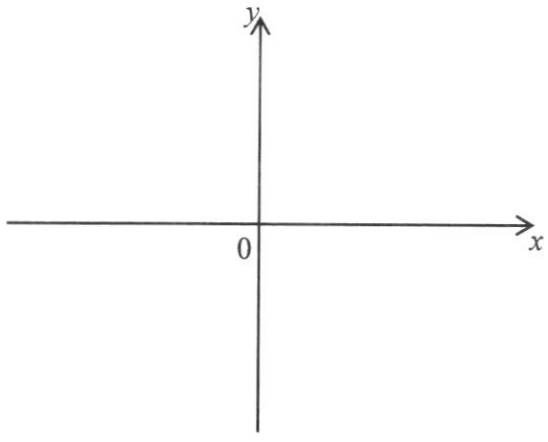
(c) Point X is equidistant from B and C and equidistant from BC and AC.
Mark the point X on the diagram and measure the length BX.

Answer ..... cm [1]

(d) Given that $AB = 23.5$ km, calculate the distance from B to C.

Answer ..... km [2]

12 **(a)** **(i)** Sketch the graph of $y = (x-5)(x+3)$.



[2]

(ii) Write down the equation of the line of symmetry of $y = (x-5)(x+3)$.

Answer ..... [1]

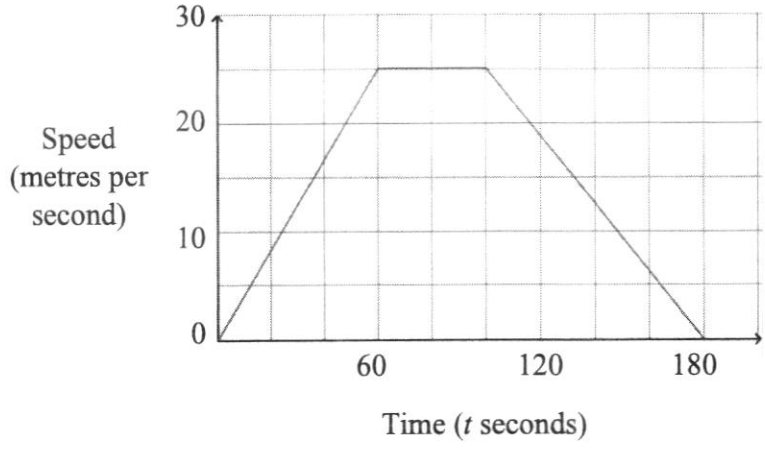
(b) **(i)** Express $x^2 - 6x + 1$ in the form $(x + a)^2 + b$.

Answer ..... [1]

(ii) **Hence** solve the equation $x^2 - 6x + 1 = 0$, giving your answers correct to two decimal places.

Answer ..... or ..... [3]

13 The diagram shows the speed-time graph of a car's journey.



(a) Find the deceleration of the car when $t = 120$.

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

(b) Calculate the speed of the car when $t = 120$.

Answer ..... m/s [2]

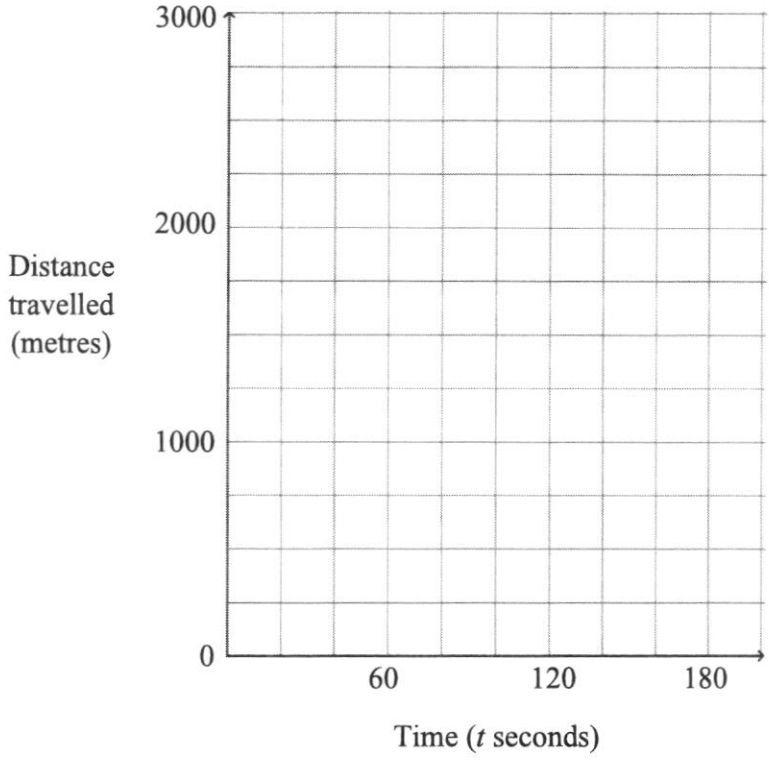
(c) Calculate the total distance travelled on the journey.

Answer ..... m [2]

(d) Calculate the average speed for the whole journey.

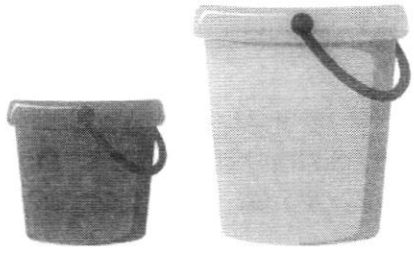
Answer ..... m/s [1]

(e) On the grid in the answer space, sketch the distance-time graph for the same journey.



[3]

14 Two similar buckets have base areas of 16 cm^2 and 25 cm^2.



(a) The surface area of the top of the bigger bucket is 55 cm^2.
Find the surface area of the top of the smaller bucket.

Answer ..... cm^2 [1]

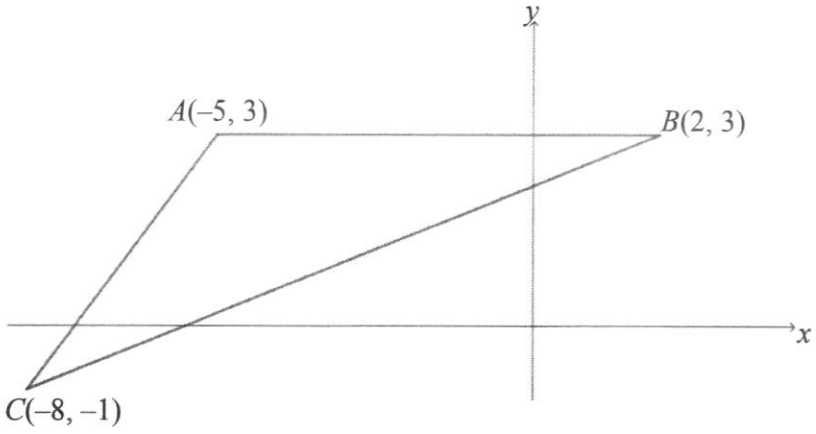
(b) The height of the smaller bucket is 20 cm.
Find the height of the bigger bucket.

Answer ..... cm [2]

(c) Find, in its simplest integer form, the ratio of the mass of the smaller bucket to the mass of the bigger bucket.

Answer ..... : ..... [1]

15 The points $A(-5, 3)$, $B(2, 3)$ and $C(-8, -1)$ are shown in the diagram.



(a) Find the area of triangle ABC.

Answer ..... units^2 [1]

(b) Find the length AC.

Answer ..... units [1]

(c) State the value of cosine $\angle CAB$.

Answer ..... [1]

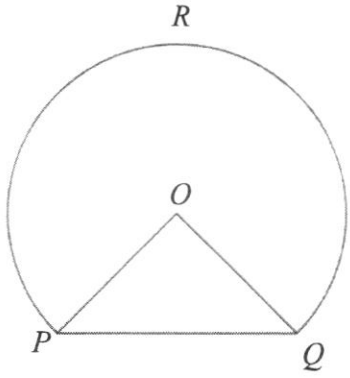
(d) Find the gradient of the line AC.

Answer ..... [1]

(e) The product (gradient of AC) × (gradient of BD) = –1.
Use this information to find the equation of the line BD.

Answer ..... [2]

16



The cross-section of a tunnel, is a major segment of a circle with centre O.
The total perimeter of the major sector $POQR$ is 34.5 m and
reflex angle $POQ = 4.1$ radians.

(a) Show that the radius of the circle is 5.66 m.

Answer

[2]

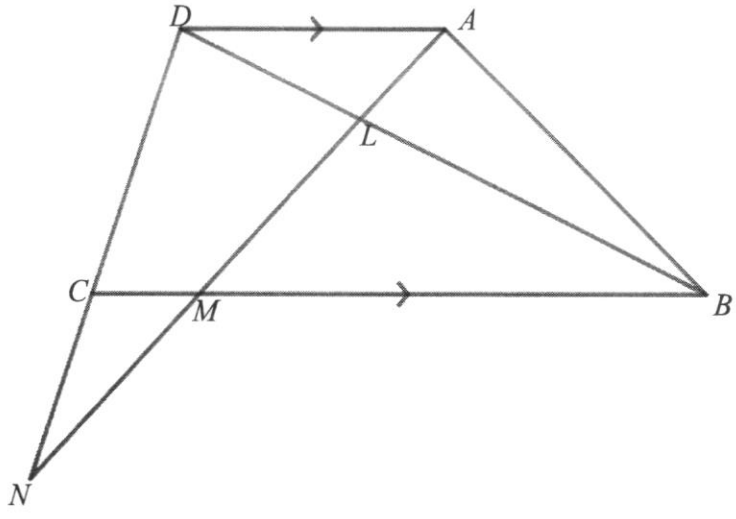
(b) Find the area of triangle POQ.

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

(c) Find the area of the cross-section of the tunnel.

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

17 $ABCD$ is a trapezium and L is a point on DB.
The line AL produced meets BC at M and DC produced at N.



(a) Show that triangles ALD and MLB are similar.

Answer

.....

.....

.....

..... [2]

(b) Given that $LB = 2LD$ and $AL = 1.4$ cm, find

(i) length of LM,

Answer ..... cm [1]

(ii) $\dfrac{\text{Area of triangle } ALD}{\text{Area of triangle } MLB}$,

Answer ..... [1]

(iii) $\dfrac{\text{Area of triangle } ABL}{\text{Area of triangle } ALD}$.

Answer ..... [1]

REGENT SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2022
SECONDARY THREE (EXPRESS)

NAME: _____ INDEX NUMBER: _____

CLASS: _____ SETTER: MS KAREN LEE

MATHEMATICS **4052/02**

Paper 2 **10 Oct 2022**

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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Answer **all** questions.
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For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

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.

	TARGET
80	

This document consists of **17** printed pages.

1 **(a)** Solve these simultaneous equations.

$$2x+3y=28$$
$$5x-6y=-2$$

You must show your working.

Answer $x =$ .....

$y =$ ..... [3]

(b) Write as a single fraction in its simplest form $\frac{5}{2x+1}-\frac{x}{x+2}$.

Answer ..... [2]

(c) Solve the equation $\frac{2}{x} = x - 1$.

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

---

2 **(a)** The cash price of a scooter is \$1888.
Ryder buys this scooter on credit.
He pays a deposit of one third of the cash price.
He then pays 24 monthly payments of \$58.

Calculate the total amount Ryder pays for the scooter.

Answer \$..... [2]

(b) Alan pays \$6.20 for a meal.
This is 4.5% more than the same meal he paid for last year.
Calculate the cost of his meal last year.

Answer \$..... [2]

(c) Lenny wants to make an investment of \$5000 for a period of 5 years. He saw the advertisements for two products.

Product A:	Product B:
Simple interest of 3% per annum	Compound interest of 2.7% compounded half-yearly

Which product should he invest in to obtain a higher return?
Justify your answer with calculations.

Answer ..... [3]

---

3 Factorise completely

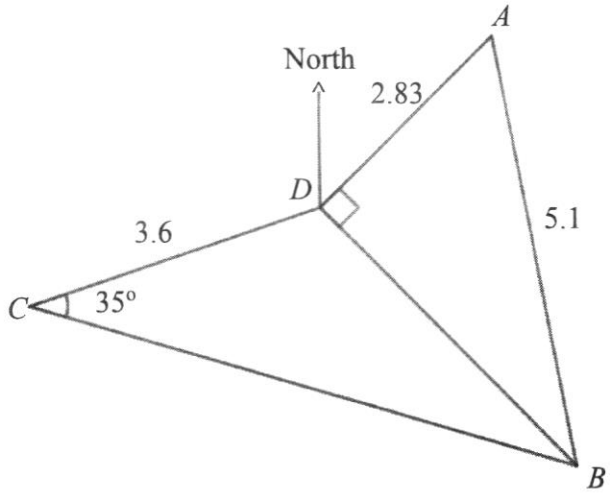
(a) $4x^2 - 36$,

Answer ..... [2]

(b) $3ab - 9ac - 7bd + 21cd$.

Answer ..... [2]

4



ABCD is a field on horizontal ground.
$AB = 5.1$ m, $AD = 2.83$ m and $CD = 3.6$ m.
The bearing of *B* from *A* is 168°.
Angle $BCD = 35°$ and *AD* is perpendicular to *BD*.

(a) Calculate angle *ABD*.

Answer ..... ° [2]

(b) Calculate the bearing of *D* from *B*.

Answer ..... ° [2]

(c) Calculate the shortest distance from D to BC.

Answer ..... m [2]

(d) Find BD.

Answer ..... m [1]

(e) Calculate angle CDB.

Answer ..... ° [2]

(f) Calculate the area of the field, $ABCD$.

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

(g) Mirza built a vertical tower of height 3 m at B.

(i) Calculate the angle of elevation of the top of the tower when viewed from A.

Answer ..... ° [2]

(ii) At which point, A, C or D should Mirza stands so that the angle of elevation of the top of the tower is the greatest?
Explain your answer.

Answer

At point ..... because .....

.....

..... [1]

---

5 **(a)** Solve the inequalities $2 < 3x - 5 \leq \frac{8x+1}{4}$.

Answer ..... [2]

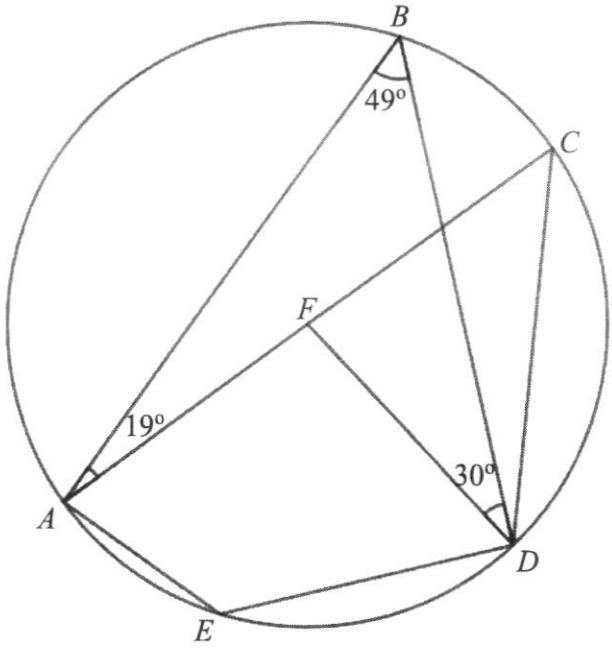
(b) Hence, show your solution on the number line below.

[1]

(c) State the largest integer that satisfies the inequality.

Answer ..... [1]

6



Given AFC is a straight line, angle $ABD = 49°$, angle $BAC = 19°$ and angle $FDB = 30°$.

(a) Find, stating your reasons clearly,

(i) angle ACD,

Answer ..... ° [1]

(ii) angle AED.

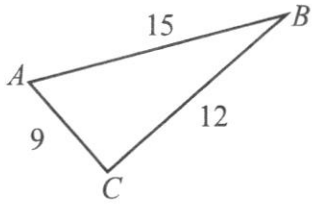
Answer ..... ° [1]

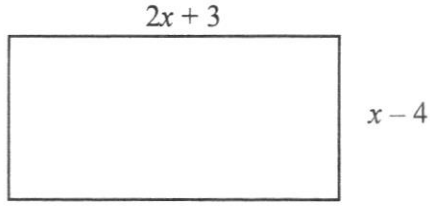
(b) Show that F is the centre of the circle.

Answer

[3]

7 The diagram shows a triangle and a rectangle. All dimensions are in centimetres.





(a) Show that triangle ABC is a right-angled triangle.

Answer

[2]

(b) Given that the area of the rectangle is 26 cm^2 more than the area of triangle, form an equation, in terms of x, and show that it reduces to $2x^2 - 5x - 92 = 0$.

Answer

[3]

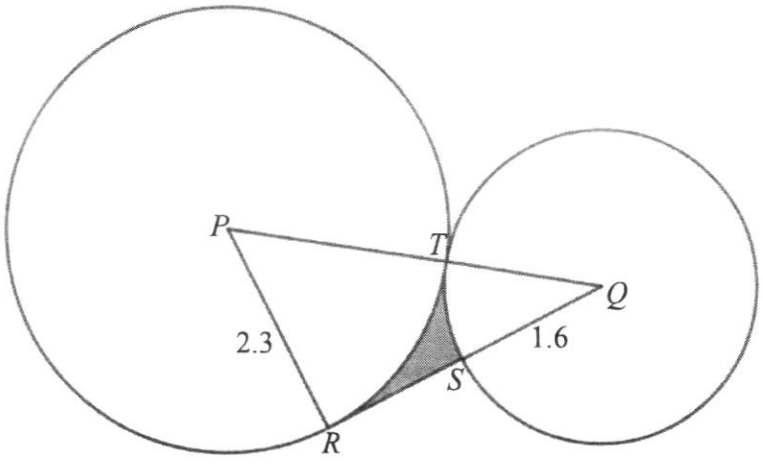
(c) Solve the equation $2x^2 - 5x - 92 = 0$.

Answer x = ... or ..... [3]

(d) Find the perimeter of the rectangle.

Answer ..... cm [1]

8



P and Q are centres of two circles that meet at T and RQ is a tangent to the bigger circle.
The radius of the circles are 2.3 cm and 1.6 cm respectively.

(a) Show that angle RPQ is approximately 53.9°.

Answer

[2]

(b) Find the shaded area.

Answer ..... cm^2 [4]

9 The variables x and y are connected by the equation

$$y = \frac{x^2}{3} + \frac{5}{x}.$$

The table below shows some values of x and the corresponding values of y correct to 1 decimal place.

x	0.5	1	1.5	2	3	4	5
y	10.1	5.3	4.1	3.8	4.7	6.6	p

(a) Calculate the value of p.

Answer $p =$ ..... [1]

(b) On the grid opposite, draw the graph of $y = \frac{x^2}{3} + \frac{5}{x}$ for $0.5 \leq x \leq 5$. [3]

(c) **Hence**, solve the equation $\frac{x^2}{3} + \frac{5}{x} - 5 = 0$

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

(d) By drawing a tangent, find the gradient of the curve at the point (4, 6.6).

Answer ..... [2]

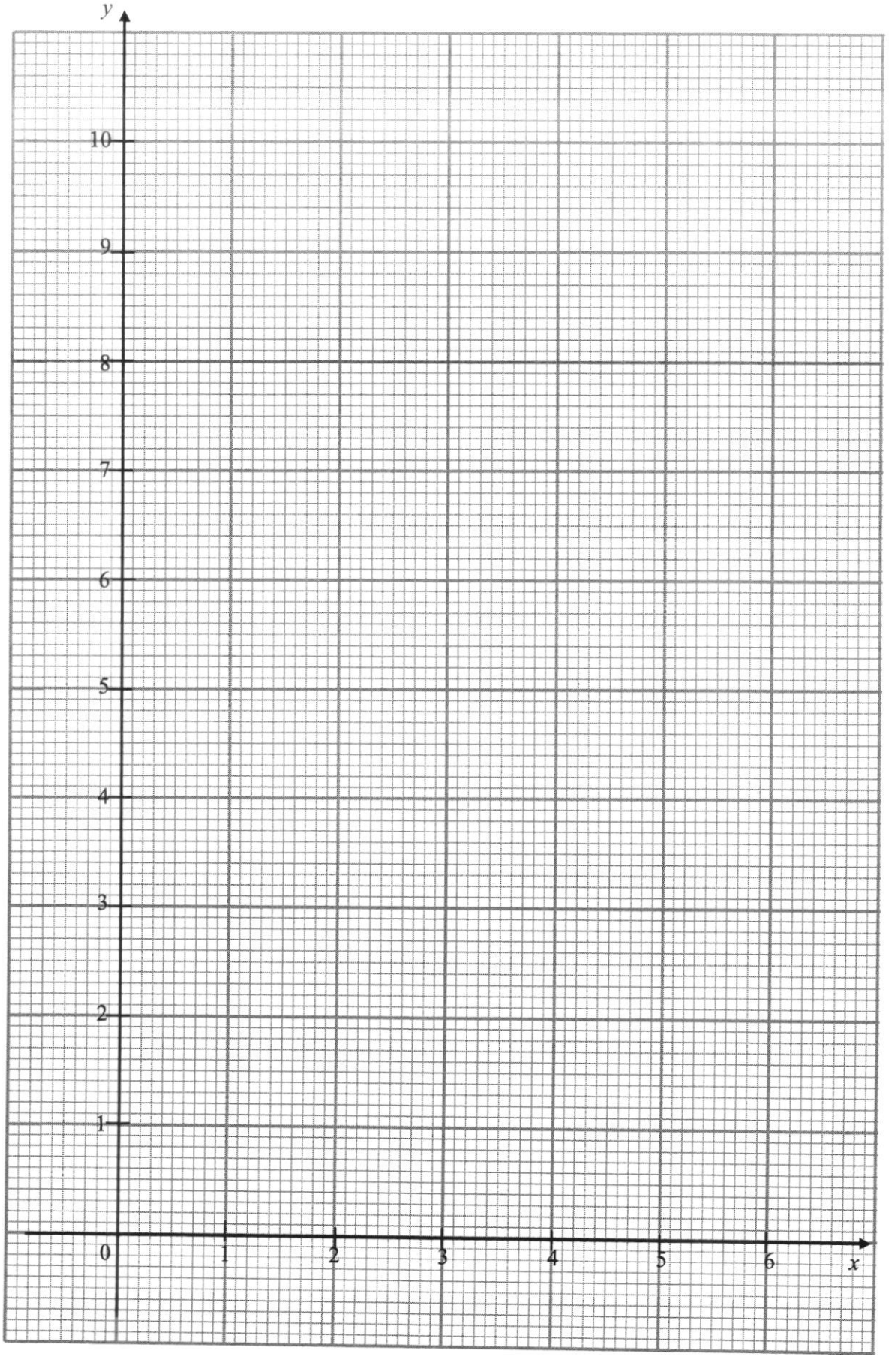
(e) **(i)** On the same axes, draw the graph of $y = 6 - \frac{x}{2}$. [2]

(ii) Write down the x-coordinates of the points at which the two graphs intersect.

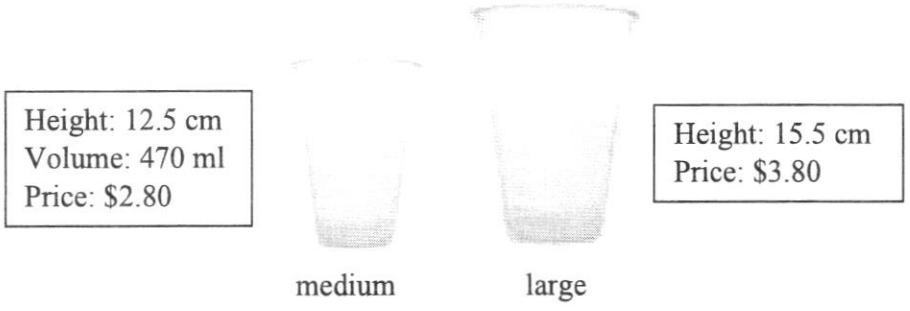
Answer $x =$ ..... or ..... [2]

(iii) Find the equation, in the form $2x^3 + ax^2 + bx + c = 0$, which is satisfied by the values of x found in part **(e)(ii)**.

Answer ..... [2]


y
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
x

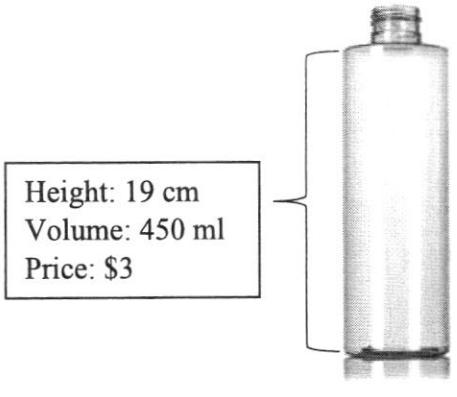
10 Stall A sells sugarcane drinks in two similar-cup sizes, medium and large cups.



(a) Calculate the volume of sugarcane that the large cup can hold.

Answer ..... ml [2]

(b) The stall decides to have a new packaging for the sugarcane drink.



The new packaging is a cylindrical bottle. Calculate the diameter of the bottle's base.

Answer ..... cm [2]

(c) The stall is currently running a promotion as shown in the leaflet below.

Danver wants to buy sugarcane drink for 6 people.
He claims that buying 6 large cups is the most cost-effective choice.
Do you agree with his claim? Justify your answer with calculations.
Assume that all 6 drinks have to be of the same type of packaging.

Answer

.....

..... [6]

3 Express Mathematics SA2 Paper 1 2022 Marking Scheme

1	(a)	(i)	$2^2 \times 3^3 \times 7$	B1	1	
		(ii)	$k = 2 \times 7^2$ $= 98$	B1	1	
		(iii)	HCF $= 2^2 \times 3^2$ $= 36$	B1	1	
	(b)		LCM $= 2^2 \times 5 \times 7$ $= 140$ min $= 2$h 20 min Time $= 0850$	M1 A1	 2	
						Total marks = 5

2	(a)	0.3295	B1	1	Accept 3.295×10^{-1}
	(b)	$\frac{7.3 \times 10^7}{3.295 \times 10^8} = \frac{146}{659}$	B1	1	
	(c)	$3.295 \times 10^8 - 2.36 \times 10^7$ $= 3.059 \times 10^8$	M1 A1	2	
					Total marks = 4

3	(a)	(i)	$\frac{10}{x^3}$	B1	1	
		(ii)	$5x^{2-(-4)} \times 3$ $= 15x^6$	M1 A1	2	M1 for x^6
	(b)		$2^p = 16$ $2^p = 2^4$ $p = 4$	M1 A1	2	
						Total marks = 5

4	(a)	1	B1	1	
	(b)	4	B1	1	
	(c)	3	B1	1	
					Total marks = 3

5	(a)	(3, 0)	B1	1	
	(b)	As the gradient of both lines are the same, they are parallel and will never meet.	B1	1	Accept: using simultaneous to solve and arrive at no solution
					Total marks = 2

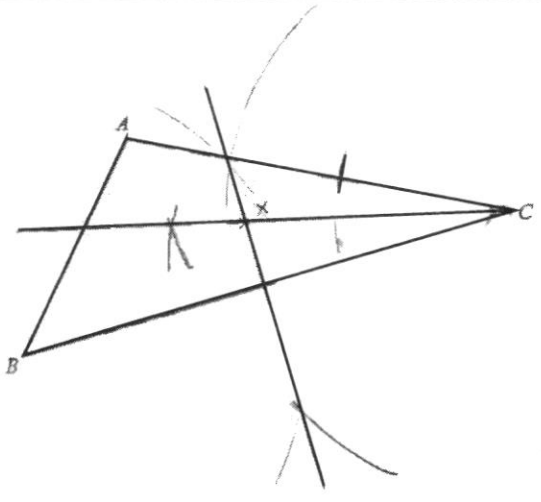
6		$\angle ADB = \angle CDB$ (given) $AD = CD$ (given) $BD = BD$ (common side) $\therefore$ Triangle $ADB \equiv$ triangle CDB (SAS) $\therefore \angle ABD = \angle CBD$ and BD is the angle bisector of angle ABC.	M1 M1 A1	3	
					Total marks = 3

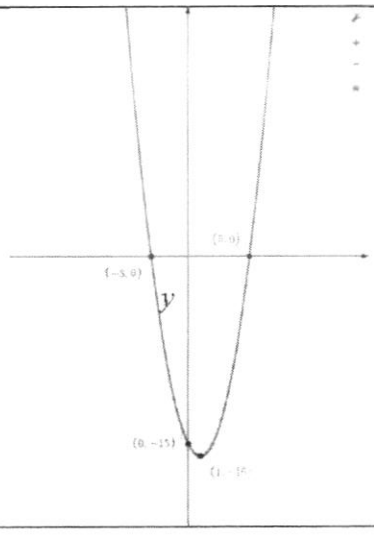
7	(a)	1 cm rep 0.3 km 5 cm rep $0.3 \times 5 = 1.5$ km	B1	1	
	(b)	1 cm rep 0.3 km 1 cm^2 rep 0.09 km^2 Area on map $= \dfrac{45}{0.09}$ $= 500\ cm^2$	M1 A1	2	
					Total marks = 3

8	(a)	$\dfrac{m(m+1)}{(n-1)^2} \times \dfrac{n-1}{m}$ $= \dfrac{m+1}{n-1}$	M1 A1	2	M1 for factorising HCF and for KCF
	(b)	$\left(\dfrac{2}{x}\right)^3 = \dfrac{8}{x^3}$	B1	1	
					Total marks = 3

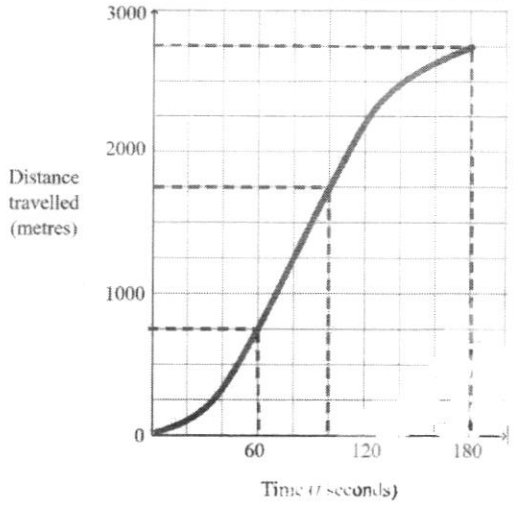
9	(a)	$360° - 36° - 120° - 50° = 154°$ $\dfrac{154°}{360°} \times 100\%$ $= 42\dfrac{7}{9}\%$	M1 A1	2	Reject 3sf as final ans
	(b)	36 : 50 = 18 : 25	B1	1	
	(c)	The represented angle in the pie chart only determines the proportion of each type of animals. Unless the total number of animals is given, it is not possible to know the number of each type of animals.	B1	1	
					Total marks = 4

10	**(a)**	**(i)**	$x^2+16x+64$	B1	1	
		(ii)	$108^2=(100+8)^2$ $=100^2+16(100)+64$ $=10000+1600+64$ $=11664$	M1 A1	2	
	(b)	**(i)**	$f=2.5\times\sqrt{\frac{144}{4}}$ $=15$	B1	1	
		(ii)	$\frac{f}{m}=\sqrt{\frac{L}{4}}$ $\frac{f^2}{m^2}=\frac{L}{4}$ $L=\frac{4f^2}{m^2}$	M1 A1	2	Accept $\left(\frac{f}{m}\right)^2$
						Total marks = 6

11	**(a)** **(b)**			C1 C1	2	
	(c)		5.1 ± 0.1	B1	1	
	(d)		4.7 cm rep 23.5 km 1 cm rep 5 km 10 cm rep 50 km	M1 A1	2	Allows 4.7 ± 0.1
						Total marks = 5

12	**(a)**	**(i)**		C1 C1 2	C1 – correct intercepts C1 – correct shape and quadrant of min point
		(ii)	$x = 1$	B1 1	
	(b)	**(i)**	$x^2 - 3x + 3^2 - 3^2 + 1$ $= (x-3)^2 - 8$	 B1 1	
		(ii)	$(x-3)^2 - 8 = 0$ $(x-3)^2 = 8$ $x - 3 = \pm\sqrt{8}$ $x - 3 = -\sqrt{8}$ or $x - 3 = \sqrt{8}$ $x = 3 - \sqrt{8}$ or $x = 3 + \sqrt{8}$ $= 0.17$ $=5.83$	 M1 A1A1 3	
					Total marks = 7

13	**(a)**		$\frac{25}{80} = \frac{5}{16}$ m/s^2	B1 1	Accept 0.3125
	(b)		$\frac{5}{16} \times 20 = 6.25$ m/s $25 - 6.25 = 18.75$ m/s	M1 A1 2	
	(c)		Total dist $= \frac{1}{2}(25)(40+180)$ $= 2750$ m	M1 A1 2	
	(d)		Avg speed $= \frac{2750}{180}$ $= 15\frac{5}{18}$ m/s	 B1 1	

(e)		B1 B1 B1	3	B1 for each part FT for 2nd and 3rd mark if shape and increment in distance is correct
				Total marks = 9

14	**(a)**	$\frac{16}{25}=\frac{A}{55}$ $A = 35.2 \text{ cm}^2$	B1	1	
	(b)	$\sqrt{\frac{16}{25}}=\frac{4}{5}$ $\frac{4}{5}=\frac{20}{h}$ $h = 25$	M1 A1	2	
	(c)	$\left(\frac{4}{5}\right)^3=\frac{64}{125}$ 64 : 125	B1	1	
					Total marks = 4

15	**(a)**	$\frac{1}{2}\times 7\times 4 = 14 \text{ units}^2$	B1	1	
	(b)	$\sqrt{(-5-(-8))^2+(3-(-1))^2}=5 \text{ units}$	B1	1	
	(c)	$\cos \angle CAB = -\frac{3}{5}$	B1	1	
	(d)	$\frac{3-(-1)}{-5-(-8)}=\frac{4}{3}$	B1	1	

(e)	$\frac{4}{3} \times m_{BD} = -1$ $m_{BD} = -\frac{3}{4}$ $y = -\frac{3}{4}x + c$ $3 = -\frac{3}{4}(2) + c$ $c = \frac{9}{2}$ $y = -\frac{3}{4}x + \frac{9}{2}$	M1 A1	2	
				Total marks = 6

16 **(a)**	$r\theta + 2r = 34.5$ $4.1r + 2r = 34.5$ $6.1r = 34.5$ $r = 5.6557$ $= 5.66$ m (3sf) (shown)	M1 A1	2	
(b)	$\angle POQ = 2\pi - 4.1$ $= 2.1832$ rad Area of triangle $= \frac{1}{2}(5.6557)^2 \sin 2.1832$ $= 13.087$ $= 13.1\ \text{m}^2$	 M1 A1	 2	Accept use of $r = 5.66$. Area of triangle = $13.107\ \text{m}^2$
(c)	Area of major sector $= \frac{1}{2}(5.6557)^2(4.1)$ $= 65.573\ \text{m}^2$ Total area $= 65.573 + 13.087$ $= 78.7\ \text{m}^2$	M1 A1	 2	Area of sector = $65.673\ \text{m}^2$ Total area = $78.8\ \text{m}^2$
				Total marks = 6

17 **(a)**	$\angle ALD = \angle MLB$ (vert opp angles) $\angle DAL = \angle BML$ (alt angles, $AD \,//\, BC$) triangle ALD is similar to triangle MLB (AA Similarity test) *Or* Since 2 pairs of corresponding angles are equal, triangle ALD is similar to triangle MLB.	} M1 A1	2	

(b) (i)	$\frac{LB}{LD} = 2$ $\frac{LM}{LA} = 2$ $\frac{LM}{1.4} = 2$ $LM = 2.8$ cm	B1	1	
(ii)	$\frac{\text{Area of triangle } ALD}{\text{Area of triangle } MLB}$ $= \left(\frac{LD}{LB}\right)^2$ $= \left(\frac{1}{2}\right)^2$ $= \frac{1}{4}$	B1	1	
(iii)	$\frac{\text{Area of triangle } ABL}{\text{Area of triangle } ALD}$ $= \frac{\frac{1}{2} \times LB \times h}{\frac{1}{2} \times LD \times h}$ $= \frac{LB}{LD}$ $= 2$	B1	1	
				Total marks = 5

3 Express Mathematics SA2 Paper 2 2022 Marking Scheme

1	(a)	$(1)\times 2$ $4x+6y=56$ ---(3) $(2)+(3)$ $5x-6y+4x+6y=56+(-2)$ $9x=54$ $x=6$ Sub $x=6$ into (1) $2(6)+3y=28$ $3y=16$ $y=5\frac{1}{3}$	M1 A1 A1	3	
	(b)	$\frac{5(x+2)-x(2x+1)}{(2x+1)(x+2)}$ $=\frac{5x+10-2x^2-x}{(2x+1)(x+2)}$ $=\frac{-2x^2+4x+10}{(2x+1)(x+2)}$	M1 A1	2	
	(c)	$2=x^2-x$ $x^2-x-2=0$ $(x-2)(x+1)=0$ $x=2$ or $x=-1$	 M1 A1	2	
					Total marks = 7

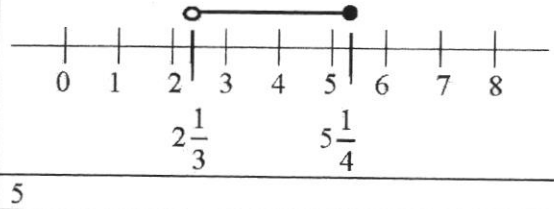
2	(a)	$\text{Deposit}=\frac{1}{3}\times\$1888$ $=\$629.3333$ $\text{Total amt}=\$629.3333+(\$58\times 24)$ $=\$2021.33$	 M1 A1	2	
	(b)	$\frac{\$6.20}{104.5}\times 100=\$5.93$	M1A1	2	

2	(c)	Product A: $\text{Interest} = \frac{5000(3)(5)}{100}$ $= \$750$ $\text{Total amt} = \$5750$ Product B: $\text{Total amt} = 5000\left(1+\frac{1.35}{100}\right)^{10}$ $= \$5717.5179$ Ans: Product A	M1 M1 A1	3	
					Total marks = 7

3	(a)	$4(x^2-9)$ $-4(x-3)(x+3)$	M1 A1	2	
	(b)	$3a(b-3c)-7d(b-3c)$ $=(3a-7d)(b-3c)$	M1 A1	2	
					Total marks = 4

4	(a)	$\sin\angle ABD = \frac{2.83}{5.1}$ $\angle ABD = 33.704$ $= 33.7°$	M1 A1	2	
	(b)	$180° - 168° = 12°$ $360° - 12° - 33.704° = 314.296°$ $= 314.3°$	M1 A1	2	
	(c)	$\sin 35° = \frac{d}{3.6}$ $d = 3.6\sin 35°$ $= 2.06488$ $= 2.06$ m	M1 A1	2	
	(d)	$BD = \sqrt{5.1^2 - 2.83^2}$ $= 4.24277$ $= 4.24$ m (3 sf)	 B1	1	

(e)	$\frac{3.6}{\sin\angle CBD} = \frac{4.24277}{\sin 35°}$ $\angle CBD = 29.123°$ $\angle CDB = 180° - 35° - 29.123°$ $= 115.877°$ $= 115.9°$ (1 dp)	M1 A1	 2	
(f)	Area of $\Delta ABD = \frac{1}{2} \times 2.83 \times 4.24277$ $= 6.0035$ m^2 Area of $\Delta CBD = \frac{1}{2}(3.6)(4.24277)\sin 115.877°$ $= 6.8712$ m^2 Total area $= 6.0035 + 6.8712$ $= 12.8747$ $= 12.9$ m^2	M1 A1	 2	M1 for finding one of the area of triangle
(g) **(i)**	$\tan\theta = \frac{3}{5.1}$ $\theta = 30.4655°$ $= 30.5°$	M1 A1	 2	
(ii)	Point D because BD is the shortest distance thus the angle of elevation is the greatest.	B1	1	
				Total marks = 14

5 **(a)**	$2 < 3x - 5$ and $3x - 5 \le \frac{8x+1}{4}$ $7 < 3x$ $12x - 20 \le 8x + 1$ $x > 2\frac{1}{3}$ $4x \le 21$ $x \le 5\frac{1}{4}$ $\therefore 2\frac{1}{3} < x \le 5\frac{1}{4}$	M1 A1	 2	M1 for either $x > 2\frac{1}{3}$ or $x \le 5\frac{1}{4}$
(b)		B1	1	
(c)	5	B1	1	
				Total marks = 4

6	(a) (i)	$\angle ACD = \angle ABD$ ($\angle$s in same segment) $= 49°$	B1	1	For part (a), wrong reason, 0m
	(ii)	$\angle AED = 180° - 49°$ ($\angle$s in opp segment) $= 131°$	B1	1	
	(b)	reflex $\angle AFD = 360° - 49° - 19° - 30°$ $= 262°$ $\angle AFD = 360° - 262°$ $= 98°$ $= 2\angle ABD$ Since $\angle AFD = 2\angle ABD$, it fulfils angle at centre = 2 angle at circumference, F is the centre of the circle.	M1 M1 A1	3	
					Total marks = 5

7	(a)	$AB^2 = 15^2$ $= 225$ $AC^2 + BC^2 = 9^2 + 12^2$ $= 225$ As $AB^2 = AC^2 + BC^2$, by the converse of Pythagoras' theorem, triangle ABC is a right-angled triangle. Or $\cos \angle ACB = \frac{9^2 + 12^2 - 15^2}{2(9)(12)}$ $\angle ACB = 90°$	M1 A1	2	
	(b)	$(2x+3)(x-4) - 26 = \frac{1}{2}(9)(12)$ $2x^2 - 8x + 3x - 12 - 26 = 54$ $2x^2 - 5x - 92 = 0$ (shown)	M1M1 A1	3	M1 for $(2x + 3)(x - 4)$ and M1 for forming equation
	(c)	$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-92)}}{2(2)}$ $= \frac{5 \pm \sqrt{761}}{4}$ $x = \frac{5 - \sqrt{761}}{4}$ or $x = \frac{5 + \sqrt{761}}{4}$ $= -5.6466$ $= 8.1466$ $= -5.65$ $= 8.15$	M1 A1A1	3	

(d)	$2(2x+3+x-4)$ $-2(3x-1)$ $-2[3(8.1466)-1]$ -46.9 cm	B1	1	
				Total marks = 9

8	**(a)**	$\angle PRQ = 90°$ (tangent ⊥ radius) $PQ = 2.3+1.6$ $= 3.9$ cm $\cos\angle RPQ = \frac{2.3}{3.9}$ $\angle RPQ = 53.861°$ $= 53.9°$ (shown)	M1 A1	2	
	(b)	Area of sector $RPT = \frac{53.861}{360} \times \pi(2.3)^2$ $= 2.4864$ cm^2 $\angle PQR = 180° - 90° - 53.861°$ $= 36.139°$ Area of sector $TQS = \frac{36.139}{360} \times \pi(1.6)^2$ $= 0.80735$ cm^2 Area of $\Delta PRQ = \frac{1}{2}(2.3)(3.9)\sin 53.861°$ $= 3.6220$ cm^2 Shaded area $= 3.6220 - 0.80735 - 2.4864$ $= 0.328$ cm^2	M1 M1 M1 A1	4	
					Total marks = 6

9	**(a)**	9.3	B1	1	
	(b)	Refer to Appendix 1 P1 – 3 points plotted correctly P2 – all points plotted correctly C1 – smooth curve		3	
	(c)	Draw $y = 5$ $x = 1.05$ or 3.2 (± 0.1)	B1B1	2	
	(d)	$m = \frac{9.7-5}{5.4-3.3}$ $= 2.24$ (3 sf)	M1 A1	2	The 2 points must be indicated on tangent

(e)	(i)	Refer to Appendix 1 P1 – 3 points plotted correctly C1 – straight line		2	
	(ii)	$x = 0.95$ or 2.9 (± 0.1)	B1B1	2	
	(iii)	$\frac{x^2}{3} + \frac{5}{x} = 6 - \frac{x}{2}$ $2x^3 + 30 = 36x - 3x^2$ $2x^3 + 3x^2 - 36x + 30 = 0$	M1 A1	2	
					Total marks = 14

10	**(a)**	$\left(\frac{15.5}{12.5}\right)^3 = \frac{\text{vol}}{470}$ $\text{vol} = 896.11$ $= 896$ ml	M1 A1	2	
	(b)	$\text{vol} = \pi r^2 h$ $450 = \pi r^2 (19)$ $r^2 = 7.5389$ $r = 2.7457$ $d = 5.49$ cm	M1 A1	2	
	(c)	cost of each medium cup $= \$2.80 \times 0.90$ $= \$2.52$ cost per 100ml $= \frac{2.52}{4.7}$ $= \$0.53617$ cost of each large cup $= \$3.80 \times 0.90$ $= \$3.42$ cost per 100ml $= \frac{3.42}{8.9611}$ $= \$0.38165$ total cost of 6 bottles $= \$3 \times 5$ $= \$15$ cost per 100ml $= \frac{15}{6(4.5)}$ $= \$0.55556$ I agree with his claim as the cost per 100ml is the lowest for 6 large cups.	M1 M1 M1 M1 M1 A1	6	M1 for either finding cost of each medium cup or each large cup
					Total marks = 10

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