22

$f(x) = \frac{3}{x+2}, x \neq -2$ $g(x) = 8x - 5$ $h(x) = x^2 + 6$

(a) Work out $g\left(\frac{1}{4}\right)$.

Ans . -3

..... [1]

(b) Work out $fh(2)$.

Ans . 12 / 11

..... [2]

(c) Find $gg(x)$, giving your answer in its simplest form.

Ans . 64x - 50

..... [2]

(d) Find $g^{-1}(x)$.

Ans . x+ 5 / 8

$g^{-1}(x) =$ ..... [2]

(e) Write $g(x) - f(x)$ as a single fraction in its simplest form.

Ans . $8x^2 - 11x - 13$ / x+2

..... [3]

(f) (i) Show that $hg(x) = 19$ simplifies to $16x^2 - 20x + 3 = 0$.

[3]

(ii) Use the quadratic formula to solve $16x^2 - 20x + 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

Ans by formula .... x = 1.08 or x0.17

23 $f(x) = 4x - 1$ $g(x) = x^2$ $h(x) = 3^{-x}$

(a) Find in its simplest form

(i) $f(x-3)$,

..... [1]

(ii) $g(5x)$.

..... [1]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find the value of $hh(1)$, correct to 4 significant figures.

..... [3]

(d) **(i)** Show that $g(3x-2)-h(-3)$ can be written as $9x^2-12x-23$.

[2]

(ii) Use the quadratic formula to solve $9x^2-12x-23=0$.
Give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $f(61) = h(x)$.

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

24 $f(x) = 3x + 2$ $g(x) = x^2 + 1$ $h(x) = 4^x$

(a) Find h(4).

..... [1]

(b) Find fg(1).

..... [2]

(c) Find gf(x) in the form $ax^2 + bx + c$.

..... [3]

(d) Find x when $f(x) = g(7)$.

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

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(f) Find $\frac{g(x)}{f(x)} + x$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(g) Find x when $h^{-1}(x) = 2$.

$x =$ ..... [1]

$f(x) = 2x + 1$ $g(x) = x^2 + 4$ $h(x) = 2^x$

(a) Solve the equation $f(x) = g(1)$.

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

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find $gf(x)$ in its simplest form.

..... [3]

(d) Solve the equation $h^{-1}(x) = 0.5$.

$x =$ ..... [1]

(e) $\frac{1}{h(x)} = 2^{kx}$

Write down the value of k.

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

Chapter . 6

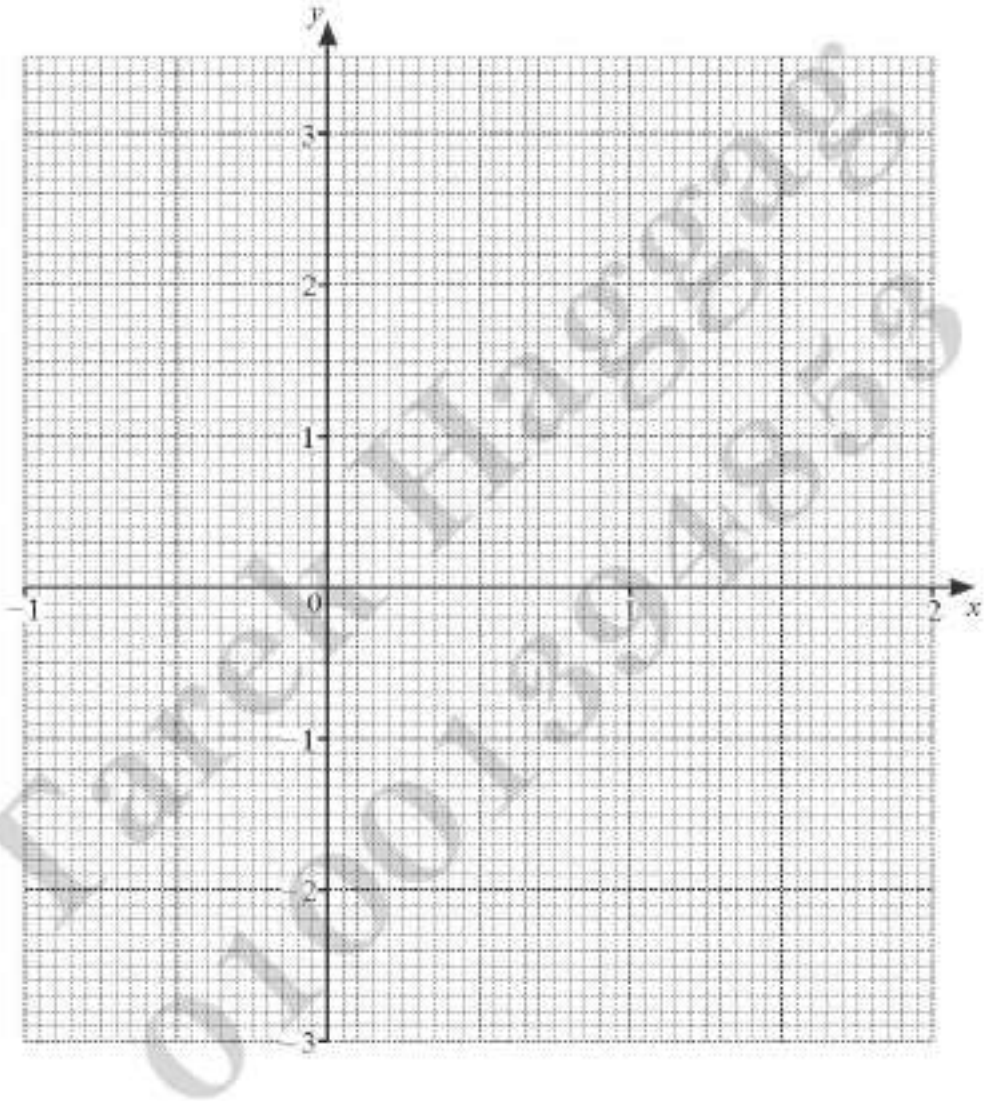
Graphs

a) The table shows some values for $y = 2x^3 - 4x^2 + 3$)

x	-1	-0.5	0	0.5	1	1.5	2
y	-3	1.75				0.75	3

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 2x^3 - 4x^2 + 3$ for $-1 \leqslant x \leqslant 2$.



[4]

(iii) Use your graph to solve the equation $2x^3 - 4x^2 + 3 = 1.5$.

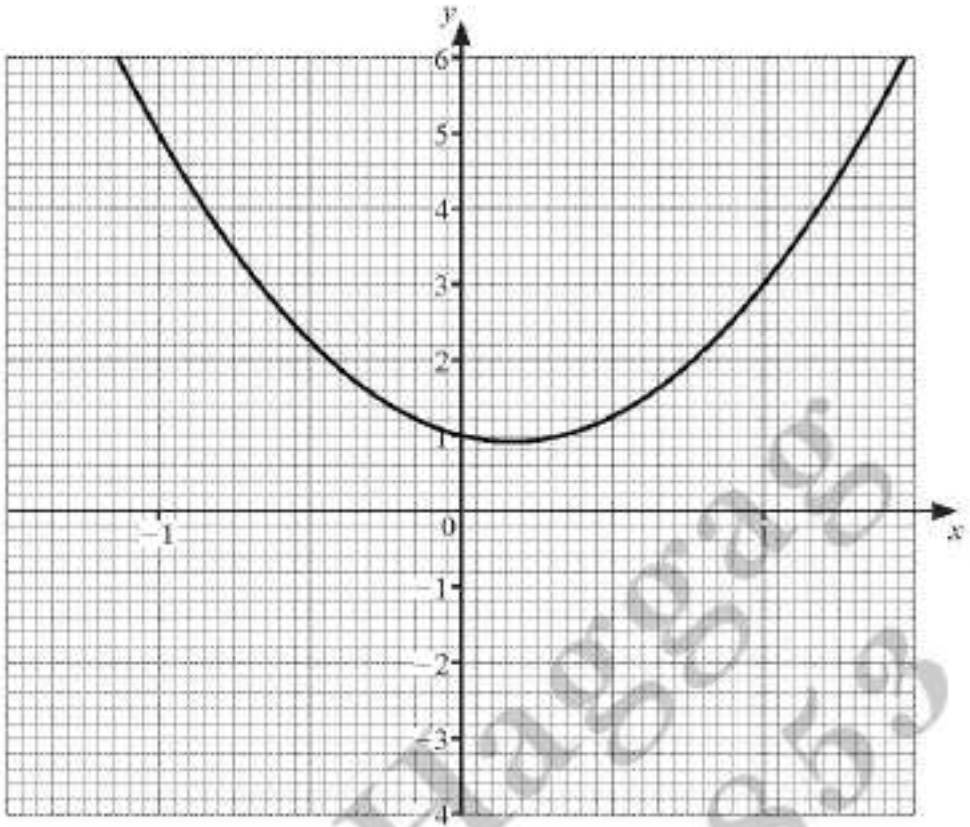
$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iv) The equation $2x^3 - 4x^2 + 3 = k$ has only one solution for $-1 \leqslant x \leqslant 2$.

Write down a possible integer value of k.

..... [1]

(b)



(i) On the grid, draw the tangent to the curve at $x = 1$. [1]

(ii) Use your tangent to estimate the gradient of the curve at $x = 1$.

..... [2]

(iii) Write down the equation of your tangent in the form $y = mx + c$.

$y =$ ..... [2]

/ October
November/2020/0580/42

2 $y = x^2 + \frac{1}{x},\ x \neq 0$

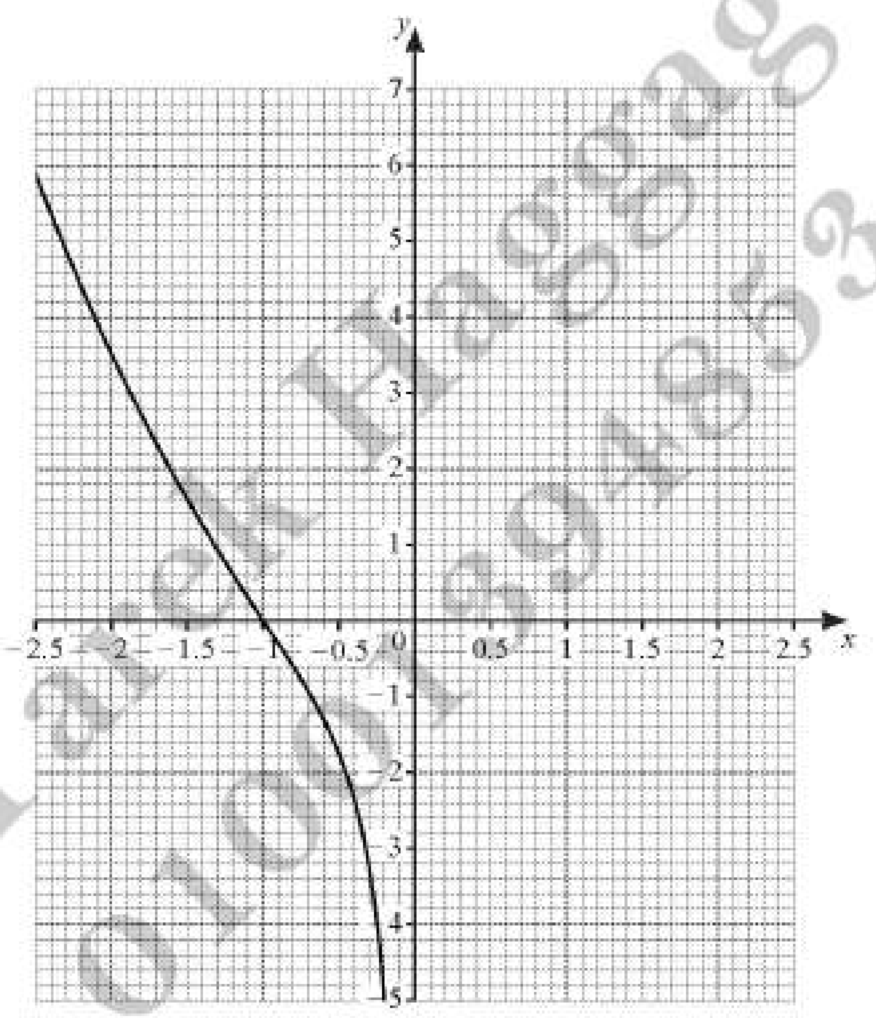
(a) Complete the table.

x	0.2	0.3	0.5	1	1.5	2	2.5
y	5.0	3.4	2.3		2.9		6.7

[2]

(b) On the grid, draw the graph of $y = x^2 + \frac{1}{x}$ for $0.2 \leqslant x \leqslant 2.5$.

The graph of $y = x^2 + \frac{1}{x}$ for $-2.5 \leqslant x \leqslant -0.2$ has been drawn for you.



[4]

(c) By drawing suitable straight lines on the grid, solve the following equations.

(i) $x^2 + \frac{1}{x} = -2$

$x =$ ..... [1]

(ii) $x^2 + \frac{1}{x} + x - 1 = 0$

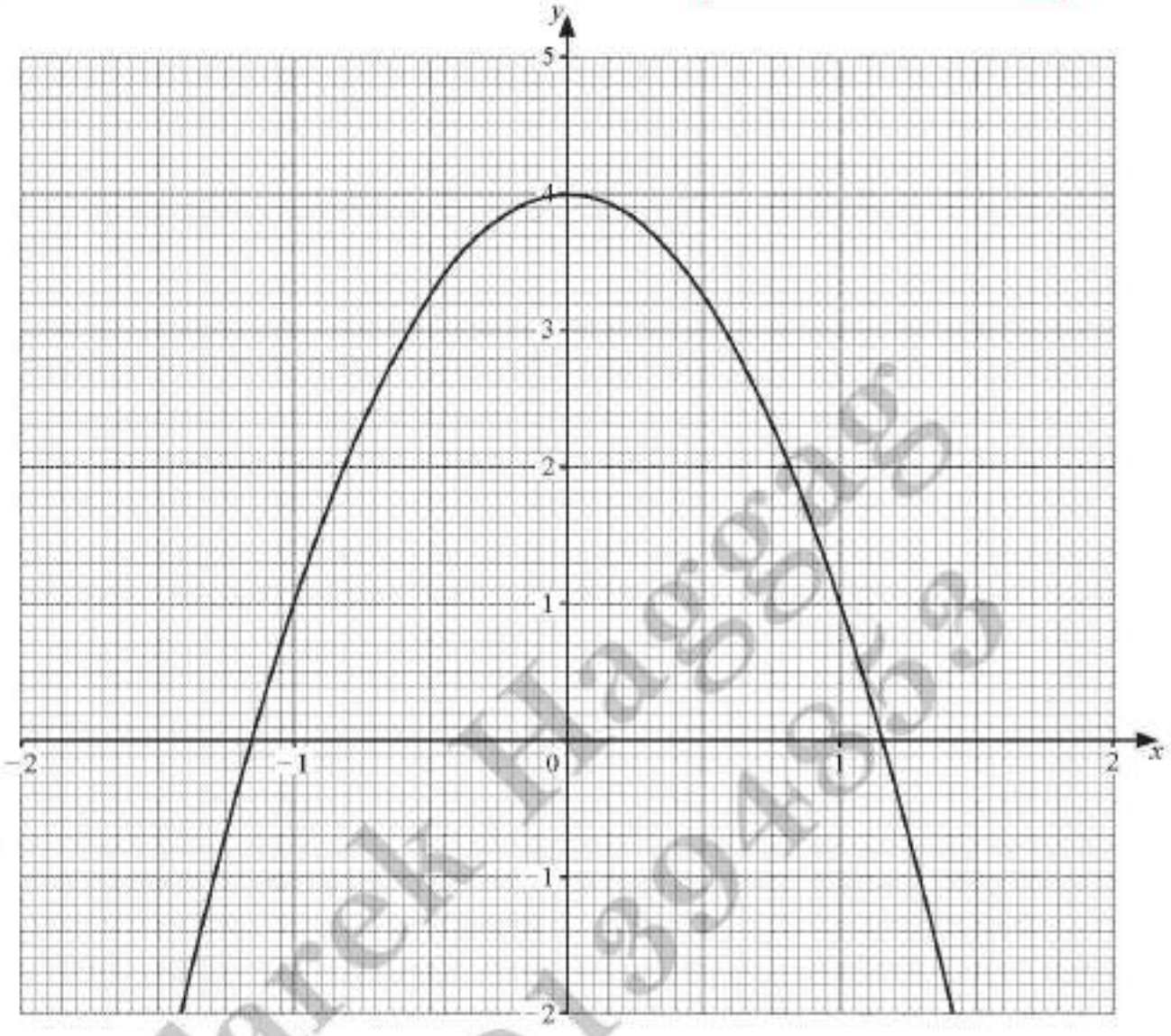
$x =$ ..... [2]

(d) k is an integer and the equation $x^2 + \frac{1}{x} = k$ has three solutions.

Write down a possible value of k.

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

3



(a) The grid shows the graph of $y = a + bx^2$.

The graph passes through the points with coordinates (0, 4) and (1, 1).

(i) Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

(ii) Write down the equation of the tangent to the graph at (0, 4).

..... [1]

(iii) The equation of the tangent to the graph at $x = -1$ is $y = 6x + 7$.

Find the equation of the tangent to the graph at $x = 1$.

..... [2]

(b) The table shows some values for $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$.

x	−2	−1.5	−1	−0.5	0	0.5	1	1.5
y	2	2.11		2.43		3		4.33

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$. [4]

(c) **(i)** Write down the values of x where the two graphs intersect.

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

(ii) The answers to **part(c)(i)** are two solutions of a cubic equation in terms of x.

Find this equation in the form $ax^3 + bx^2 + cx + d = 0$, where a, b, c and d are integers.

..... [4]

(a)	-3	1	
(b	$\frac{12}{11}$ oe	2	M1 for $\frac{3}{\frac{3}{x+2}+2}$ soi
(c)	$64x-45$ final answer	2	M1 for $8(8x-5)-5$ isw
(d)	$\frac{x+5}{8}$ oe final answer	2	M1 for a correct first step $y+5=8x$, $\frac{y}{8}=x-\frac{5}{8}$ or $x=8y-5$
(e)	$\frac{8x^2+11x-13}{x+2}$ final answer	3	M1 for $(8x-5)(x+2)-3$ oe isw B1 for common denominator $(x+2)$
(f)(i)	$(8x-5)^2+6=19$	M1	
	$64x^2-40x-40x+25$	B1	
	$64x^2-40x-40x+25+6=19$ oe leading to $16x^2-20x+3=0$	A1	with no errors and must show $(8x-5)^2+6=19$ with no omissions after this
(f)(ii)	$\frac{[-\!-]20\pm\sqrt{([-]20)^2-4(16)(3)}}{2\times16}$ oe	2	B1 for $\sqrt{([-]20)^2-4(16)(3)}$ or better or B1 for $\frac{[-\!-]20+\sqrt{q}}{2(16)}$ oe or $\frac{[-\!-]20-\sqrt{q}}{2(16)}$
	0.17 and 1.08 final ans	2	B1 for each If 0 scored, SC1 for answer 0.2 and 1.1 or answer – 0.17 and –1.08 or 0.174... and 1.075 to 1.076 seen or 0.17 and 1.08 seen in working

a)(i)	$4x-13$ final answer	1	
(a)(ii)	$25x^2$ final answer	1	
(b)	$\frac{x+1}{4}$ or $\frac{x}{4}+\frac{1}{4}$	2	M for correct first step $x=4y-1$ or $y+1=4x$ or $\frac{y}{4}=x-\frac{1}{4}$
(c)	0.6934 final answer	3	B2 for 0.69336… or $3^{-\frac{1}{3}}$ oe or 0.693 or M1 for $3^{-3^{-1}}$ oe
d)(i)	$(3x-2)^2-3^{-(-3)}$	M1	
	$9x^2-6x-6x+4-27$ or $9x^2-12x+4-27$ leading to $9x^2-12x-23$	A1	with no errors seen

Question	Answer	Marks	Partial Marks
(d)(ii)	$\frac{-(-12)\pm\sqrt{(-12)^2-4(9)(-23)}}{2\times9}$ or better	B2	B1 for $\sqrt{(-12)^2-4(9)(-23)}$ oe or $\frac{-(-12)+\sqrt{q}}{2\times9}$ oe or $\frac{-(-12)-\sqrt{q}}{2\times9}$ oe or both
	– 1.07, 2.40 final answers	B2	B for each If B0, SC1 for answers – 1.1 or –1.06 or –1.065… to – 1.065 and 2.4 or 2.39 or 2.398 to 2.398… or – 1.07 and 2.40 seen in working or for –2.40 and 1.07 as final answer
(e)	–5 final answer	2	M1 for $243=3^{-x}$

(a)	256	1	
(b)	8	2	M1 for $3(x^2 + 1) + 2$ or for $3(2) + 2$
(c)	$9x^2 + 12x + 5$	3	M1 for $(3x + 2)^2 + 1$ B1 for $[(3x + 2)^2 =] \ 9x^2 + 6x + 6x + 4$ oe
(d)	16	2	M1 for $3x + 2 = 7^2 + 1$ or better
(e)	$\frac{x-2}{3}$ oe final answer	2	M1 for $x = 3y + 2$ or for $y - 2 = 3x$ or for $\frac{y}{3} = x + \frac{2}{3}$
(f)	$\frac{4x^2 + 2x + 1}{3x + 2}$ final answer	3	B1 for $x^2 + 1 + x(3x + 2)$ or better seen M1 for common denominator $3x + 2$
(g)	16	1	

25

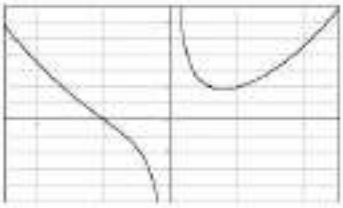
Question	Answer	Marks	Partial Marks
(a)	2	2	M1 for $2x + 1 = 1 + 4$
(b)	$\frac{x-1}{2}$ oe final answer	2	M1 for $y - 1 = 2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y + 1$
(c)	$4x^2 + 4x + 5$ final answer	3	M1 for $(2x + 1)^2 + 4$ and B1 for $[(2x + 1)^2 =] 4x^2 + 2x + 2x + 1$ or better
(d)	$\sqrt{2}$ or 1.41 or 1.414...	1	
(e)	–1	1	

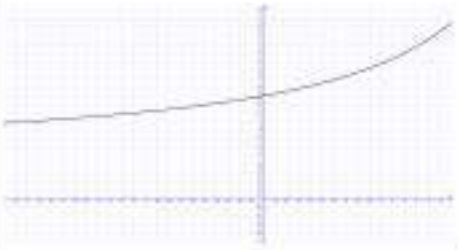
Chapter . 6

Graphs

March/2020/058
0/42

(a)(i)	3 2.25 1	**3**	**B** for each
(a)(ii)	Fully correct smooth curve	**4**	**B3F** for 7 or 6 correct plots **B2FT** for 5 or 4 correct plots **B1FT** for 3 correct plots
(a)(iii)	–0.6 to –0.51, 0.75 to 0.85, 1.7 to 1.85	**3**	**B** for each If 0 scored, **SC1** for $y = 1.5$ drawn
(a)(iv)	–3 or –2 or –1 or 0	**1**	
(b)(i)	Tangent ruled at $x = 1$	**1**	
(b)(ii)	4.4 to 5.6	**2**	Dep on tangent at $x = 1$ or close attempt **M1** for rise/run for *their* line
(b)(iii)	$y = (4.4 \text{ to } 5.6)x - (1.8 \text{ to } 2.2)$ or [$y =$] *their* **(b)(ii)**x + *their*(y-intercept)	**2**	**F** for any line but not horizontal or vertical line for 2 marks or **B1** **B1FT** for [$m =$] *their* 5 or for *their* y-intercept

(a)	2, 4.5	2	**B1** for each
(b)	Correct graph 	4	**B3 FT** for 6 or 7 correct points FT *their* table or **B2 FT** for 4 or 5 correct points FT *their* table or **B1 FT** for 2 or 3 correct points FT *their* table
(c)(i)	–0.5 to –0.4	1	
(c)(ii)	$y = 1 - x$ ruled **and** –1.9 to –1.75	2	**M1** for $[y =] 1 - x$ or $\left[x^2 + \frac{1}{x} =\right] 1 - x$ soi or **B1** for –1.9 to –1.75
(d)	Any integer ≥ 2	1	

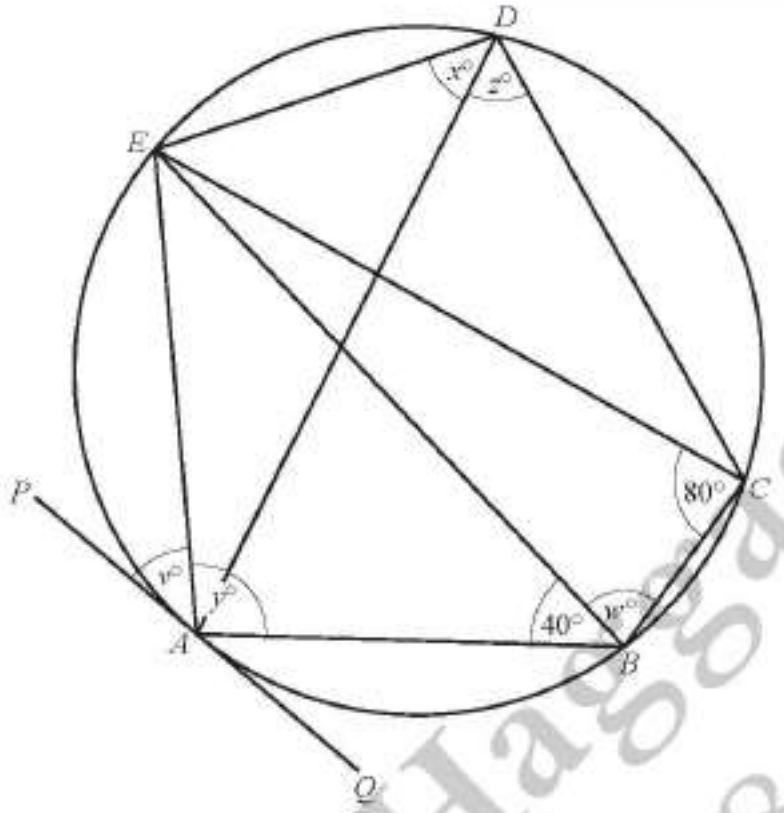
Question	Answer	Marks	Partial Marks
(a)(i)	$[a =]\ 4$ $[b =] -3$ nfwrw	**2**	**B1** for $[a =]\ 4$ **B1** for $[b =] -3$ nfwrw
(a)(ii)	$y = 4$ oe	**1**	
(a)(iii)	$y = -6x + 7$ oe final answer	**2**	**B1** for answer $-6x + 7$ or answers $y = -6x + c$ or $y = kx + 7$ $(k < 0)$
(b)(i)	2.25 2.67 3.5	**3**	**B1** for each
(b)(ii)	correct curve 	**4**	**B3 FT** for 7 or 8 points or **B2 FT** for 5 or 6 points or **B1 FT** for 3 or 4 points
(c)(i)	-0.78 to -0.72 and 0.55 to 0.59	**2**	**B1** for each
(c)(ii)	$3x^3 - 9x^2 - 3x + 4\ [= 0]$ final answer	**4**	**B3FT** for 3 out of 4 correct terms or for $bx^3 - 3bx^2 + (a-1)x + 8 - 3a\ [= 0]$ oe or **B2FT** for 2 out of 4 correct terms or for 3 out of 4 terms from $bx^3 - 3bx^2 + (a-1)x + 8 - 3a\ [= 0]$ or **M1** for $1 + \frac{5}{3-x} = \textit{their}\ 4 + (\textit{their}(-3))x^2$ oe

Chapter . 7

Circle

PART ONE

(a)

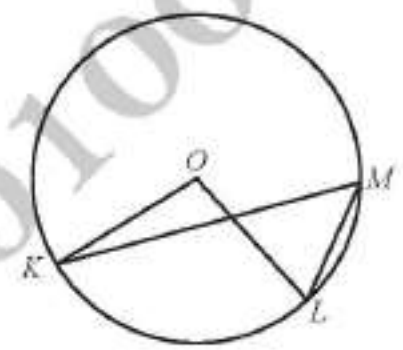


The points A, B, C, D and E lie on the circle.
PAQ is a tangent to the circle at A and $EC = EB$.
Angle $ECB = 80°$ and angle $ABE = 40°$.

Find the values of v, w, x, y and z.

$v =$ ..... $w =$ ..... $x =$ ..... $y =$ ..... $z =$ ..... [5]

(b)



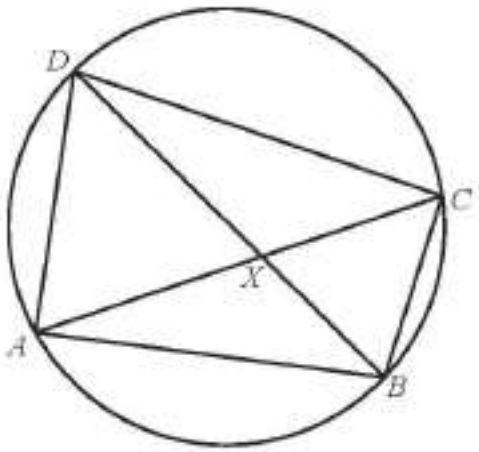
NOT TO
SCALE

In the diagram, K, L and M lie on the circle, centre O.
Angle $KML = 2x°$ and reflex angle $KOL = 11x°$.

Find the value of x.

$x =$ ..... [3]

(c)



NOT TO SCALE

The diagonals of the cyclic quadrilateral $ABCD$ intersect at X.

(i) Explain why triangle ADX is similar to triangle BCX.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $AD = 10$ cm, $BC = 8$ cm, $BX = 5$ cm and $CX = 7$ cm.

(a) Calculate DX.

$DX =$ ..... cm [2]

(b) Calculate angle BXC.

Angle $BXC =$ ..... [4]

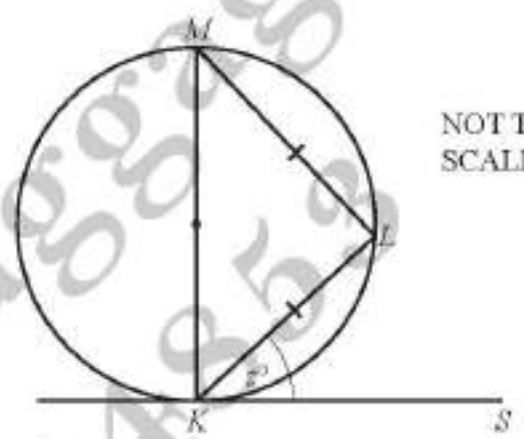
(a) The interior angle of a regular polygon with n sides is $150°$

Calculate the value of n.

$n =$ ..... [2]

(b) (i) K, L and M are points on the circle.
KS is a tangent to the circle at K.
KM is a diameter and
triangle KLM is isosceles.

Find the value of z.

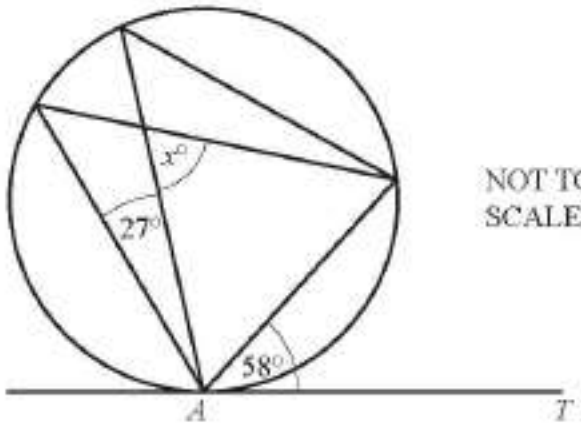


NOT TO SCALE

$z =$ ..... [2]

(ii) AT is a tangent to the circle at A.

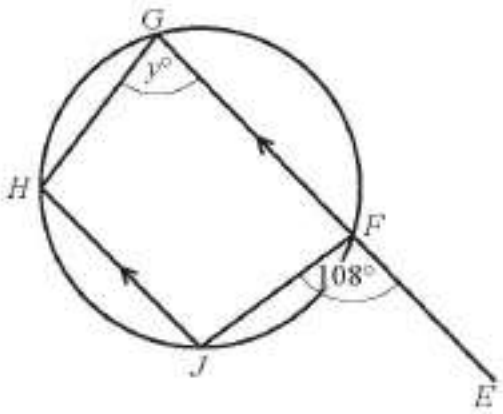
Find the value of x.



NOT TO SCALE

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

(iii)



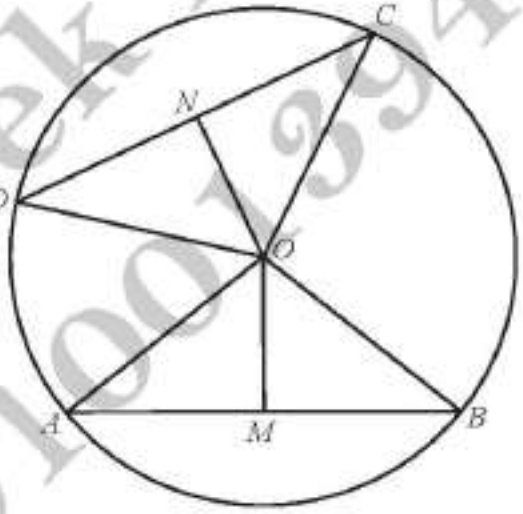
NOT TO SCALE

F, G, H and J are points on the circle.
EFG is a straight line parallel to JH.

Find the value of y.

$y =$ ..... [2]

(c)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
M is the midpoint of AB and N is the midpoint of CD.
$OM = ON$

Explain, giving reasons, why triangle OAB is congruent to triangle OCD.

.....

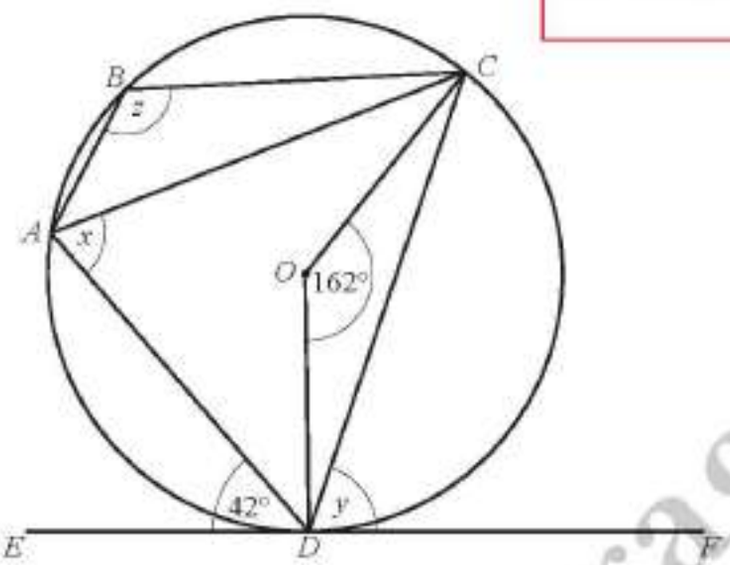
.....

.....

..... [3]

October/ November/2020/0580/43

(a)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
EF is a tangent to the circle at D.
Angle $ADE = 42°$ and angle $COD = 162°$.

Find the following angles, giving reasons for each of your answers.

(i) Angle x

$x =$ ..... because .....

..... [2]

(ii) Angle y

$y =$ ..... because .....

..... [2]

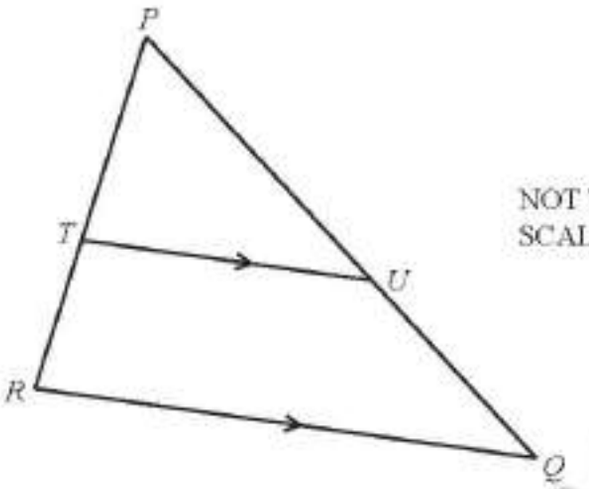
(iii) Angle z

$z =$ ..... because .....

.....

..... [3]

(b)



NOT TO SCALE

PQR is a triangle.
T is a point on PR and U is a point on PQ.
RQ is parallel to TU.

(i) Explain why triangle PQR is similar to triangle PUT.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $PT : TR = 4 : 3$

(a) Find the ratio $PU : PQ$.

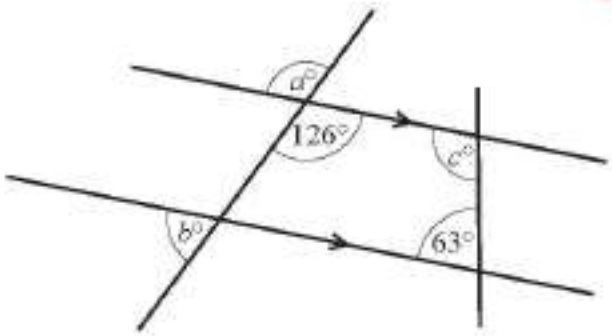
..... : ..... [1]

(b) The area of triangle PUT is $20\,cm^2$.

Find the area of the quadrilateral $QRTU$.

..... cm^2 [3]

(a)



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

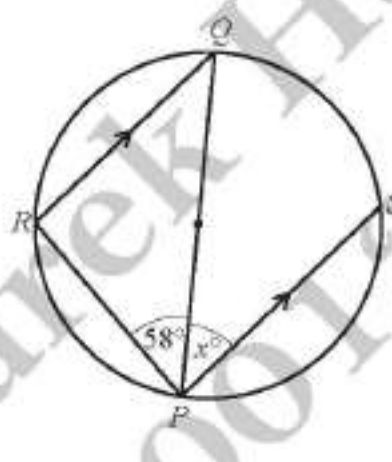
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

(b)



NOT TO SCALE

Points R and S lie on a circle with diameter PQ.
RQ is parallel to PS.
Angle $RPQ = 58°$.

Find the value of x, giving a geometrical reason for each stage of your working.

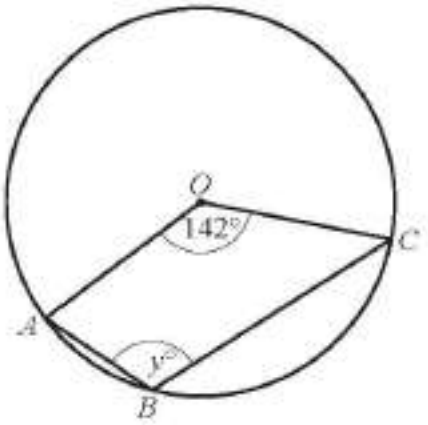
.....

.....

.....

$x =$ ..... [3]

(c)



NOT TO SCALE

Points A, B and C lie on a circle, centre O.
Angle $AOC = 142°$.

Find the value of y.

$y =$ ..... [2]

Chapter . 7

Circle

PART ONE

Question	Answer	Marks	Partial Marks
(a)	[v =] 40 [w =] 80 [x =] 40 [y =] 100 [z =] 60	5	**B1** for each **FT** angle z as 140 – *their w*
(b)	24	3	**M2** for $360 - 11x = 2 \times 2x$ oe or **M1** for $360 - 11x$ seen or obtuse angle $KOL = 2 \times 2x$ oe
(c)(i)	angle ADX = angle BCX oe same segment oe angle DAX = angle CBX oe same segment oe angle AXD = BXC oe [vertically] opposite oe	M2	Accept in any order **M1** for one correct pair with reason If 0 scored, **SC1** for two correct pairs of equal angles identified with incorrect/no reasons
	corresponding angles are equal oe	A1	
(c)(ii)(a)	8.75 or 8¾	2	**M1** for $\frac{8}{10} = \frac{7}{DX}$ oe
(c)(ii)(b)	81.8 or 81.78 to 81.79	4	**M2** for [cos[BXC] =] $\frac{5^2 + 7^2 - 8^2}{2 \times 5 \times 7}$ oe or **M1** for $8^2 = 5^2 + 7^2 - 2 \times 5 \times 7 \times \cos(...)$ oe **A1** for $\frac{10}{70}$ oe

(a)	12	**2**	**M1** for $150 = \frac{(n-2)\times 180}{n}$ or $\frac{360}{180-150}$ oe
(b)(i)	45	**2**	**B1** for angles at M or $K = 45$ or angle at $L = 90$
(b)(ii)	85	**2**	**B1** for either angle in alt segment = 58
(b)(iii)	72	**2**	**B1** for either angle at J or $H = 108$ or angle at $F = 72$
(c)	$OA = OB = OC = OD$ Radii	**B1**	
	$AB = CD$ chords equidistant from centre are equal	**B1**	
	SSS implies congruent	**B1**	

(a)(i)	81° Angle at centre is twice angle at circumference oe	2	B1 for 81°
(a)(ii)	81° Alternate segment [theorem] oe	2	FT *their* (a)(i) B1FT for 81°
(a)(iii)	123° Angles on a straight line [= 180] Opposite angles in a cyclic quadrilateral are supplementary oe	3	FT *their* acute (a)(ii) + 42 B1 for each element
(b)(i)	Angle PTU = angle PRQ corresponding Angle PUT = angle PQR corresponding Angle RPQ is common oe	M2	Accept in any order M1 for one correct pair with reason If 0 scored, SC1 for two correct pairs of equal angles identified with incorrect/no reasons
	Corresponding angles are equal oe	A1	
(b)(ii)(a)	4 : 7 oe	1	
(b)(ii)(b)	41.25 oe	3	M2 for $20 \times \left(\frac{7}{4}\right)^2$ oe or $20 \times \frac{7^2 - 4^2}{4^2}$ oe or M1 for $\left(\frac{7}{4}\right)^2$ or $\left(\frac{4}{7}\right)^2$ or $\frac{7^2 - 4^2}{4^2}$ or $\frac{4^2}{7^2 - 4^2}$

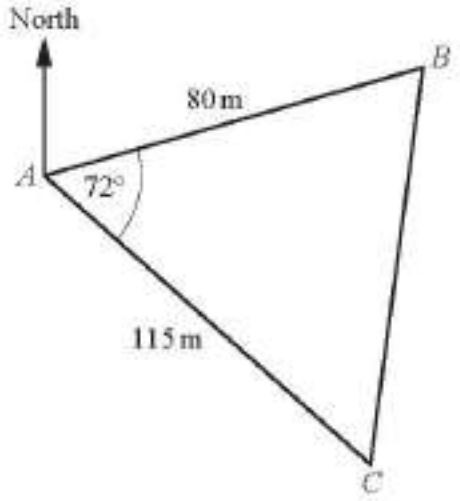
March 2021

(a)	126 54 117	**3**	**B1** for each
(b)	angle [in a] semicircle is 90	**B1**	Do not accept triangle for angle
	Allied, co-interior [add to 180] or Angles in triangle [= 180] and alternate oc	**B1**	
	32	**B1**	
(c)	109	**2**	**B1** for 218 or 71 in correct places or correctly labelled

Chapter . 8

Trigonometry

1



NOT TO SCALE

The diagram shows the positions of three points A, B and C in a field.

(a) Show that BC is 118.1 m, correct to 1 decimal place.

[3]

(b) Calculate angle ABC.

Angle ABC = ... [3]

(c) The bearing of C from A is 147°.

Find the bearing of

(i) A from B,

..... [3]

(ii) B from C.

..... [2]

(d) Mitchell takes 35 seconds to run from A to C.

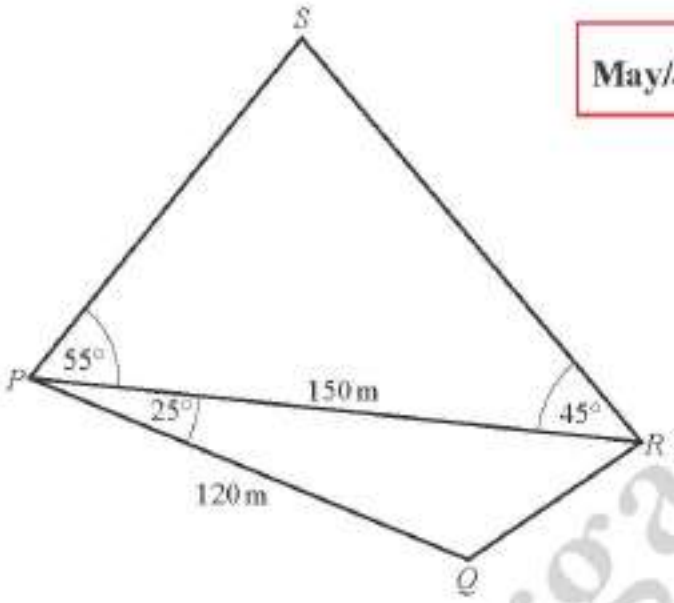
Calculate his average running speed in kilometres per hour.

..... km/h [3]

(e) Calculate the shortest distance from point B to AC.

..... m [3]

2



NOT TO SCALE

The diagram shows two triangles.

(a) Calculate QR.

$QR =$ ..... m [3]

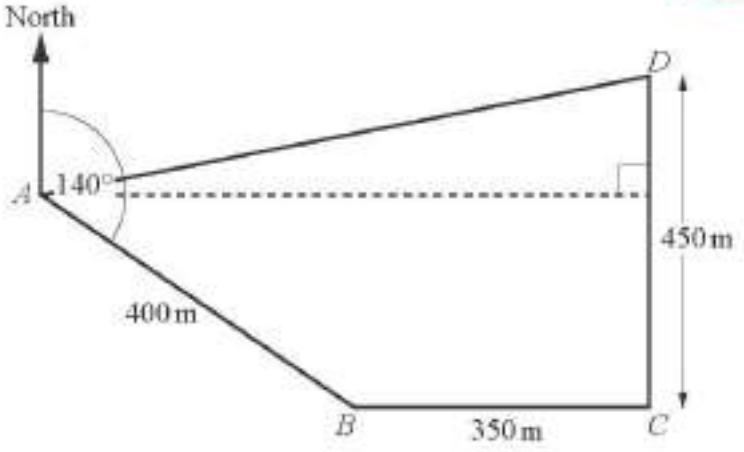
(b) Calculate RS.

$RS =$ ..... m [4]

(c) Calculate the total area of the two triangles.

..... m^2 [3]

3



The diagram shows a field $ABCD$.
The bearing of B from A is 140°.
C is due east of B and D is due north of C.
$AB = 400$ m, $BC = 350$ m and $CD = 450$ m.

(a) Find the bearing of D from B.

..... [2]

(b) Calculate the distance from D to A.

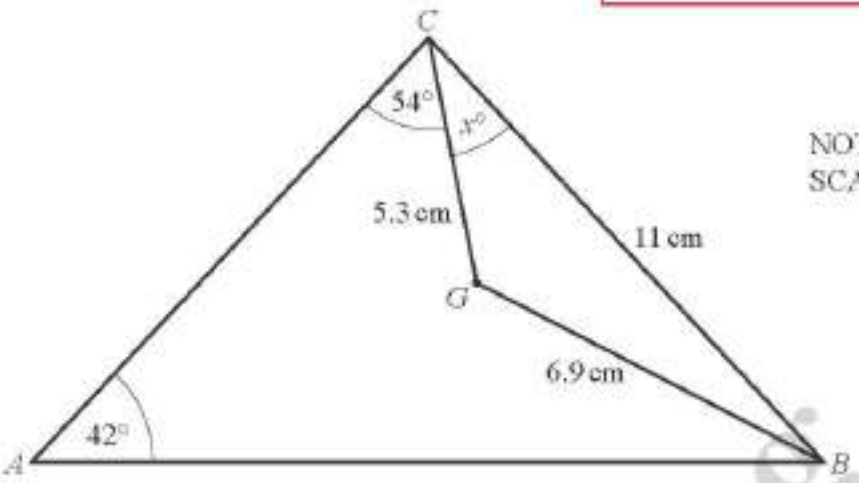
..... m [6]

(c) Jono runs around the field from A to B, B to C, C to D and D to A.
He runs at a speed of 3 m/s.

Calculate the total time Jono takes to run around the field.
Give your answer in minutes and seconds, correct to the nearest second.

..... min ..... s [4]

(a)



NOT TO SCALE

The diagram shows triangle ABC with point G inside.
$CB = 11$ cm, $CG = 5.3$ cm and $BG = 6.9$ cm.
Angle $CAB = 42°$ and angle $ACG = 54°$.

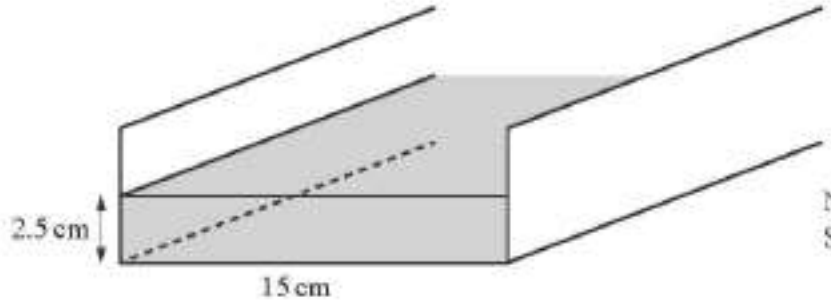
(i) Calculate the value of x.

$x =$ ..... [4]

(ii) Calculate AC.

$AC =$ ..... cm [4]

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

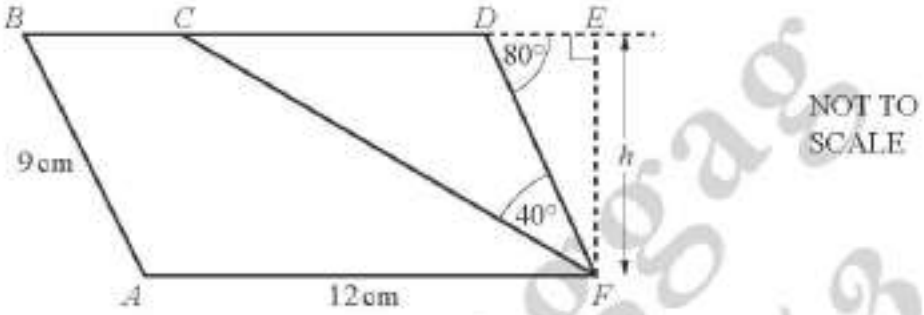
..... litres [4]

a) A rectangle measures 8.5 cm by 10.7 cm, both correct to 1 decimal place)

Calculate the upper bound of the perimeter of the rectangle.

..... cm [3]

(b)



$ABDF$ is a parallelogram and $BCDE$ is a straight line.
$AF = 12$ cm, $AB = 9$ cm, angle $CFD = 40°$ and angle $FDE = 80°$.

(i) Calculate the height, h, of the parallelogram.

$h =$ ..... cm [2]

(ii) Explain why triangle CDF is isosceles.

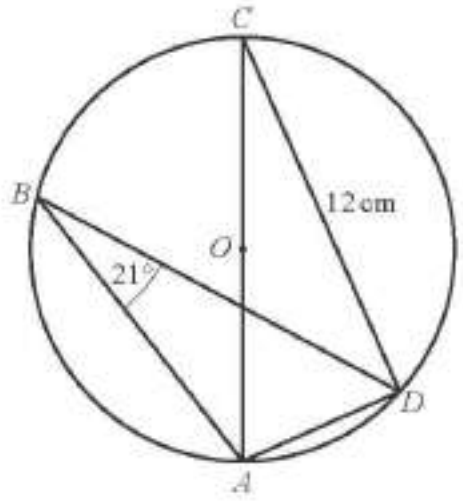
.....

..... [2]

(iii) Calculate the area of the **trapezium** $ABCF$.

..... cm^2 [3]

(c)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
Angle $ABD = 21°$ and $CD = 12$ cm.

Calculate the area of the circle.

..... cm^2 [5]

(d)

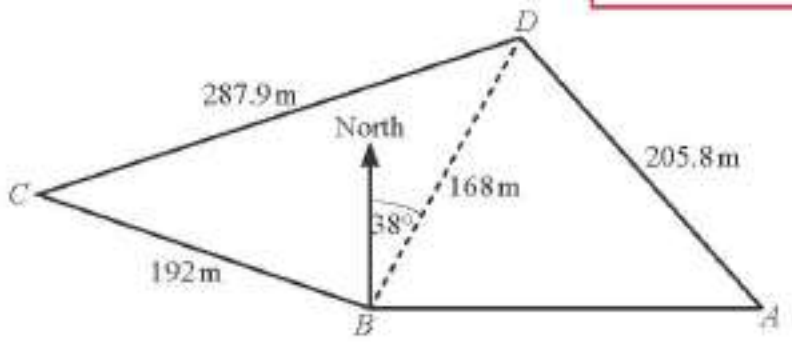
NOT TO SCALE

The diagram shows a square with side length 8 cm and a sector of a circle with radius 9.5 cm and sector angle $x°$.
The perimeter of the square is equal to the perimeter of the sector.

Calculate the value of x.

$x =$ ..... [3]

6



The diagram shows a field, $ABCD$, on horizontal ground.
$BC = 192$ m, $CD = 287.9$ m, $BD = 168$ m and $AD = 205.8$ m.

(a) (i) Calculate angle CBD and show that it rounds to 106.0°, correct to 1 decimal place.

[4]

(ii) The bearing of D from B is 038°.

Find the bearing of C from B.

..... [1]

(iii) A is **due east** of B.

Calculate the bearing of D from A.

..... [5]

(b) (i) Calculate the area of triangle BCD.

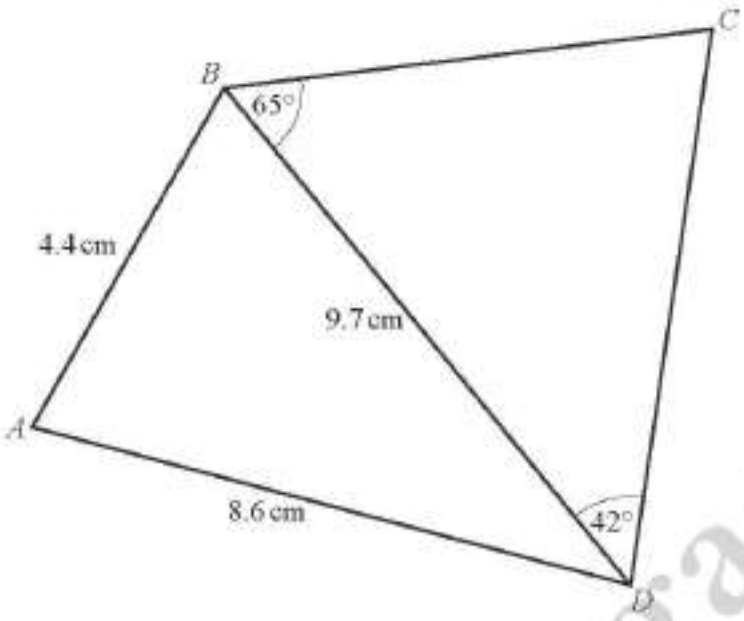
..... m^2 [2]

(ii) Tomas buys the triangular part of the field, BCD.
The cost is \$35 750 per hectare.

Calculate the amount he pays.
Give your answer correct to the nearest \$100.
[1 hectare = 10 000 m^2]

\$ ..... [2]

7



NOT TO SCALE

(a) Calculate angle ADB.

Angle ADB = ... [3]

(b) Calculate DC.

DC = ... cm [4]

(c) Calculate the shortest distance from C to BD.

..... cm [3]

Chapter . 8

Trigonometry

(a)	$[BC^2 =] 80^2 + 115^2 - 2 \times 80 \times 115 \cos 72$ oe	**M1**	
	118.06…	**A2**	A1 for 13939…
(b)	67.8 or 67.9 or 67.83 to 67.88	**3**	**M2** for $[\sin B =] \frac{115 \times \sin 72}{118.1}$ oe or **M1** for $\frac{115}{\sin B} = \frac{118.1}{\sin 72}$ oe
7(c)(i)		**3**	**B1** for bearing of B from A is 75 soi **M1** for 180 + 75 oe
(c)(ii)7		**2**	M for *their* **(c)(i)** – *their* **(b)** –180
(d)	11.8 or 11.82 to 11.83	**3**	**M1** for 115 ÷ 35 oe **M1** for *their* speed in m/s × 60 × 60 ÷ 1000
(e)	76.1 or 76.08 to 76.09	**3**	**M2** for $\frac{\text{distance}}{80} = \sin 72$ oe or **M1** for distance required is perpendicular to AC soi

(a)	65.4 or 65.36 to 65.37	3	M1 for $150^2 + 120^2 - 2 \times 150 \times 120 \cos 25$ A1 for 4270 or 4272 to 4273
(b)	125 or 124.7 to 124.8	4	B1 for [angle S =] 80 M2 for $\frac{150\sin 55}{\sin \textit{their}80}$ or M1 for $\frac{\sin \textit{their}80}{150} = \frac{\sin 55}{RS}$
(c)	10 400 or 10 410 to 10 440 nfww	3	M1 for $\frac{1}{2} \times 120 \times 150 \sin 25$ oe M1 for $\frac{1}{2} \times 150 \times \textit{their (b)} \sin 45$ oe

(a)	[0]38 or [0]37.9 or [0]37.87...	**2**	**M1** for $\tan = \frac{350}{450}$ oe If 0 scored, **SC1** for answer [0]52 or [0]52.1 or [0]52.12 to [0]52.13
(b)	624 or 623.8 to 623.9	**6**	**M2** for $450 - 400 \sin 50$ or **M1** for $\sin 50 = \frac{\ldots}{400}$ **M2** for $350 + 400 \cos 50$ or **M1** for $\cos 50 = \frac{\ldots}{400}$ **M1** for (*their* $(450 - 400 \sin 50))^2 + (\textit{their}\ (350 + 400 \cos 50))^2$
(c)	min 8 s	**4**	**B3** for 10.1 or 10.13… or **M2** for $(400 + 350 + 450 + \textit{their } DA) \div 3$ [÷ 60] oe or **M1** for any distance ÷ 3 **M1** for rounding *their* minutes into minutes and seconds to nearest second if clearly seen

(a)(i)	29.5 or 29.50...	4	**M2** for $\frac{11^2+5.3^2-6.9^2}{2\times11\times5.3}$ or **M1** for $6.9^2 = 11^2+5.3^2-2\times11\times5.3\cos x$ **A1** for 0.87[0...] oe
(a)(ii)	13.4 or 13.38...	4	**B1FT** 84 – *their* **(a)(i)** **M2** for $\frac{11}{\sin 42}\times\sin$ *their* 54.5 or **M1** for implicit form
(b)	2700	4	**M2** for $15\times2.5\times20\times60\times60$ or **M1** for $15\times2.5\times20$ **M1** for *their* volume ÷ 1000 If 0 scored, **SC1** for figs 27 with no working

5

Question	Answer	Marks	Partial Marks
(a)	38.6	3	**M2** for [2 ×] (8.5 + 0.05 + 10.7 + 0.05) or **M1** for 8.5 + 0.05 or 10.7 + 0.05
(b)(i)	8.86 or 8.863…	2	**M1** for $\frac{h}{9}$ = sin 80 or better oe
(b)(ii)	∠CDF = 100 leading to $\angle DCF = 40$ Or ∠EDF = 80 leading to $\angle DCF = 40$	M1	Implied by 180-(100 + 40) = 40 or 80 − 40
	'two equal angles'	A1	With no incorrect work seen
(b)(iii)	66.5 or 66.45 to 66.47…	3	**M2** for 0.5(3 + 12) × *their* **(b)(i)** or 12 × *their* **(b)(i)** − 0.5 × 9 × 9 × sin 100 oe or **B1** for $DC = 9$ or $BC = 3$

Question	Answer	Marks	Partial Marks
(c)	130 nfww or 129.6 to 129.8	5	B1 for $\angle ACD = 21°$ or $\angle CAD = 69°$ **Method 1** **M2** for $\cos 21 = \frac{12}{AC}$ oe or **M1** for $\angle ADC = 90$ soi **M1** for $\pi(their\ AC/2)^2$ OR **Method 2** **M2** for $\frac{12}{sin138} = \frac{r}{sin21}$ oe or **M1** for $\angle COD = 138$ soi **M1** for $\pi(their\ r)^2$ OR **Method 3** **M2** for $\cos 21 = \frac{6}{OC}$ oe or **M1** for $\angle CXO = 90$ soi where X is the point where the perpendicular from O meets the chord CD **M1** for $\pi(their\ OC)^2$
(d)	78.4 or 78.37 to 78.41	3	**M2** for $\frac{x}{360} \times 2 \times \pi \times 9.5 + 2 \times 9.5 = 4 \times 8$ oe or **M1** for $\frac{x}{360} \times 2 \times \pi \times 9.5$ After **M0, SC1** for $9.5x + 19 = 32$ oe

Question	Answer	Marks	Partial Marks
6(a)(i)	106.01 to 106.02	4	**M2** for $[\cos[\angle CBD] =] \frac{192^2+168^2-287.9^2}{2\times192\times168}$ oe or **M1** for the implicit form A1 for −0.276 to − 0.275
6(a)(ii)	292.0 or 291.98 to 291.99	1	
6(a)(iii)	310.0 or 310.03 to 310.04	5	**M2** for $[\sin A =] \frac{168\times\sin(90-38)}{205.8}$ or **M1** for $\frac{\sin A}{168} = \frac{\sin(90-38)}{205.8}$ A1 for [$A =$] 40.0 or 40.03 to 40.04 **M1 dep** for 270 + *their* angle *DAB* oe
6(b)(i)	15 500 or 15 501 to 15 503. …	2	**M1** for $0.5\times192\times168\times\sin(106)$ oe
6(b)(ii)	55 400	2	FT 3.575 × *their* (b)(i) oe rounded to nearest 100 M1 for figs 35 75× figs *their* (b)(i) or figs 554 or figs 5541 to figs 5543

March 2021

7

(a)	27[.0] or 26.97… nfww	3	**M2** for [cos =] $\frac{8.6^2+9.7^2-4.4^2}{2\times8.6\times9.7}$ or **M1** for implicit form
(b)	9.19 or 9.192 to 9.193	4	**B1** for [angle BCD =] 73 seen **M2** for $\frac{9.7\times\sin65}{\sin(180-65-42)}$ oe or **M1** for $\frac{\sin(180-65-42)}{9.7}=\frac{\sin65}{DC}$ oe
(c)	6.15 or 6.149 to 6.151…	3	**M2** for $\frac{d}{\text{their}9.19}=\sin42$ oe or **M1** for right angle between line from C to BD and BD soi