



Unit 1 Revision Sheet D Shape and Space Higher

Note: Higher tier students must also revise using the foundation tier revision worksheets as this content can also be assessed on higher tier papers.

Questions

Q1.

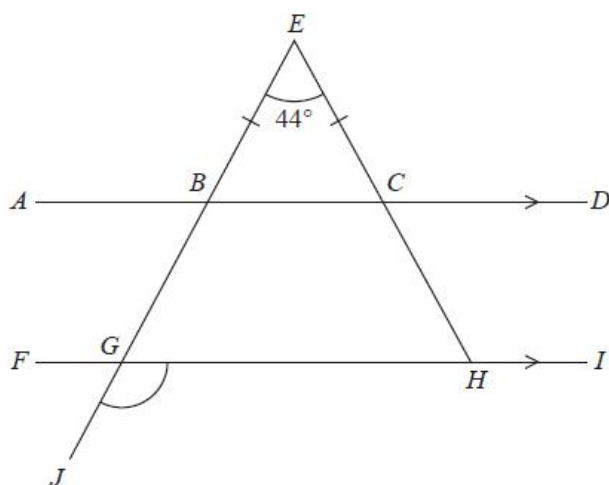


Diagram NOT
accurately drawn

$ABCD$ and $FGHI$ are parallel straight lines.
 $EBGJ$ and ECH are straight lines.

$BE = CE$
Angle $BEC = 44^\circ$

Work out the size of angle JGH .
Give a reason for each stage of your working.

(Total for question = 5 marks)

Q2.

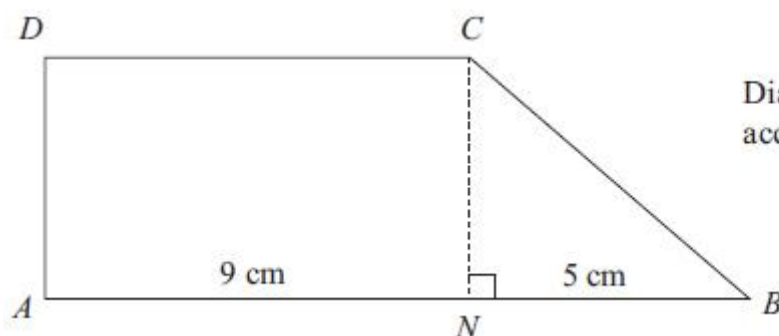


Diagram NOT
accurately drawn

The shape $ABCD$ is made from a rectangle $ANCD$
and the right-angled triangle NBC .



ANB is a straight line.

$AN = 9$ cm.

$NB = 5$ cm.

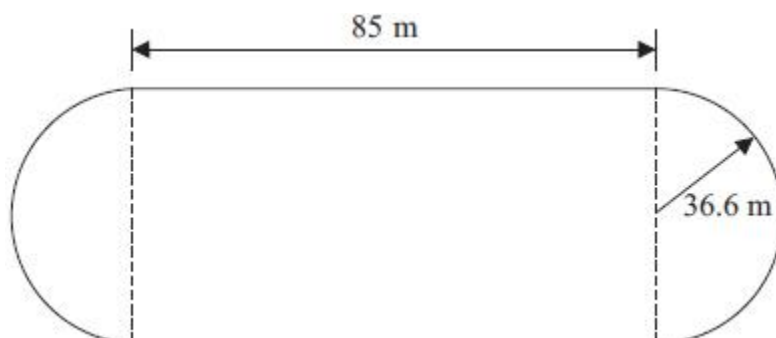
The area of rectangle $ANCD$ is 36 cm².

Work out the area of shape $ABCD$.

(Total for question = 4 marks)

Q3.

The diagram shows the path of an athlete on a running track.



The path consists of two straight lengths and a semicircle at each end.

Each straight length is 85 metres.

Each semicircle has a radius of 36.6 metres.

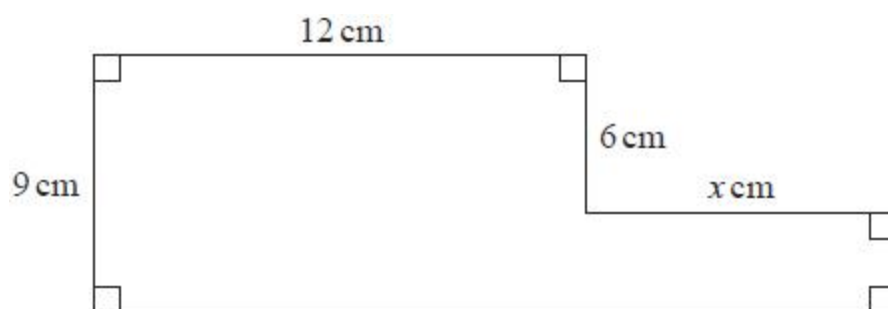
Calculate the area enclosed by the path.

Give your answer correct to 3 significant figures.

(Total for question = 4 marks)

Q4.

The diagram shows a shape.



The shape has area 129 cm²

Work out the value of x .

(Total for question = 4 marks)



Q5.

Here is a trapezium.

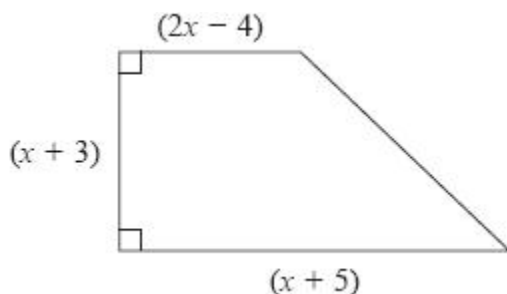


Diagram **NOT**
accurately drawn

All measurements are in centimetres.

The area of the trapezium is 60 cm^2

Show that $3x^2 + 10x - 117 = 0$

(3)

(b) Work out the value of x

Show your working clearly.

Give your answer correct to 3 significant figures.

(3)

(Total for question = 6 marks)

Q6.

The diagram shows a circular pond, of radius r metres, surrounded by a circular path.
The circular path has a constant width of 1.5 metres.

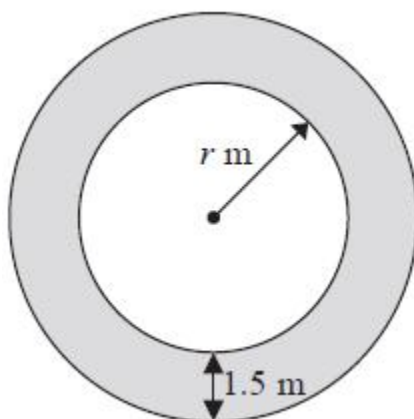


Diagram **NOT**
accurately drawn



The area of the path is $\frac{1}{10}$ the area of the pond.

(a) Show that $2r^2 - 60r - 45 = 0$

(3)

(b) Calculate the area of the pond.

Show your working clearly.

Give your answer correct to 3 significant figures.

(5)

(Total for question = 8 marks)

Q7.

Here is a hexagon.

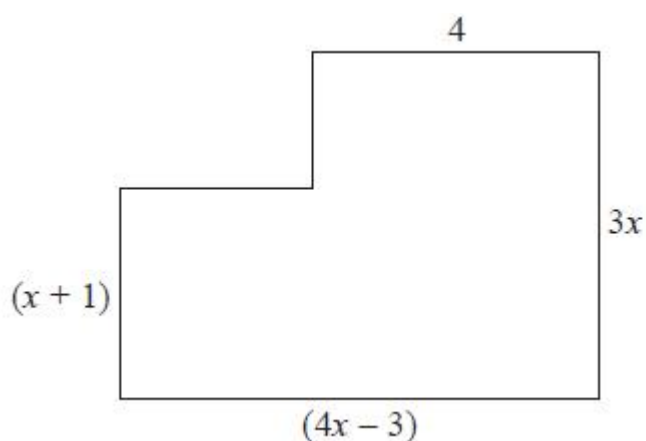


Diagram NOT
accurately drawn

In the diagram, all the measurements are in centimetres.
All the corners are right angles.

The area of the hexagon is 40 cm^2

(a) Show that $4x^2 + 9x - 47 = 0$

(3)

(b) Solve $4x^2 + 9x - 47 = 0$

Show your working clearly.

Give your solutions correct to 3 significant figures.

(3)

(c) Find the length of the longest side of the hexagon.

Give your answer correct to 3 significant figures.

(2)

(Total for Question is 8 marks)



Q8.

A steam engine for pulling trains has wheels of diameter 1.5 metres.



- (a) Calculate the circumference of a wheel.
Give your answer correct to 3 significant figures.

(2)

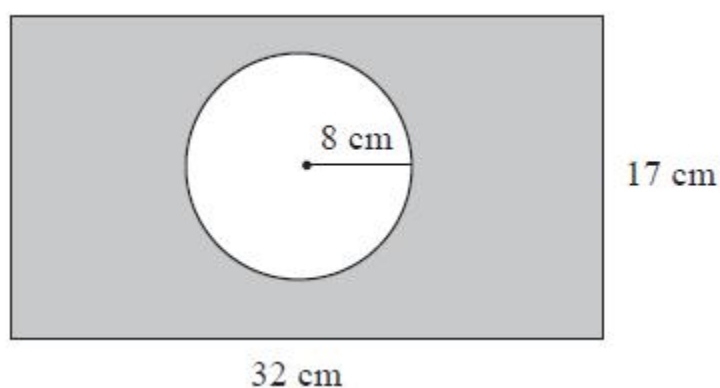
The steam engine travels 1000 metres along a test track.

- (b) Work out the number of complete turns of a wheel.

(2)

(Total for question = 4 marks)

Q9.



The diagram shows a circle inside a rectangle.

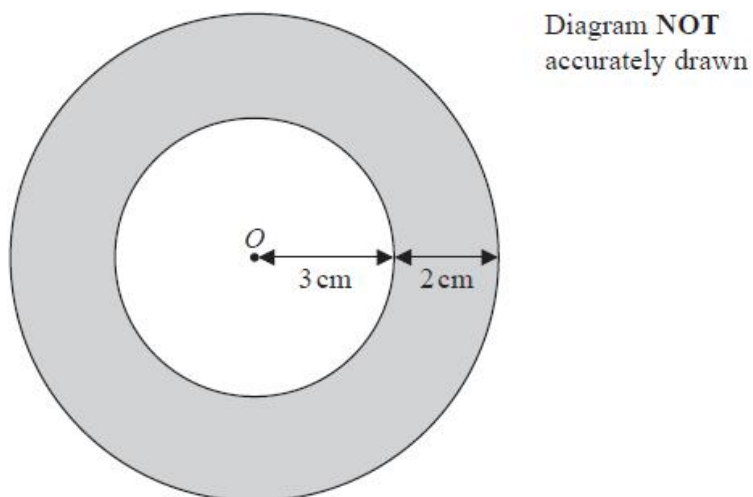
Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

(Total for question = 3 marks)



Q10.

Here are two circles.



The circles have the same centre O .

The radius of the inner circle is 3 cm.

The width of the shaded region between the inner circle and outer circle is 2 cm.

Work out the area of the shaded region.

Give your answer correct to 3 significant figures.

(Total for question = 3 marks)

Q11.

The wheel of the Singapore Flyer is a circle with a diameter of 150 metres.





- (a) Calculate the circumference of the wheel.
Give your answer correct to the nearest metre.

(2)

The wheel takes 30 minutes to rotate once.

- (b) Work out the average speed of a point on the circumference of the wheel as it rotates once.
Give your answer in metres per second correct to 3 significant figures.

(3)

The diagram shows a giant wheel above horizontal ground.

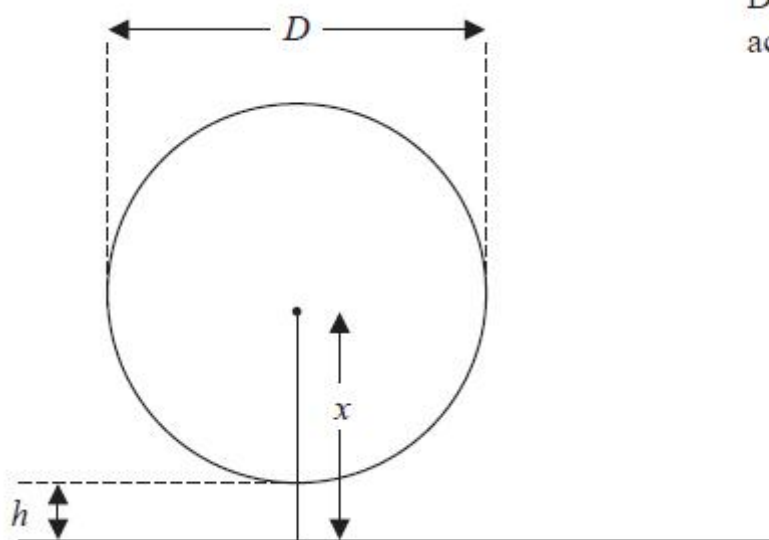


Diagram **NOT**
accurately drawn

The wheel is a circle of diameter D metres.
The lowest point of the wheel is h metres above the ground.
The centre of the wheel is x metres above the ground.

- (c) Express h in terms of D and x

(2)

(Total for question = 7 marks)



Mark Scheme

Q1.

Q	Working	Answer	Mark	Notes
	Angle EBC or $ECB = (180 - 44) \div 2 (= 68)$		5	M1 Could be seen on diagram
	Angle $GBC = 180 - "68"$ (= 112) or Angle $GBC = "68" + 44$ (= 112) or Angle $BGH = "68"$ (same as EBC) Angle $ABE = 180 - "68"$ (= 112) and Angle $BGF = "112"$ or Angle $ABG = "68"$ and Angle $BGH = "68"$ or Angle $FGJ = "68"$ or Angle $BGF = 180 - "68"$ (=112)			M1 for a method to as far as one step away from working out Angle JGH (an angle corresponding or vertically opposite to JGH or at the same point on a straight line with JGH) Could be seen on diagram. (the award of this mark also implies the previous M1)
	<i>Working not required, so correct angle scores 3 marks (unless from obvious incorrect working)</i>	112		A1 Could be seen in correct place on diagram
	<i>NB: reasons must include the underlined words Accept \angle for angle(s) and \square for triangle</i> For all angles: They must be clearly stated as the correct angle or shown on the diagram in the correct position. (eg just seeing 68 in working without a label is not sufficient for the award of a mark for angle EBC)			B2 for correct answer with full reasons for their method eg <u>isosceles triangle</u> (or <u>2 equal sides</u> , <u>2 equal angles</u>) Angles in a <u>triangle</u> sum to <u>180°</u> or <u>angles in a triangle</u> Angles on a straight <u>line</u> sum to <u>180°</u> <u>Angles</u> on a straight <u>line</u> sum to <u>180°</u> <u>Exterior</u> angle in a <u>triangle</u> is <u>equal</u> to the two <u>opposite</u> <u>interior</u> angles. <u>Vertically opposite</u> angles are equal. <u>Vertically opposite angles</u> are equal. <u>Corresponding</u> angles are equal. <u>Alternate</u> angles are equal <u>Allied</u> angles sum to <u>180°</u> (or <u>co-interior</u> angles) Angles at a <u>point</u> (or <u>full turn</u>) add up to <u>360°</u> (or <u>angles at a point</u>) (B1 for one correct reason appropriate to their method, dep on M1)
				Total 5 marks



Q2.

Question number	Working	Answer	Mark	Notes
	$9 \times \text{height} = 36$		4	M1
	height = 4			A1
	$36 + \frac{1}{2} \times 5 \times 4$ or $\frac{14+9}{2} \times 4$			M1
		46		A1 cao
				Total 4 marks

Q3.

Question	Working	Answer	Mark	Notes
	$\pi \times 36.6^2 (= 4208.35..)$ $85 \times 2 \times 36.6$ $(= 6222)$ "4208.35.." + "6222" $(= 10430.35..)$	10400	4	M1 or $\times 36.62 \div 2$ $(= 2104.17..)$ M1 M1 dep on both previous method marks A1 awrt 10400 (accept correct answers given in an alternative form eg. 1.04×10^4 ; 104×10^2) SC: B2 for an awrt 7320
				Total 4 marks



Q4.

Question		Working	Answer	Mark	Notes
		E.g. $12 \times 9 (=108)$ or $(9 - 6) \times x (= 3x)$		4	M1 for one correct relevant area
		E.g. $129 - '108' (= 21)$ or $'108' + '3x' = 129$			M1 (dep on M1) for 129 used correctly with another area or for a correct equation (ft) with bracket(s) expanded
		E.g. $'21' \div (9 - 6)$ or $x = \frac{129 - '108'}{9 - 6}$			M1 for a complete method
			7		A1 Accept 7 cm
					Total 4 marks



Q5.

Q	Working	Answer	Mark	Notes
(a)	$\frac{1}{2} \times (x+5+2x-4) \times (x+3)$ or $(3x+1)(x+3) = 120$ or $(2x-4)(x+3) + \frac{1}{2}(9-x)(x+3)$ or $(x+5)(x+3) - \frac{1}{2}(9-x)(x+3)$			M1 correct expression for area (trapezium) (rectangle + triangle) (rectangle - triangle)
	$\frac{1}{2} \times (3x^2 + 9x + x + 3) = 60$ oe			M1 correct expansion of (all pairs) brackets in a correct equation
	$3x^2 + 10x + 3 = 120$ or $1.5x^2 + 5x + 1.5 = 60$	shown	3	A1 dep on fully correct working to get to $3x^2 + 10x - 117 = 0$
(b)	$\frac{-10 \pm \sqrt{1504}}{6}$ or $\frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times -117}}{2 \times 3}$ oe or $\frac{-10 \pm 4\sqrt{94}}{6}$ NB: denominator must be 2×3 or 6 and there must be evidence for correct order of operations in the numerator			M2 If not M2 then M1 for $\frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times -117}}{2 \times 3}$ (may have just + rather than \pm) Condone one sign error in substitution; allow partial evaluation
		4.80	3	A1 Award M2A1 for answers in range 4.796 – 4.8 (and no other answer) with sufficient correct working that would gain at least M1 [Award M2A0 for working sufficient for M1 with both the -ve and +ve answers (-8.13 & 4.80)]
Total 6 marks				



Q6.

Apart from b, where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
(a)	$\pi(r + 1.5)^2 - \pi r^2 (= 0.1 \times \pi r^2)$		3	M1 Correct expression for area of path (may be seen as part of an equation)
	$r^2 + 3r + 2.25 - r^2 = 0.1r^2$			M1 ind. $r^2 + 3r + 2.25$ or $r^2 + 3r + 1.5^2$ (i.e. correct expansion of brackets with or without π)
		$2r^2 - 60r - 45 = 0$		A1 Correct algebraic steps to $2r^2 - 60r - 45 = 0$
(b)	$\frac{- -60 \pm \sqrt{(-60)^2 - 4 \times 2 \times -45}}{2 \times 2}$		5	M1 Condone 1 sign error; condone missing brackets around -60 ; accept 60^2 ; some evaluation may be seen NB: allow + instead of \pm
	$\frac{60 \pm \sqrt{3600 + 360}}{4}$			M1 for $\sqrt{3600 + 360}$ or $\sqrt{3960}$
	$30.7(32 \dots)$ or $\frac{30 \pm 3\sqrt{110}}{2}$			A1 dep on at least M1 awarded NB: Ignore $-0.73\dots$
	(Area =) $\pi \times "30.732\dots" ^2 (= 2967.12\dots)$			M1 ind (ft for r (at least 3 sf)) do not award for
				substitution of $r = 1.5$
		2970		A1 for 2960 – 2970
				Total 8 marks



Q7.

Question	Working	Answer	Mark	Notes
(a)	Eg. Area = $(4x-3)(x+1) + [3x-(x+1)] \times 4$ OR Area = $4 \times 3x + (x+1)(4x-3-4)$ OR Area = $(4x-3) \times 3x - (4x-3-4)(3x-(x+1))$			M1 for a complete correct expression for area of hexagon
				A1 for all brackets correctly expanded
		Answer given	3	A1 for convincing progression to given equation
(b)	$\frac{-9 \pm \sqrt{9^2 - 4 \times 4 \times (-47)}}{2 \times 4}$			M1 for correct substitution; condone one sign error; brackets not necessary; condone + instead of \pm in formula There may be partial evaluation – if so, this must be correct
	$\sqrt{833}$ or $\sqrt{81+752}$ or $7\sqrt{17}$ or 28.8.....			M1 (independent) for correct simplification of discriminant (if evaluated, at least 3sf rounded or truncated)
		2.48, -4.73	3	A1 awrt 2.48 and -4.73 NB. If negative solution is discarded (or omitted at any stage) then full marks can still be obtained Award 3 marks if first M1 scored and answer correct
(c)	$3 \times "2.48" \dots (=7.44\dots)$ or $4 \times "2.48" - 3 (=6.93\dots)$			M1
		7.45	2	A1 for 7.44 - 7.45



b	Alternative $x^2 + \frac{9}{4}x - \frac{47}{4} = 0$ $(x + \frac{9}{8})^2 - \frac{81}{64} - \frac{47}{4} = 0$		M1	for $(x + \frac{9}{8})^2$ oe
	$(x + \frac{9}{8}) = \pm \sqrt{\frac{833}{64}}$		M1	for $(x + \frac{9}{8}) = \pm \sqrt{\frac{833}{64}}$ oe
		2.48, -4.73	3	A1 awrt 2.48 and -4.73 NB. If negative solution is discarded (or omitted) then full marks can still be obtained Award 3 marks if first M1 scored and answer correct
				Total 8 marks

Q8.

The correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
(a)	$1.5 \times \pi$ or $2 \times \pi \times (1.5 \div 2)$		2	M1
		4.71		A1 4.71 - 4.72
(b)	$1000 \div$ “4.71”		2	M1 ft from (a) (accept use of rounded answer from (a) for method mark only)
		212		A1 ft from (a) provided working is shown (must round down to integer value)
				Total 4 marks



Q9.

Q	Working	Answer	Mark	Notes
	32×17 or 544 or $\pi \times 8^2$ oe or $200.9 - 201.602$		3	M1
	$32 \times 17 - \pi \times 8^2$			M1 dep for the complete, correct method
		343		A1 for awrt 343
				Total 3 marks

Q10.

Ques	Working	Answer	Mark	Notes
	$\pi \times 3^2 (= 9\pi = 28.27..)$ or $\pi \times (3+2)^2 (=25\pi = 78.53..)$		3	M1 A correct calculation for the area of one of the circles
	$\pi \times 5^2 - \pi \times 3^2$ oe eg 16π			M1 A correct calculation for the shaded area
		50.3		A1 50.2 – 50.3
				Total 3 marks

Q11.

Ques	Working	Answer	Mark	Notes
a	$\pi \times 150$ oe		2	M1
		471		A1 awrt 471
b	$30 \times 60 (=1800)$ or “471” $\div 30 (=15.7)$		3	M1
	“471” \div “1800” or “15.7” $\div 60$			M1 dep
		0.262		A1 for 0.26 – 0.262 or ft from (a)
c	Radius = $x - h$ or $\frac{D}{2} = x - h$ oe		2	M1
		$h = x - \frac{D}{2}$ oe		A1 or $h = \frac{2x - D}{2}$
				Total 7 marks