1(a). A circular table top has radius 70 cm.

Calculate the area of the table top in $cm^2$, giving your answer as a multiple of π.

**(a)** _____ $cm^2$ **[2]**

(b). The volume of the table top is 17 150π $cm^3$.

Calculate the thickness of the table top.

**(b)** _____ cm **[2]**

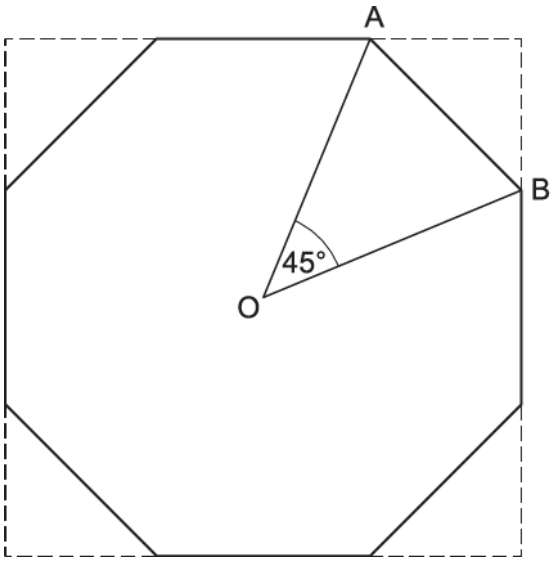
2(a). Simon cuts the corners off a square piece of card to leave the regular octagon shown below.

O is the centre of the octagon.

A and B are vertices of the octagon.

OA = OB = 5 cm.

Angle AOB = 45°.




**Not to scale**

(i) Work out the area of the octagon.

_____ $cm^2$ **[3]**

(ii) Work out the area of the original square piece of card.

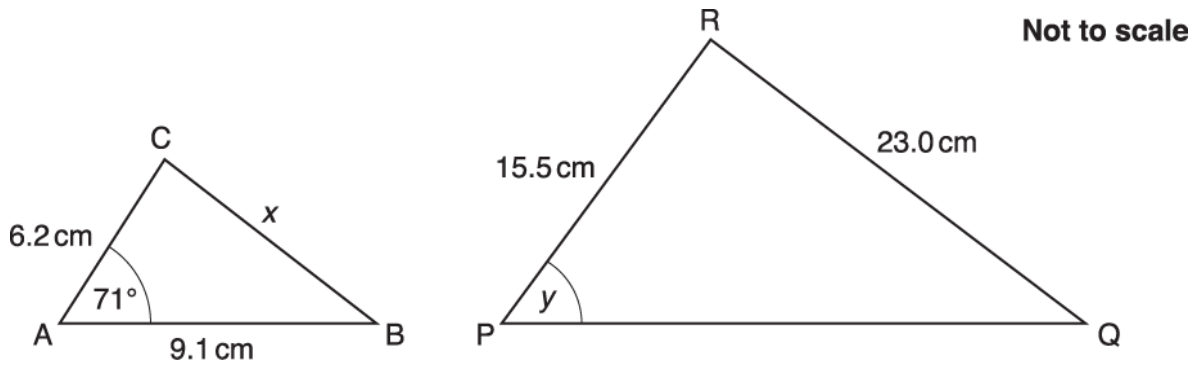
_____ $cm^2$ **[5]**

(b). Simon now makes a table top using the card as a model.
The sides of the table top are 8 times as long as the sides of the card model.

Find the ratio of the **area** of Simon's table top to the **area** of the card model.

_____ : _____ **[2]**

3(a). Triangles ABC and PQR are mathematically similar.



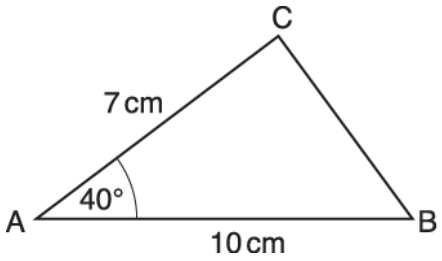

Show that the area of triangle ABC is 26.7 $cm^2$, correct to 1 decimal place.

**[2]**

(b). Work out the area of triangle PQR.

_____ $cm^2$ **[2]**

4(a). This is a sketch of triangle ABC.




**Not to scale**

Draw accurately triangle ABC below.
AB is drawn for you.


**[2]**

(b). On your triangle, construct the perpendicular from point C to line AB.
Leave in all your construction lines.

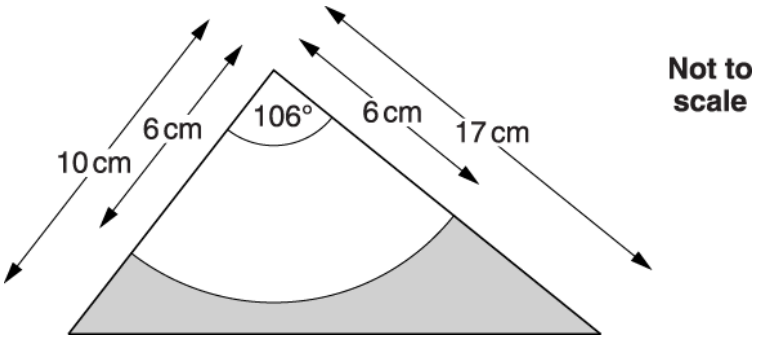
**[2]**

(c). Work out the area of triangle ABC.
Show the measurements from your diagram that you use.

_____ $cm^2$

**[2]**

5. Elaine has this triangular piece of material.
From the material, she cuts out a sector of a circle, radius 6 cm.

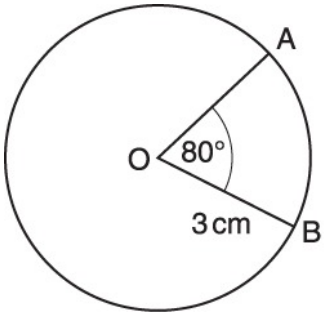



Find the area of the material left over, shown shaded.

_____ $cm^2$ **[6]**

6. Here is a circle, centre O.

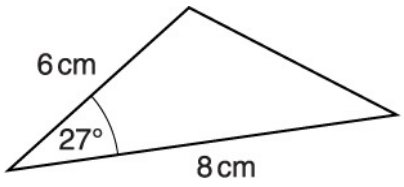
Find the area of the sector OAB in terms of π.
Write your answer in its simplest form.




**Not to scale**

_____ $cm^2$ **[3]**

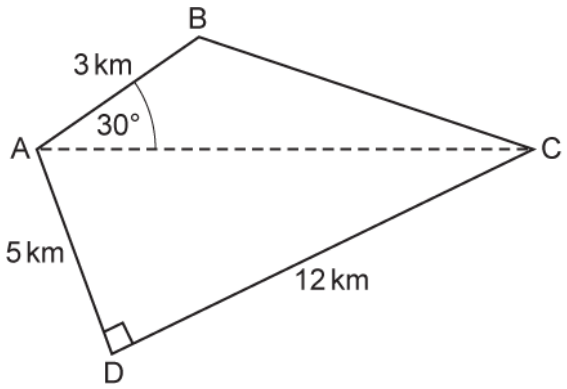
7. Calculate the area of this triangle.




**Not to scale**

_____ $cm^2$ **[2]**

8. The diagram shows some land in the shape of a quadrilateral, ABCD.




**Not to scale**

AB = 3 km, AD = 5 km, CD = 12 km and angle BAC = 30°.

The land is sold for £10 million per square kilometre.

Calculate the total cost of the land.

£ _____ million **[7]**

END OF QUESTION PAPER

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| 1 | a | | 4900π | 2 | M1 for $\pi \times 70^2$ may be implied by 15393.8… | |
| | b | | 3.5 | 2 | **M1** for $\frac{17150\pi}{\textit{their } '4900\pi'}$ | FT from (a), provided (a) is a multiple of π |
| | | | Total | 4 | | |
| 2 | a | i | 70.71[0678…] | 3 | **M2** for $8 \times \frac{1}{2} \times 5 \times 5 \times \sin 45$<br>or<br>**M1** for $\frac{1}{2} \times 5 \times 5 \times \sin 45$ | |
| | | ii | 85 – 85.4 | 5 | M4 for $(2 \times 5 \cos 22.5)^2$ or $(2 \times 5 \sin 67.5)^2$<br>or<br>M3 for $2 \times 5 \cos 22.5$ or $2 \times 5 \sin 67.5$<br>or<br>M2 for $5 \cos 22.5$ or $5 \sin 67.5$<br>or<br>**M1** for $\cos 22.5 = \frac{x}{5}$ or $\sin 67.5 = \frac{x}{5}$ | 9.238…<br><br>4.619… |
| | b | | $64 : 1$ or $1 : \frac{1}{64}$ | 2 | M1 for making the link to, and using, enlargement eg $(\frac{1}{8})^2$ or $8^2$ **soi** | |
| | | | Total | 10 | | |
| 3 | a | | 1/2 × 6.2 × 9.1 × sin71 | M1 | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| | | | 26.66 to 26.67… | A1 | | **Examiner's Comments**<br><br>In this part most candidates used ½*ab*sin*C* to find the area of the triangle but, once again, a number employed right-angle trigonometry with varying degrees of success. Some did not realise that they needed to give their answer to two or more decimal places to show how this could become 26.7 when rounded to one decimal place. A common error was to use the 9.2 from an earlier part in the formula, instead of 9.1.<br>Only a few candidates used the area scale factor. Some incorrectly used a linear scale factor. The majority again used ½absinC with varying degrees of success. A common error was to<br><br>calculate<br><br>$\frac{1}{2} \times 15.5 \times 23 \times \sin 71$<br>where 23 was used instead of 22.75. Others worked out another angle in the triangle and used this in the formula with a different arrangement of sides. These approaches were generally less successful. |
| | b | | 166.6 to 167 | 2 | **B1** for (*their* 2.5)$^2$ oe seen | OR<br>M1 ½ × 15.5 × (9.1 × 2.5) × sin71 |
| | | | **Total** | **4** | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| 4 | a | | Triangle ABC correct | 2 | **B1** for ∠BAC = 40° ± 2°<br>Or for AC = 7 cm ± 2 mm | Use overlay<br>Touching or between red lines for angle<br>Touching or between green lines for length<br><br><u>Examiner's Comments</u><br><br>Nearly all candidates were able to construct the triangle accurately using ruler and protractor. Incorrect triangles usually had either the line AC or the angle CAB correct and gained 1 mark. Incorrect angles usually appeared to result from incorrect use of a protractor with an angle of 50° rather than 40° drawn.<br><br>The majority of candidates understood the meaning of the term 'perpendicular from A to BC' but it was rare to award full marks in part (b) because the line was often drawn by eye with correct arcs seldom used. When 2 marks were awarded the arcs were usually drawn centred on A, radius AC, and centred on B, radius BC. In other cases, where arcs were drawn, these were often the construction arcs for an angle bisector. |
| | b | | Ruled perpendicular from C to AB | 1FT | **FT** their C, must reach AB | Use overlay<br>Allow 88° to 92° to AB, intention of passing through C<br>Condone dashed/dotted line |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| | | | Correct arcs for construction | 1 | Arc centre C intersecting AB twice, second pair from these intersecting below AB<br>Or arc centre A radius AC and arc centre B radius BC crossing below AB | Check arcs carefully: angle bisector of C gives inaccurate perpendicular, this scores max 1 |
| | c | | 22 to 23 | 2 | **FT** area = 5 × *their* height<br><br>**B1FT** for length of *their* perpendicular seen | After full credit in (a) answer must be in range 22 to 23 for 2 marks<br>2FT is 5 × perpendicular height of their triangle, measure diagram and allow<br><br>tolerance of 2mm ignore<br><br>$\frac{1}{2} \times 7 \times 10 \sin 40$<br><br><u>Examiner's Comments</u><br><br>Those candidates who realised that the perpendicular constructed was intended to be used in the calculation of the area using $\frac{1}{2}$ × base × height<br><br>usually found the correct area. Some candidates measured their perpendicular but then used an incorrect formula, usually base × height.<br><br>It was common for candidates to take no measurement from their diagram and attempt to use just the 7 and 10 given in the question leading to the answer 35. It was also common to measure side BC as 6.5 cm and to use that in an area calculation. A small number of candidates complicated the question by dividing the |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| | | | | | | shape into two right-angled triangles and adding the two areas, which often resulted in arithmetic errors.<br><br>Some candidates attempted to use Pythagoras' theorem in their answer or to use the formula $\frac{1}{2}ab\sin C$<br><br>from the formulae page, despite this being a non-calculator paper. |
| | | | Total | 6 | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| 5 | | | 48.3 to 49 | 6 | **M1** for ½ × 10 × 17 × sin106 oe<br>AND<br>**M2** for $\frac{106}{360}$ π × $6^2$ oe<br><br>Or **B1** for $\frac{106}{360}$ or $\frac{360}{106}$ oe seen<br>AND<br>**M1** for *their* triangle - *their* sector soi<br><br>AND<br>**A1** for 81.6 to 82<br>Or for 33 to 33.3<br><br>Examiner's Comments<br><br>It was pleasing to see candidates working well, the last question of the paper. There were many fully correct answers, well explained and clearly set out. All knew to subtract the area of the sector from the area of the triangle and a large number knew the required formula for each. Some, however, ignored the 106° and assumed the angle was 90°. This incorrectly allowed the use of ¼ × π × $r^2$ for the area of the sector and ½ × base × height for the area of the triangle. | Dep. on at least 1 previous M mark scored<br><br>Accept 10.6π or better |
| | | | Total | 6 | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| 6 | | | 2π or π2 | 3 | M2 for $\pi \times 3^2 \times \frac{80}{360}$<br>**or**<br>M1 for [k×] π × $3^2$ or better<br>or SC1 for 7π<br><br>Examiner's Comments<br><br>Most gave $3^2$ × π as the area of the circle but they could not simplify the 80/360 and often they worked out 360 divided by 80 as 4.5 and multiplied 9π by this 4.5. This demonstrated how uncomfortable many candidates are with fractions. | clearly not $\pi^2$<br><br>accept 3.14[2] or 22/7 for π for M1 |
| | | | Total | 3 | | |
| 7 | | | 10.89 to 10.9[0] | 2 | M1 for $\frac{1}{2}$ [×] 8 [×] 6 [×] sin 27 oe<br><br>Examiner's Comments<br><br>The formula is given on the Formulae Sheet, yet it was incorrectly copied and cos C was often used instead of sin C. Some candidates failed to divide the product by 2. | must be fully correct method |
| | | | Total | 2 | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | | |
|---|---|---|---|---|---|---|---|
| 8 | | | 397.5 [million] | 7 | **B6** for [area of field = ] 39.75 oe<br><br>**OR**<br><br>**B2** for [AC =] 13 or<br><br>$\sqrt{169}$<br>Or **M1** for $5^2 + 12^2$ oe<br><br>**M2** for ½ × 5 × 12 + ½ × 3 × *their* 13 × sin 30 oe<br><br>Or **M1** for ½ × 5 × 12 oe<br>or ½ × 3 × *their* 13 × sin 30 oe<br><br>**B1indep** for sin 30 = 0.5 oe soi | For 7 marks, condone 397 500 000<br>For B6, accept<br><br>$\frac{159}{4}$<br><br>or better for 39.75<br><br>Check diagram for B marks and M marks<br><br>*their* 13 must be *their* AC written or indicated and is not 3, 5 or 12<br>M2 can be given for adding costs if correct total area method is implied<br><br>[30] or [ 9.75 oe] 9.75 implies M1B1 | |
| | | | | | **Examiner's Comments**<br><br>This question tested a number of elements and linked different areas of mathematics into the problem. There were a number of excellent | | |

| Question | | | Answer/Indicative content | Marks | Part marks and guidance | |
|---|---|---|---|---|---|---|
| | | | | | answers showing clear step by step working. Most candidates were able to make some progress and earn marks for their method, but few gained full marks. Working again was often randomly set out and steps not explained fully, but method marks were awarded if key values were seen and used. The usual starting point was to use Pythagoras' theorem to find the length of AC as 13 km; this was done quite well, but a few were unable to work out $\sqrt{169}$ correctly. Most candidates were also able to find the area of triangle ADC as 30 $km^2$. Finding the area of triangle ABC proved harder and some candidates either did not recognise the use of the correct trig area formula for a triangle or made arithmetic errors in the calculation.<br><br>Candidates who used the correct area formula usually also knew that sin 30 = 0.5, but many could not deal with the fractions and arithmetic involved in the calculation; 9.5 instead of 9.75 was a common error. | |
| | | | Total | 7 | | |