Exercises for Specialist Calculators

Edition 2.0

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Using Specialist Calculators

The exercises in this unit of work are specificially written for the range of Specialist Calculators also available from this site. Of course the exercises could be attempted without that aid but, at school level, some would be impossible to solve - except by “trial and error” methods. The overall topic which is being covered here is that of mensuration of a range of shapes, and the units involved.

For those who are meeting these calculators for the first time, it might be necessary to point out that an entry-box is selected by putting the mouse-pointer on that and clicking on it. Within any (allowed) entry-box only numbers, spaces and ONE decimal point may be entered (NO commas or letters). The normal correction processes can be used on an entry. Highlighting (by dragging the pointer), can also be done, which allows “cutting and pasting” to be carried out - this skill is used in later work.

Cautions

Many tests have been conducted on these calculators but no claim can be made to have covered every eventuality. Things can go wrong. If they do, the simplest solution is usually to press the reload (or refresh) button on the browser.

Be aware that some of these calculators do not work on some browsers. Everything was developed and tested on Netscape 4.5 (later 4.7) and Internet Explorer 5.0 also works for most (but not all) of them. So much for standards!

Remember that the program code is accessible and can be tampered with. In the event of a consistent malfunction go back to the original CIMT site and reload from there.

Limits have had to be set on these calculators, but they are sufficiently wide that most ‘normal’ needs should be covered. However, it should be borne in mind that these are very much ‘first generation’ calculators and probably lack in some detail or other.

Of course we always want to hear of problems (as much detail as possible please) though we cannot promise that we will always be able to fix them!

Clearly the introduction to this work (for pupils) will depend upon the abilities and experience of the group, and can only be determined by the teacher. Similarly the starting-point in this series of worksheets will have to be decided upon, not everyone will need to start at Sheet 1, and these notes about the various stages and sheets are intended to help in making that decision.

Stage 1 Finding and familiarisation.

No understanding of the mathematics or the shapes is required at this stage, only an ability to find the correct calculator, read and match words, use a mouse, key in numbers and write down results.

Sheet 1 The calculator to be used in each case is clearly stated and the tabular layout exactly matches that of the screen to make it as easy as possible. Significant figures are referred to (but could be ignored if thought desirable) and the first five tables only need the default setting of 3 anyway. Only the last three tables call for that setting to be altered. Note that the top four tables require only one piece of data to be entered. The lower four need the entry of two values for each shape. NO units are used on this sheet.

Sheet 2 The questions are grouped and the calculator to be used is clearly stated each time. But now the set-up does not match that of the screen so the words have to be matched, both for entering the given data and also for reading off the required answers. Again, significant figures could be ignored but, regardless of understanding, it would be good to see this facility being used by now. The units are stated in each question, but a verbal instruction should be given as to whether units are to be written as part of the answer or not. The wording has been varied to make the questions match more closely the form in which pupils will usually meet them. Provision has been made for all answers to be written on the sheet but, since all the questions are numbered, pupils could be required to write the answers separately so that the sheets could be re-used.

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Stage 2 Towards normality and extending the coverage.

There is less guidance given at this stage, some hitherto unused calculators are required, and more is expected in the way of significant figures and units.

Sheet 3 There is no categorisation, and no clear statement of which calculator is to be used. That will have to be determined by reference to each question in turn. The order is mixed and some calculators not previously used are brought in. Units (which are now varied for the first time) should be required in the answers, and also the number of significant figures as specified in the question. There is no especial provision for writing the answers on the sheet, but there is room.

Sheet 4 This is different to previous work in that it deals only with the conversion of units. The calculators needed are specified (in the earlier questions) since it will not always be clear to which category or type the units belong. These calculators are broadly similar to those met with previously but now the entry-box is always at the top and, as well as the value or quantity, the units must be selected before doing the calculation (unless it is the default setting that is required).

Stage 3 Putting it into practice

Up to here the matter of which calculator to use has been easy to determine either from a given heading or from the explicit wording of the question. Some of that support is now withdrawn.

Sheet 5 This is best described as 'the naming of the parts'. By using drawings none of the shapes is actually named, though it does say at the top of the sheet which 6 shapes are involved. Also, as far as possible, the measurement that has to be found is indicated only by **?** without naming it. (This clearly cannot be done for some parts.) So matching is called for, between the diagrams and the calculator.

Stage 4 Problems requiring 2 (or more) steps

The problems now require answers to be derived from two (or more) calculators and combined in some way. For instance, the area of a circle can be got from the circles calculator in (say) square metres, but the final answer is asked for in (say) acres. The ability to 'cut and paste' is very useful now. This requires that in the first calculator 'point and drag' is used to highlight the required value, followed by [ctrl]+[insert] to copy it; and then in the second calculator [shift]+[insert] is used to paste it. Otherwise it means writing something down. This helps many keep track of just what they are doing. (It can also be useful for marking and error-detecting purposes.) The idea of 'intermediate accuracy' should be introduced here. That is, the matter of carrying forward a figure which is more accurate than is required in the final answer, in order that rounding errors are not introduced to 'taint' the working.

Sheet 6 Mostly these problems involve a shape calculator coupled with a change of units calculator (and vice versa), but some need two (different) shape calculators. The knowledge that a cubic centimetre (cc) is equivalent to a millilitre is needed.

Sheet 7 This continues the work in Sheet 6 but requires the relevant shapes to be identified. Further than that, results can no longer be 'cut and pasted' but have to extracted (written down) and combined; probably using a hand-held calculator. This has implications for the production of the final answers to 3 significant figures. It is necessary in some places to make assumptions about what exactly is intended, but there is no 'trickery' used here. If it looks like a square then it is; if two lines look parallel then they are, and so on. There might be some controversy over what constitutes the perimeter of a shape when it has a hole in it ('definition and decision' time!).

That just about completes the 'introduction' to the use of Specialised Calculators. After that, it is much more a matter of knowing what is available and selecting the correct one to solve the problem in hand. Or perhaps being able to re-cast or interpret a problem so that it can be handled by a Specialist Calculator. The following worksheets are intended to increase awareness of the calculators available, how to use them, and how to get the most out of them. Notes are given for guidance, concerning the background to the situations (where applicable) and some possible difficulties.

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Sheet 8 ~ Costs and Comparisons

Note that all the action is on the top line and it is being able to manipulate that line which is important. What is being done there is very simple arithmetically and could easily be done with a basic hand-held calculator. The real strength of this calculator is in the comparative costing that can be seen at a glance for a wide range of units.

The early questions are structured to match as closely as possible the format of the calculator, even to the extent of using the default settings for the units. There are only four categories of calculator available - dealing with length, area, volume and mass. The choice of category should be easy for most questions but, in a few cases, the unit given may be unfamiliar.

Watch the interpretation of money. Suppose 15 were bought at 78p each. It is a matter of choice whether 78 pence is entered as 78 or 0.78 but, the answer must be considered in the same units of currency. To match the example given, the answer for the total cost must be seen as (say) 1170 pence or £11.70 respectively and the price per unit size must also be treated in the same way.

The later questions concern prices as quoted on the different commodity markets operating in London. The variety of units used for dealing in these commodities are accurately reflected in the questions. Though the given prices were correct (in July 2000) it is obvious that they change over time, and looking at current values could be an additional exercise. To obtain a useful coverage it is necessary to look at a specialised paper such *The Financial Times* or go to their Web-site at

www.ft.com

In international dealings, many prices of commodities are given in dollars or cents, and that reality has been retained in many of these questions. Since these have the same structure as pounds and pence there should be no difficulties, unless there is any requirement to change currency - which the calculator does not do - and that is raised only in the last two problems.

Sheet 9 ~ Changing Units

The main purpose here is to introduce some more unit-changing calculators from the wide range available. Many (most) of the units will be unfamiliar, but the text of each problem provides all the words necessary to identify which calculator has to be selected from the menu, and the units to be changed. So, provided the user's reading skills are adequate, these problems should not be difficult. As much as possible, the problems have been given some context, many of them having been dealt with by our query-desk at some time. The questions have been spaced so that there is room to write the answers on the sheet if preferred.

Sheet 10 ~ More 3-dimensional Shapes

Three more calculators are brought in to play (Cylinders, Pyramids and Cuboids) and a few old ones are used as well. Some simple questions at the start encourage the newer ones to be found, and then the separate shapes are put together to make more complex ones. A knowledge of the relationships between units is required (cubic cm, litres, cubic metres). A calculator would be useful (but is not essential) to perform some simple calculations 'outside' those done on screen.

Sheet 11 ~ A Revision

This is simply a complete run through nearly all of the calculators that have been met previously. There is just one new item**:** The Table of Equivalent Fractions, and only one question on that.

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Sheet 12 ~ Digging Deeper!

No new calculators are brought into play here but questions are now asked which require a little more than merely putting numbers in the correct boxes and reading off the answer. There is some 'working-out' to be done, following on-screen instructions, but the main emphasis is on reading and 'finding-out'.

Part A is based on the Shape Calculators.

Part B All of this part deals with the backgrounds of various types of units. The questions are worded so as to give a clear hint as to which calculator has to be consulted. The answers to the majority of the questions will be found in the Background Notes linked to each of the calculators.

Part C All the questions here can be answered from the Dictionary of Units. As a help, the questions are given in the same order as the answers which will be found on scrolling through the Dictionary.

Sheet 13 ~ The General Triangle

This introduces what may be considered to be the most important of all the 2-dimensional shape calculators. It deals with the triangle, taking any three pieces of information from the lengths of its edges or the sizes of its angles, and returning the sizes of the missing dimensions as well as its perimeter, area and the radii of its two principal circles. The first 10 questions are familiarisation exercises only. The emphasis is on fitting the given data to the 'standard case' for the calculator and interpreting the results. Note that two have NO solution, and the 'ambiguous case' does arise. Two different forms of notation are used as well as alternative lettering. No particular degree of accuracy has been specified for the answers.

Triangulation

This is the technique of dividing up a shape into triangles and dealing with the mensuration of the individual triangles before aggregrating the results for the complete shape. It is, of course, the method used by the Ordnance Survey to produce their maps. Or, more correctly, was used, as it has now been largely replaced by satellites using high-resolution cameras, though much groundwork is still necessary. The big advantage of triangulation for land-surveying work is that angles can be measured more accurately and more conveniently than lengths. So, after measuring with great care the length of one line (the base-line) all else can be done by measuring angles and calculating. As a check on the progress of the work and its continuing accuracy, other line lengths are measured from time to time.

Sheet 14 ~ Applying Trangulation Methods

This shows how the idea of triangulation can be used in three different situations: small, medium and large. Organisation is important to this work, especially in the last question. The ability to 'cut and paste' will not only save a lot of re-keying of data but will also reduce the risk of errors. It might be thought desirable to write the values on the sheet itself as they are generated.

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Sheet 15 ~ Practical Triangulation Work

This provides an opportunity to apply the ideas to a real situation - finding the area of an irregular shape. Unlike the previous sheet, users now have to decide for themselves how the shape is to be divided up and then make all the necessary measurements. This sheet clearly has to be marked in order to be used. The simplest way of tackling each of these is to divide the shape up into triangles and measure the lengths of the edges of each triangle. Done that way there can be no problems of ambiguity or conflicting data. Writing the answers on the sheet would seem to be convenient. Try estimating the area before doing any calculation.

It might be worthwhile trying different methods, say, using angles around one particular point. This usually throws up a few problems especially at the end, when calculations do not match the measurements, which is what happens in reality. Reconciliation is the name of the game.

Also using one point for angle measures is almost bound to throw up some ambiguous cases. Care is needed then. Does the first solution offered fit the bill? Is it necessary to look at the supplementary case? Would it be better to measure and use a different angle - if only as an additional check?

These are the sort of problems real surveyors have to deal with. Also remember that a surveyor would like to keep the amount of movement done to take measurements to a minimum, apart from those needed to serve as checks.

Sheet 16 ~ More Calculators

This set of exercises is to introduce 6 calculators not used in any of the previous sheets. The 6 are

Percentages Loan Repayments Growth & Decay Barrels Ellipses
Cost of Living (there are 7 of these)

The sheet is divided into 2 sections

Section A has familiarisation exercises, finding and using each of the necessary calculators.

Section B has a mixed set of questions, requiring a little more thought and understanding. Use has to be made of the "additional information" and also some iterative work on a "trial and error" basis is called for.

Tests and Answers

It is clearly not desirable that tests and answers should be openly available from the Internet. For that reason, the file containing those is locked and needs a password in order to be accessed. The file can be downloaded by anyone, but it needs a password in order to open it.

The route to that file starts at the bottom of the **trol** index page under

Index to Restricted Files

and details about obtaining the necessary password can also be found there.

Further Work

More worksheets will be added to this unit as other calculators become available.

For other worksheets which already exist and would be suitable with these specialist calculators, look on the **trol index** page under the following headings

Circles Trigonometry Mensuration
Graduated Problems Flow Diagrams Miscellaneous

The first three are particularly good, from the others it will be necessary to make a selection.

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Using Specialist Calculators ~ 1

Each of these tables is for a different calculator as shown by the name above the table.
Each column, identified as *(a) (b) (c)* and so on, is for a different version (or size) of that shape.
Complete these tables, using the information given in the separate columns. No units are needed.
Give each answer *[to the number of significant figures]* stated at the top of the table.

Squares *[to 3 sig. figs.]*

	(a)	(b)	(c)
edge	7		
perimeter		35	
diagonal			17
area			

Circles *[to 3 sig. figs.]*

	(a)	(b)	(c)
radius			
diameter	5		
circumference		8.5	
area			27.8

Cubes *[to 3 sig. figs.]*

	(a)	(b)	(c)
edge	3.5		
space diagonal			
surface area		23	
volume			65

Spheres *[to 3 sig. figs.]*

	(a)	(b)	(c)
radius			3
diameter			
surface area	16		
volume		12.4	

Rectangles *[to 3 sig. figs.]*

	(a)	(b)	(c)	(d)
first edge	4	5		
second edge	7			
perimeter			24	1579
diagonal		17		654
area			31	

Sectors *[to 4 sig. figs.]*

	(a)	(b)	(c)	(d)
radius	7		45	
angle	50	240		
arc		35		200
chord				130
area			1500	

Polygons *[to 4 sig. figs.]*

	(a)	(b)	(c)	(d)
number of edges	6	8	24	10
length of edge	2.5			
area		45		
in-radius				4.68
circum-radius			15.6	

Cones *[to 4 sig. figs.]*

	(a)	(b)	(c)	(d)
base radius	4.4			3.7
perp. height	9.7		7.64	
slant height		0.752		
volume		0.0384	200	
S angle				180

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Using Specialist Calculators ~ 2

These questions are grouped according to the particular calculator required.
Give each answer *[to the number of significant figures]* stated.

Squares

1. The edge of a square measures 15 cm. What is the length of its diagonal? *[to 3 s.f.]*

_____

2. A square has a perimeter of 27 cm. What is its area? *[to 3 s.f.]*

_____

3. Find the length of the edge of a square which has a diagonal 10.5 cm long. *[to 3 s.f.]*

_____

Circles

4. What is the the diameter of a circle which has an area of 40 sq.cm? *[to 3 s.f.]*

_____

5. A circle has a radius of 5.7 cm. What is its area? *[to 3 s.f.]*

_____

6. What radius is needed to draw a circle with a circumference of 86 cm? *[to 3 s.f.]*

_____

Cubes

7. If the edge of a cube measures 4.7 cm, what must its volume be? *[to 3 s.f.]*

_____

8. What would be the length of the space diagonal of the cube described in Qn.7? *[to 3 s.f.]*

_____

9. A cube has a volume of 38.5 cubic cm. Find its surface area. *[to 3 s.f.]*

_____

Spheres

10. Give the volume of a sphere whose diameter is 9.7 cm. *[to 3 s.f.]*

_____

11. What would be the radius of sphere which has a surface area of 185 sq.cm? *[to 4 s.f.]*

_____

Rectangles

12. A rectangle has edges measuring 7 cm and 12 cm. What is the length of its diagonal? *[to 4 s.f.]*

_____

13. The area of a rectangle is 430 sq. cm and its perimeter is 90 cm. Find the lengths of its two edges. *[to 5 s.f.]*

_____ & _____

Sectors

14. Find the area of a sector drawn with a radius of 9.5 cm and an angle of 80 degrees. *[to 4 s.f.]*

_____

15. What radius and angle are needed to draw a sector whose area is 100 sq.cm and having an arc length of 20 cm? *[to 3 s.f.]*

radius =_____ angle = _____

Cones

16. A cone has a base radius of 12.3 cm and a slant height of 17.64 cm. Find its volume. *[to 4 s.f.]*

_____

17. The volume of a cone is 350 cubic cm, and its slant height is 14.5 cm. What is its base radius and its perp. height? *[to 4 s.f.]*

radius =_____ height = _____

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Using Specialist Calculators ~ 3

Each of the answers to these questions should be given to the required number of significant figures and the units clearly stated.

1. Find the surface area of a sphere whose volume is 173 cubic cm. *[to 3 s.f.]*

2. A circle has an area of 64.7 square cm. What is its radius? *[to 3 s.f.]*

3. What will be the volume of a cube whose surface area is 58 square cm? *[to 4 s.f.]*

4. Give the area *[to 5 s.f.]* of the square which has a diagonal 7.35 cm long.

5. A rectangle has a perimeter of 45 cm and an area of 115 square cm. Find the lengths of its two edges. *[to 4 s.f.]*

6. What is the area of a regular polygon having 8 edges, each of length 4.6 cm? *[to 3 s.f.]*

7. Find the arc length *[to 4 s.f.]* of a sector which is made with a 6.5 cm radius and an angle of 73 degrees.

8. A cone is made with a base radius of 4.75 cm and a perpendicular height of 9.5 cm. What will be *[to 4 s.f.]*
(a) its slant height
(b) its volume?

9. A regular polyhedron having 12 faces has an edge length of 10 cm. What is its volume? *[to 5 s.f.]*

10. In a right-angled triangle, angle **A** is 35 degrees, and the opposite edge ***a*** measures 17.8 cm. What is the length of the hypotenuse? *[to 4 s.f.]*

11. What will be the area of a circle *[to 4 s.f.]* having a circumference of 2 metres?

12. Find the perpendicular height of a cone which has a volume of 3 000 000 cubic millimetres and a slant height of 300 mm. *[to 5 s.f.]*

13. For a sector of radius 7.4 metres, and an angle of 53 degrees, find the length of its chord. *[to 3 s.f.]*

14. A rectangle measures 9.5 cm by 16.3 cm. Find
(a) the length of its diagonal
(b) its area. *[both to 4 s.f.]*

15. A regular polygon having 10 edges covers an area of 100 square metres. What is the length of each of its edges? *[to 5 s.f.]*

16. Find the volume of a sphere which has a diameter of 17 millimetres. *[to 4 s.f.]*

17. What will be the length *[to 4 s.f.]* of
(a) the edge
(b) the space diagonal
of a cube, which has a volume of 1 cubic metre?

18. A right-angled triangle, whose hypotenuse measures 26 cm, has one angle of 43.7 degrees. Find the lengths of the other two edges. *[to 4 s.f.]*

19. What is the length of the diagonal of a square which has an area of 20 square metres? *[to 5 s.f.]*

20. Find the size *[to 5 s.f.]* of the circum-diameter of a regular polyhedron which has 20 faces and a volume of 2000 cubic millimetres.

21. A cube has an edge length of of 27 mm. Give its volume. *[to 4 s.f.]*

22. What is the volume of a sphere which has a surface area of 1.5 square metres? *[to 5 s.f.]*

23. A rectangle has a diagonal of length 6.7 metres and its perimeter measures 17.4 metres. What is its area? *[to 4 s.f.]*

24. What is the area of a sector which has a chord of length 180 mm and an arc of length 250 mm? *[to 5 s.f.]*

25. Find *[to 4 s.f.]* the length of the hypotenuse of a right-angled triangle having other edge-lengths of 18.3 and 35.5 cm.

26. What is the volume of a cone which has a perpendicular height of 24 metres and a slant height of 27.5 metres? *[to 5 s.f.]*

27. A regular polyhedron with 4 faces has an in-diameter of 340 mm. Find
(a) its edge-length *[to 5 s.f.]*
(b) its volume *[to 3 s.f.]*

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Using Specialist Calculators ~ 4

These questions are concerned only with converting units of measurement into other units (of the same type).
Those on the left are grouped under the name of the type (of calculator) needed as an additional help.
The symbol '≡' means 'is equivalent in value to'

Length

1. 4 metres ≡ _____ feet *[to 3 s.f.]*

2. 7 metres ≡ _____ yards *[to 3 s.f.]*

3. 9 inches ≡ _____ cm *[to 3 s.f.]*

4. 14 feet ≡ _____ metres *[to 3 s.f.]*

5. 8.5 miles ≡ _____ km *[to 4 s.f.]*

6. 32 km ≡ _____ miles *[to 4 s.f.]*

7. 45 cm ≡ _____ inches *[to 3 s.f.]*

Area

8. 85 sq. metres ≡ _____ hectares *[to 3 s.f.]*

9. 7 sq. metres ≡ _____ sq. feet *[to 4 s.f.]*

10. 258 sq. feet ≡ _____ sq. metres *[to 4 s.f.]*

11. 10 sq. yards ≡ _____ sq. metres *[to 3 s.f.]*

12. 10 acres ≡ _____ hectares *[to 4 s.f.]*

13. 300 hectares ≡ _____ sq. km *[to 4 s.f.]*

Volume

14. 20 cu. metres ≡ _____ cu. feet *[to 3 s.f.]*

15. 20 cu. metres ≡ _____ gallons (UK) *[4 s.f.]*

16. 100 cu. inches ≡ _____ litres *[to 3 s.f.]*

17. 100 barrels ≡ _____ cu. metres *[to 3 s.f.]*

18. 10 pints (UK) ≡ _____ litres *[to 3 s.f.]*

19. 30 litres ≡ _____ gallons (UK) *[3 s.f.]*

Mass

20. 10 kilograms ≡ _____ pounds *[to 3 s.f.]*

21. 8 ounces ≡ _____ grams *[to 3 s.f.]*

22. 5 pounds ≡ _____ ounces *[to 4 s.f.]*

23. 500 grams ≡ _____ pounds *[to 3 s.f.]*

24. 10 tons (UK) ≡ _____ tonnes *[to 4 s.f.]*

25. 10 tonnes ≡ _____ kilograms *[to 4 s.f.]*

26. 54 inches ≡ _____ feet *[to 3 s.f.]*

27. 20 sq. inches ≡ _____ sq. cm *[to 3 s.f.]*

28. 1 litre ≡ _____ centilitres *[to 3 s.f.]*

29. 20 ounces (av.) ≡ _____ grams *[to 4 s.f.]*

30. 10 sq. metres ≡ _____ sq. yards *[to 4 s.f.]*

31. 2.5 feet ≡ _____ centimetres *[to 3 s.f.]*

32. 6 cu. yards ≡ _____ cu. metres *[to 4 s.f.]*

33. 100 km ≡ _____ miles *[to 5 s.f.]*

34. 7834 ares ≡ _____ hectares *[to 4 s.f.]*

35. 2.4 kilograms ≡ _____ grams *[to 3 s.f.]*

36. 3000 acres ≡ _____ sq. km *[to 3 s.f.]*

37. 1580 metres ≡ _____ km *[to 4 s.f.]*

38. 1 gallon (UK) ≡ _____ gallons (US liq.) *[4 s.f.]*

39. 50 kilograms ≡ _____ pounds *[to 4 s.f.]*

40. 12 furlongs ≡ _____ km *[to 3 s.f.]*

41. 1 sq. mile ≡ _____ acres *[to 3 s.f.]*

42. 1 litre ≡ _____ millilitres *[to 3 s.f.]*

43. 1 furlong ≡ _____ yards *[to 3 s.f.]*

44. 10 naut. miles ≡ _____ km *[to 5 s.f.]*

45. 1 gallon (UK) ≡ _____ pints (UK) *[to 3 s.f.]*

46. 100 sq. cm ≡ _____ sq. inches *[to 6 s.f.]*

47. 1 are ≡ _____ sq. metres *[to 3 s.f.]*

48. 10 fathoms ≡ _____ metres *[to 4 s.f.]*

49. 10 cu.metres ≡ _____ cu. yards *[to 3 s.f.]*

50. 500 milligrams ≡ _____ grams *[to 3 s.f.]*

51. 100 miles ≡ _____ naut. miles *[to 4 s.f.]*

52. 1 cu.metre ≡ _____ litres *[to 3 s.f.]*

53. 100 metres ≡ _____ yards *[to 3 s.f.]*

54. 1 ounce (av.) ≡ _____ milligrams *[to 4 s.f.]*

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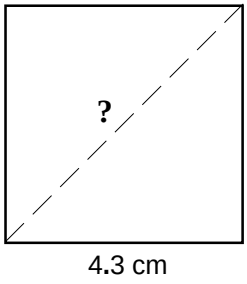
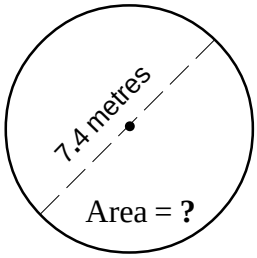
Using Specialist Calculators ~ 5

These questions are concerned with the measurements of some 2-dimensional shapes. They are not named, but the **only** shapes used are: **squares**, **circles**, **rectangles**, **sectors**, **regular polygons** and **right-angled triangles**. The drawings are NOT to scale, but each gives one (or two) measurements for that shape and **?** indicates what other measurement(s) have to be found.
Give all answers to 3 significant figures and make sure the units are correctly stated with each answer.

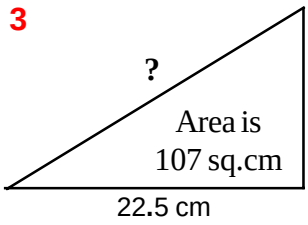
1



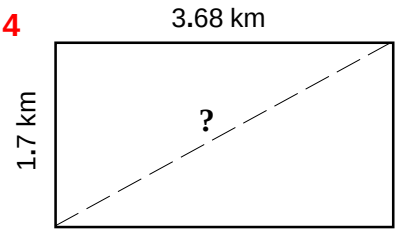
2



3



4



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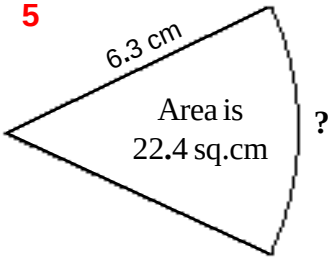

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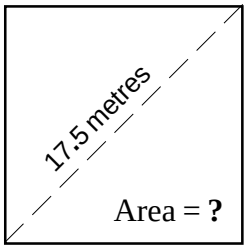

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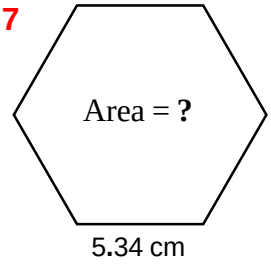

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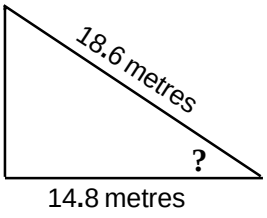

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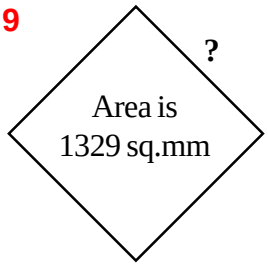

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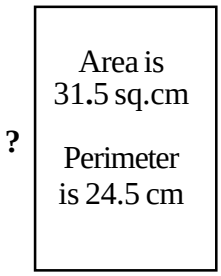

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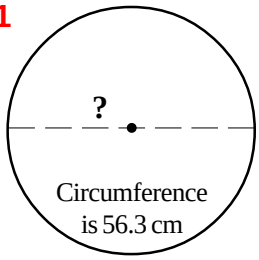

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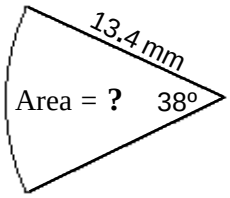

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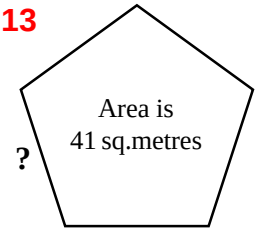

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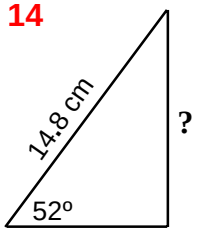

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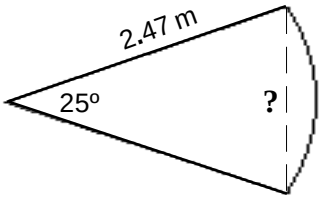

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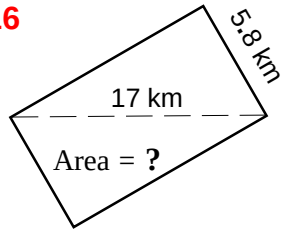

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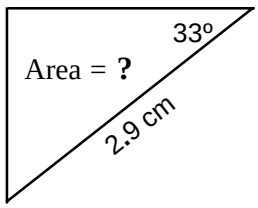

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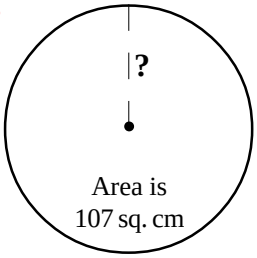

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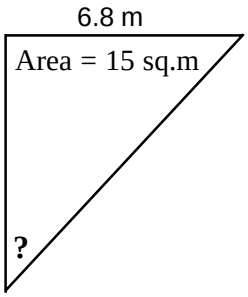

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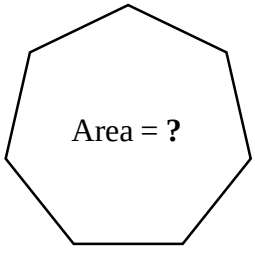

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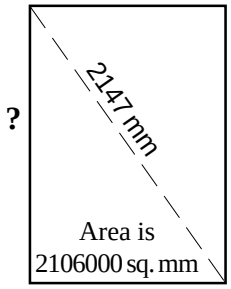

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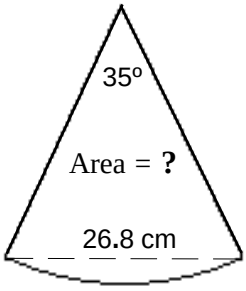

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Using Specialist Calculators ~ 6

Give all answers to 3 significant figures, and make sure units are stated in each answer.

1. A square has an edge-length of 4.5 inches. What is its area in square centimetres?

2. A circle has a circumference of 17 cm. Find its area in square millimetres.

3. A cube has a volume of 45 cubic inches. Give its edge-length in centimetres.

4. A regular polyhedron, with 12 faces, has an edge-length of 3.5 metres. What is its volume in cubic yards?

5. What would be the area of a square field which measures 100 yards on each edge
(a) in acres (b) in hectares?

6. A rectangle has a perimeter of 2000 metres and a diagonal of length 750 metres. Find its area in hectares.

7. A regular polygon has 10 edges, and its circum-circle has a radius of 15 inches. What is its area measured in square centimetres?

8. Find the area (in square cm) of a square which has a diagonal 3 inches long

9. How many litres of water would be needed to fill a cone which has a base-circle radius of 75 cm and a slant height of 200 cm?

10. Find the length, in metres, of the hypotenuse of a right-angled triangle whose other two edges measure 5.6 and 8.3 feet respectively.

11. What is the circumference (in metres) of a circle which has an area of 350 square feet?

12. A water storage tank is in the shape of a cube with an edge-length of 80 cm. What volume of water (in gallons) will it hold?

13. An ice-cream cone has a circular end of 3 cm radius, and a perpendicular height of 11 cm. When filled level to the top, how many millilitres of ice-cream will it contain?

14. A square field has an area of 1 acre. What is its edge-length in metres?

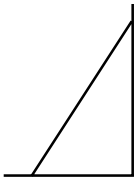
15. The throwing area for the javelin is marked out as a sector of a circle using a radius of 100 metres and an angle of 29 degrees. What area does this cover in ares?

16. A bicycle wheel is 26 inches in diameter. What is its circumference in centimetres?

17. An old gas container is in the shape of a sphere with a diameter of 7.5 feet. It is to be replaced by a new one. The standard sizes available are
1, 4, 6, 8, 10, 15, 20 cubic metres
Which is the nearest in size to the old one?

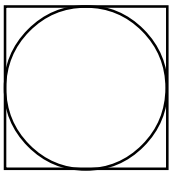
18. An association Football pitch must between 50 and 100 yards in width, and 100 to 130 yards long. Find the smallest and largest possible areas for a football pitch (a) in acres (b) in hectares.

19. The diagram represents a ladder 15 feet long leaning against a wall and making an angle of 55 degrees with the ground. how many metres up the wall does the ladder reach?



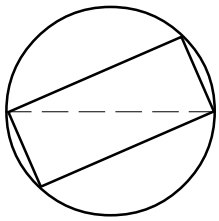
20. A flower border is in the shape of an annulus. The outer diameter is 25 feet, and it is 5 feet wide. What is the area of the border in square metres?

21. The largest possible circle is to tbe cut out from a piece of square card. If the square has an area of 120 square cm, what will be the area of the circle?



22. A tent is shaped like a cone. The circumference of its circular base is 15 metres, and its perpendicular height is 4 metres. What volume of air, in cubic metres, does the tent contain?

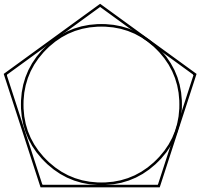
23. The diagram shows a circle, with its diameter drawn, and a rectangle which just fits inside the circle. The circle has a circumference of 1000 mm. If the rectangle has an area of 23,100 sq.mm what are the lengths of its edges?



24. The two longer edges of a right-angled triangle are 4 and 4.5 metres long respectively. A circle inside that triangle has one-quarter of the area of the triangle. What is the radius of the circle?

25. A square badge having an edge-length of 40 mm is to be replaced by an hexagonal shape of the same area. What will be the edge-length of the hexagonal badge?

26. Find the edge length of a pentagon which has an in-circle whose area is 200 sq. mm.



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Using Specialist Calculators ~ 7

Each of the shapes below is made up of two (or more) basic shapes. The basic shapes used are: **squares**, **rectangles**, **circles**, **semi-circles, sectors**, **regular polygons** and **right-angled triangles**.
The main shape is shown by a solid line, and the dashed lines help to show how it is made from the basic shapes. In a few cases, shading is used to emphasise which the main shape is. The drawings are NOT to scale.
Find the areas and perimeters of each of the main shapes.
Give all answers to 3 significant figures and make sure the units are stated with each answer.

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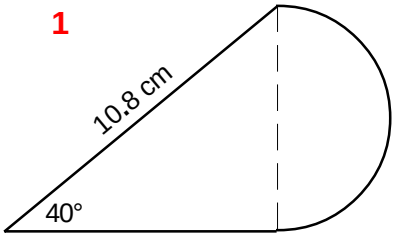

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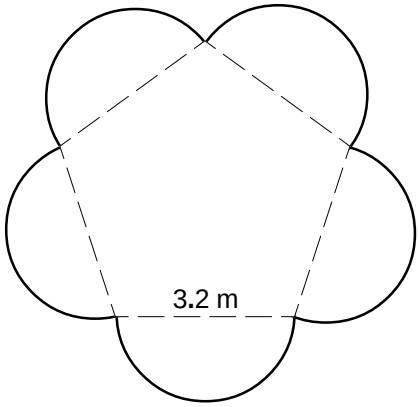

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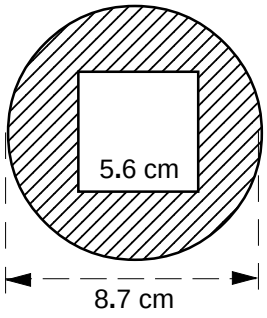

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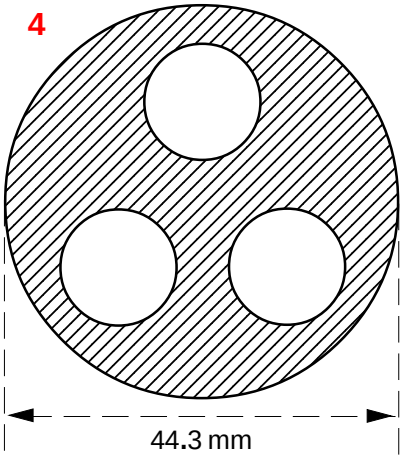

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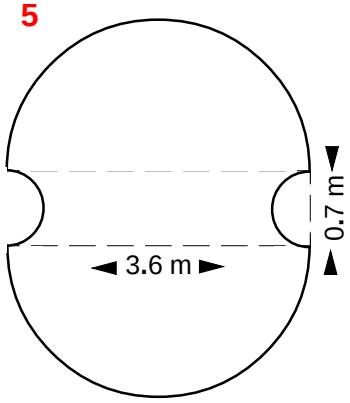

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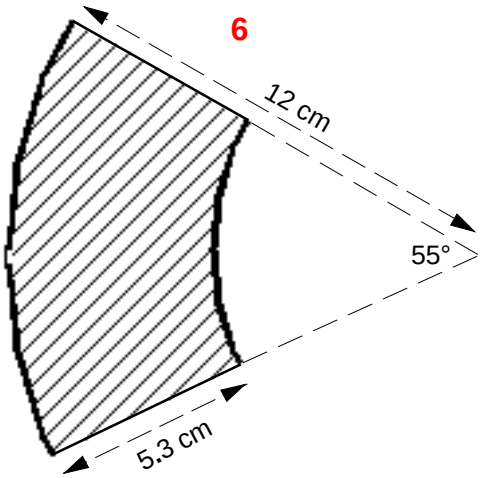

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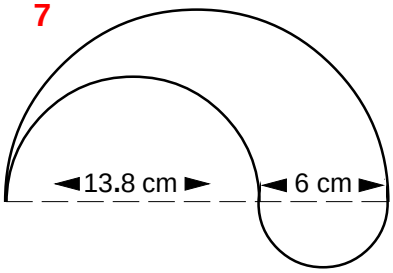

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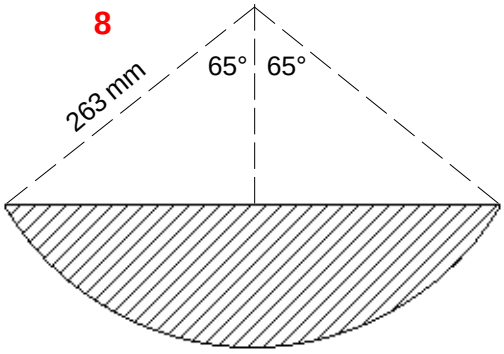

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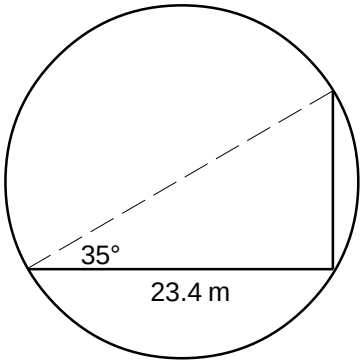

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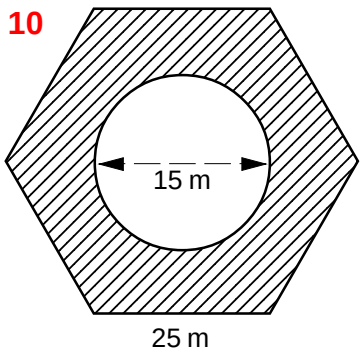

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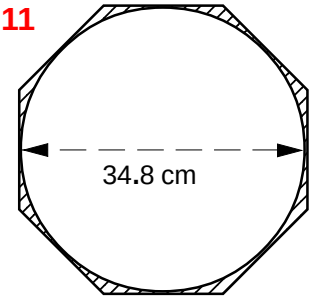

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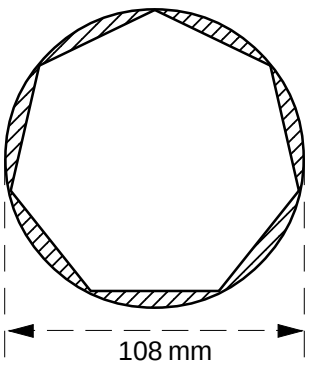

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Using Specialist Calculators ~ 8
Costs and Comparisons

1. 17 metres of wire costing £1.46 per metre are bought.
(a) What is the total cost?
(b) What is the comparative cost per yard?

2. 12 square metres of carpet costing $9.99 per sq. metre are bought.
(a) What is the total cost?
(b) What is the comparative cost per sq.yard?

3. What is the total cost of 2.5 cubic metres of concrete which costs $28.50 per cu. metre?
What is the comparative cost per cubic yard?

4. 2 kilograms of apples, priced at £1.25 per kilogram, are bought.
(a) What is the total cost?
(b) What would be the price per pound?

5. 23 metres of curtain material are bought at a total cost of £172.27 What is its price
(a) per metre *(b)* per yard?

6. 45 square metres of roofing-felt cost $165.50 What is its price
(a) per sq. metre *(b)* per sq. yard?

7. Fuel-gas is priced at £3.25 per cu. metre.
(a) How many cu. metres can be bought for £20?
(b) What is the price per cu. foot of this gas?

8. A 50 kilogram bag of potatoes costs $18.50
What is this price
(a) per kilogram *(b)* per pound?

9. Garden hose is available in one shop at 85 pence per foot. It is advertised in a catalogue at £2.50 per metre. Which is the cheapest, and by how much?

10. Before metrication the price of one particular item was 78 pence per pound. What should the price have been (in £ per Kg) after metrication?

11. When looking for office-space to rent, a firm is quoted $25 per square foot in one place and $270 per square metre in another. How much can be saved by taking the cheaper one, if it needs 5,000 square feet?

12. When petrol costs 90 pence per litre, by how much must the price rise to be the equivalent of £5 per gallon (UK)?

13. A shop-owner is able to buy cat-biscuits in bulk at £900 per ton (UK) for sale to customers at £1.15 per kilogram. What profit is being made
(a) in pence per kilogram?
(b) in £'s per ton?

14. A speculator bought 20 acres of land at $1200 per acre, and sold it several years later at $5000 per hectare. What was the total profit made?

15. It was estimated that building a motorway cost about one and a half million pounds per mile. What is the equilvalent cost per kilometre (to the nearest ten thousand pounds)?

All of the following questions concern dealings on the commodities market

16. On one particular day, the price of oil on the London market was given as $30.20 per barrel. What was the cost per gallon (in cents)
(a) in the UK *(b)* in the US?

17. The prices of precious metals are given per troy ounce. Some typical prices (in £ sterling) are

silver	3.30	platinum	352
gold	189	palladium	407

Give the price of each (to the nearest £)
(a) per ounce *(c)* per gram
(b) per pound *(d)* per kilogram

18. The prices of ordinary metals are quoted in $/tonne. Some typical prices are

lead	434	copper	1767
zinc	1131	tin	5450
aluminium	1567	nickel	8200

Give the price of each (to the nearest $)
(a) per pound *(c)* per kilogram
(b) per ton (UK) *(d)* per ton (US)

19. On a day when the quoted price for coffee was 96 cents/pound and for sugar was 237 $/tonne, which was the dearer, and by how much per pound?

20. Soya bean oil is listed at 16 cents/pound and soya bean meal at 150 $/ton(US), which is the dearer, and how many times dearer is it?

21. How much (in dollars) should be charged for 100 cubic metres of soya beans which are listed at 480 cents/bushel?

In the following questions assume £1 ≡ $1.45

22. Give the UK prices per ton for these commodities:

paper pulp	$760 / ton(US)
cotton	$1150 / ton(US)
cocoa	$935 / tonne

23. One day the market price of unleaded gasoline was given as 90 cents/US gallon. What would this price be (in pence) per UK gallon?

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Using Specialist Calculators ~ 9

Give all answers to an appropriate degree of accuracy, and make sure the units are stated

1. Give the speed of 30 miles per hour as kilometres per hour.

2. A car has an overall fuel consumption figure of 38 miles per gallon. what is the equivalent in miles per litre?

3. During Napoleon's historic retreat from Moscow (in 1812) temperatures of ⁻30° Reaumur were recorded. Express that as a temperature on the Celsius scale.

4. The reommended pressure for a particular car-tyre is given as 1.8 bars. The pressure gauges at most filling-stations are calibrated in pounds per square inch, so what figure is needed for that?

5. An old heating boiler with a power rating of 5000 Btu/hour, is to be replaced. The new ones are rated in watts. Give the equivalent size needed for the new boiler.

6. Aluminium has a density of 2710 kilograms per cubic metre. Express this in pounds per cubic inch.

7. An old instruction manual states that a torque of 15 lbf-feet is needed for tightening up some bolts. Modern torque-wrenches are marked in newton metres. What will be the equivalent value on that?

8. A river is estimated to be flowing at a rate of 150 cubic feet per minute. How many gallons per day is that?

9. An old specification calls for the use of copper sheet with an area density of 8 pounds per square foot. However, modern sheet-metal is rated in kg per square metre. So what would be the nearest equivalent?

10. A week-killer is to be made up by mixing the supplied liquid with water to a concentration of 8%. How many fluid ounces of the liquid should be put in each gallon of water?

11. When 1 inch of rain falls, how many litres per square metre is that?

12. A particular nylon thread is said to have a line density of 50 denier. What would that be in pounds/mile?

13. A wet-spun linen yarn has a count of 45. Give its equivalent tex value.

14. If a rainfall of 20mm was recorded, how many kilograms would have fallen on each square metre?

15. Natural gas has a specific energy of about 37 MJ per cubic metre. However, some systems require the specific energy to be given in Btu per cubic foot. What value will they use for natural gas?

16. A writer is up-dating a manual. There is a mention of an oil with a viscosity of 15 000 stokes. What value should be put in the up-dated manual as the SI preferred unit?

17. Many foods give their energy values in calories, but the SI preferred unit is joules. For a given value of 100 calories, what would it be in joules?

18. One well-known cereal gives the value of the specific energy of its contents as 3000 calories per gram. What would be the SI preferred equivalent?

19. A car-engine has a power rating of 90 kW. What horsepower is that?

20. A broken pump for a hot-water system has to be replaced. It flow rate was 400 gallons per hour. New pumps are available with these rates

20 25 30 35 40

litres per minute. Which would the most suitable?

21. A fast snail might go 40 cm in a minute. How many miles/hour is that?

22. Gold weighs 19.3 grams per cubic centimetre. What would be the volume of 1 tonne of gold?

23. The floor of a room measures 2.5 by 3.2 metres. What will be the total cost of buying the exact amount of carpet to cover this floor at £14.75 per square yard?

24. A fertilizer needs to be applied at the rate of 600 kg/hectare. How many tons would be needed for a 20 acre field?

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Using Specialist Calculators ~ 10

Give all answers to an appropriate degree of accuracy, and make sure units are stated

1. Find the diameter of a cylinder having a volume of 457 cm^3 and a height of 15 cm.

2. A cuboidal box has a volume of 3000 cm^3, a space diagonal of 27 cm and one edge measures 20 cm,. What is its surface area?

3. The slant edge of a pyramid measures 36 cm and its perpendicular height is 27 cm. Calculate its volume.

4. What will be the surface area of a sphere having a volume of 4000 cm^3?

5. The largest monument ever built is the Quetzacoatl pyramid in Mexico. It is 54 metres tall with a square base of edge length 426 metres. What is its slant height?

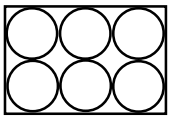
6. Silbury Hill in Wiltshire (UK) was artifically made thousands of years ago by piling chalk soil into a conical shape. It has a base diameter of 276 metres, rises to a height of 39 metres and is now covered in grass. What is the area of the grass?

7. In drilling to find water, a hole was bored in the ground using a drill-bit with a diameter of 7 cm. Water was eventually found after 1 cubic metre of earth had been drilled out. At what depth was that (to the nearest metre)?

8. A cylindrical tin of paint is advertised as holding 1 litre. The tin measures 9 cm in diameter and is 17.5 cm high. On opening a new tin, about how far below the top edge of the tin would you expect the level of the paint to be?

9. The Geat Pyramid of Cheops (built about 2600 B.C. in Egypt) is made of limestone. It has a square base of edge 230 metres, and a perpendicular height of 146 metres. A cubic metre of limestone weighs 2.268 tonnes. Find the total weight of limestone used in building it.

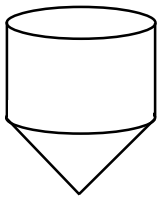
10. A snooker ball has a diameter of 52.4 mm. Six of them are packed into a cuboidal box, which they fit exactly, in a single layer. What is the volume of 'wasted' space in the box?



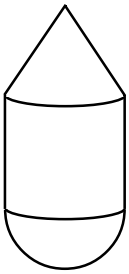
11. A metal tank to hold propane gas is made up of a cylinder with two hemi-spherical ends. The cylindrical part is 1.7 metres in diameter and 5.4 metres long. Find

(a) the volume of the tank, (b) its total surface area.

12. A grain-hopper is made up of two parts. The upper part is a cylinder 15 metres high and 6.5 metres in diameter. The lower part is a cone having a depth (or height) of 12 metres. Calculate the volume of grain the hopper can hold.



13. A hollow plastic fishing-float is made of 3 parts. A cone at the top, a cylinder in the middle, and a hemi-sphere at the bottom. The cylinder has a diameter of 4.5 cm and a height of 7 cm. The overall height of the float from top to bottom is 18 cm. What is the total volume of the float?



14. The air-reservoir for a compressor is in the shape of a closed cylinder which has its two ends 'dished' inwards. The cylinder is 84 cm in diameter and 250 cm long. The ends are approximately cones and the distance between their two 'tips' is 215 cm. Calculate the capacity of the reservoir in litres.

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Using Specialist Calculators ~ 11

Give all answers to an appropriate degree of accuracy, and make sure the units are stated

1. Find the area of a square which has a diagonal of length 34 cm.

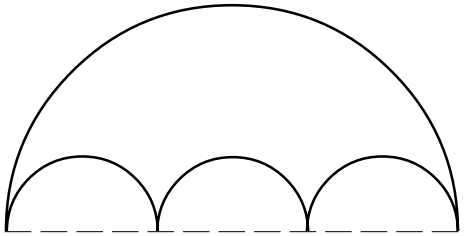
2. A pyramid has a slant height of 20 metres and a volume of 500 m^3. What is its perpendicular height?

3. Give the equivalent value of a length of 25 miles in kilometres.

4. Carpet is priced at £15.67 per square yard. What would be its cost per square metre?

5. The two shorter edges of a right-angled triangle are 42 and 85 mm. Find the size of its smallest angle.

6. This shape is made from a large semi-circle of diameter 18 cm, with three smaller, equally-sized, semi-circles cut out of it. What is the area of the shape?



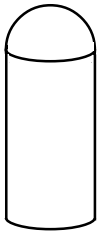
7. What is the nearest equivalent fraction (in 64ths) to 0.39 and exactly how much different in size is it?

8. Express the equivalent linear density of 25 denier in decitex.

9. It is required to draw a regular hexagon which has an area of 25 cm^2. Calculate the radius of the circum-circle which will need to be drawn.

10. The long (or space) diagonal of a cube measures 35 mm. What is the volume of the cube?

11. An observation tower is built in the shape of a cylinder with a hemi-sphere on top. On the inside of the tower the cylindrical part is 15 metres tall and 3.5 metres in diameter. Find the volume of space enclosed within the tower.



12. When oil is priced at $27 a barrel, what is the equivalent price per cubic metre?

13. Give the radius and angle needed to draw a sector having an area of 80 cm^2 and an arc length of 10 cm.

14. How many litres of water would have fallen on an area of 100 square metres after a rainfall of half an inch had been recorded?

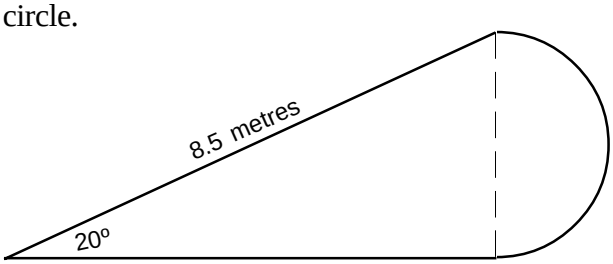
15. A hollow cone has a base radius of 17 inches and a perpendicular height of 24 inches. What is its volume in litres?

16. Give the equivalent value of 212° F on the Kelvin scale.

17. What are the dimensions of a rectangle which has an area of 100 cm^2 and a perimeter of 65 cm?

18. A drinks container is to be made in the shape of a regular octahedron. It is required to hold 1 litre of liquid. What must be its edge-length?

19. Find the area and perimeter of this shape, which is made from a right-angled triangle and a semi-circle.



20. A tank in the shape of a cuboid has to have a capacity of 300 litres. Its space diagonal cannot exceed 130 cm and no single edge must be more that 100 cm. Working to those limits, what will be the lengths of the other two edges?

21. A solution is to be made up having a concentration of 1200 parts per million. A total quantity of 30 litres of the solution is required. How many millitres of the concentrate will be needed?

22.

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Using Specialist Calculators ~ 12

Where appropriate, give answers to a reasonable degree of accuracy, and make sure the units are stated

Part A

1. What is …
(a) …the order of rotational symmetry of a square?
(b) …the difference between an oblong and a rectangle?
(c) …the name of a polygon having 11 edges?
(d) …another name for the annulus?
(e) …the dihedral angle for a regular octahedron?
(f) …another name for the sector used to make a cone?
(g) …the correct phrase to describe the 'ordinary' cylinder?
(h) …the more usual name for a cuboid whose edge-lengths are all the same?
(i) …the number of space diagonals in a cube?

2. When working with sectors, what two given pieces of data might lead to two solutions?

3. Find the perimeter of …
(a) …an octagon which has an area of 100 cm^2.
(b) …a sector having a chord of length 5 cm and an area of 36 cm^2.

4. What is the total surface area of a hemi-sphere which has a diameter of 21.5 cm?

5. Find the area of a right-angled triangle in which one edge measures 8.5 cm, and one angle measures 34°.

6. Find the area of one of the triangular faces of a right square-based pyramid which has a volume of 165 cm^3 and a slant edge of length 9cm.

Part B

7. Very large and very small numbers can more easily be written using the e-Format
(a) Who originated this notation?
(b) What does the *e* stand for?
(c) Write these numbers in e-Format
(i) 5.706×10^{13}
(ii) 1 462 000 000
(iii) 0.000 003 7

8. What was the original name for the unit of length we now know as the 'yard'?

9. How was the UK gallon defined in 1824?

10. What was the basic idea underlying the definition of the unit of area called an 'acre'? Name another unit of area which used the same idea.

11. How many different units are known for measuring pressure?

12. When buying something by weight (rather than by mass) is it better to buy it at the North Pole or at the Equator?

13. For what purpose might 'inverse density' be used?

14. What was unusual about the thermometer scale which was originally devised by Anders Celsius?

15. What is the size of a 'drop' as used in measures of concentration? How many drops in a 'teaspoon'?

16. Give a practical definition of 'energy'.

17. How, and when, did James Watt originally define the unit of power known as the 'horse-power'?

18. Why is the unit of speed known as the 'Mach' so called?

19. What is another, more usual, name for the unit of force known as the 'kilopond'?

20. In textile measures, the length known as the *spyndle* can be two different lengths. What are they?

21. During record-breaking attempts on fuel consumption of vehicles, what sort of figure might be achieved in special cases?

22. What is the approximate value of the specific energy of natural gas? What is it more usually called?

Part C

23. What (approximate) conversion factor is needed to change 'miles' into 'kilometres'?

24. Give the names of the 7 principal units of the SI System.

25. What is the definition of a 'metre'?

26. Name a 'derived unit' in the SI System.

27. How many prefixes are there in the SI System? Name the largest and the smallest.

28. Give one example of an eponymous unit.

29. What was the actual difference (in cm) between the UK and US inches previous to 1959?

30. When was metrication first discussed in the UK parliament?

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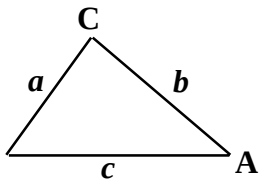
Using Specialist Calculators ~ 13

Give all answers to an appropriate accuracy.

The General Triangle

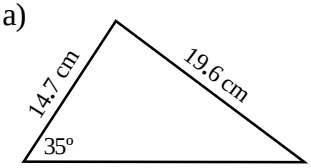


1. In each of these cases find the

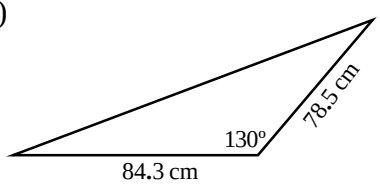
a)	area of triangle ABC when	a = 7.8 cm	b = 4.3cm	c = 6.52 cm
b)	area of triangle ABC when	b = 10.2 cm	c = 14.6 cm	A = 68º
c)	perimeter of triangle ABC when	b = 78.4 cm	A = 23.5º	C = 66.5º
d)	perimeter of triangle ABC when	c = 206 cm	A = 27º	C = 138º
e)	area of triangle ABC when	AB = 9.3 cm	BC = 12.7 cm	∠ BAC = 42º
f)	perimeter of triangle XYZ when	XY = 17 cm	YZ = 28 cm	∠ YXZ = 90º
g)	area of triangle PQR when	PQ = 8.43 cm	QR = 10.7 cm	∠ QPR = 125º
h)	area of triangle LMN when	LM = 20 cm	MN = 13 cm	∠ MLN = 48º
i)	perimeter of triangle RST when	RS = 11.4 cm	ST = 5.7 cm	∠ SRT = 30º
j)	area of triangle ABC when	BC = 24.5 cm	AC = 27 cm	∠ BAC = 56º

2. Find the perimeter and area of each of these triangles.

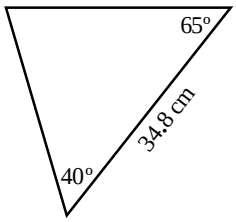
a)



b)



c)



3. A triangle has a = 12 cm B = 35º. Find its area when

a) b = 15 cm b) b = 10 cm c) b = 5 cm

4. Find the size of the smallest angle in a triangle having edge-lengths of 23, 16 and 12 cm.

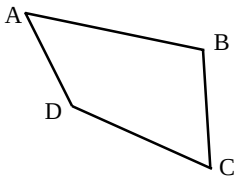
5. Explain why it is that a triangle having edge-lengths of 7, 9 and 17 cm cannot exist.

6. An equilateral triangle has an edge-length of 13.6 cm. Calculate its area.

7. An isosceles triangle has two edges of length 9.1 cm and two equal angles of 65º. What is its area?

8. A triangle PQR has PQ = 8.5 cm QR = 6.7 cm ∠ QPR = 43º
What are the two possible sizes of ∠ PQR ?

9. The drawing on the right represents a plan view of a field.
Calculate the area and perimeter of the field from these measurements.
AD = 140 metres ∠ ADB = 78º ∠ ADC = 135º
∠ DAB = 46º ∠ ABC = 106º



10. Two people start walking from the same place at the same time. One walks at 3 km/hour going due West. The other jogs at 5 km/hour going South-East.
What distance apart will they be after 5 hours?

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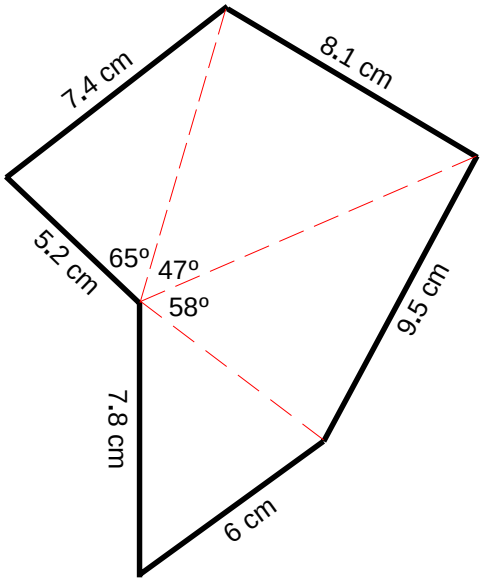
Using Specialist Calculators ~ 14

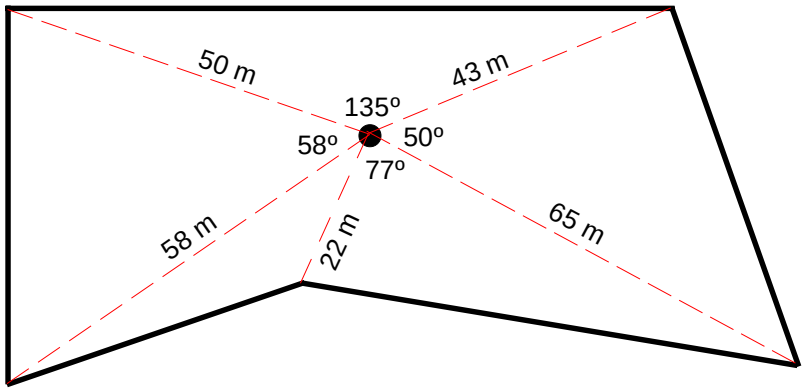
1.

The sketch below is of an irregular hexagon which has been divided into 4 triangles by drawing in some of its diagonals. Using the sizes given calculate the total area of the hexagon.



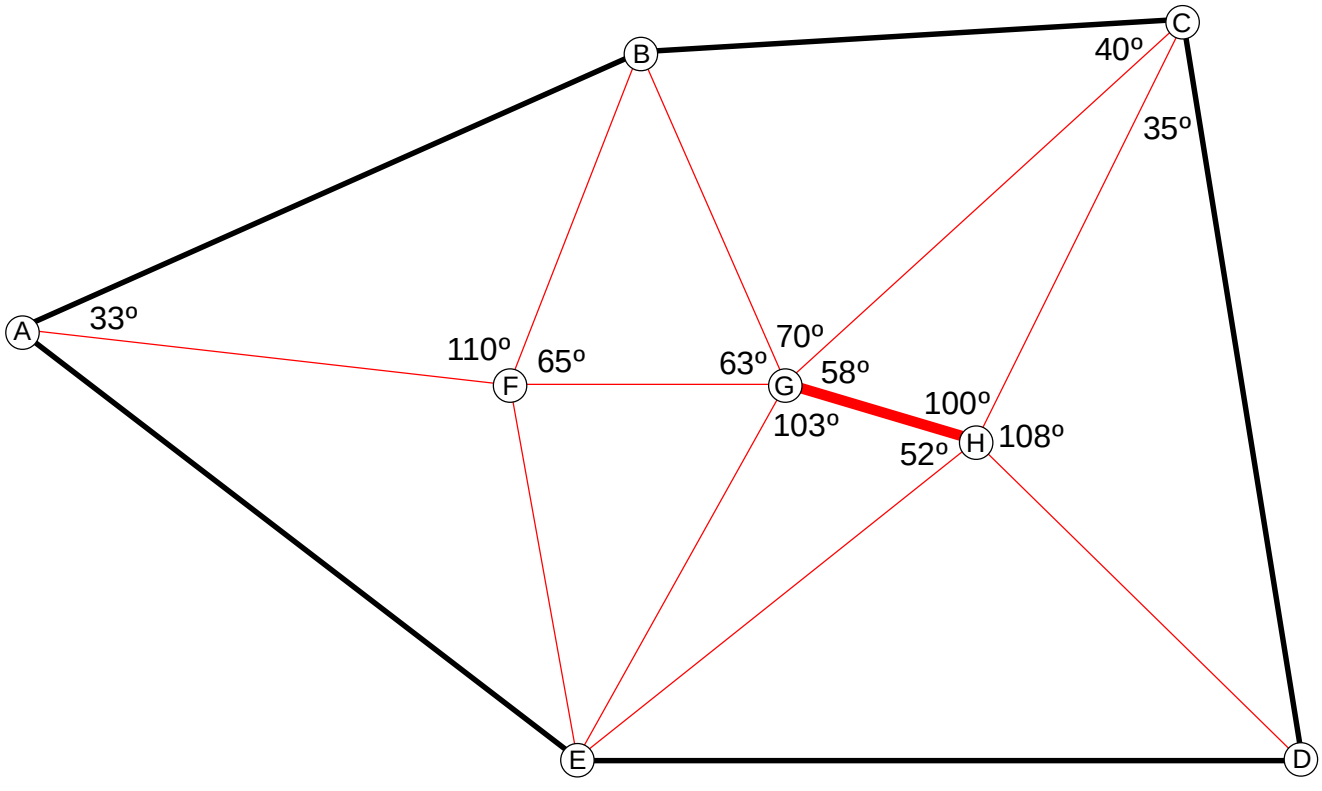
2.

The drawing below represents a sketch of an irregularly shaped field (PQRST). For land registration purposes the area of the field was required in hectares. The surveyor used the radial survey method to do this. A theodolite was placed at the place indicated by the black dot and the angles between the lines from there to each corner (the radial lines) were measured, as well as the lengths of those lines.The results of those measurements are shown.
What was the area of the field?



3.

This drawing (not to scale) shows part of a major survey carried out by the triangulation method. Note that only one length has been measured (this is known as the base line), all other measurements are of angles. The letters given are merely to help with identifying the lines and triangles. Given that the base line GH is 74 metres long work out the area and perimeter of this piece of the survey ABCDE.



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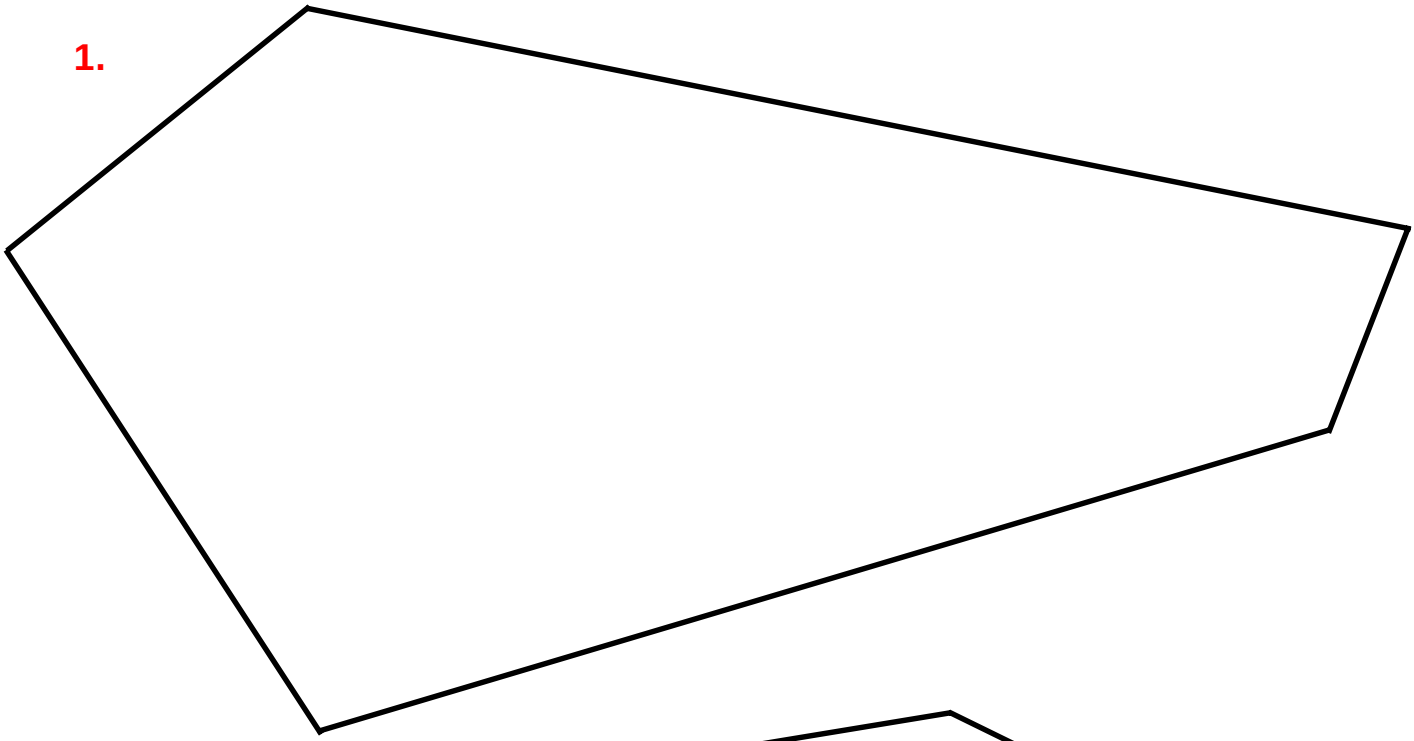
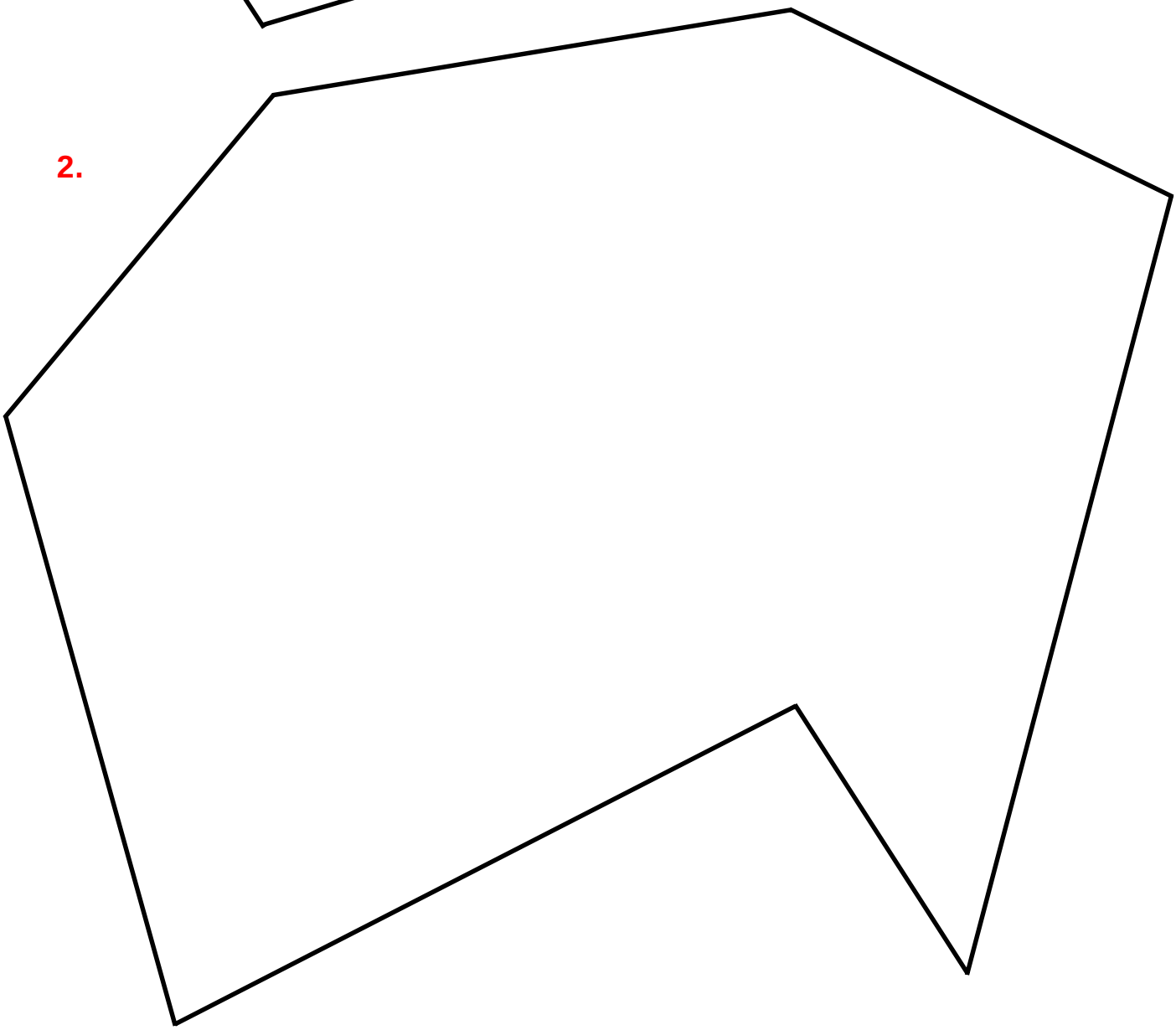
Using Specialist Calculators ~ 15

Make any necessary measurements, and use those to calculate the area of each of these shapes.

1.



2.



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Using Specialist Calculators ~ 16

Where appropriate, give answers to a reasonable degree of accuracy, and make sure the units are stated

Section A

1. What will the value of something whose original cost is £87 after a change of 9% if the change is
a) an increase *b)* a decrease ?

2. Find the amount of the change that will take place on an original value of 84 undergoing a change of 7%

3. An original value of £56 has been increased to £61 What was the percentage change?

4. The original cost-price of an object is £67.50 but tax at 17.5% has to be added on. What will be its selling-price?

5. A loan of £1000 is taken out for 1 year. It is to be repaid monthly at an interest rate of 1.7% per month. How much will each monthly instalment be?

6. A loan of £5000 is to be repaid monthly at 1.45% over 3 years. What will be the total amount repaid?

7. A 2-year loan is taken out for £2000 repayable at monthly intervals with interest charged (monthly) at 2.1%. What overall percentage will have to be paid on the loan?

8. How much extra is paid back when repaying a £800 loan in 12 monthly instalments with interest charged at 1.95%?

9. An investment account is started with an amount of £500. Interest at 7% is added annually. What will the account be worth after 10 years if the growth is
a) Simple *b)* Compounded ?

10. A manufacturer buys a new machine for £15 000. For tax purposes the machine is assumed to depreciate in value by 20% each year. This is compounded depreciation. What will the machine be valued at after 5 years?

11. In the UK in 1930 a reasonable working-wage would have been £150 per year. Using the Cost of Living Index, how much would have been needed in the year 2000 to be equivalent to that?

12. A barrel has an end-diameter of 80 cm, a mid-diameter of 110 cm, and height of 120 cm. What is its volume?

13. A barrel to hold 2000 litres is needed. Its diameters are to be 100 and 140 cm respectively. What height will it need to be? (2000 litres = 2 000 000 cm^3)

14. For an ellipse with a major axis of 13 cm and a minor axis of 7 cm find its
a) area *b)* perimeter.

15. An elliptical flower-bed is to be made measuring 3 metres in its length and 2 metres in its width. It is to be marked out on the ground using the 'loop method'. What will be the foci distance and loop length needed for that?

Section B

16. What is the name of the barrel-like container which holds 18 gallons (UK)?

17. What is the the largest area the ellipse calculator will allow for a loop length of 8 cm? And what then is strange about the sizes of the major and minor axes?

18. Which country appears to have had
a) the greatest *b)* the least
rise in its Cost of Living from 1930 to 2000?

19. A percentage change of 3.5% produces an actual change in value of £8.75. Find the original value.

20. Find the capacity (in litres) of the barrel known as a butt.

21. A mortgage of £60 000 is on offer to be repaid over 25 years at an annual rate 5.5%. The actual repayments are to be made monthly. How much a month will it cost?

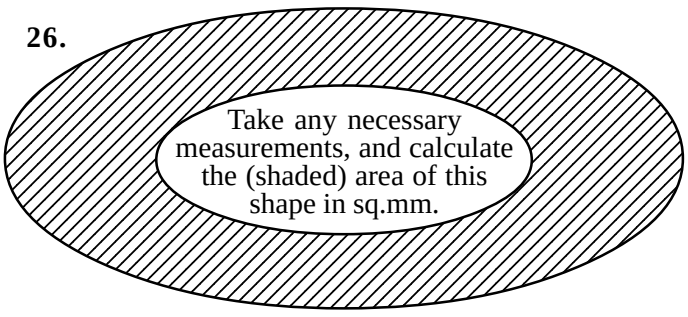
22. Give the size of the major axis of an ellipse that has an area of 20 cm^2 and a perimeter of 16 cm.

23. A credit-card quotes a monthly interest rate of 1.86%. What is the APR?

24. What was the original cost of an article which is now marked at £125 after a tax of 17.5% has been added on?

25. What world-wide authority is responsible for the cost of Living Index and what is the 'correct' title of that Index?

26.



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