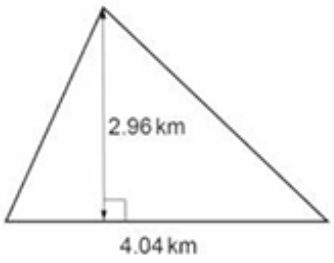
1. A housing estate is built on a triangular piece of land.



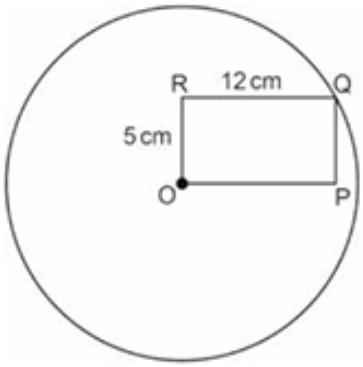
Not to scale

There are 8947 people living on the estate.

Work out an **estimate** of the population density of the estate in people per km^2.

..... people per km^2 **[4]**

2(a). The diagram shows a rectangle, OPQR, and a circle, centre O, which passes through Q.
OR = 5 cm and RQ = 12 cm.

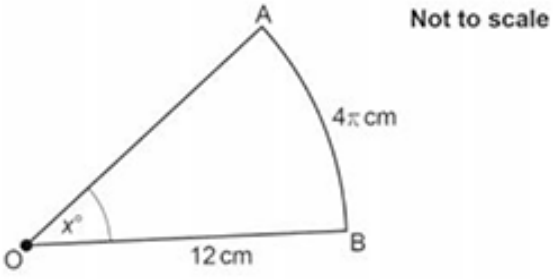


Not to scale

Find the circumference of the circle.
Give your answer in terms of π.

..... cm **[4]**

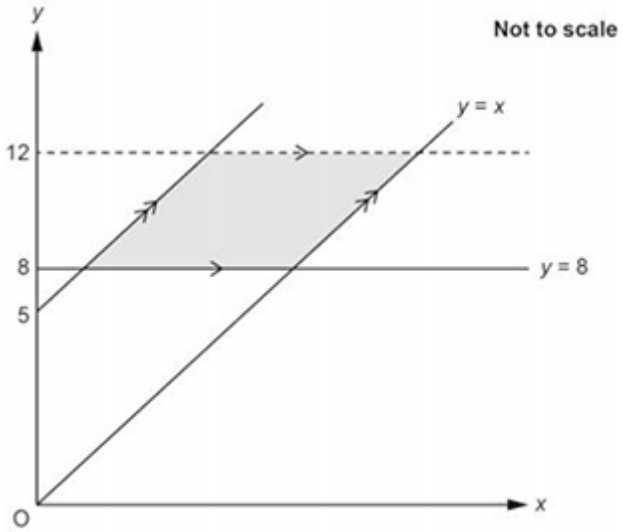
(b). AOB is a sector of a circle, centre O and radius 12 cm.
Angle AOB = $x°$.
The arc, AB, has length 4π cm.



Find the area of the sector.
Give your answer in terms of π.

..... cm^2 **[4]**

3(a). In the diagram below, the shaded region is a parallelogram.
The parallelogram can be identified by four inequalities.
Two of the inequalities are $y \geqslant 8$ and $y \geqslant x$.



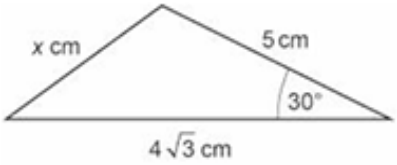
Write down the other **two** inequalities that identify the parallelogram.

.....
.....**[3]**

(b). Work out the area of the parallelogram.
You must show your working.

..... square units **[4]**

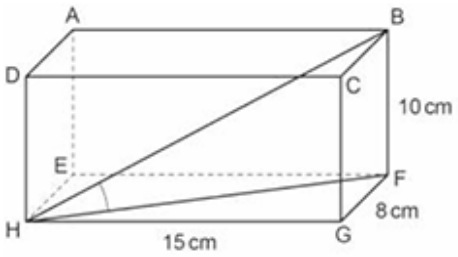
4. Work out the exact value of x in this triangle.



Not to scale

x = ...**[4]**

5. The diagram shows a cuboid ABCDEFGH.



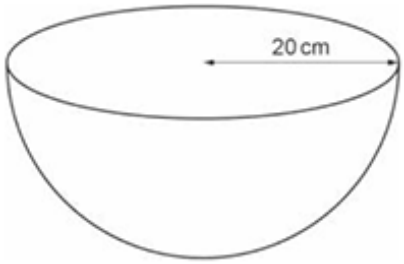
Not to scale

FB = 10 cm, GF = 8 cm and HG = 15 cm.

Calculate the angle BHF.
You must show your working.

Angle BHF = ...°**[5]**

6. A bowl in the shape of a hemisphere with radius 20 cm is used to collect raindrops.



Assume each raindrop has the volume of a sphere of radius 4×10^{-4} cm.

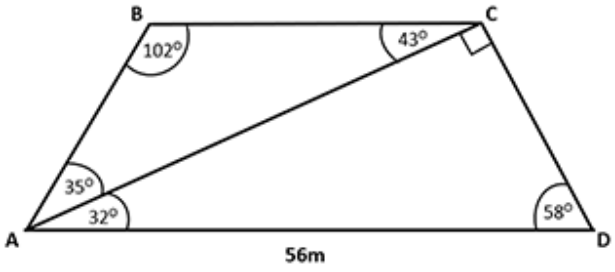
Calculate how many raindrops it takes to completely fill the bowl.
Give your answer in standard form.
You must show your working.

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.....**[6]**

7. AC is a diagonal of the quadrilateral ABCD.

Not to scale



AD = 56 m.
Angle ABC = 102°, angle BCA = 43° and angle BAC = 35°.
Angle ACD = 90°, angle CDA = 58° and angle CAD = 32°.

Find the area of ABCD.
You must show your working.

..... m^2 **[6]**

8. A rock has a mass of 37 260 g and a volume of 13 800 cm^3.

Work out the density of the rock.
Give the units of your answer.

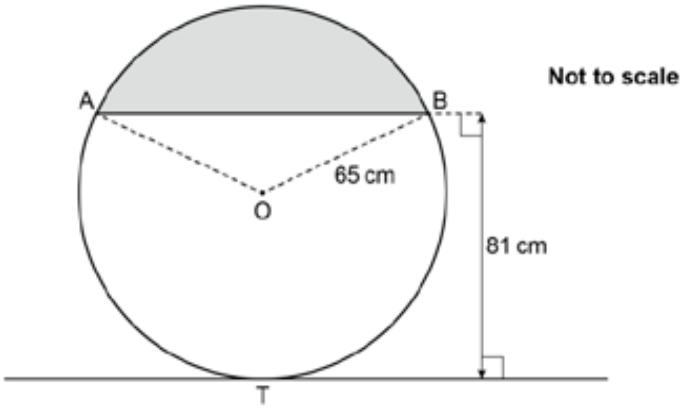
.... **[3]**

9. A cylinder has a radius of 11.2 cm.
The ratio of the radius of the cylinder to the height of the cylinder is 4 : 9.

Find the volume of the cylinder.

..... cm^3 **[4]**

10. The diagram shows a circle, centre O and radius 65 cm.



AB is a chord of the circle.
The line through T is a tangent to the circle.

The chord is parallel to the tangent.
The perpendicular distance between the chord and the tangent is 81 cm.

Calculate the area of the shaded segment.
You must show your working.

.....cm^2 **[6]**

11. A sphere has radius *a* cm.

A cone has radius $\frac{D}{2}$ cm and height *D* cm.

The volume of the sphere is equal to the volume of the cone.

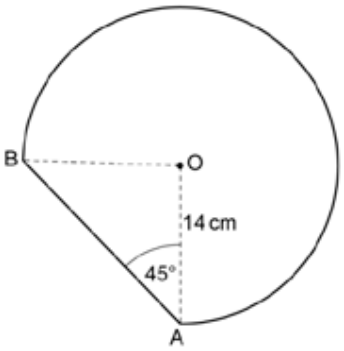
Write *D* in terms of *a*.

[The volume *V* of a sphere with radius *r* is $V = \frac{4}{3}\pi r^3$.

The volume *V* of a cone with radius *r* and height *h* is $V = \frac{1}{3}\pi r^2 h$.]

..... **[4]**

12. The shape below is part of a circle, centre O and radius 14 cm.
Angle OAB = 45°.



Not to scale

Work out the perimeter of the shape.

Give your answer in its simplest terms in the form $a\sqrt{b} + k\pi$.
You must show your working.

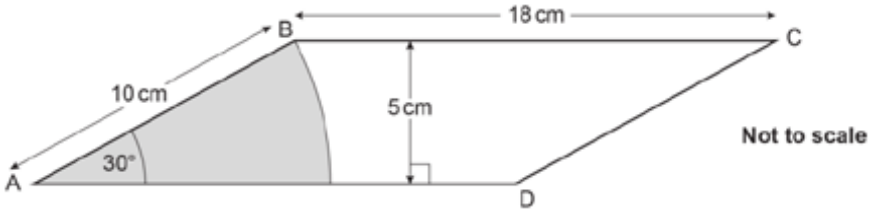
..... **[7]**

13. An aluminium photo frame has a volume of 497 cm^3.
The density of aluminium is 2.7 g/cm^3.

By rounding each value correct to one significant figure, work out an estimate for the mass of the aluminium photo frame.

..... g **[3]**

14(a). The diagram shows a shaded sector inside a parallelogram.
The sector has an angle of 30°.
The parallelogram, ABCD, has length BC = 18 cm and AB = 10 cm.
The perpendicular distance between BC and AD is 5 cm.



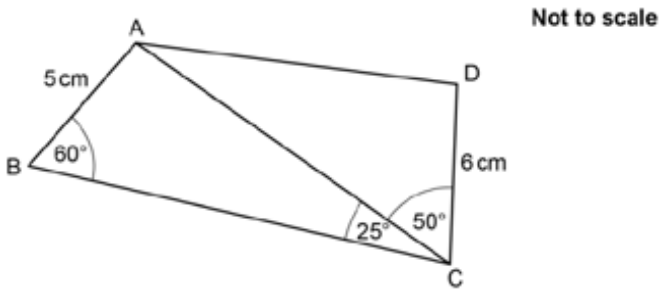
Show that the area of the sector is 26.2 cm^2, correct to **3** significant figures.

[3]

(b). The shaded area is 31.4 cm^2. Work out the percentage of the parallelogram that is **not** shaded.

..... % **[4]**

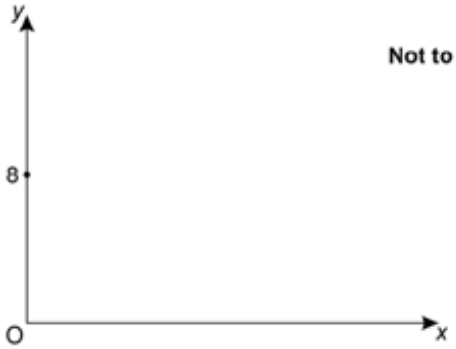
15. The diagram shows two triangles ABC and ADC.



Angle ABC = 60°, angle ACB = 25° and angle ACD = 50°.
AB = 5 cm and DC = 6 cm.
Calculate length AD.
You must show your working.

AD = ... cm **[6]**

16. The sketch shows the coordinate axes and the point (0, 8).

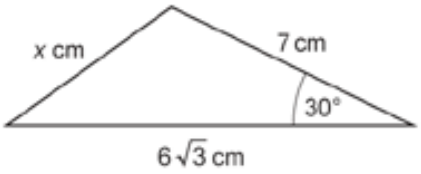


The distance from the point (0, 8) to a point (6, *t*) is 7.5 units.

Work out the **two** possible values of *t*.
You must show your working and you may use the sketch to help.

t = ... and ..... **[5]**

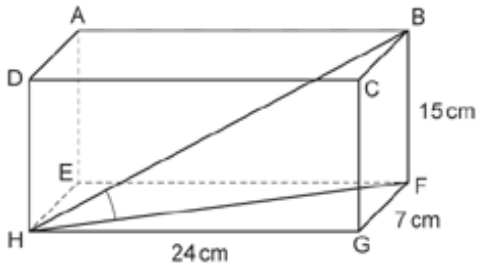
17. Work out the exact value of x in this triangle.



Not to scale

x = ... **[4]**

18. The diagram shows a cuboid ABCDEFGH.



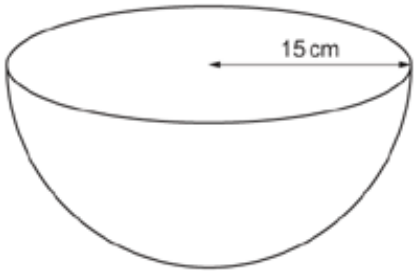
Not to scale

FB = 15 cm, GF = 7 cm and HG = 24 cm.

Calculate the angle BHF.
You must show your working.

Angle BHF = ... ° **[5]**

19. A bowl in the shape of a hemisphere with radius 15 cm is used to collect raindrops.



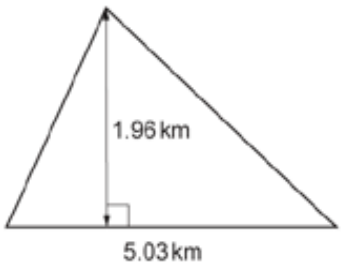
Assume each raindrop has the volume of a sphere of radius 3×10^{-4} cm.

Calculate how many raindrops it takes to completely fill the bowl.
Give your answer in standard form.
You must show your working.

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$]

..... **[6]**

20. A housing estate is built on a triangular piece of land.



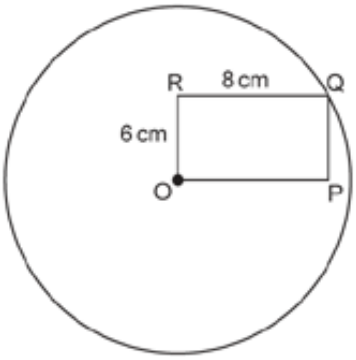
Not to scale

There are 3951 people living on the estate.

Work out an **estimate** of the population density of the estate in people per km^2.

..... people per km^2 **[4]**

21(a). The diagram shows a rectangle, OPQR, and a circle, centre O, which passes through Q. OR = 6 cm and RQ = 8 cm.

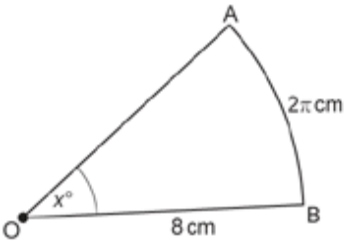


Not to scale

Find the circumference of the circle.
Give your answer in terms of π.

..... cm **[4]**

(b). AOB is a sector of a circle, centre O and radius 8 cm.
Angle AOB = $x°$.
The arc, AB, has length 2π cm.

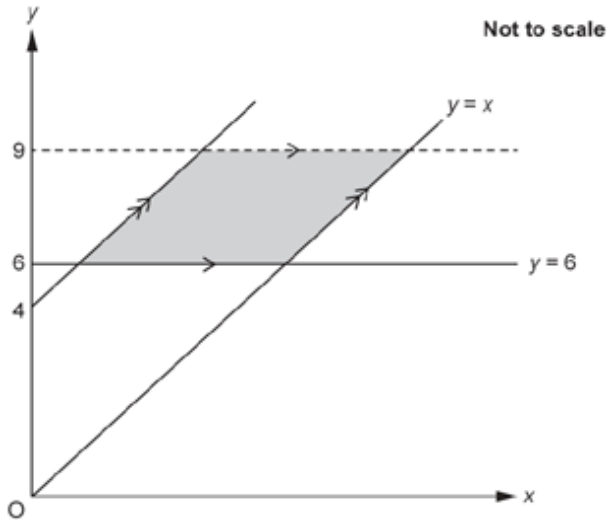


Not to scale

Find the area of the sector.
Give your answer in terms of π.

..... cm^2 **[4]**

22(a). In the diagram below, the shaded region is a parallelogram.
The parallelogram can be identified by four inequalities.
Two of the inequalities are $y \geq 6$ and $y \geq x$.



Write down the other **two** inequalities that identify the parallelogram.

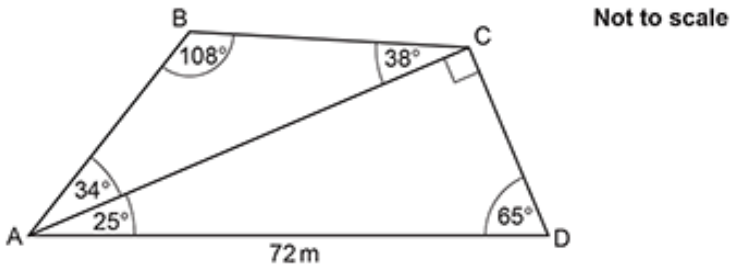
.....

_____ **[3]**

(b). Work out the area of the parallelogram.
You must show your working.

..... square units **[4]**

23. AC is a diagonal of the quadrilateral ABCD.



AD = 72 m.
Angle ABC = 108°, angle BCA = 38° and angle BAC = 34°.
Angle ACD = 90°, angle CDA = 65° and angle CAD = 25°.

Find the area of ABCD.
You must show your working.

..... m^2 **[6]**

24. A rock has a mass of 36 920 g and a volume of 14 200 cm^3.

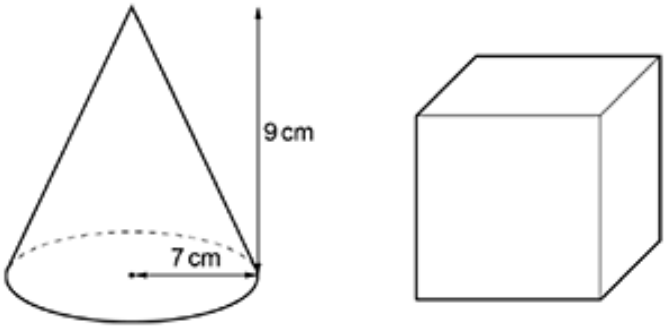
Work out the density of the rock.
Give the units of your answer.

.... **[3]**

25. A cylinder has a radius of 8.4 cm.
The ratio of the radius of the cylinder to the height of the cylinder is 2 : 5.
Find the volume of the cylinder.

..... cm^3 **[4]**

26. The diagram shows a cone and a cube.
The cone has radius 7 cm and height 9 cm.



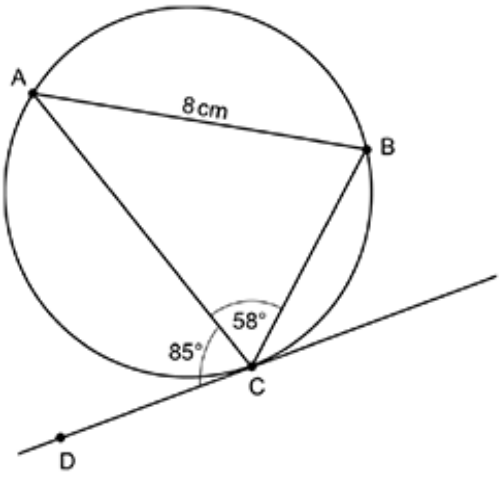
The volume of the cone is equal to the volume of the cube.

Work out the length of one side of the cube.

[The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm **[4]**

27. A, B and C are points on the circumference of a circle.



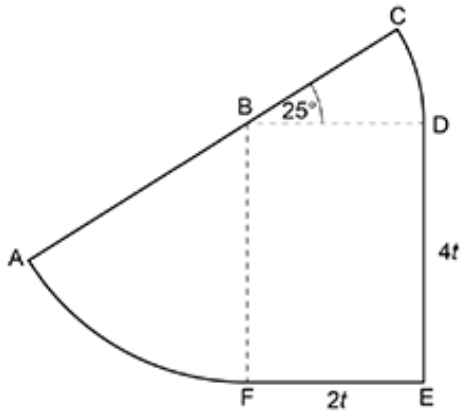
Not to scale

Points C and D lie on a tangent to the circle at C.
Angle ACD = 85°.
Angle ACB = 58°.
AB = 8 cm.

Find the length of AC.

..... cm **[4]**

28(a). This shape is formed from a rectangle and two sectors of circles.



Not to scale

Points A, B and C lie on a straight line.
Angle CBD = 25°.
DE = 4*t* and EF = 2*t*.

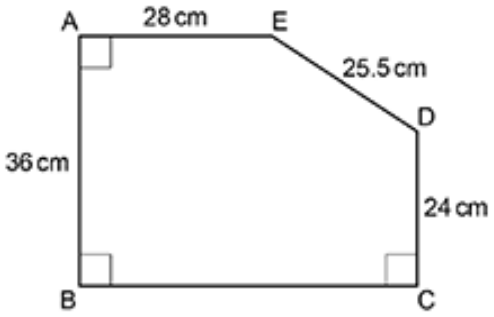
Explain why AB = 4*t*.
Give a reason for each step of your explanation.

---**[2]**

(b). Show that the perimeter of the shape is $\frac{31}{18}\pi t + 12t$.

[5]

29. The diagram shows a pentagon ABCDE.

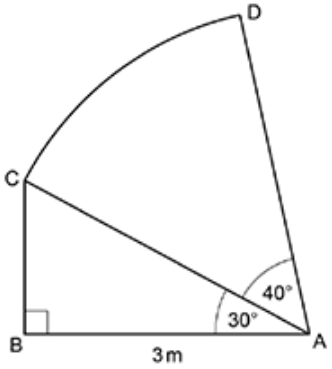


Not to scale

Find the area of the pentagon.
You must show your working.

..... cm^2 **[6]**

30(a). In the diagram,



Not to scale

- ABC is a right-angled triangle
- ACD is the sector of a circle with centre A.

Show that the area of the sector ACD is $\frac{4}{3}\pi m^2$.

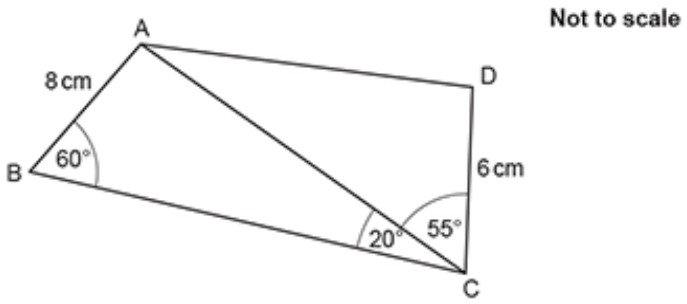
[6]

(b). Work out the total area of the shape ABCD.

Give your answer in the form $\left(\frac{a\sqrt{k}}{b}+\frac{4}{3}\pi\right)\text{m}^2$.

..... m^2 **[3]**

31. The diagram shows two triangles ABC and ADC.

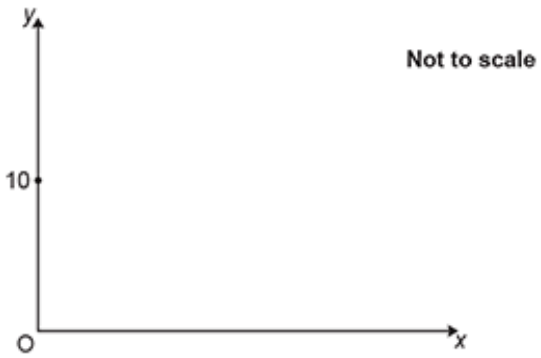


Angle ABC = 60°, angle ACB = 20° and angle ACD = 55°.
AB = 8cm and DC = 6cm.

Calculate length AD.
You must show your working.

AD = ... cm **[6]**

32. The sketch shows the coordinate axes and the point (0, 10).



The distance from the point (0, 10) to a point (12, *t*) is 12.5 units.

Work out the **two** possible values of *t*.
You must show your working and you may use the sketch to help.

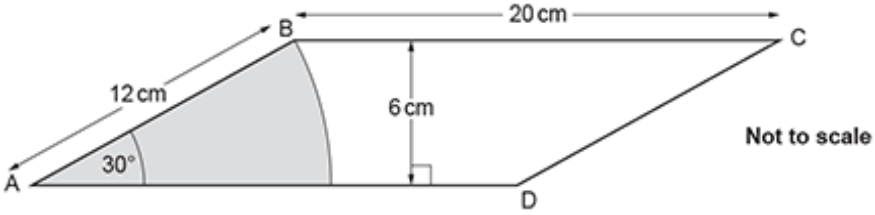
t = ... and ..... **[5]**

33. The density of some cement is 1.4 g/cm^3.
A lump of this cement has a volume of 700 cm^3.

Work out the mass of the lump of cement.

..... g **[2]**

34(a). The diagram shows a shaded sector inside a parallelogram.
The sector has an angle of 30°.
The parallelogram, ABCD, has length BC = 20cm and AB = 12cm.
The perpendicular distance between BC and AD is 6 cm.



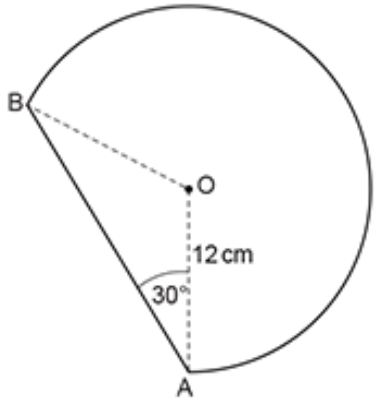
Show that the area of the sector is 37.7cm^2, correct to **3** significant figures.

[3]

(b). The shaded area is 37.7 cm^2. Work out the percentage of the parallelogram that is **not** shaded.

..... % **[4]**

35. The shape below is part of a circle, centre O and radius 12 cm.
Angle OAB = 30°.



Not to scale

Work out the perimeter of the shape.
Give your answer in its simplest terms in the form $a\sqrt{b} + k\pi$.
You must show your working.

..... **[7]**

36. A sphere has radius x cm.
A cone has radius R cm and height $2R$ cm.

The volume of the sphere is equal to the volume of the cone.

Write R in terms of x.

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.

The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

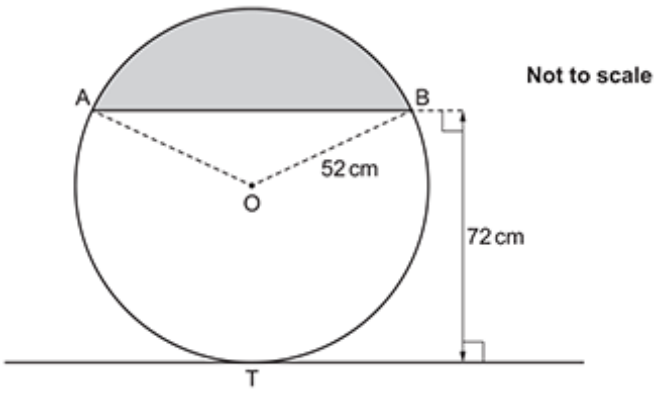
..... **[4]**

37. A bronze ornament has a volume of 198 cm^3.
The density of bronze is 8.9 g/cm^3.

By rounding each value correct to one significant figure, work out an estimate for the mass of the bronze ornament.

.....g **[3]**

38. The diagram shows a circle, centre O and radius 52 cm.



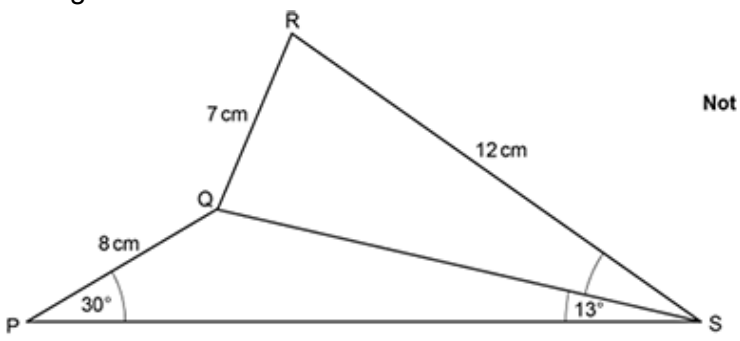
AB is a chord of the circle.
The line through T is a tangent to the circle.

The chord is parallel to the tangent.
The perpendicular distance between the chord and the tangent is 72 cm.

Calculate the area of the shaded segment.
You must show your working.

..... cm^2 **[6]**

39. PQS and QRS are triangles.



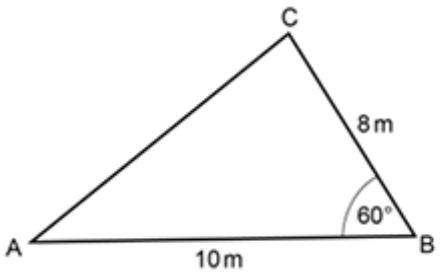
Not to scale

PQ = 8 cm, QR = 7 cm and RS = 12 cm.
Angle QPS = 30° and angle PSQ = 13°.

Calculate angle QSR.
Give your answer correct to **1** decimal place.
You must show your working.

…….…….…….. ° **[6]**

40. The diagram shows triangle ABC.

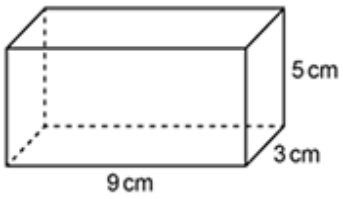


Not to scale

Find the area of the triangle.
Give your answer in the form $a\sqrt{b}$ where *a* and *b* are integers.

…….…….…….. m^2 **[3]**

41. Reece has a box in the shape of a cuboid.
The internal dimensions of the box are 9 cm by 3 cm by 5 cm.



Reece is given a crayon of length 11 cm.
Show that the crayon does not fit completely inside the box.

[4]

42. Blake goes on a journey.

She travels by taxi for $\frac{2}{9}$ of the journey.

She travels by train for $\frac{7}{10}$ of the journey.

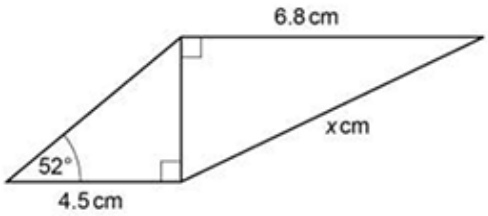
She walks for the remaining 700 m of the journey.

Find the length of this journey in kilometres.
You must show your working.

…….…… km **[6]**

43. The diagram shows two right-angled triangles that are joined together.

All measurements are given accurate to 2 significant figures.

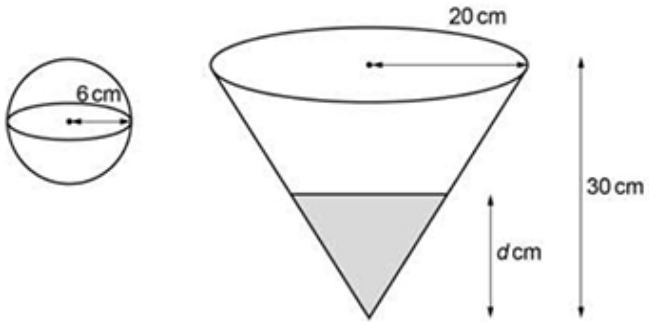


Not to scale

Work out the value of x.
Give your answer correct to an appropriate degree of accuracy.
You must show your working.

x = ... **[6]**

44. The diagram shows a sphere and a cone.



Not to scale

The sphere has radius 6 cm.
The cone has radius 20 cm and height 30 cm.

The sphere is completely filled with water.
The same amount of water is poured into the cone.

Work out the depth, *d* cm, of the water in the cone.
You must show your working.

[The volume *V* of a sphere with radius *r* is $V = \frac{4}{3}\pi r^3$.

The volume *V* of a cone with radius *r* and height *h* is $V = \frac{1}{3}\pi r^2 h$.]

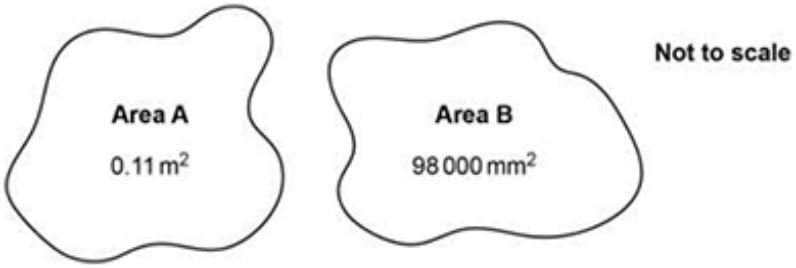
d = ... **[6]**

45(a). A solid block of wood is a cuboid which measures 2 cm by 5 cm by 7 cm.
Its density is 0.56 g/cm^3.

Work out the mass of the block of wood.

..... g **[2]**

(b). Here are two areas.

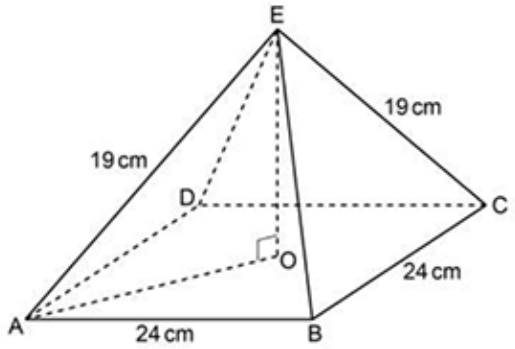


State which area is greater.
Show how you decide.

Area _____ is greater because _____

_____ **[2]**

46. The diagram shows a square-based pyramid ABCDE.
O is the centre of the base.



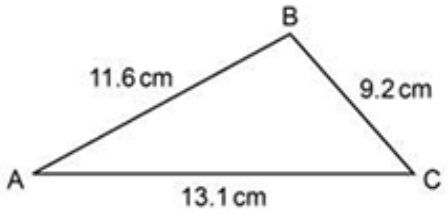
The pyramid has base length 24 cm and each sloping edge has length 19 cm.

Calculate the volume of the pyramid.
You must show your working.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height]

…….…….…… cm^3 **[5]**

47(a). The diagram shows triangle ABC.



Not to scale

AB = 11.6 cm, BC = 9.2 cm and AC = 13.1 cm.

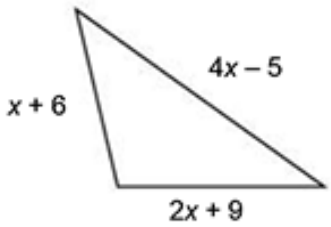
Show that angle BAC = 43.2°, correct to **1** decimal place.

[3]

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

..... cm^2 **[2]**

48(a). The sides of this triangle are given in centimetres.
The perimeter of the triangle is 80 cm.



Not to scale

Find the length of each side of the triangle.
You must show your working.

…….. cm, …….. cm and …….. cm **[5]**

(b). Is the triangle above a right-angled triangle?
Use calculations to show how you decide.

_____ because _____

_____

_____ **[3]**

49. A block made of copper is in the shape of a cuboid.
The block is 4.8 cm by 2.1 cm by 3.2 cm.
The density of copper is 8.89 g / cm^3.
Azmi thinks that the mass of the block is about 2.7 kg.

Use estimation to decide if Azmi's answer is reasonable.
Show how you decide.

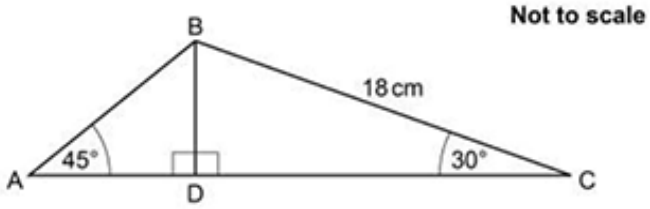
Azmi's answer is _____ because _____

_____

_____

_____ **[5]**

50(a). The diagram shows a triangle, ABC, with perpendicular height BD.



BC = 18 cm, angle BCD = 30° and angle BAD = 45°.

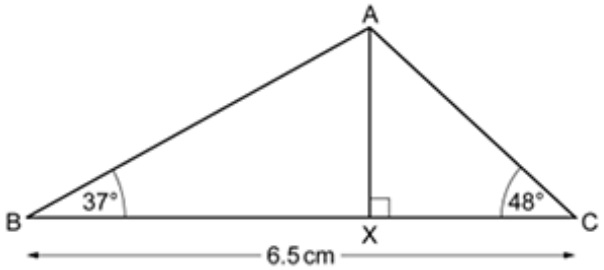
Work out the length of BD.

…….. cm **[3]**

(b). Work out the exact length of AB.
Give your answer in its simplest form.

…….…….. cm **[3]**

51. The diagram shows triangle ABC.
X lies on BC such that angle AXC = 90°.



Not to scale

BC = 6.5 cm, angle ABC = 37° and angle ACB = 48°.

Work out length AX.
You must show your working.

..... cm **[6]**

52. The circumference of a circle is 32 cm.

Show that the area of the circle is 81.5 cm^2, correct to **3** significant figures.

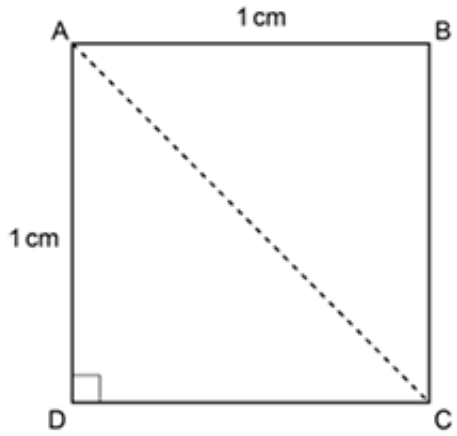
[4]

53. Light from the Sun travels 1 kilometre in 3.3×10^{-6} seconds.
The distance from the Sun to the planet Saturn is 1.5×10^{9} kilometres.

How long does it take light to travel from the Sun to Saturn?
Give your answer in minutes and seconds.

..... minutes ..... seconds **[4]**

54. ABCD is a square of side length 1 cm.
AC is the diagonal of the square.

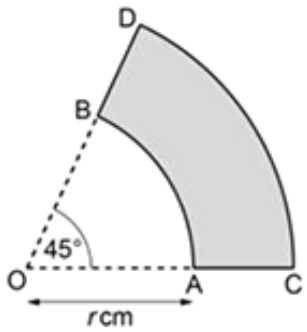


Not to scale

Using this diagram, show that $\cos 45° = \frac{1}{\sqrt{2}}$

[4]

55. The diagram shows a shaded shape made by removing sector OAB from sector OCD.
Both sectors have an angle of 45°.
The radius, OA, of the smaller sector is *r* cm.
The ratio of radius OA to radius OC is 3 : 4.



Not to scale

Work out, in terms of π and *r*, the **total** length of arc AB and arc CD.
Give your answer in its simplest form.
You must show your working.

…….…….. cm **[5]**

56. The scale diagram below shows the position of two ships, R and S.

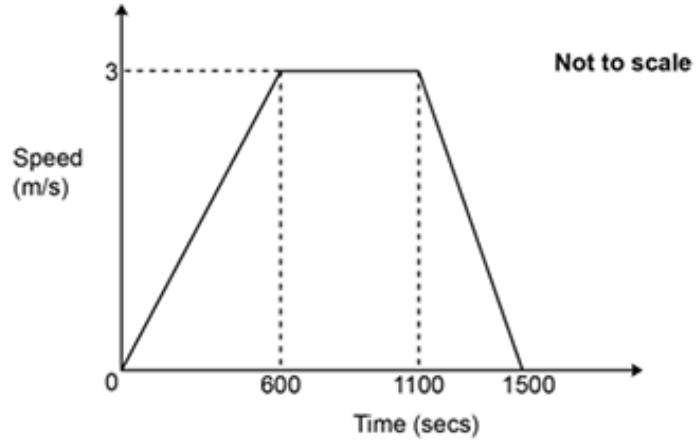
Scale: 1 cm represents 5 km

The bearing of a lighthouse from ship R is 078°.
The bearing of the lighthouse from ship S is 114°.

Use construction to find the distance from ship R to the lighthouse.
Give your answer to the nearest 0.1 km.

…….…….…… km **[4]**

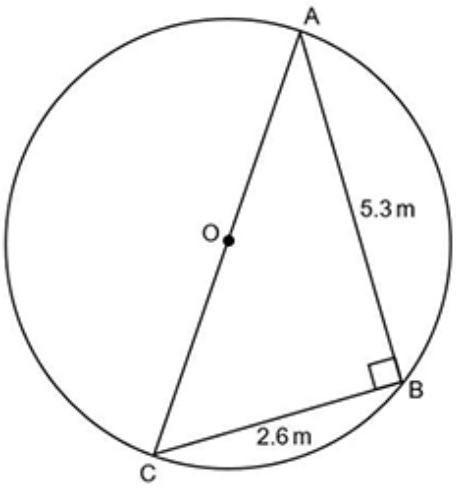
57. Harper goes for a training run.
The graph shows their speed as they run.



Work out Harper's average speed, in m/s, during the 1500 seconds.
You must show your working.

…….…….…… m/s **[5]**

58. Points A, B and C lie on the circumference of a circle, centre O.



Angle ABC = 90°, AB = 5.3 m and BC = 2.6 m.

Work out the circumference of the circle.
You must show your working.

…….…….. m **[5]**

59(a). Train A travels 180 km at a constant speed of 75 km/h.
Train B travels 180 km at a constant speed of 72 km/h.

How many more minutes does train B take to travel 180 km than train A?

..... minutes **[4]**

(b). Train C has a speed of x metres per second.

Write an algebraic expression for train C's speed in kilometres per hour.

..... km/h **[2]**

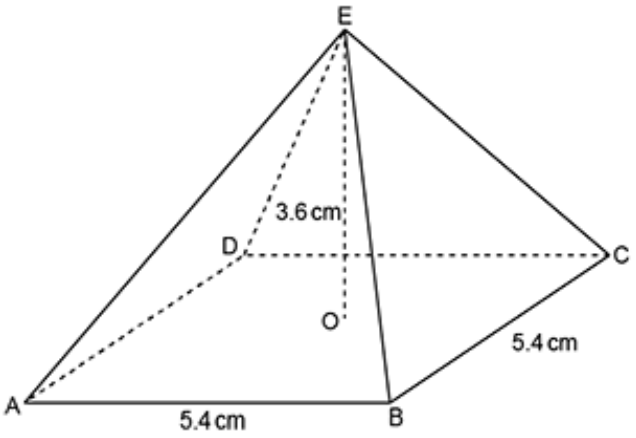
60. A solid metal sphere has mass 240 g.
The density of the metal is 8.66 g/cm^3.

Show that the surface area of this sphere is 44.3 cm^2, correct to **3** significant figures.
You must show your working.

[For a sphere with radius r : $\text{Volume} = \frac{4}{3}\pi r^3$ Surface area = $4\pi r^2$.]

[6]

61. The diagram shows a pyramid ABCDE.



Not to scale

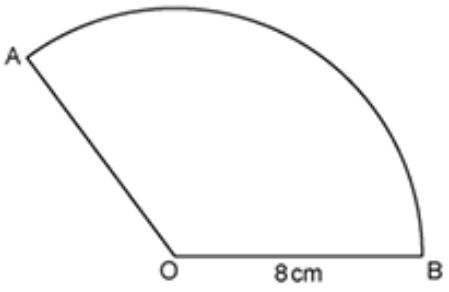
The pyramid has a square horizontal base ABCD with side 5.4 cm.

The vertex E is vertically above the centre O of the base.
The height OE of the pyramid is 3.6 cm.

Calculate the surface area of the pyramid.
You must show your working.

..... cm^2 **[5]**

62. AOB is a sector of a circle, centre O and radius 8 cm.



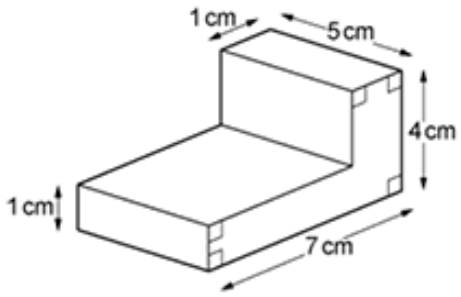
Not to scale

The area of the sector is 24π cm^2.

Work out the perimeter of the sector.
Give your answer in the form $a + b\pi$, where a and b are integers.
You must show your working.

…….…….…….. cm **[6]**

63. Work out the volume of this prism.

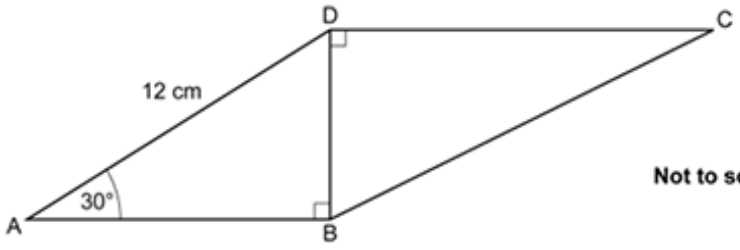


Not to scale

…….…….…….. cm^3 **[4]**

64. The diagram shows a quadrilateral ABCD.

AD = 12 cm, angle BAD = 30° and angle ABD = angle BDC = 90°.



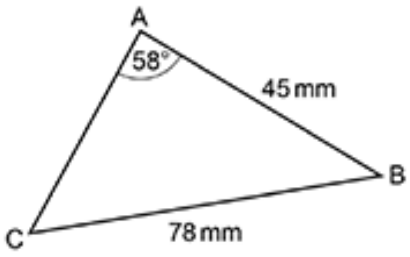
Not to scale

The ratio of length DC to length DB is $\frac{4}{3}$: 1.

Work out length BC.
You must show your working.

…….…….…….. cm **[7]**

65. The diagram shows triangle ABC.



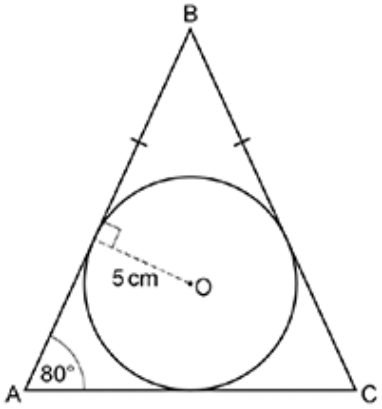
Not to scale

AB = 45 mm, BC = 78 mm and angle BAC = 58°.

Calculate length AC.
You must show your working.

…….…….…….. mm **[6]**

66. ABC is an isosceles triangle.
The sides of the triangle ABC are all tangents to a circle of radius 5 cm, centre O.



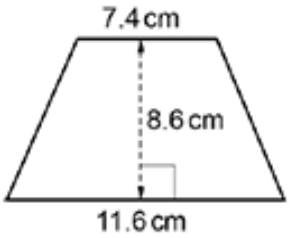
Not to scale

Angle BAC = 80° and BA = BC.

Show that length BO is 28.79 cm, correct to 2 decimal places.

[4]

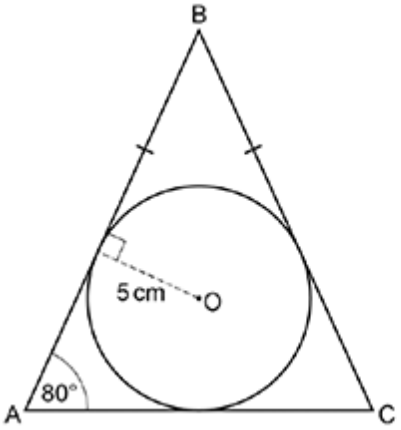
67. Calculate the area of this trapezium.



Not to scale

…….…….…… cm^2 **[2]**

68. ABC is an isosceles triangle.
The sides of the triangle ABC are all tangents to a circle of radius 5 cm, centre O.



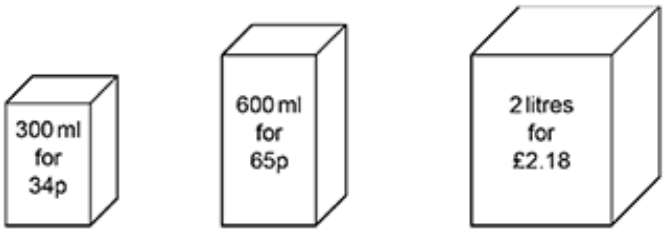
Not to scale

Angle BAC = 80° and BA = BC.

Length BO is 28.79 cm. Find the area of triangle ABC.
You must show your working.

…….…….…….. cm^2 **[5]**

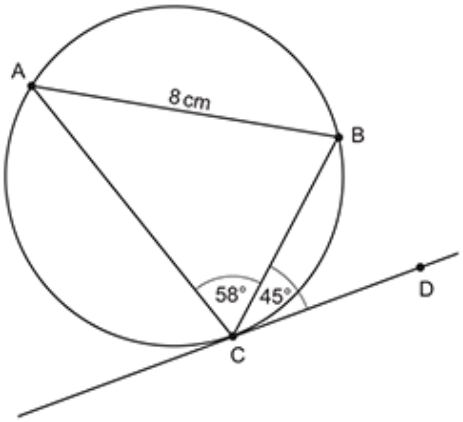
69. A shop sells the same milk in three different sized cartons.
The diagram shows the price of each carton.



Which carton is the best value for money?
Show how you decide.

_____ **[3]**

70. A, B and C are points on the circumference of a circle.



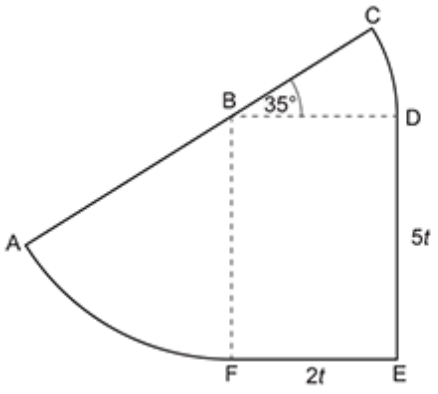
Not to scale

Points C and D lie on a tangent to the circle at C.
Angle BCD = 45°.
Angle ACB = 58°.
AB = 8cm.

Find the length of BC.

..... cm **[4]**

71(a). This shape is formed from a rectangle and two sectors of circles.



Not to scale

Points A, B and C lie on a straight line.
Angle CBD = 35°.
DE = 5*t* and EF = 2*t*.

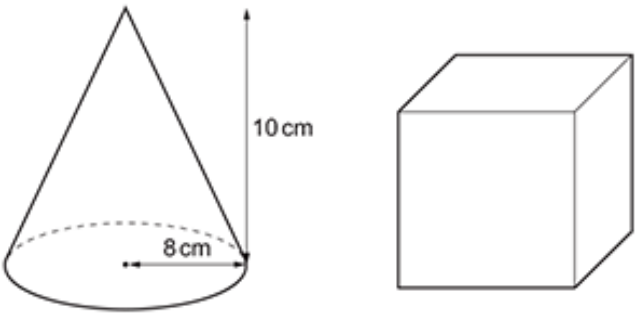
Explain why BC = 2*t*.
Give a reason for each step of your explanation.

[2]

(b). Show that the perimeter of the shape is $\frac{23}{12}\pi t + 14t$.

[5]

72. The diagram shows a cone and a cube.
The cone has radius 8 cm and height 10 cm.



The volume of the cone is equal to the volume of the cube.

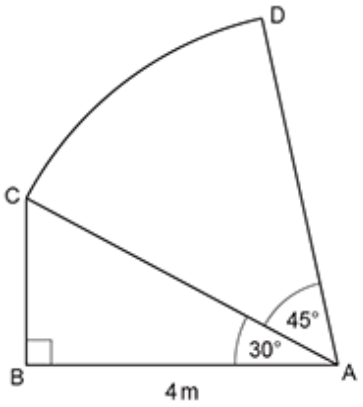
Work out the length of one side of the cube.

[The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm **[4]**

73(a). In the diagram,

- ABC is a right-angled triangle
- ACD is the sector of a circle with centre A.



Not to scale

Show that the area of the sector ACD is $\frac{8}{3}\pi\,\text{m}^2$.

[6]

(b). Work out the total area of the shape ABCD.

Give your answer in the form $\left(\frac{a\sqrt{k}}{b}+\frac{8}{3}\pi\right)\text{m}^2$.

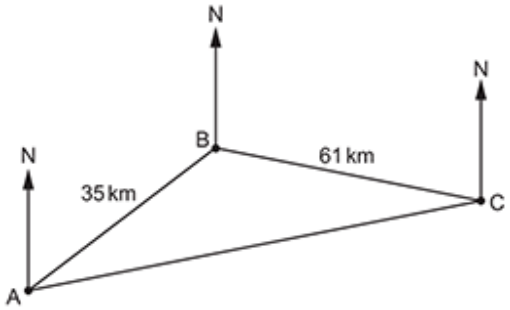
..... m^2 **[3]**

74. The density of some concrete is 2.4 g/cm^3.
A lump of this concrete has a volume of 400 cm^3.

Work out the mass of the lump of concrete.

..... g **[2]**

75. The diagram shows the positions of three towns A, B and C.



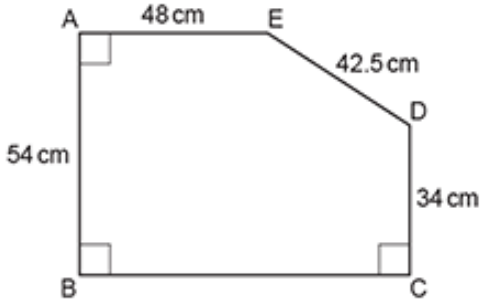
Not to scale

The bearing of town B from town A is 053°.
The bearing of town C from town B is 108°.
AB = 35 km and BC = 61 km.

Calculate AC.
You must show your working.

AC = ... km **[5]**

76. The diagram shows a pentagon ABCDE.

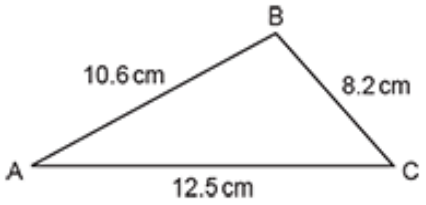


Not to scale

Find the area of the pentagon.
You must show your working.

..... cm^2 **[6]**

77(a). The diagram shows triangle ABC.



Not to scale

AB = 10.6 cm, BC = 8.2 cm and AC = 12.5 cm.

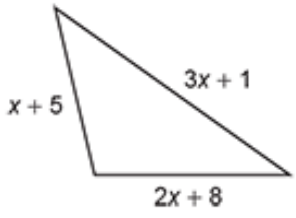
Show that angle BAC = 40.5°, correct to **1** decimal place.

[3]

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

..... cm^2 **[2]**

78(a). The sides of this triangle are given in centimetres.
The perimeter of the triangle is 80 cm.



Not to scale

Find the length of each side of the triangle.

You must show your working.

..... cm, ... cm and ..... cm **[5]**

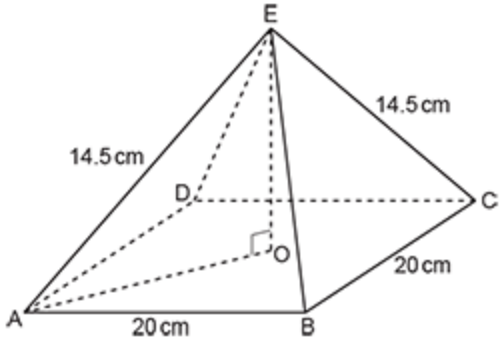
(b). Is the triangle above a right-angled triangle?
Use calculations to show how you decide.

_____ because _____

_____

_____ **[3]**

79. The diagram shows a square-based pyramid ABCDE.
O is the centre of the base.



The pyramid has base length 20 cm and each sloping edge has length 14.5 cm.

Calculate the volume of the pyramid.
You must show your working.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height]

..... cm^3 **[5]**

80. A block made of iron is in the shape of a cuboid.
The block is 3.1 cm by 4.9 cm by 2.2 cm.
The density of iron is 7.87 g / cm^3.
Sam thinks that the mass of the block is about 2.4 kg.

Use estimation to decide if Sam's answer is reasonable.
Show how you decide.

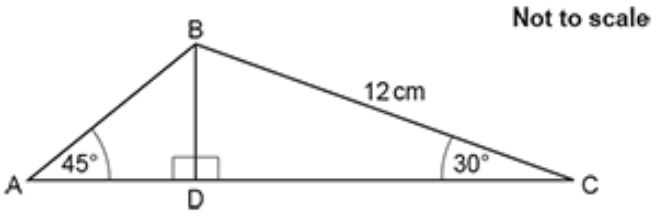
Sam's answer is _____ because _____

_____

_____

[5]

81(a). The diagram shows a triangle, ABC, with perpendicular height BD.



BC = 12 cm, angle BCD = 30° and angle BAD = 45°.

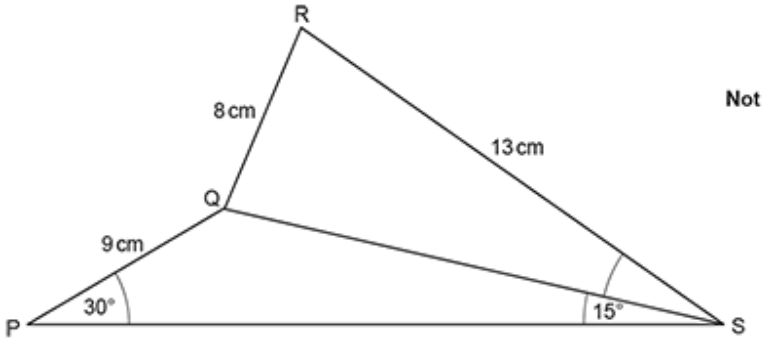
Work out the length of BD.

..... cm **[3]**

(b). Work out the exact length of AB.
Give your answer in its simplest form.

..... cm **[3]**

82. PQS and QRS are triangles.

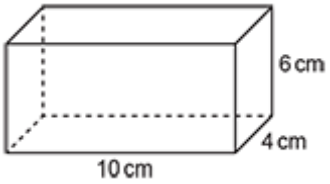


PQ = 9 cm, QR = 8 cm and RS = 13 cm.
Angle QPS = 30° and angle PSQ = 15°.

Calculate angle QSR.
Give your answer correct to **1** decimal place.
You must show your working.

..... ° **[6]**

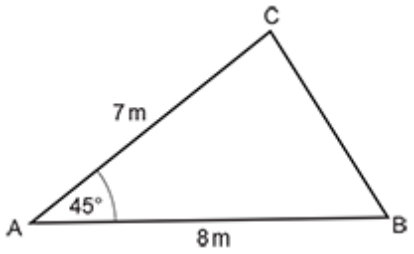
83. Kai has a box in the shape of a cuboid.
The internal dimensions of the box are 10 cm by 4 cm by 6 cm.



Kai is given a pencil of length 13 cm.
Show that the pencil does not fit completely inside the box.

[4]

84. The diagram shows triangle ABC.



Find the area of the triangle.

Give your answer in the form $a\sqrt{b}$ where *a* and *b* are integers.

..... m^2 **[3]**

85. Ashley goes on a journey.

She travels by taxi for $\frac{1}{8}$ of the journey.

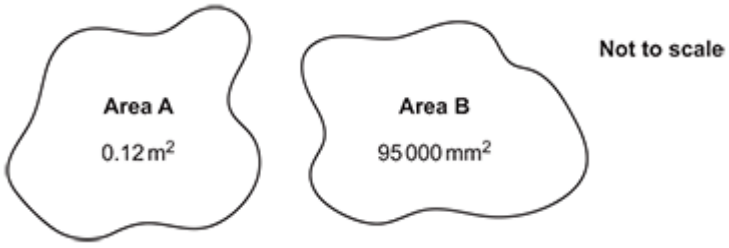
She travels by train for $\frac{4}{5}$ of the journey.

She walks for the remaining 900 m of the journey.

Find the length of this journey in kilometres.
You must show your working.

..... km **[6]**

86(a). Here are two areas.



State which area is greater.
Show how you decide.

Area _____ is greater because _____

_____ **[2]**

(b).

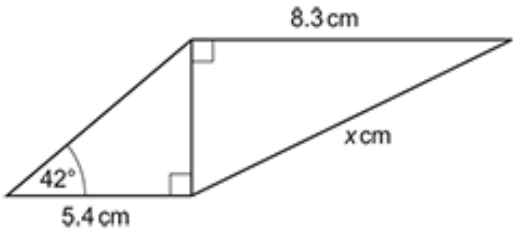
A solid block of wood is a cuboid which measures 3 cm by 4 cm by 5 cm.
Its density is 0.65 g/cm^3.

Work out the mass of the block of wood.

..... g **[2]**

87. The diagram shows two right-angled triangles that are joined together.

All measurements are given accurate to 2 significant figures.

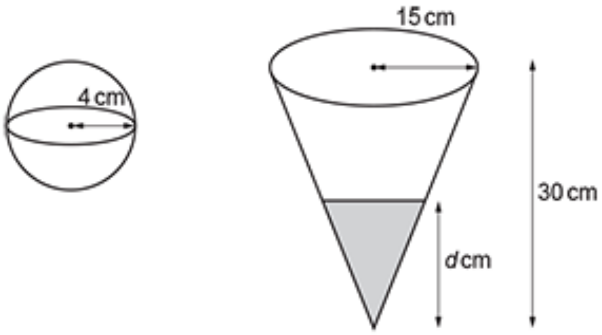


Not to scale

Work out the value of x.
Give your answer correct to an appropriate degree of accuracy.
You must show your working.

x = ... **[6]**

88. The diagram shows a sphere and a cone.



Not to scale

The sphere has radius 4 cm.
The cone has radius 15 cm and height 30 cm.

The sphere is completely filled with water.
The same amount of water is poured into the cone.

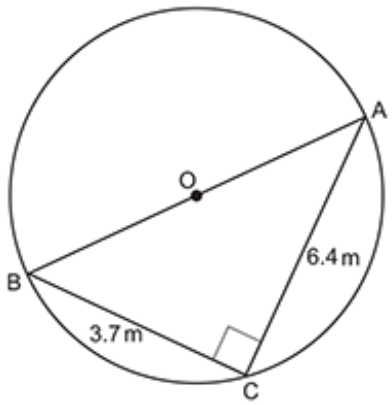
Work out the depth, *d* cm, of the water in the cone.
You must show your working.

[The volume *V* of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.

The volume *V* of a cone with radius *r* and height *h* is $V = \frac{1}{3}\pi r^2 h$.]

d = ... **[6]**

89. Points A, B and C lie on the circumference of a circle, centre O.



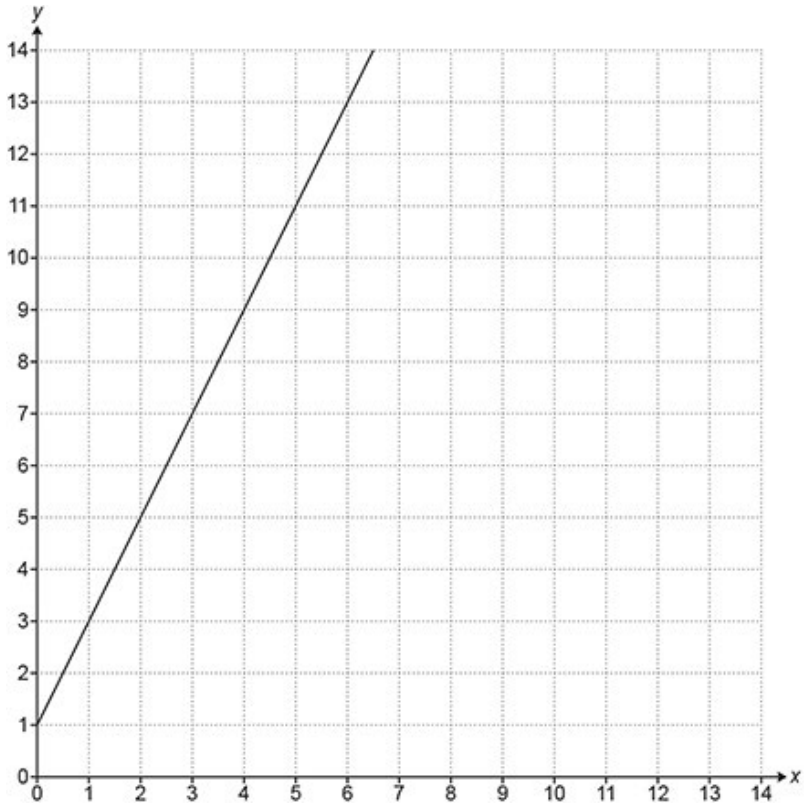
Not to scale

Angle ACB = 90°, AC = 6.4 m and BC = 3.7 m.

Work out the circumference of the circle.
You must show your working.

..... m **[5]**

90. The graph of $y = 2x + 1$ is drawn on this one centimetre grid.



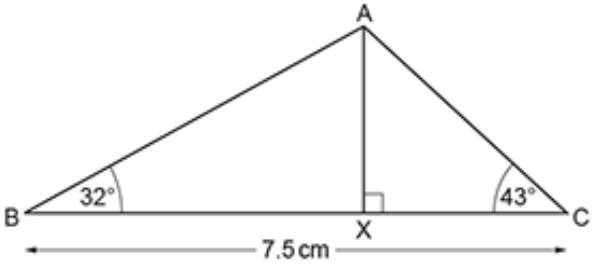
The region **R** satisfies these inequalities.

$y \leq 2x + 1$
$y \geq 5$
$x + y \leq 13$

Show that the area of region **R** is 12 cm^2.

[6]

91. The diagram shows triangle ABC.
X lies on BC such that angle AXC = 90°.



Not to scale

BC = 7.5 cm, angle ABC = 32° and angle ACB = 43°.

Work out length AX.
You must show your working.

..... cm **[6]**

92. The circumference of a circle is 23 cm.

Show that the area of the circle is 42.1 cm^2, correct to **3** significant figures.

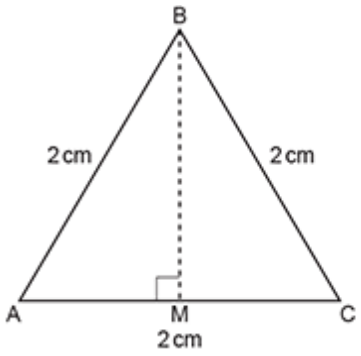
[4]

93. Light from the Sun travels 1 kilometre in 3.3×10^{-6} seconds.
The distance from the Sun to the Earth is 1.5×10^{8} kilometres.

How long does it take light to travel from the Sun to the Earth?
Give your answer in minutes and seconds.

.....minutes ..... seconds **[4]**

94. ABC is an equilateral triangle of side length 2 cm.
M is the midpoint of AC.

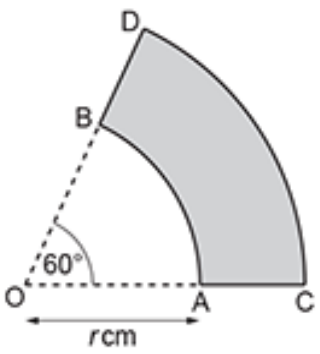


Not to scale

Using this diagram, show that $\tan 30° = \frac{1}{\sqrt{3}}$.

[4]

95. The diagram shows a shaded shape made by removing sector OAB from sector OCD.
Both sectors have an angle of 60°.
The radius, OA, of the smaller sector is *r* cm.
The ratio of radius OA to radius OC is 2 : 3.



Not to scale

Work out, in terms of π and *r*, the **total** length of arc AB and arc CD.
Give your answer in its simplest form.
You must show your working.

..... cm **[5]**

96. Work out the athlete's average speed, in m/s, during the 1200 seconds.
You must show your working.

..... m/s **[5]**

97. The scale diagram below shows the position of two castles, J and K.

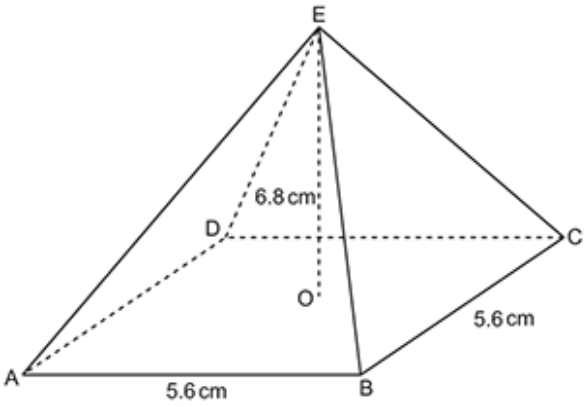
Scale: 1 cm represents 2 km

The bearing of a tower from castle J is 072°.
The bearing of the tower from castle K is 116°.

Use construction to find the distance from castle J to the tower.
Give your answer to the nearest 0.1 km.

..... km **[4]**

98. The diagram shows a pyramid ABCDE.



Not to scale

The pyramid has a square horizontal base ABCD with side 5.6 cm.

The vertex E is vertically above the centre O of the base.
The height OE of the pyramid is 6.8 cm.

Calculate the surface area of the pyramid.
You must show your working.

..... cm^2 **[5]**

99(a). Train A travels 120 km at a constant speed of 80 km/h.
Train B travels 120 km at a constant speed of 50 km/h.

How many more minutes does train B take to travel 120 km than train A?

..... minutes **[4]**

(b). Train C has a speed of *x* km/h.

Write an algebraic expression for train C's speed in metres per second.

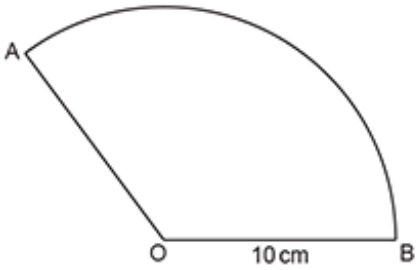
..... m/s **[2]**

100. A solid metal sphere has mass 235 g.
The density of the metal is 7.78 g/cm^3.

Show that the surface area of this sphere is 46.9 cm^2, correct to 3 significant figures.
You must show your working.

[For a sphere with radius *r* : $\text{Volume} = \frac{4}{3}\pi r^3$ Surface area = $4\pi r^2$. **[6]**

101. AOB is a sector of a circle, centre O and radius 10 cm.



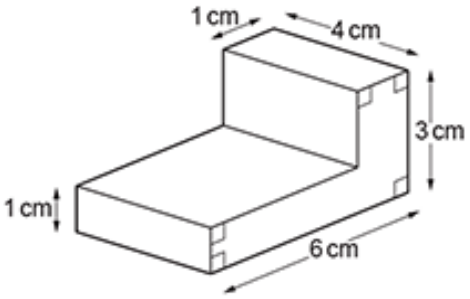
Not to scale

The area of the sector is 40π cm^2.

Work out the perimeter of the sector.
Give your answer in the form $a + b\pi$, where a and b are integers.
You must show your working.

..... cm **[6]**

102. Work out the volume of this prism.



Not to scale

..... cm^3 **[4]**

103. Force is measured in newtons (N).
A force of 198.5 N is applied to a rectangular surface of length 4.9 cm and width 4.1 cm.

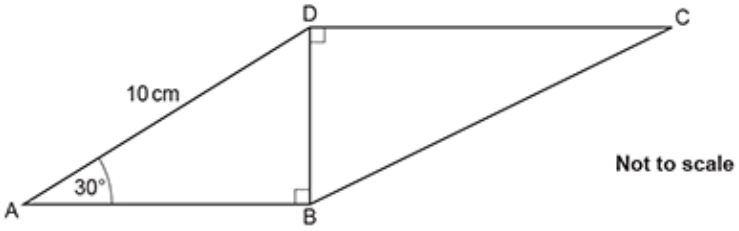
Work out an **estimate** of the pressure, in N / cm^2, applied to this rectangular surface.

[The formula for pressure is: Pressure $= \frac{\text{Force}}{\text{Area}}$]

..... N / cm^2 **[4]**

104. The diagram shows a quadrilateral ABCD.

AD = 10 cm, angle BAD = 30° and angle ABD = angle BDC = 90°.

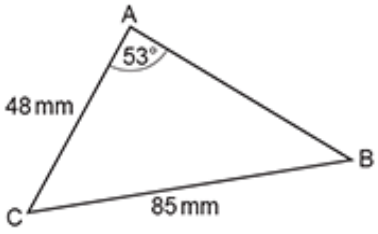


The ratio of length BD to length DC is 1 : 2.4 .

Work out length BC.
You must show your working.

..... cm **[7]**

105. The diagram shows triangle ABC.



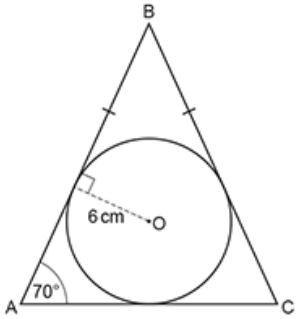
Not to scale

AC = 48 mm, BC = 85 mm and angle BAC = 53°.

Calculate length AB.
You must show your working.

..... mm **[6]**

106(a). ABC is an isosceles triangle.
The sides of the triangle ABC are all tangents to a circle of radius 6 cm, centre O.



Not to scale

Angle BAC = 70° and BA = BC.

Show that length BO is 17.54 cm, correct to **2** decimal places.

[4]

(b). Find the area of triangle ABC.
You must show your working.

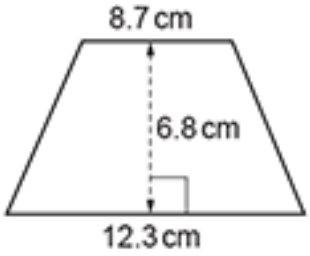
..... cm^2 **[5]**

107. A shop sells the same milk in three different sized cartons.
The diagram shows the price of each carton.

Which carton is the best value for money?
Show how you decide.

[3]

108. Calculate the area of this trapezium.



Not to scale

..... cm^2 **[2]**

END OF QUESTION PAPER