Revision F4 (Topics 11-18) [56]

Surface area

Sphere $= 4\pi r^2$ where r is the radius

Cone $= \pi r^2 + \pi rl$ where l is the ***slant*** height and r is the base radius

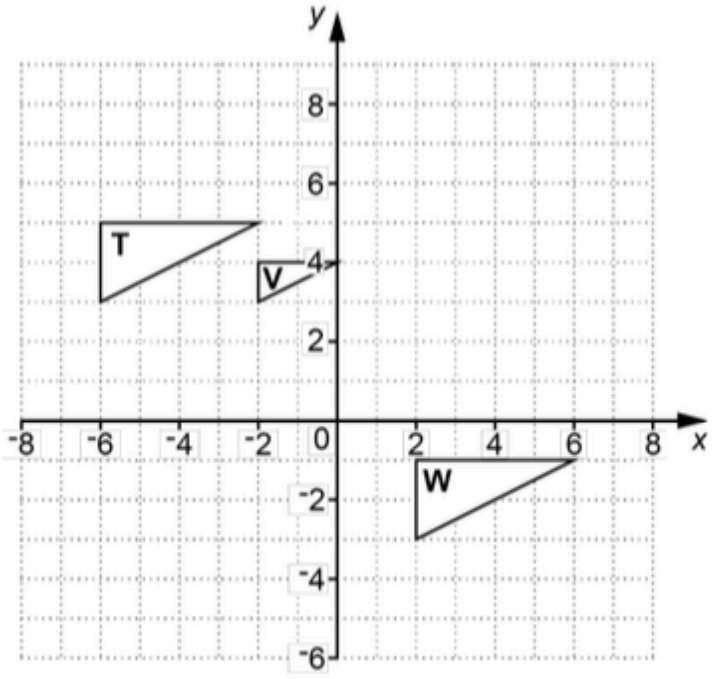
Volume

Sphere $= \frac{4}{3}\pi r^3$ where r is the radius

Cone $= \frac{1}{3}\pi r^2 h$ where h is the ***perpendicular*** height and r is the base radius

1. **Non-calculator**

Three triangles are drawn on a coordinate grid.



(a) (i) Draw the image of triangle **T** after a reflection in the line $y = 0$.

[2]

(ii) Draw the image of triangle **T** after a rotation 90° clockwise about (0, 0).

[2]

(b) (i) Describe fully the **single** transformation that maps triangle **T** onto triangle **W**.

(ii) Describe fully the **single** transformation that maps triangle **T** onto triangle **V**.

(c) Heather says

> Any transformation always produces a shape that is congruent to the original shape.

Is her statement correct? Explain your reasoning.

(Total 8 marks)

2.

(a) List the integer values of x such that $5 \leq 3x < 18$

(3)

(b) Solve the equation $\frac{20}{y} = 4$

(2)

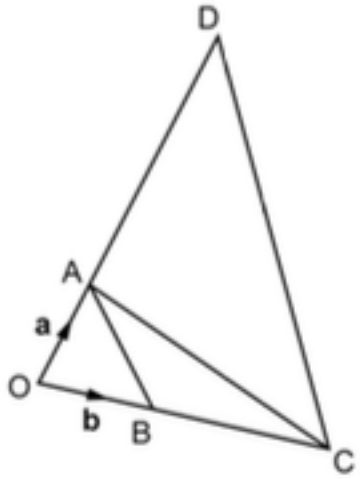
(c) Sove the equation $z^2 - 9z + 8 = 0$

(3)

(Total 8 marks)

3.

In the diagram, A is a point on OD and B is a point on OC.



Not to scale

$\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**.

OA = $\frac{1}{4}$ OD and OB = $\frac{1}{3}$ OC.

(a) Find $\overrightarrow{CD}$.
Give your answer in its simplest form in terms of **a** and **b**.

(b) E is the point such that $\overrightarrow{AE}$ = 3**b** + 2**a**.

Show that ACED is a parallelogram.

(Total 7 marks)

4.

(a) Factorise $m^2 - 49$

(1)

(b) Solve these simultaneous equations

$$5x + 3y = 6$$
$$3x - 7y = 19$$

You **must** show your working. Do **not** use trial and improvement.

(4)

(Total 5 marks)

5.

There are 11 sweets in a bag.
Four are soft-centred and seven are hard-centred.
Two sweets are selected at random.

Calculate the probability that

(a) both sweets are hard-centred,

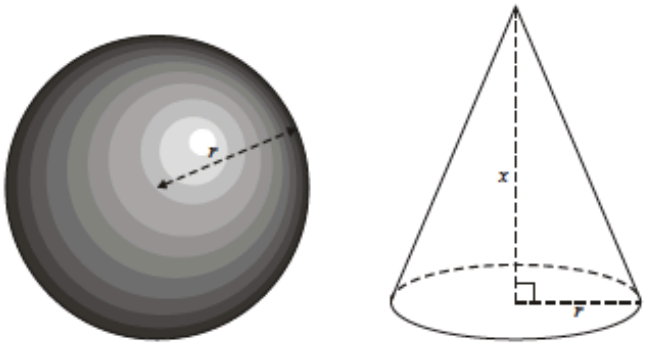
(2)

(b) one sweet is soft-centred and one sweet is hard-centred.

(3)
(Total 5 marks)

6.

A sphere has radius r.
A cone has base radius r and perpendicular height x.
The volume of the sphere is double the volume of the cone. Not drawn accurately



(a) Show that $x = 2r$

(2)

(b) Calculate the ratio of the surface area of the sphere to the curved surface area of the cone.
Give your answer in surd form.

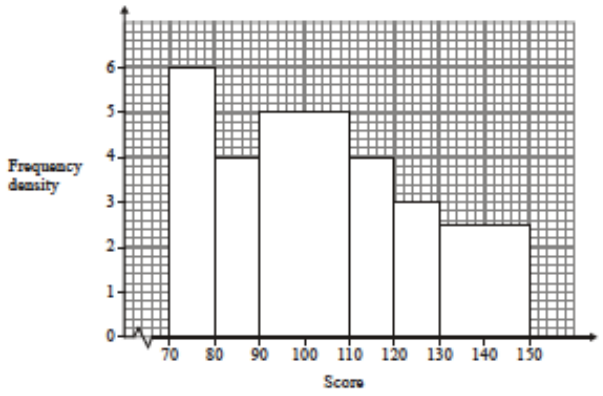
(4)
(Total 6 marks)

7. Work out the formula for the n-th term of the sequence: 2, 10, 24, 44, …

(Total 4 marks)

8.

The histogram shows the test scores of 320 children in a school.

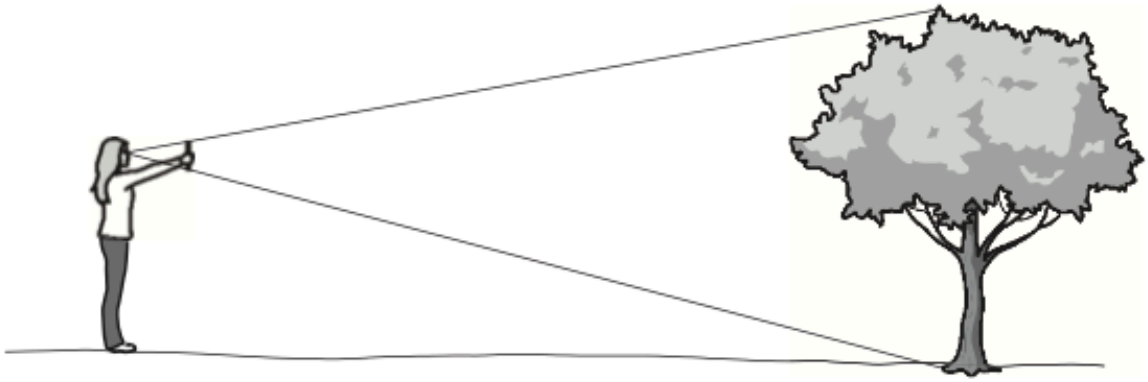


(a) Find the median score. **(2)**

(b) Find the interquartile range of the scores. **(2)**
(Total 4 marks)

9.

(a) Anna estimates the height of a tree.



Anna holds a ruler vertically so the height of the tree is exactly covered by the ruler.
She is 20 metres from the tree.
The ruler is 30 cm long.
The horizontal distance from her eyes to the ruler is 60 cm.

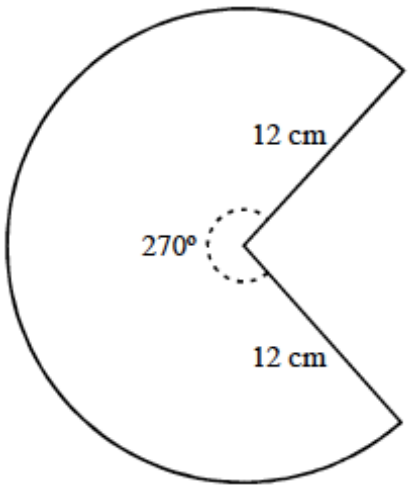
Calculate an estimate of the height of the tree.

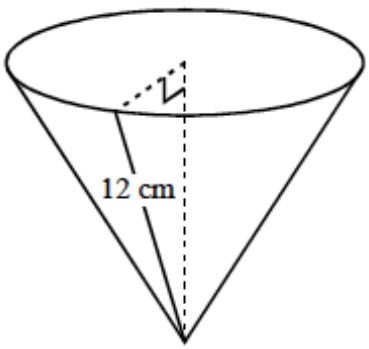
(b) Give two reasons why this method may not be suitable to estimate the height of a very tall building.

(Total 5 marks)

10.

A firm makes cone shaped containers out of card.
The card is in the shape of a sector of a circle of radius 12 cm.
The angle of the sector is 270°.
The straight edges are brought together to make the cone.





(a) Find the arc length of the card used to make the cone.
Give your answer in terms of π.

(2)

(b) Calculate the radius of the base of the cone.

(2)
(Total 4 marks)