

Daily Practice 16.3.2018

Q1. Multiply out and simplify $(3x - 2)(x^2 - 7x + 3)$

$$3x^3 - 21x^2 + 9x - 14x^2 + 14x - 6$$

Q2. Factorise fully $3x^2 - 75$

$$3(x^2 - 25)$$

$$3(x-5)(x+5)$$

$$3x^3 - 21x^2 + 9x - 2x^2 + 14x - 6$$

Q3. Write as a single fraction $\frac{3}{a} \div \frac{2a^2}{b}$

$$\frac{3}{a} \times \frac{b}{2a^2} = \frac{3b}{2a^3}$$

Q4. Calculate the area of an eighth of a circle with diameter 14cm

$$\frac{\pi r^2}{8} = \frac{\pi \times 7^2}{8} = 19.2 \text{ cm}^2 \text{ (1.d.p.)}$$

Daily Practice 19.3.2018

Q1. Multiply out and simplify $(2x + 3)(x^2 + 7x + 4)$

$$2x^3 + 14x^2 + 8x + 3x^2 + 21x + 12$$

$$2x^3 + 17x^2 + 29x + 12$$

Q2. Simplify $x^2(x^{-5} + 2x^{-3})$

$$= x^{-3} + 2x^{-1}$$

$$= \frac{1}{x^3} + \frac{2}{x}$$

Q3. Find the value of a house that was purchased for £165 000 and depreciated in value by 3% in its first year and appreciated in value by 4.5% in its second

$$165000 \times 0.97 = 160050$$

$$160050 \times 1.045 = 167252.25$$

Q4. $2\frac{1}{3} - \frac{3}{4} = \frac{7}{3} - \frac{3}{4}$

$$\frac{28}{12} - \frac{9}{12} = \frac{19}{12} = 1\frac{7}{12}$$

Q5. Factorise $x^2 + 4x - 12$

$$(x-2)(x+6)$$

L.I: Today we will be revising how to find the volume of a prism.

S.C: We will be able to find the volume of prisms and be able to calculate the height or radius given the volume.

Volume of a prism

- a 3D shape that has the same cross-section throughout.

E.g. Cylinder, Triangular Prism

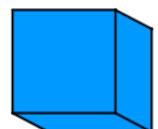
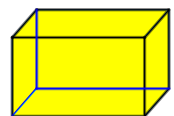
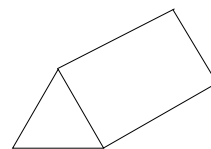
$$\text{Volume of a prism} = \text{Area cross-section} \times \text{Length}$$

Volume of a prism

$$\text{The volume of a prism} = \text{Area of Cross Section} \times \text{Length}$$

Volume of a prism

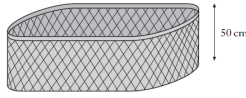
Use your knowledge of volume of prisms to state the formula for the volume of the following objects.



Volume of a prism

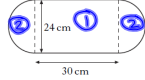
Jim Reid keeps his washing in a basket. The basket is in the shape of a prism.

Example:



The height of the basket is 50 centimetres.

The cross section of the basket consists of a rectangle and two semi-circles with measurements as shown.



Find the volume of the basket in cubic centimetres.
Give your answer correct to three significant figures.

Area Cross-Section

$$A_1 = 24 \times 30 = 720 \text{ cm}^2$$

$$A_2 = \pi \times 12^2 = 452.39 \text{ cm}^2$$

Total Area = 1172.39 cm²

$$V = 1172.39 \times 50 = 58619.5 \text{ cm}^3$$

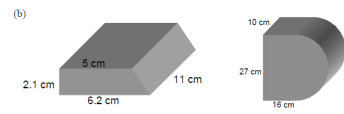
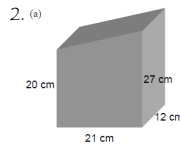
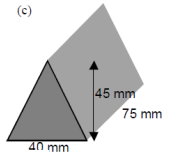
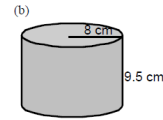
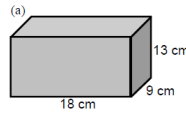
$$\rightarrow \underline{58600 \text{ cm}^3}$$

3sf

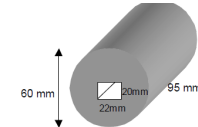
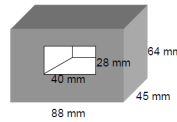
Volume of a prism

Worksheet

1. Calculate the volume of each shape below.

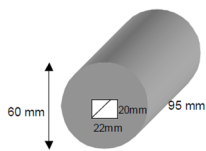
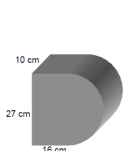
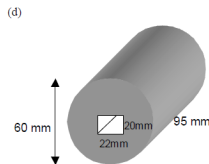
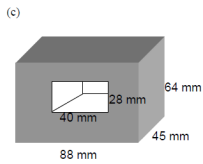
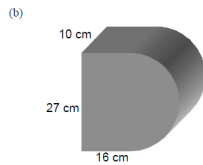
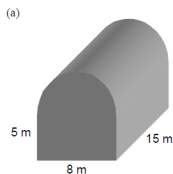


Calculate the volume of each shape.



Volume of a prism

3. Each shape below has a cross-section made of a rectangle and a semi-circle.

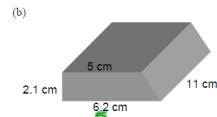
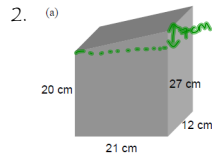


Area cross-section \times height

$$\left[(27 \times 16) + \left(\frac{\pi \times 13.5^2}{2} \right) \right] \times 10$$

$$[432 + 286.3] \times 10 = \underline{7183 \text{ cm}^3}$$

Volume of a prism



Calculate the volume of each shape.

$$\left[(21 \times 20) + \left(\frac{1}{2} \times 21 \times 7 \right) \right] \times 12$$

$$[420 + 73.5] \times 12$$

$$\underline{5922 \text{ cm}^3}$$

Area $\square +$ Area \triangle

$$\left[(2.1 \times 5) + \left(\frac{1}{2} \times 1.2 \times 2.1 \right) \right] \times 11$$

$$[10.5 + 1.26] \times 11$$

$$= \underline{129.36 \text{ cm}^3}$$

Daily Practice

21.3.2018

Q1. Calculate the volume of a cylinder with diameter 16 cm and height 24 cm

$$V = \pi r^2 h = \pi \times 8^2 \times 24 = \underline{4825.49 \text{ cm}^3}$$

(2dp)

Q2. Multiply out and simplify $(2x - 1)(4 + x)$

$$8x + 2x^2 - 4 - x$$

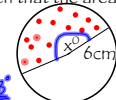
$$\underline{2x^2 + 7x - 4}$$

Q3. Calculate the angle at the centre of this sector, given that the area is 56 cm^2

$$\frac{x}{360} \times \pi r^2 = 56$$

$$\frac{x}{360} = \frac{56}{\pi \times 6^2}$$

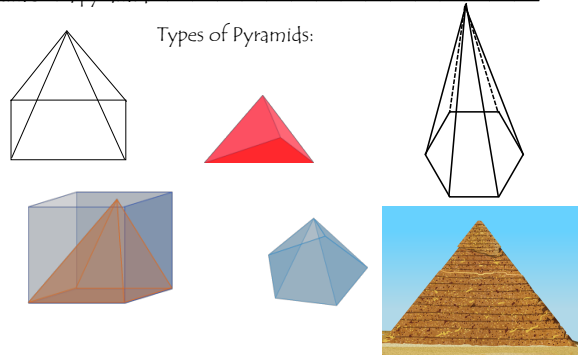
$$x = \frac{56}{\pi \times 6^2} \times 360 = \underline{178^\circ}$$



L.I: Today we will be learning how to find the volume of a pyramid and a cone.

Homework online due 26.3.2018

Volume of a pyramid



Volume of a pyramid

This cube has been divided into 6 equal square based pyramids.

Volume = Area Base x h

$V = \frac{\text{Area Base} \times h}{3}$

Volume of a pyramid

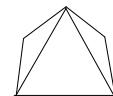
Volume = $\frac{1}{3}$ Area base x Height

Examples:

1. Find the volume of a pyramid with a square base with sides of length 6cm and a height of 10cm.

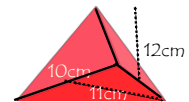
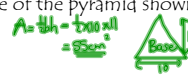
$V = \frac{1}{3} Ah$
 $= \frac{1}{3} \times 36 \times 10$
 $= 120 \text{ cm}^3$

$A = b \times b = 36 \text{ cm}^2$



2. Find the volume of the pyramid shown

$V = \frac{1}{3} Ah$
 $V = \frac{1}{3} \times 55 \times 12$
 $V = 620 \text{ cm}^3$



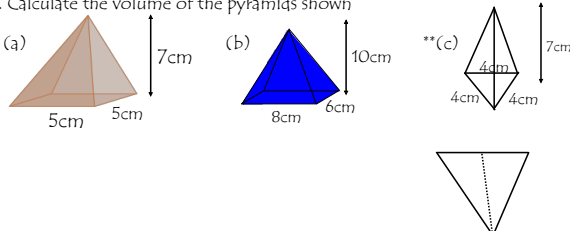
Volume of a pyramid

Questions:

1. A pyramid has a square base of side 7cm and a height of 13cm. Calculate the volume to 2 s.f.

2. A pyramid has a rectangular base measuring 15mm by 14mm and a vertical height of 10mm. Calculate the volume.

3. Calculate the volume of the pyramids shown



Volume of a pyramid

Questions:

1. A pyramid has a square base of side 7cm and a height of 13cm. Calculate the volume to 2 s.f.

2. A pyramid has a rectangular base measuring 15mm by 14mm and a vertical height of 10mm. Calculate the volume. **700mm³**

3. Calculate the volume of the pyramids shown

(a) 58.3 cm^3

(b) $\frac{1}{3} \times 48 \times 10 = 160 \text{ cm}^3$

(c) $V = \frac{1}{3} \times 6.92 \times 7 = 16.2 \text{ cm}^3$

Area $\Delta = \frac{1}{2} \times 4 \times 3.46 = 6.92$

$4^2 - 2^2 = 16 - 4 = 12$
 $\sqrt{12} = 3.46$

Daily Practice 22.3.2018

Q1. Write 6 million in scientific notation

6×10^6

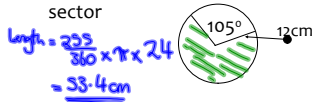
Q2. Multiply out and simplify $(3x - 1)^2$

$9x^2 - 6x + 1$

Q3. Factorise $16 - y^2$

$(4+y)(4-y)$

Q4. Calculate the arc length of the shaded sector



L.I: Today we will be learning how to find the volume of a cone.

Homework due Monday.

Volume of a cone

A cone is a type of pyramid with a circular base.

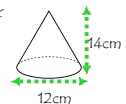
What do you think the formula for the volume of a cone would be?



Volume of a cone

Examples:

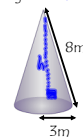
1. Calculate the volume of a cone when the diameter of the base is 12cm and its perpendicular height is 14cm.



Round your answer to 2 s.f.

$V = \frac{1}{3} \pi r^2 h$
 $V = \frac{1}{3} \pi \times 6^2 \times 14$
 $V = 527.79$ (2d.p.) \rightarrow 530 cm^3 (2s.f.)

2. Calculate the volume of this cone given the slant height is 8m and the radius is 3m



$h^2 = 8^2 - 3^2$
 $h^2 = 64 - 9$
 $h^2 = 55$
 $h = \sqrt{55} = 7.42 \text{ m}$ (2d.p.)
 $V = \frac{1}{3} \pi r^2 h$
 $V = \frac{1}{3} \pi \times 3^2 \times 7.42$
 $V = 69.93 \text{ m}^3$ (2d.p.)

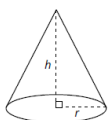
3. Calculate the total volume of this shape



$V_1 = \pi \times 8^2 \times 15 = 3015.93$
 $V_2 = \frac{1}{3} \pi \times 8^2 \times 6 = 402.12$ (2d.p.)
 $V_1 + V_2 = 3418.05 \text{ cm}^3$ (2d.p.)

Volume of a cone

1. Calculate the volume of each cone described below, rounding your answers to 1 decimal place.



- (a) $r = 3 \text{ cm}$ and $h = 6 \text{ cm}$
- (b) $r = 8 \text{ mm}$ and $h = 12 \text{ mm}$
- (c) $r = 3 \text{ cm}$ and $h = 5 \text{ cm}$
- (d) $r = 2 \text{ m}$ and $h = 6 \text{ m}$

2. A cone has a base diameter of 8cm and a height of 5cm. Calculate the volume of this cone.

3. A cone has a base diameter of 10cm and a slant height of 13cm. Calculate the volume of the cone.



4. A cone has a base radius of 9cm and a slant height of 15cm. Calculate the volume of the cone.

Daily Practice 26.3.2018

Q1. Calculate the height of a cylinder that has a volume of 540 cm^3 and a radius of 4.5cm (Give your answer to 1 s.f.)

$540 = \pi \times 4.5^2 \times h$
 $h = \frac{540}{\pi \times 4.5^2} = 8.49$
 $\rightarrow 9 \text{ cm}$ (1s.f.)

Q2. Multiply out and simplify $(2x - 1)(x^2 + 5x - 4)$

$2x^3 + 10x^2 - 8x - x^2 - 5x + 4$
 $2x^3 + 9x^2 - 13x + 4$

Q3. State the equation of the line joining $(-2, 3)$ and $(0, 1)$

$m = \frac{1-3}{0-(-2)} = \frac{-2}{2} = -1$
 $y = mx + c$
 $y = -x + 1$

Q4. Factorise $3x^2 - 14x + 8$

$(3x - 2)(x - 4)$

L!: Today we will be continuing to work backwards with the volume of a cone .

Homework due!

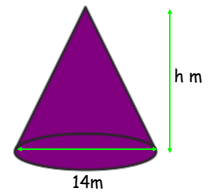
Volume of a cone working backwards

1. Calculate the height given that the volume is 924m^3

$$V = \frac{1}{3} \pi r^2 h$$

$$924 = \frac{1}{3} \pi \times r^2 \times h$$

$$\frac{924}{(\frac{1}{3} \pi \times r^2)} = h \quad \underline{h = 18\text{m}}$$



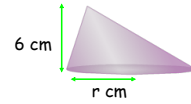
2. Calculate the radius given that the volume = 658cm^3

$$658 = \frac{1}{3} \pi r^2 \times 6$$

$$\frac{658}{(\frac{1}{3} \pi \times 6)} = r^2$$

$$r^2 = 104.72\dots$$

$$r = \sqrt{104.72\dots} = \underline{10.23\text{cm}} \text{ (2.d.p.)}$$



Calculate the missing value for each of the following:

(a) $V = 1800\text{cm}^3$

(b) $V = 1.26\text{m}^3$

(c) $V = 16493\text{cm}^3$

(d) Capacity = 2.2L

Daily Practice 28.3.2018

Q1. Round 814403 to 2 significant figures

$$\underline{810000}$$

Q2. Multiply out and simplify $(2x - 1)(x^2 - 3x - 4)$

$$2x^3 - 6x^2 - 8x - x^2 + 3x + 4$$

$$\underline{2x^3 - 7x^2 - 5x + 4}$$

Q3. Factorise fully $50x^2 - 8$

$$2(25x^2 - 4)$$

$$\underline{2(5x+2)(5x-2)}$$

Q4. Calculate the length of the minor arc that has angle at centre 15° and radius 28cm

$$\frac{15}{360} \times \pi \times 28^2 = \underline{7.3\text{cm}} \text{ (1.d.p.)}$$

Today we will be working out the volume of a sphere.

Volume of a sphere

The volume of a sphere is found using Integration, a type of Maths in the Higher Course. You will be given the formula in your exam.

$$V = \frac{4}{3} \pi r^3$$

Volume of a sphere

Examples:

1. Calculate the volume of a sphere with diameter 8cm

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 4^3 = \underline{\underline{268.08 \text{ cm}^3}} \text{ (2d.p.)}$$



2. Calculate the volume of a hemisphere with radius 7cm

$$V = \left(\frac{4}{3} \times \pi \times 7^3\right) \div 2 = \underline{\underline{718.4 \text{ cm}^3}} \text{ (1d.p.)}$$

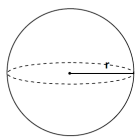
or

$$\frac{2}{3} \times \pi \times 7^3 = \underline{\underline{718.4 \text{ cm}^3}} \text{ (1d.p.)}$$



2. Find the volume of a sphere for the following values of r and d .

(give your answers correct to 3 significant figures)



- | | |
|------------------------|-----------------------|
| (a) $r = 10\text{cm}$ | (f) $d = 18\text{cm}$ |
| (b) $r = 25\text{cm}$ | (g) $r = 80\text{mm}$ |
| (c) $d = 2\text{m}$ | (h) $d = 55\text{cm}$ |
| (d) $r = 200\text{mm}$ | (i) $r = 3.5\text{m}$ |
| (e) $d = 11\text{cm}$ | (j) $d = 48\text{cm}$ |

3. A sphere has a diameter of 8cm.

Calculate its volume giving your answer correct to 3 significant figures.

L.I: Today we will be learning how to create marking schemes for past exam questions.

Volume of a sphere

3. Calculate the radius of this sphere given the volume is 780cm^3

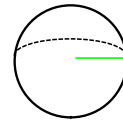
$$780 = \frac{4}{3} \pi r^3$$

$$r^3 = \frac{780}{\left(\frac{4}{3} \pi\right)}$$

$$r^3 = 186.211\dots$$

$$r = \sqrt[3]{186.211\dots}$$

$$r = \underline{\underline{5.71\text{cm}}} \text{ (2d.p.)}$$



Daily Practice

29.3.2018

- Q1. Multiply out and simplify $(4x-1)(2x^2+3x-4)$

$$8x^3 + 12x^2 - 16x - 2x^2 - 3x + 4 = 8x^3 + 10x^2 - 19x + 4$$

- Q2. Factorise $6x^2 + 10x - 4$

$$2(3x^2 + 5x - 2)$$

$$2(3x - 1)(x + 2)$$

- Q3. Simplify $\frac{3p^2 \times 4p \times 5}{2p^3}$

$$\frac{60p^3}{2p^3} = 30$$

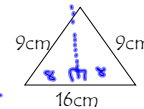
- Q4. Calculate the area of this triangle

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2} \times 16 \times 4.1 \quad h = 9^2 - 8^2$$

$$A = 32.8 \text{ cm} \quad h^2 = 17$$

$$\text{(2d.p.) } h = \sqrt{17} = 4.1 \text{ cm (1d.p.)}$$



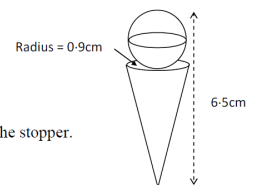
A metal bottle stopper is made up from a cone topped with a sphere.

The sphere has diameter 1.5cm.

The cone has radius 0.9cm.

The overall length of the stopper is 6.5cm.

Calculate the volume of metal required to make the stopper. Give your answer correct to 3 significant figures.

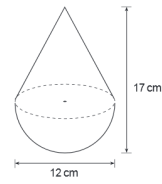


Identifying the allocation of marks for Exam Questions

For each question you have been given:

- Work out a possible solution.
- Double-check your working.
- Show where you think the marks would be allocated.

6. A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.



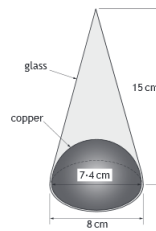
The toy is 12 centimetres wide and 17 centimetres high.
Calculate the volume of the toy.
Give your answer correct to 2 significant figures.

5

Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
6	<p>Ans: 870 cm³</p> <ul style="list-style-type: none"> •¹ know how to calculate volume of toy •² substitute correctly into formula for volume of hemisphere •³ substitute correctly into formula for volume of cone •⁴ calculate volume correctly •⁵ round to 2 significant figures 	5	<ul style="list-style-type: none"> •¹ add volume of cone and volume of hemisphere •² $\frac{1}{2} \times \frac{4}{3} \times \pi \times 6^3$ (= 452.389...) •³ $\frac{1}{3} \times \pi \times 6^2 \times 11$ (= 414.690...) •⁴ 867.079... •⁵ 870

7. An ornament is in the shape of a cone with diameter 8 centimetres and height 15 centimetres.

The bottom contains a hemisphere made of copper with diameter 7.4 centimetres. The rest is made of glass, as shown in the diagram below.



Calculate the volume of the glass part of the ornament.
Give your answer correct to 2 significant figures.

5

Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
7.	<p>Ans: 150 cm³</p> <ul style="list-style-type: none"> •¹ substitute correctly into formula for volume of cone •² substitute correctly into formula for volume of sphere or hemisphere •³ know to subtract volume of hemisphere from volume of cone •⁴ carry out all calculations correctly (must involve difference or sum of two volume calculations) •⁵ round final answer to 2 significant figures 	5	<ul style="list-style-type: none"> •¹ $\frac{1}{3} \times \pi \times 4^2 \times 15$ (= 251.32...) •² $\frac{4}{3} \times \pi \times 3.7^3$ (= 212.17...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 3.7^3$ (= 106.08...) •³ evidence •⁴ 145.24... •⁵ 150 (cm³)

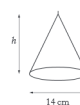
2. (a) A candle is in the shape of a cylinder with diameter 10 centimetres and height 15 centimetres.



Calculate the volume of the candle.
Give your answer correct to 3 significant figures.

3

(b) A second candle is in the shape of a cone with a circular base of diameter 14 centimetres and height h centimetres.



It has the same volume as the first candle.
Calculate h .

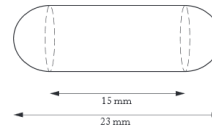
3

2.	(a)	<p>Ans: 1180 cm³</p> <ul style="list-style-type: none"> •¹ process: substitute correctly •² process: correct calculation •³ process: round to 3 sig fig 	3	<ul style="list-style-type: none"> •¹ $V = \pi \times 5^2 \times 15$ •² 1178.1 •³ 1180 cm³
2.	(b)	<p>Ans: 23 cm</p> <ul style="list-style-type: none"> •¹ strategy: know how to find expression for volume of a cone •² process: know to equate volumes •³ process: calculate height 	3	<ul style="list-style-type: none"> •¹ $\frac{1}{3} \times \pi \times 7^2 \times h$ •² $\frac{1}{3} \times \pi \times 7^2 \times h = 1180$ •³ 23 cm

3. A health food shop produces cod liver oil capsules for its customers. Each capsule is in the shape of a cylinder with hemispherical ends as shown in the diagram below.



Marks



The total length of the capsule is 23 millimetres and the length of the cylinder is 15 millimetres. Calculate the volume of one cod liver oil capsule.

4

3.	<p>Ans: 1022 mm³</p> <ul style="list-style-type: none"> •¹ strategy: know to add volumes of cylinder and sphere •² process: substitute correctly into formula •³ process: substitute correctly into formula •⁴ process: calculate volume correctly 	<ul style="list-style-type: none"> •¹ evidence •² $V = \pi \times 4^2 \times 15 (= 753.98)$ •³ $V = \frac{4}{3} \times \pi \times 4^3 (= 268.08)$ •⁴ 1022.06481
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4 marks

7. A lead **cube**, of side 10 centimetres, is melted down. During this process 8% of the metal is lost. The remaining metal is then made into a **cone**, with radius 8 centimetres. Calculate the height of this cone. **Give your answer correct to 2 significant figures.**

5

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
7	<p>Ans: 14 cm</p> <ul style="list-style-type: none"> •¹ strategy: know how to calculate volume of remaining metal •² strategy: know how to find expression for volume of cone •³ process: equate above volumes •⁴ process: calculate height •⁵ process: round answer to 2 significant figures 	5	<ul style="list-style-type: none"> •¹ 0.92×10^3 •² $\frac{1}{3} \times \pi \times 8^2 \times h$ •³ $\frac{1}{3} \times \pi \times 8^2 \times h = 0.92 \times 10^3$ •⁴ 13.72711384 •⁵ 14