Stewards Academy

Maths Summer 1

Year 10 Higher

Blended Learning Booklet

Name:

Form:

Each week covers topics you would complete in your 3 Maths lessons that week. Write out the title and LI and then complete the tasks.

All video links are online using the ClassCharts link.

The Knowledge Organiser on page 4 has further practice questions and page numbers linking to your pocket revision guides for all the key information and examples to help you with this unit.

Upload all work onto ClassCharts for feedback.

Stewards Academy

Contents

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Big Picture –Year 10 Higher   Overview
Mathematics Department

Students will understand how to use formulae for find surface area and volume of pyramids, spheres and cones. They will also find arc and circumference of sectors.

Students will understand how to represent various equations on a coordinate grid.

Develop an understanding of how to sketch graphs including linear, quadratic and cubic.

This unit will provide students with an understanding of equations and how they are represented on graphs and an introduction into volume and area of 3D shapes.

Further Geometry

Equations and their graphs

Sketching graphs

UNIT 6

This unit will introduce students to quadratics and rearranging formulae as well as a deeper understanding of shape problems including area and volume.

Students will develop an understanding of quadratic equations using their knowledge of factorising and how to rearrange formula by finding common factors.

Students will develop their knowledge of surface area and volume of 3D shapes.

Introduction to quadratics and rearranging formula

Surface area and volume

UNIT 5

Students will understand how to find the probability of combined events and dependent events.

Students will develop knowledge of probability of independent events using Venn diagrams and tree diagrams.

Students will develop their understanding of simultaneous equations.

This unit will provide students with an in depth understanding of probability including representation and analysis and an understanding of simultaneous equations.

Conditional probability

Relative frequency/ Venn diagrams/Tree diagrams

Simultaneous Equations

This unit will develop knowledge of 2D geometry to include congruency, Pythagoras theorem and trigonometry. They will also be introduced to algebraic fractions.

Students will understand and use Pythagoras theorem and use sine/cosine rule to solve problems involving missing sides and angles in right angle triangles.

Students use their knowledge of fractions and manipulating algebraic expressions to understand algebraic fractions.

UNIT 4

Congruence and Similarity

Pythagoras Theorem and trigonometry

Algebraic fractions

UNIT 3

Students will understand similarity and solve problems involving similar triangles. They will develop their knowledge of the criteria for congruent triangles.

Students will develop knowledge of index laws including simplifying algebraic expressions with indices.

Students will develop their understanding of how to analyse data from cumulative frequency graphs and histograms.

This unit will provide students with a deeper understanding of statistical measures, indices and properties of polygons.

Properties of polygons

Indices

Histograms and Cumulative frequency

UNIT 2

Students will develop their knowledge of the properties of polygons including angle sums. They will derive and use formula to find interior and exterior angles.

Students will develop their understanding of percentages, increasing and decreasing, reverse percentages and understanding simple and compound interest.

Students will understand compound measures including speed and pressure. They will also understand how to work with upper and lower bounds.

Measures

Calculating with percentages

Students will understand how to simplify surds, manipulate expressions involving surds and rationalise the denominator.

This unit will provide students with an in depth understanding of the number system and percentages and give students an understanding of compound measures, including the use of upper and lower bound. They will explore surds using previous knowledge of number and algebra.

Surds

UNIT 1

Year 10H

Stewards Academy

Year 10 - Higher

Summer One

Introduction to Quadratics, Rearranging Equations, Surface Area and Volume

Revision Guide pages:
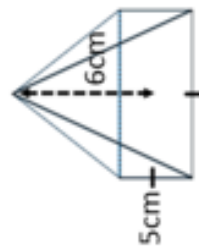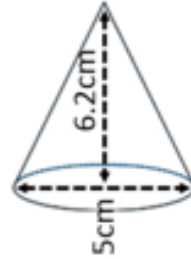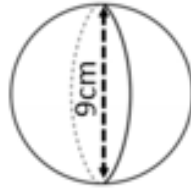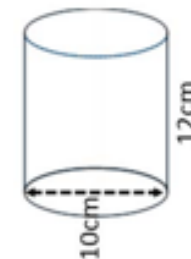
Quadratics– 38, 39

Rearranging Equations – 35

Surface Area – 84

Volume – 82, 83

Task 1 – Calculate the volume of each shape

Task 2

⭐

Factorise

1) $x^2 - 7x + 12$
2) $x^2 + 3x - 10$
3) $x^2 - 8x - 20$
4) $x^2 - 2x - 35$
5) $x^2 - x - 12$
6) $x^2 - 11x - 12$
7) $x^2 - 8x + 12$
8) $x^2 + x - 12$

⭐⭐

Factorise

1) $x^2 - 9$
2) $x^2 - 4$
3) $x^2 - 100$
4) $x^2 - 1$
5) $x^2 - 16$
6) $x^2 - 36$
7) $x^2 - 64$
8) $x^2 - 121$

Task 3 – Solve using the quadratic formula

1) $2x^2 + 2x - 2 = 0$
2) $x^2 + 5x + 3 = 0$
3) $x^2 + 2x - 4 = 0$
4) $x^2 + 2x - 2 = 0$
5) $3x^2 + 5x + 1 = 0$
6) $2x^2 + 4x - 2 = 0$
7) $2x^2 + 4x - 5 = 0$
8) $x^2 + 2x - 5 = 0$
9) $x^2 - 3x - 5 = 0$
10) $2x^2 + 4x + 1 = 0$
11) $2x^2 - 2x - 1 = 0$
12) $2x^2 + 5x + 1 = 0$
13) $x^2 + x - 1 = 0$
14) $x^2 + 4x + 1 = 0$

Task 4

Make x the subject
$$y = x - a$$

Make x the subject
$$y = \sqrt{x}$$
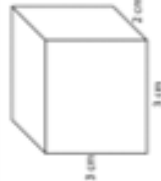
Make x the subject
$$y = ax - b$$
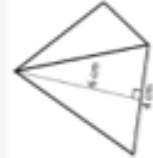
Make x the subject
$$y = ax^2$$

Task 5
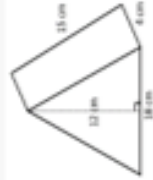
Calculate the surface area

Calculate the surface area

Calculate the surface area

Calculate the surface area

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- **LI: I can expand single brackets**

Demonstration Videos:

http://corbettmaths.com/2013/12/23/expanding-brackets-video-13/

Tasks:

4x - 2	42x + 21	15x - 10	8x - 6	10x - 5
14x - 14	6x - 2	9x - 6	18x - 18	2x + 4
12x + 8	12x - 8	8x - 4	15x - 18	6x + 9
12x+ 9	6x - 3	10x + 4	20x + 15	15x + 9
9x + 6	12x - 12	30x + 18	20x + 16	6x + 6

2(5x + 2)	6(2x - 2)	4(3x + 2)	3(2x - 1)
3(3x - 2)	2(2x - 1)	2(1x + 2)	6(5x + 3)
7(2x - 2)	2(3x - 1)	5(2x - 1)	5(4x + 3)
4(2x - 1)	6(3x - 3)	4(5x + 4)	4(3x - 2)
5(3x - 2)	7(6x + 3)	3(5x + 3)	3(2x + 2)

[ ] [ ] [ ] [ ] [ ]   TOTAL [ ]

Expand $6x(x - 5x^2)$	**Expand** $5x(2x^3 - x^2)$
Expand $x(x - 2x^2)$	**Expand** $5x(x^3 - 2x^2)$
Expand $2x(3x^3 - 5x)$	**Expand** $8x(3x^2 + 4x^3)$
Expand $5x(x^3 - 2x^2)$	**Expand** $4x(x^2 + 2x^3)$

Question 4: Expand the following brackets

(a) $a(a + 2)$ (b) $y(y - 5)$ (c) $w(a + w)$ (d) $c(9 - c)$

(e) $p(2p + 5)$ (f) $2w(3w - 1)$ (g) $9y(2y + 3)$ (h) $4c(2a + 5c)$

(i) $2u(3 - u)$ (j) $m(m^2 + 3)$ (k) $y(y^2 - 7)$ (l) $g^2(g - 8)$

(m) $2w(w^2 + 6)$ (n) $4a(2a^2 - 3)$ (o) $5c(3c^2 - a)$ (p) $8w(3w^2 + 3y)$

(q) $x^2(x^2 + 4)$ (r) $3w^2(7 + 2w^2)$

5

Question 5:   Expand and simplify

(a) $5(y + 3) + 2(y + 7)$

(b) $6(2w + 5) + 9(w + 2)$

(c) $3(y - 2) + 4(2y + 5)$

(d) $7(2g + 3) - 5(g + 2)$

(e) $6(x - 2) - 4(x - 8)$

(f) $2(3y - 8) - 5(2y - 1)$

(g) $8(5 + 2m) + 3(5 - 3m)$

(h) $4(w + 7) - 2(2w + 1)$

(i) $9(1 + 2y) + 3(3 - y)$

Question 6:   Expand and simplify

(a) $w(w + 5) + w(w + 7)$

(b) $2g(4g + 3) + g(g - 7)$

(c) $n(n - 4) - n(5 - n)$

(d) $2e(4e + 3) - 3e(e - 5)$

(e) $a(3 + c) + c(a + 2)$

(f) $m(a + 7) - a(4 - 3m)$

(g) $8c(8 - 3a) + 3(4 - c)$

(h) $5y(3y + z) - 2y(4y - 3z)$

(i) $4c(3c - c^2) - 2c^2(4 - 5c)$

Apply

Question 1: Can you spot any mistakes in the questions below.

Expand $3(2y - 1)$

$6y - 1$

Multiply out $x(x + 3)$

$2x + 3x = 5x$

Expand and simplify $6(w + 3) - 2(w - 5)$

$6w + 18 - 2w - 10$

$= 4w + 8$

Challenge:

Expand and simplify the following:

$$-x(x - 3) - x(3 - x) - x(x - 3) - x(3 - x)$$

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- **LI: I can expand double brackets**

Demonstration Videos:

http://corbettmaths.com/2013/12/23/expanding-two-brackets-video-14/

Tasks:

1.

Expanding Double Brackets: Grid Method

EXAMPLE

$(x + 2)(x + 3)$

	x	$+2$
x	x^2	$+2x$
$+3$	$+3x$	$+6$

$= \underline{\quad x^2 + 5x + 6 \quad}$

a) $(x + 2)(x + 1)$

	x	$+2$
x	x^2	$+2x$
$+1$	$+x$	

$= \underline{\qquad}$

b) $(x + 3)(x + 4)$

	x	$+3$
x	x^2	
$+4$	$+4x$	

$= \underline{\qquad}$

c) $(x + 2)(x + 2)$

	x	$+2$
x	x^2	$+2x$
$+2$		

$= \underline{\qquad}$

d) $(x + 5)(x + 3)$

	x	$+5$
x		
$+3$		

$= \underline{\qquad}$

e) $(x + 2)(x + 5)$

	x	
x		
$+5$		

$= \underline{\qquad}$

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

x		
$+3$		

$= \underline{\qquad}$

g) $(x + 4)(x - 3)$

$= \underline{\qquad}$

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

$= \underline{\qquad}$

i) $(x - 2)$

$-3x$		

$= \underline{\qquad}$

j) $(x - 3)$

	x	-3
		$+12$

$= \underline{\qquad}$

k) $(x - 6)(x + 6)$

$= \underline{\qquad}$

Question 1: Expand and simplify

(a) $(w + 4)(w + 2)$ (b) $(y + 1)(y + 2)$ (c) $(c + 2)(c + 5)$ (d) $(x + 6)(x + 7)$

(e) $(a + 5)(a - 3)$ (f) $(g + 7)(g - 4)$ (g) $(s - 4)(s + 5)$ (h) $(x + 1)(x - 3)$

(i) $(p - 3)(p - 2)$ (j) $(y - 4)(y - 4)$ (k) $(k - 5)(k - 6)$ (l) $(v + 4)(v + 3)$

(m) $(n + 8)(n - 10)$ (n) $(b - 3)(b + 7)$ (o) $(z - 9)(z - 3)$ (p) $(a - 5)(a + 7)$

(q) $(w + 2)(w - 8)$ (r) $(r + 7)(r + 7)$ (s) $(w - 11)(w + 1)$ (t) $(t - 8)(t - 7)$

Question 2: Expand and simplify

(a) $(8 + x)(2 + x)$ (b) $(9 + y)(4 - y)$ (c) $(1 + y)(3 + y)$ (d) $(10 - t)(4 - t)$

(e) $(4 - w)(w + 2)$ (f) $(6 - x)(x - 4)$ (g) $(2 - r)(8 - r)$ (h) $(x + 2)(8 - x)$

Question 3: Expand and simplify

(a) $(y + 2)(y - 2)$ (b) $(w + 7)(w - 7)$ (c) $(a + 1)(a - 1)$ (d) $(x - 10)(x + 10)$

(e) $(g - 8)(g + 8)$ (f) $(6 - x)(6 + x)$ (g) $(4 - r)(4 + r)$ (h) $(11 + y)(11 - y)$

Question 4: Expand and simplify

(a) $(2c + 1)(2c + 3)$ (b) $(5x + 1)(2x + 5)$ (c) $(3w + 2)(w + 1)$

(d) $(3p + 2)(2p - 1)$ (e) $(5g - 4)(g + 1)$ (f) $(2a - 3)(4a + 7)$

(g) $(4r - 5)(2r - 3)$ (h) $(2y - 3)(9y - 1)$ (i) $(5k - 4)(2k - 1)$

(j) $(2n + 3)(2n + 5)$ (k) $(3b + 4)(2b + 9)$ (l) $(2z - 9)(6z - 5)$

(m) $(4w - 3)(3w - 1)$ (n) $(4r + 3)(3r + 2)$ (o) $(5w - 1)(2w - 3)$

(p) $(3 + 2c)(5 + c)$ (q) $(9 + 2x)(3 - 2x)$ (r) $(9 - 4y)(2 + 3y)$

(s) $(3w + 2)(3w - 2)$ (t) $(2y + 3)(2y - 3)$ (u) $(5w - 1)(5w + 1)$

(v) $(9 - 5a)(9 + 5a)$ (w) $(1 - 2x)(1 + 2x)$ (x) $(3 + 2y)(3 - 2y)$

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- **LI: I can factorise a linear expression**

Demonstration Videos:

http://corbettmaths.com/2013/02/06/factorisation/

Tasks:

4(4x - 5)	3(5x - 7)	4(4x - 5)	4(x + 5)	6(x + 7)
8(3x + 5)	2(x + 2)	6(2x + 5)	7(4x - 7)	6(2x - 5)
5(2x - 7)	4(2x + 5)	6(2x + 3)	4(x + 5)	7(2x + 5)
3(3x - 10)	3(x + 4)	5(x + 4)	5(2x + 7)	2(2x - 9)
3(2x + 3)	2(x + 3)	7(2x + 3)	5(3x + 4)	7(x + 8)

8x + 20	14x + 21	15x - 21	12x - 30
16x - 20	2x + 4	4x - 18	12x + 30
9x - 30	28x - 49	5x + 20	14x + 35
24x + 40	6x + 9	12x + 18	10x - 35
16x - 20	10x + 35	15x + 20	4x + 20

Missing expression

9y(1 + 5y)	4y(5 - 2y²)	4y(7y + 11)	7x²(3 + 2x)	2x(x + 3)
7x²(2x + 3)	4y³(7 + 3y)	11y(7 + 4y)	7y(3y² + 11)	9x(3 + 5x²)
8x²(5 - 3x)	3x(1 + 5x²)	10x(3 + x)	2x(x + 6)	7x(2 - 5x)
8x³(11 - 5x)	2x(x + 2)	6x²(3 - 2x)	4x²(5 - 7x)	3y²(7 - 3y)
10y(2 + y)	2x(x + 1)	5x²(7 + 3x)	7x(1 + 7x)	2x(x + 5)

3x + 15x³	35x² + 15x³	20y - 8y³	27x + 45x³
28y² + 44y	28y³ + 12y⁴	21y² - 9y³	77y + 44y²
88x³ - 40x⁴	21y³ + 77y	18x² - 12x³	14x - 35x²
14x³ + 21x²	20y + 10y²	30x + 10x²	40x² - 24x³
9y + 45y²	20x² - 28x³	7x + 49x²	21x² + 14x³

Missing term

☆
Factorise
1) $4x^2 + 12x$
2) $6x^2 + 24x$
3) $8x^2 - 16x$
4) $8x^2 + 12x$
5) $9x^2 + 3x$
6) $21x + 7x^2$
7) $5x^2 + 45x$
8) $25x - 5x^2$

☆☆
Factorise
1) $16x^2 + 12x$
2) $24x^2 + 42x$
3) $16x^2 - 24x$
4) $8x^2 + 18x$
5) $9x^2 + 21x$
6) $28x + 35x^2$
7) $30x^2 + 45x$
8) $20x - 36x^2$

☆☆☆
Factorise
1) $5x^2y + 10xy$
2) $12xy^2 + 18xy$
3) $15xy - 10x$
4) $60x - 25x^2y$
5) $21x^2y - 49xy$
6) $24xy^2 - 42xy$
7) $30x^2y^2 - 15xy$
8) $8xy^2 - 32x^2y$

![Stewards Academy logo]

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- **LI: I can factorise a quadratic expression of the form $x^2 + bx + c$**

Demonstration Videos:

http://corbettmaths.com/2013/02/06/factorising-quadratics-1/

https://corbettmaths.com/2019/03/26/splitting-the-middle-term/

Tasks:

Number Pairs

What two numbers have a **sum** of 6 and a **product** of 8?

EXAMPLE

Sum = 6
Product = 8   [2] & [4]

1) Sum = 7
Product = 12   [3] & [ ]

2) Sum = 11
Product = 30   [ ] & [ ]

3) Sum = 4
Product = 4   [ ] & [ ]

4) Sum = 8
Product = 7   [ ] & [ ]

5) Sum = 10
Product = 24   [ ] & [ ]

⭐ How do we get a **negative product**? ⭐

6) Sum = 3
Product = −10   [ ] & [ ]

7) Sum = 3
Product = −18   [ ] & [ ]

8) Sum = 7
Product = −8   [ ] & [ ]

9) Sum = 1
Product = −20   [ ] & [ ]

10) Sum = −1
Product = −20   [ ] & [ ]

11) Sum = −4
Product = −21   [ ] & [ ]

12) Sum = 0
Product = −36   [ ] & [ ]

⭐ A **negative** sum, but a **positive** product? ⭐

13) Sum = −9
Product = 18   [ ] & [ ]

14) Sum = −10
Product = 24   [ ] & [ ]

15) Sum = −13
Product = 36   [ ] & [ ]

16) Sum = −13
Product = −42   [ ] & [ ]

17) Sum = −11
Product = 28   [ ] & [ ]

18) Sum = −1
Product = 72   [ ] & [ ]

19) Sum = −4
Product = −45   [ ] & [ ]

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Question 1:   Factorise each of the following

(a) $x^2 + 7x + 12$ (b) $x^2 + 6x + 8$ (c) $x^2 + 5x + 6$ (d) $x^2 + 8x + 7$

(e) $x^2 + 4x + 4$ (f) $x^2 + 8x + 15$ (g) $x^2 + 6x + 9$ (h) $x^2 + 11x + 28$

(i) $x^2 + 10x + 25$ (j) $x^2 + 12x + 20$ (k) $x^2 + 25x + 24$ (l) $x^2 + 11x + 24$

(m) $x^2 + 9x + 14$ (n) $x^2 + 23x + 60$ (o) $x^2 + 29x + 100$ (p) $x^2 + 20x + 51$

Question 2:   Factorise each of the following

(a) $x^2 + x - 12$ (b) $x^2 + 5x - 6$ (c) $x^2 + 3x - 10$ (d) $x^2 + 3x - 4$

(e) $x^2 + 2x - 48$ (f) $x^2 + 4x - 32$ (g) $x^2 + 2x - 35$ (h) $x^2 + 8x - 33$

Question 3:   Factorise each of the following

(a) $x^2 - 3x - 10$ (b) $x^2 - x - 20$ (c) $x^2 - 6x - 27$ (d) $x^2 - 2x - 3$

(e) $x^2 - x - 12$ (f) $x^2 - 4x - 12$ (g) $x^2 - 4x - 21$ (h) $x^2 - 6x - 55$

Question 4:   Factorise each of the following

(a) $x^2 - 6x + 9$ (b) $x^2 - 9x + 20$ (c) $x^2 - 9x + 14$ (d) $x^2 - 13x + 22$

(e) $x^2 - 9x + 8$ (f) $x^2 - 12x + 32$ (g) $x^2 - 15x + 36$ (h) $x^2 - 14x + 48$

Question 5:   Factorise each of the following

(a) $x^2 - 9x + 8$ (b) $x^2 + 24x + 23$ (c) $x^2 - 5x - 14$ (d) $x^2 - 7x + 12$

(e) $x^2 + 12x + 36$ (f) $x^2 - 2x - 63$ (g) $x^2 + 14x + 24$ (h) $x^2 + 17x + 60$

(i) $x^2 - 11x + 30$ (j) $x^2 - 4x - 32$ (k) $x^2 - 2x - 63$ (l) $x^2 - 16x - 17$

(m) $x^2 - 11x + 18$ (n) $x^2 - 13x + 22$ (o) $x^2 + 18x + 56$ (p) $x^2 - 21x + 110$

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- **LI: I can factorise a quadratic expression of the form $ax^2 + bx + c$**

Demonstration Videos:

http://corbettmaths.com/2013/02/07/factorising-quadratics-2/

https://corbettmaths.com/2019/03/26/splitting-the-middle-term/

Tasks:

Question 1:   Factorise each of the following

(a) $2x^2 + 7x + 5$ (b) $2x^2 + 11x + 15$ (c) $2x^2 + 9x + 10$

(d) $3x^2 + 13x + 4$ (e) $3x^2 + 4x + 1$ (f) $3x^2 + 8x + 4$

(g) $5x^2 + 13x + 6$ (h) $5x^2 + 26x + 5$ (i) $7x^2 + 10x + 3$

(j) $11x^2 + 47x + 12$ (k) $2x^2 + 17x + 36$ (l) $5x^2 + 62x + 24$

Question 2:   Factorise each of the following

(a) $3x^2 + x - 4$ (b) $7x^2 + 20x - 3$ (c) $2x^2 - 13x + 15$

(d) $3x^2 - 17x + 10$ (e) $3x^2 - 16x - 12$ (f) $3x^2 - x - 4$

(g) $5x^2 - 13x - 6$ (h) $3x^2 + 8x - 3$ (i) $2x^2 - x - 10$

(j) $2x^2 - 3x - 44$ (k) $7x^2 - 22x + 16$ (l) $2x^2 + 15x - 38$

Question 3:   Factorise each of the following

(a) $6x^2 + 13x + 6$ (b) $9x^2 + 9x + 2$ (c) $6x^2 + 13x + 2$

(d) $8x^2 + 41x + 5$ (e) $9x^2 + 6x + 1$ (f) $8x^2 + 26x + 15$

(g) $8x^2 + 29x + 15$ (h) $10x^2 + 9x + 2$ (i) $9x^2 + 27x + 20$

(j) $10x^2 + 17x + 7$ (k) $12x^2 + 13x + 3$ (l) $15x^2 + 32x + 16$

Question 4:   Factorise each of the following

(a) $9x^2 - 12x - 5$ (b) $4x^2 - 4x - 3$ (c) $4x^2 - 11x + 6$

(d) $6x^2 - 7x + 2$ (e) $10x^2 - 91x + 9$ (f) $4x^2 + 25x - 56$

(g) $6x^2 - 35x + 49$ (h) $6x^2 - 7x - 10$ (i) $8x^2 + 10x - 3$

(j) $15x^2 + 31x + 10$ (k) $12x^2 + 5x - 3$ (l) $20x^2 - 23x + 6$

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- LI: **I can identify and use the difference of two squares**

Demonstration Videos:

http://corbettmaths.com/2013/02/08/difference-between-two-squares/

Tasks:

Question 1:   Factorise each of the following

(a) $x^2 - 25$ (b) $y^2 - 49$ (c) $w^2 - 100$ (d) $x^2 - 4$

(e) $c^2 - 64$ (f) $x^2 - 1$ (g) $x^2 - 900$ (h) $y^2 - 9$

(i) $16 - x^2$ (j) $1 - y^2$ (k) $81 - x^2$ (l) $144 - h^2$

(m) $x^2 - y^2$ (n) $a^2 - c^2$ (o) $9x^2 - 25$ (p) $4y^2 - 1$

(q) $49x^2 - 16$ (r) $100 - 81x^2$ (s) $9x^2 - 4y^2$ (t) $36a^2 - c^2$

(u) $121w^2 - 196y^2$ (v) $225 - 121y^2$

Question 2:   Factorise **fully** each of the following

(a) $2x^2 - 32$ (b) $2y^2 - 18$ (c) $2x^2 - 200$ (d) $3x^2 - 75$

(e) $5c^2 - 20$ (f) $18x^2 - 2$ (g) $12x^2 - 147$ (h) $20y^2 - 320$

Question 3:   Factorise each of the following

(a) $x^4 - 1$ (b) $y^4 - 16$ (c) $a^4 - 25$ (d) $x^4 - y^4$

(e) $h^2 - p^4$ (f) $16x^4 - 49$ (g) $y^6 - 36$ (h) $x^6 - 64$

(i) $81p^4 - x^6$ (j) $144x^8 - 1$

Can you spot any mistakes?

Factorise $x^2 - 16$ Factorise $x^2 - 25$

$(x + 8)(x - 8)$ $(x - 5)(x - 5)$

Factorise fully $2y^2 - 50$ Factorise $y^2 - 9w^2$

$2(y^2 - 25)$ $(3w - y)(3w + y)$

13

Stewards Academy

- **LI: I can solve a quadratic equation of the form $x^2 + bx + c = 0$**

Demonstration Videos:

http://corbettmaths.com/2013/05/03/solving-quadratics-by-factorising/

Tasks:

Question 1:   Solve each of the equations below

(a) $(x - 1)(x - 3) = 0$

(b) $(y - 4)(y - 9) = 0$

(c) $(m + 1)(m + 6) = 0$

(d) $(x - 3)(x + 2) = 0$

(e) $(t + 7)(t - 3) = 0$

(f) $(k - 10)(k + 9) = 0$

(g) $(w + 5)(w + 11) = 0$

(h) $(y - 8)(y - 2) = 0$

(i) $(x + 3)(x - 9) = 0$

Question 2:   Solve each of the equations below

(a) $x^2 + 6x + 8 = 0$

(b) $x^2 + 7x + 12 = 0$

(c) $y^2 + 7y + 10 = 0$

(d) $y^2 + 3y - 4 = 0$

(e) $x^2 - 2x - 8 = 0$

(f) $m^2 - 7m + 12 = 0$

(g) $y^2 - 10y + 25 = 0$

(h) $y^2 - 4y - 45 = 0$

(i) $x^2 - x - 56 = 0$

(j) $y^2 + 10y + 24 = 0$

(k) $x^2 + 9x + 18 = 0$

(l) $x^2 + 23x + 22 = 0$

(m) $y^2 - 13y + 22 = 0$

(n) $x^2 + x - 12 = 0$

(o) $m^2 - 6m - 27 = 0$

(p) $x^2 - 11x + 18 = 0$

(q) $y^2 - 14y + 48 = 0$

(r) $x^2 - 15x + 56 = 0$

(s) $m^2 - m - 56 = 0$

(t) $y^2 + 22y + 96 = 0$

(u) $k^2 - 18k - 88 = 0$

(v) $x^2 - 38x + 72 = 0$

(w) $x^2 + 14x - 51 = 0$

(x) $y^2 + 32y + 240 = 0$

(y) $g^2 - 12g - 64 = 0$

(z) $y^2 + 22y + 121 = 0$

Question 3:   Solve each of the equations below

(a) $(y - 5)(y + 5) = 0$

(b) $(x + 2)(x - 2) = 0$

(c) $(m - 9)(m + 9) = 0$

Question 4:   Solve each of the equations below

(a) $x^2 - 9 = 0$

(b) $y^2 - 100 = 0$

(c) $w^2 - 1 = 0$

(d) $k^2 - 144 = 0$

(e) $x^2 - 64 = 0$

(f) $c^2 - 0.25 = 0$

14

- **LI: I can solve a quadratic equation of the form $ax^2 + bx + c = 0$**

Demonstration Videos:

http://corbettmaths.com/2013/05/03/solving-quadratics-by-factorising/

Tasks:

Question 1:   Solve each of the equations below

(a) $(2y - 1)(y - 2) = 0$ (b) $(4x - 3)(x + 1) = 0$ (c) $(2y + 3)(2y - 5) = 0$

(d) $(5m - 4)(m + 2) = 0$ (e) $(h + 9)(3h - 1) = 0$ (f) $(2x - 3)(3x + 7) = 0$

(g) $(7y + 4)(2y + 1) = 0$ (h) $(8w - 5)(w - 11) = 0$ (i) $(5x + 6)(3x - 4) = 0$

Question 2:   Solve each of the equations below

(a) $2x^2 + 5x + 2 = 0$ (b) $2x^2 + 7x + 5 = 0$ (c) $5x^2 + 7x + 2 = 0$

(d) $2x^2 + 17x + 36 = 0$ (e) $5x^2 + 23x + 12 = 0$ (f) $3x^2 + 7x + 2 = 0$

(g) $3x^2 + 4x + 1 = 0$ (h) $2x^2 + 7x - 4 = 0$ (i) $2x^2 - x - 6 = 0$

(j) $7x^2 + 23x + 6 = 0$ (k) $3x^2 - x - 2 = 0$ (l) $5x^2 - 16x + 3 = 0$

(m) $3x^2 + x - 4 = 0$ (n) $2x^2 - 13x + 15 = 0$ (o) $7x^2 - 22x + 16 = 0$

(p) $2x^2 + 15x - 38 = 0$ (q) $5x^2 - 31x + 30 = 0$ (r) $3x^2 - 10x - 48 = 0$

Question 3:   Solve each of the equations below

(a) $4x^2 + 8x + 3 = 0$ (b) $4x^2 + 12x - 7 = 0$ (c) $4x^2 - 11x + 6 = 0$

(d) $6x^2 + 31x + 5 = 0$ (e) $4x^2 - 16x - 9 = 0$ (f) $8x^2 - 10x - 3 = 0$

(g) $10x^2 - 11x + 1 = 0$ (h) $6x^2 + 31x + 18 = 0$ (i) $9x^2 - 6x - 8 = 0$

(j) $4x^2 - 4x - 35 = 0$ (k) $12x^2 + 25x + 12 = 0$ (l) $14x^2 + 23x - 10 = 0$

(m) $6x^2 + 13x - 5 = 0$ (n) $6x^2 - 11x - 7 = 0$ (o) $16x^2 - 30x + 9 = 0$

Question 4:   Solve each of the equations below

(a) $4x^2 - 9 = 0$ (b) $4x^2 - 121 = 0$ (c) $16x^2 - 25 = 0$ (d) $36x^2 - 1 = 0$

(e) $9x^2 - 196 = 0$ (f) $100x^2 - 49 = 0$ (g) $4x^2 - 900 = 0$ (h) $64x^2 - 169 = 0$

Stewards Academy

- **LI: I can solve quadratic equations that need rearranging**

Demonstration Videos:

http://corbettmaths.com/2013/05/03/solving-quadratics-by-factorising/

Tasks:

Question 1: Solve each of the equations below

(a) $x^2 + 2x = -1$

(b) $y^2 + 8y + 10 = 3$

(c) $x^2 = 7x - 12$

(d) $y^2 + 6y + 15 = 3 - 7y$

(e) $x^2 - x - 8 = 2x + 2$

(f) $2x^2 - 14x + 49 = x^2$

(g) $-2x^2 + x - 1 = -x^2 - 5x + 8$

(h) $11x^2 - 105 = 10x^2 + x + 105$

Question 2: Solve each of the equations below

(a) $\dfrac{3}{x-4} = x - 2$

(b) $\dfrac{x+3}{4} = \dfrac{3}{x-1}$

(c) $\dfrac{45}{x^2} - \dfrac{4}{x} - 1 = 0$

Question 3: Solve each of the equations below

(a) $2x^2 + 5x = 0$

(b) $2x^2 - 9x = 0$

(c) $3x^2 + x = 0$

(d) $4x^2 + 15x = 0$

(e) $5x^2 - x = 0$

(f) $6x + 3x^2 = 0$

(g) $15x - 2x^2 = 0$

(h) $16x^2 - 20x = 0$

Question 4: Solve each of the equations below

(a) $5x^2 - 9x + 6 = 2$

(b) $2m^2 + 6m + 2 = m + 5$

(c) $10x^2 + 26x - 3 = x^2$

(d) $3x^2 + 9x + 8 = x^2 + 2x + 3$

(e) $6y^2 + 4 = 13 - 3y + 4y^2$

(f) $3x^2 + x + 2 = 3(x + 1)$

(g) $(4x + 3)(x + 2) = 3(x + 1)$

Question 5: Solve each of the equations below

(a) $\dfrac{3}{2x-1} = x - 3$

(b) $\dfrac{2x-1}{4} = \dfrac{1}{2x-1}$

(c) $\dfrac{2}{x^2} + \dfrac{13}{x} + 6 = 0$

(d) $\dfrac{3}{x^2} - \dfrac{5}{x} - 12 = 0$

Stewards Academy

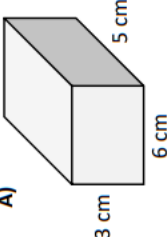- **LI: I can use the laws of indices with numbers and algebraic terms**

Demonstration Videos:

http://corbettmaths.com/2012/08/20/powers-indices/

http://corbettmaths.com/2013/03/13/laws-of-indices-algebra/

Tasks:

Question 1:   Write as a single power of 2.

(a) $2^2 \times 2^2$ (b) $2^2 \times 2^3$ (c) $2^6 \times 2^2$ (d) $2^4 \times 2^3$ (e) $2^6 \times 2^8$ (f) $2^2 \times 2$ (g) 2×2^4

(h) $2^8 \times 2^8$ (i) $2^9 \times 2^2$ (j) 2×2^8 (k) $2^6 \times 2^5$ (l) $2^2 \times 2^2 \times 2^2 \times 2^2$

Question 2:   Write as a single power of 5.

(a) $5^5 \div 5^2$ (b) $5^8 \div 5^3$ (c) $5^9 \div 5^2$ (d) $5^7 \div 5^5$ (e) $5^3 \div 5$ (f) $5^8 \div 5$ (g) $5^7 \div 5^4$

(h) $5^9 \div 5^3$ (i) $5^4 \div 5^8$ (j) $5 \div 5^3$ (k) $5^{45} \div 5^5$ (l) $5^3 \div 5^3$

Question 3:   Write as a single power of 3.

(a) $\dfrac{3^5}{3^2}$ (b) $\dfrac{3^{10}}{3^5}$ (c) $\dfrac{3^8}{3^3}$ (d) $\dfrac{3^{20}}{3^5}$

(e) $\dfrac{3^7}{3^7}$ (f) $\dfrac{3^2}{3^4}$ (g) $\dfrac{3^{15}}{3^9}$ (h) $\dfrac{3^3}{3^8}$

Question 4:   Write as a single power of 8.

(a) $(8^5)^2$ (b) $(8^3)^2$ (c) $(8^4)^3$ (d) $(8^5)^4$ (e) $(8^3)^6$ (f) $(8^7)^3$ (g) $(8^6)^6$

(h) $(8^9)^2$ (i) $(8^4)^8$ (j) $(8^3)^{-5}$ (k) $(8^{-5})^2$

Question 5:   Write as a single power of y.

(a) $y^7 \times y^3$ (b) $y^9 \div y^7$ (c) $y^6 \div y^2$ (d) $(y^3)^5$ (e) $y^7 \div y$ (f) $y^3 \div y^7$ (g) $(y^9)^5$

(h) $y^6 \times y^7$ (i) $y^6 \times y^5 \times y^2$ (j) $y^8 \times y \times y^3$ (k) $\dfrac{y^8}{y^5}$

Stewards Academy

Question 1:   Write as a single power of m.

(a) $m^2 \times m^3$ (b) $m^3 \times m^3$ (c) $m^6 \times m^2$ (d) $m^7 \times m^3$ (e) $m^6 \times m^8$ (f) $m^2 \times m$ (g) $m \times m^3$

(h) $m^7 \times m^8$ (i) $m^9 \times m^2$ (j) $m \times m^8$ (k) $m^6 \times m^5$ (l) $m^2 \times m^2 \times m^2 \times m^2$

Question 2:   Write as a single power of n.

(a) $n^5 \div n^2$ (b) $n^8 \div n^3$ (c) $n^9 \div n^2$ (d) $n^7 \div n^5$ (e) $n^3 \div n$ (f) $n^8 \div n$ (g) $n^7 \div n^4$

(h) $n^9 \div n^3$ (i) $n^4 \div n^8$ (j) $n \div n^3$ (k) $n^{45} \div n^5$ (l) $n^3 \div n^3$

Question 3:   Write as a single power of a.

(a) $\dfrac{a^5}{a^2}$ (b) $\dfrac{a^9}{a^3}$ (c) $\dfrac{a^{10}}{a^2}$ (d) $\dfrac{a^7}{a}$

(e) $\dfrac{a^{14}}{a^7}$ (f) $\dfrac{a^4}{a^4}$ (g) $\dfrac{a^3}{a^4}$ (h) $\dfrac{a^5}{a^9}$

Question 4:   Write as a single power of y.

(a) $(y^5)^2$ (b) $(y^3)^2$ (c) $(y^4)^3$ (d) $(y^5)^4$ (e) $(y^3)^6$ (f) $(y^7)^3$ (g) $(y^6)^6$

(h) $(y^9)^2$ (i) $(y^4)^8$ (j) $(y^3)^{-5}$ (k) $(y^{-5})^2$

Question 5:   Write as a single power of y.

(a) $y^7 \times y^3$ (b) $y^9 \div y^7$ (c) $y^6 \div y^2$ (d) $(y^3)^5$ (e) $y^7 \div y$ (f) $y^3 \div y^7$ (g) $(y^9)^5$

(h) $y^6 \times y^7$ (i) $y^6 \times y^5 \times y^2$ (j) $y^8 \times y \times y^3$ (k) $\dfrac{y^8}{y^5}$

Question 6:   Write as a single power of x.

(a) $(2x^3)^2$ (b) $(5x^6)^2$ (c) $(5x^5)^3$ (d) $(2x^3)^4$ (e) $(7x^5)^2$ (f) $(4x^7)^3$ (g) $(2x^6)^6$

(h) $(10x^9)^3$ (i) $(3x^4)^4$

- **LI: I can use the laws of indices with fractional and negative powers**

Demonstration Videos:

http://corbettmaths.com/2013/03/03/fractional-indices/

http://corbettmaths.com/2013/03/24/negative-indices/

Tasks:

Question 1:   Evaluate each of the following

(a) 5^{-2} (b) 2^{-1} (c) 2^{-3} (d) 4^{-2} (e) 3^{-3} (f) 6^{-1}

(g) 10^{-2} (h) 2^{-4} (i) 9^{-2} (j) 3^{-4} (k) 10^{-1} (l) 7^{-2}

(m) 2^{-5} (n) 5^{-3} (o) 2^{-6} (p) 10^{-4} (q) 6^{-3} (r) 10^{-6}

Question 2:   Write each of the following in index form.

(a) $\dfrac{1}{5^2}$ (b) $\dfrac{1}{3^4}$ (c) $\dfrac{1}{8^3}$ (d) $\dfrac{1}{4^5}$ (e) $\dfrac{1}{10^3}$ (f) $\dfrac{1}{2^6}$

Question 3:   Write each of the following in the form 2^n

(a) $\dfrac{1}{2}$ (b) $\dfrac{1}{4}$ (c) $\dfrac{1}{32}$ (d) $\dfrac{1}{8}$ (e) $\dfrac{1}{64}$ (f) $\dfrac{1}{256}$

Question 4:   Evaluate each of the following

(a) $25^{\frac{1}{2}}$ (b) $81^{\frac{1}{2}}$ (c) $4^{\frac{1}{2}}$ (d) $144^{\frac{1}{2}}$ (e) $8^{\frac{1}{3}}$ (f) $125^{\frac{1}{3}}$

(g) $100^{\frac{1}{2}}$ (h) $1000^{\frac{1}{3}}$ (i) $49^{\frac{1}{2}}$ (j) $225^{\frac{1}{2}}$ (k) $64^{\frac{1}{2}}$ (l) $27^{\frac{1}{3}}$

(m) $216^{\frac{1}{3}}$ (n) $64^{\frac{1}{3}}$ (o) $16^{\frac{1}{4}}$ (p) $1^{\frac{1}{4}}$ (q) $81^{\frac{1}{4}}$ (r) $625^{\frac{1}{4}}$

Question 5:   Write each of the following in index form

(a) $\sqrt{x}$ (b) $\sqrt{y}$ (c) $\sqrt[3]{a}$ (d) $\sqrt[4]{y}$ (e) $\sqrt[6]{x}$ (f) $\sqrt[8]{c}$

LINK
Left & Right

A	$36^{-\frac{1}{2}}$	$\frac{1}{3}$	
B	$25^{-\frac{1}{2}}$	$\frac{1}{6}$	
C	$8^{-\frac{1}{3}}$	$\frac{1}{27}$	
D	$27^{-\frac{1}{3}}$	$\frac{1}{8}$	
E	$27^{-\frac{2}{3}}$	$\frac{1}{4}$	
F	$8^{-\frac{2}{3}}$	0.2	
G	$9^{-\frac{3}{2}}$	$\frac{1}{32}$	
H	$8^{-\frac{4}{3}}$	0.5	
I	$16^{-\frac{3}{4}}$	$\frac{1}{16}$	
J	$16^{-\frac{5}{4}}$	$\frac{1}{9}$	

Challenge:

$$4^{\frac{-3}{2}} \times 8^{\frac{1}{2}} = 2^{x}$$

Find the value of x.

Stewards Academy

Week 4:

- LI: **I can change the subject of a formula by rearranging**

Demonstration Videos:

http://corbettmaths.com/2013/12/23/changing-the-subject-video-7/

http://corbettmaths.com/2013/12/28/changing-the-subject-advanced-video-8/

Tasks:

Question 1:   Make y the subject of each of the following

(a) $y + w = c$

(b) $y - p = m$

(c) $m + y = s$

(d) $y - 2g = n$

(e) $3y = c$

(f) $ay = w$

(g) $\dfrac{y}{c} = w$

(h) $\dfrac{y}{a} = 2c$

(i) $a = y + p$

(j) $c = y - k$

(k) $y^2 = s$

(l) $y^3 = x$

(m) $\sqrt{y} = g$

(n) $\pi y = c$

(o) $n - y = t$

(p) $ry = c$

(q) $4\pi y = b$

(r) $y + 7t = c + r$

(s) $\dfrac{r}{y} = w$

(t) $y^2 = k + x$

(u) $A = xy$

Question 2:   Make x the subject of the following formulae

(a) $4x + c = w$

(b) $dx - t = 8$

(c) $x^2 + 3 = h$

(d) $2x + 2y = P$

(e) $s = x^2 - 3$

(f) $y = xz + s$

(g) $\dfrac{x}{n} + 2 = w$

(h) $\dfrac{x}{6} - 5 = w$

(i) $\dfrac{x + 3}{c} = h$

(j) $3y = 4x + 1$

(k) $x^2 + a = v$

(l) $x^3 - 4 = 5y$

(m) $\dfrac{x + t}{m} = 2c$

(n) $\dfrac{w + x}{u} = 3z$

(o) $A = \pi x^2$

(p) $A = \frac{1}{2}bx$

(q) $V = abx$

(r) $v^2 = u^2 + 2ax$

(s) $\dfrac{a + b}{x} = r$

(t) $\dfrac{5cx}{b} = a$

(u) $\sqrt[3]{\dfrac{x}{k}} = w$

Question 3:   Make c the subject of the following

(a) $(a + c)^2 = t$

(b) $v = u + ac$

(c) $v = \pi c^2 h$

21

Decide if each card is TRUE or FALSE

A $ax + bx = y \implies x = \dfrac{y}{a+b}$

B $a(x-3) = b(x-2) \implies \dfrac{3a-2b}{b-a} = x$

C $\dfrac{5}{x} + 7 = y \implies \dfrac{5}{y-7} = x$

D $\dfrac{a+1}{a} = y \implies \dfrac{1}{y+1} = a$

E $\dfrac{x-1}{x} = y \implies \dfrac{-1}{y-1} = x$

F $\dfrac{g+5}{2g} = e \implies \dfrac{5}{2e+1} = g$

G $\dfrac{2x}{x+3} = y \implies \dfrac{2y}{3-y} = x$

H $\dfrac{x+a}{x-b} = y \implies \dfrac{by-a}{1-y} = y$

I $\dfrac{4x}{7-x} = y \implies \dfrac{7y}{4+y} = x$

J $\dfrac{6w}{8-3w} = q \implies \dfrac{8q}{6+3q} = w$

K $\dfrac{t-7}{t+1} = s \implies \dfrac{s+7}{1-s} = t$

L $\dfrac{2a+8}{3a} = b \implies \dfrac{8}{3b+2} = a$

M $\dfrac{3-4h}{2h} = i \implies \dfrac{3}{2i+4} = h$

N $\dfrac{3q-6}{7-2q} = r \implies \dfrac{6r+7}{3+2r} = q$

O $\dfrac{2x}{a} + \dfrac{x+3}{b} = y \implies \dfrac{ay-3a}{2b+a} = x$

Stewards Academy

- **LI: I can calculate the volume of cuboids and prisms**

Demonstration Videos:

http://corbettmaths.com/2012/08/09/volume-of-cuboids-and-cubes/

http://corbettmaths.com/2013/04/20/volume-of-a-prism/

Tasks:

Complete the table for cuboids **A** to **E**.

Cuboid	Width	Height	Length	Volume
A	5 cm	7 cm	5.5 cm	
B	6 cm	45 mm		189 cm³
C		6 m	450 cm	94.5 m³
D	8.5 mm		7 mm	148.75 mm³
E	2.4 cm	32 mm	0.067 m	

F) These are the side lengths of cubes. Calculate their volumes.

a) 8 cm
b) 5 mm
c) 3.5 m
d) 0.5 cm

G) These are the volumes of cubes. Calculate their side lengths.

a) 64 cm³
b) 125 m³
c) 343 mm³
d) 729 cm³

I) These two attached cuboids are identical.

H) Calculate the volume of these 3 compound cuboids.

J)

Volume of a Cuboid

Calculate the volume of these cuboids.

A)

B)

C) The area of the face of this prism is 24 m².

D)

E) This is a cube. What is its volume?

F) The volume of this cuboid is 105 mm³. What is the cuboid's length?

G) The volume of a cuboid is 64 m³. Its height is twice its width. Its length is twice its height. What are the cuboid's dimensions?

23

Stewards Academy

Calculate the volume

1)
5 cm
3 cm
6 cm

2)
2 cm
3 cm
6 cm

3)
3 cm
2 cm
4.5 cm

★ ★

Calculate the volume

1)
4 cm
3 cm
5 cm

2)
2 cm
5 cm
3 cm

3)
3 cm
3 cm
4 cm

★ ★ ★

Calculate the volume

1)
3 cm
5 cm
4 cm

2)
5 cm
4 cm
7 cm
3 cm

3)
2 cm
5 cm
4 cm
4 cm
3 cm

Volume of a Prism

= 1 cm³

The prism has been cut into two.

A) Volume = _____ cm³

B) V =

C) V =

D) V = 6 cm
8 cm²
G) V =

8 cm
3 cm
4 cm
J) V =

5 m
6 m
5 m
4 m
M) V =

7 cm
11 cm²
F) V =

8 cm
3 cm
4 cm
I) V =

6 cm
4 cm
7 cm
L) V =

6 cm
11 cm²
E) V =

8 cm²
3 cm²
4 cm
H) V =

4 cm
7 cm
5 cm
K) V =

Stewards Academy

- **LI: I can calculate the volume of cylinders**

Demonstration Videos:

http://corbettmaths.com/2013/02/15/volume-of-a-cylinder/

Tasks:

Question 1: Work out the volume of each cylinder.
Give each answer to one decimal place.

(a) 4cm 10cm

(b) 8cm 30cm

(c) 10cm 9cm

(d) 2.5mm 8mm

(e) 40cm 25cm

(f) 5cm 17cm

Question 2: Work out the volume of each cylinder.
Give each answer in terms of π.

(a) 2cm 3cm

(b) 20cm 22cm

(c) 3cm 25cm
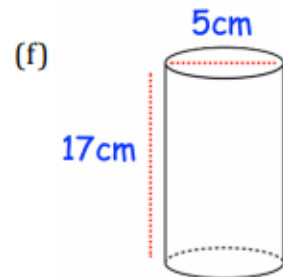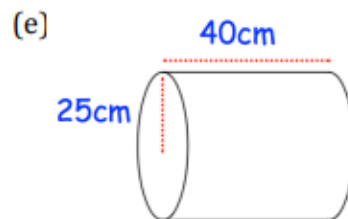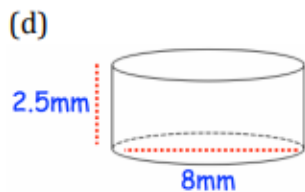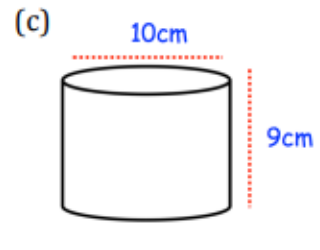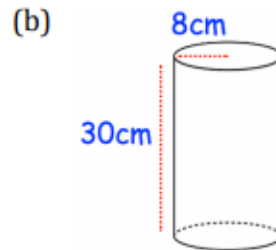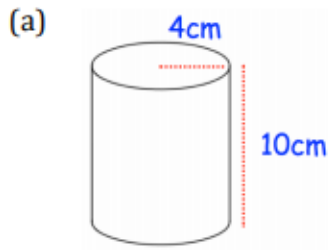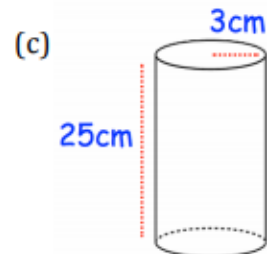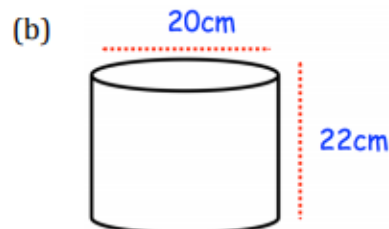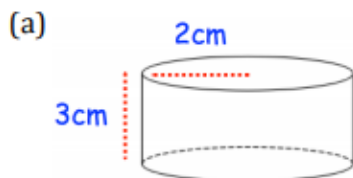
Question 3: Work out the height of each cylinder.
Give each answer to one decimal place.

(a) 6cm h Volume = 1600cm³

(b) 9cm h Volume = 800cm³

(c) 0.2m h Volume = 0.11m³
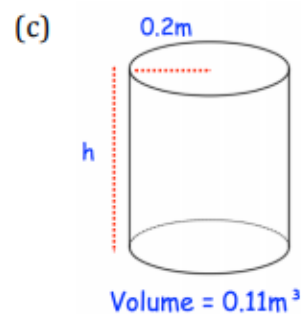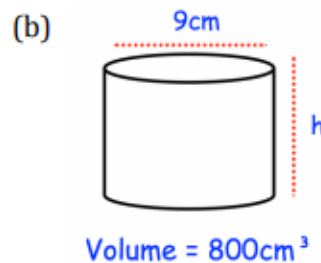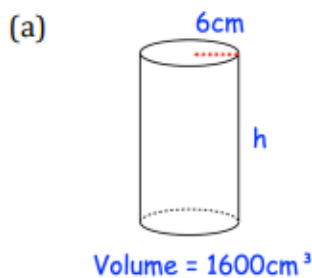
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25

Question 4: Work out the value of x.
Give each answer to one decimal place.

(a) Volume = 725cm³

x
20cm

(b)

12cm
x
Volume = 9000cm³

(c)

x
9cm
Volume = 170cm³
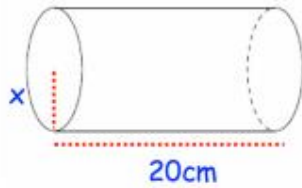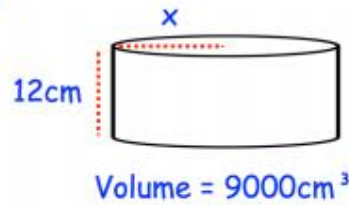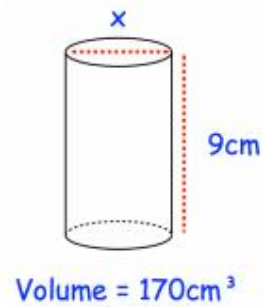
Apply

Question 1: A cylindrical oil drum has a diameter of 48cm and a height of 92cm.
Calculate the volume of the oil drum.

48cm
92cm

Question 2: A cylinder has a radius of 2m and a height of 5cm.
Work out the volume of the cylinder in terms of π.

Question 3: Timothy is filling cups with orange juice.
Each cup is a cylinder with radius 3cm and height 7cm.
Timothy has 2 litres of orange juice.
1 litre = 1000cm³

How many cups can be filled?

3cm
7cm
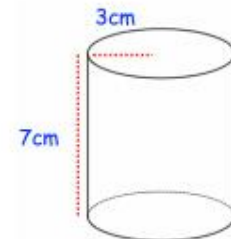
Question 4: Shown below is a cylinder and a cube.
The volume of the cylinder is equal to the volume of the cube.
Find y.

8cm
y

9cm

![Stewards Academy logo]

Stewards Academy
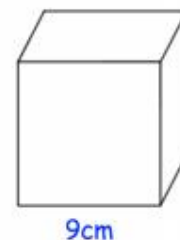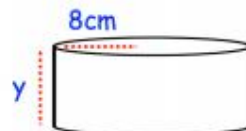
- **LI: I can calculate the volume of spheres**

Demonstration Videos:

http://corbettmaths.com/2013/03/03/volume-of-a-sphere/

Formulae:
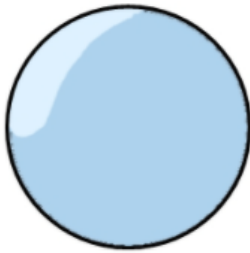
Volume of a Sphere:

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

where r is the radius of the sphere.

Tasks:

Question 1: Find the volume of each of these spheres.
Give each answer to one decimal place (you may use a calculator)

(a) **8cm**

(b) **3cm**

(c) **1.5m**

(d) **22cm**

(e) **7m**

(f) **0.8cm**
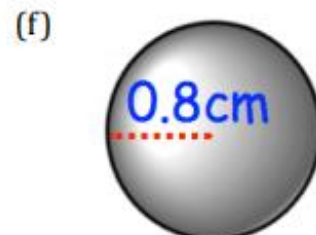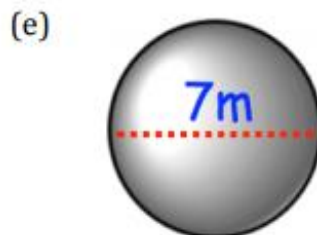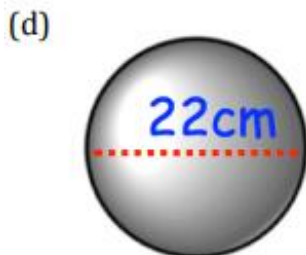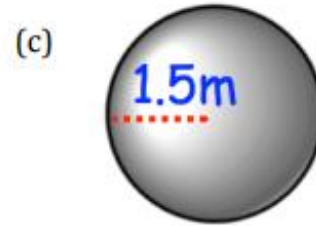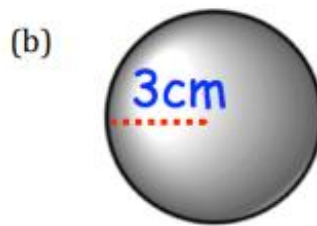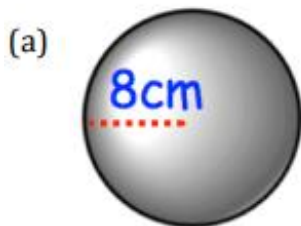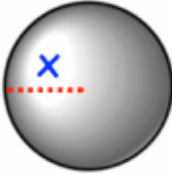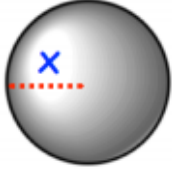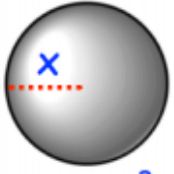
Question 2: Find the volume of each of these spheres.
Give each answer in terms of π (you may not use a calculator)

(a) **3cm**

(b) **12cm**

(c) **5cm**

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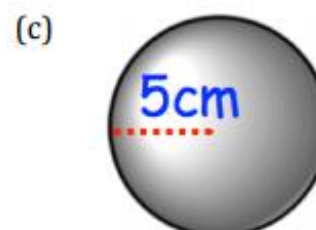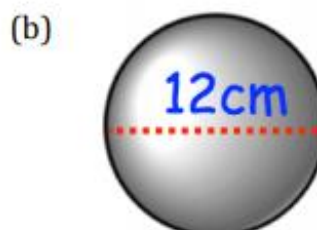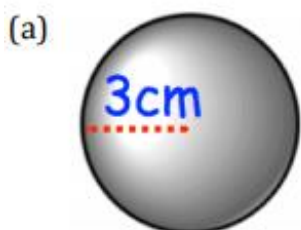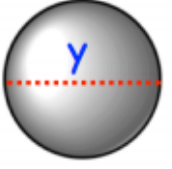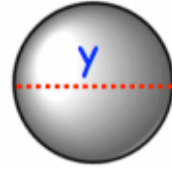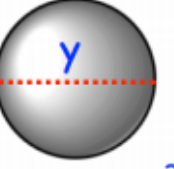
Question 3: Find the volume of each of these spheres.
Give your answers to three significant figures (you may use a calculator)

(a) A sphere with radius 9cm

(b) A sphere with diameter 38cm

(c) A sphere with diameter 6.7cm

(d) A sphere with radius 1.25 inches.

Question 4: Find the size of the radius in each of the spheres below.
Give your answers to one decimal place (you may use a calculator)

(a)

x

Volume = 200cm^3

(b)

x

Volume = 1950cm^3

(c)

x

Volume = 1m^3

Question 5: Find the size of the diameter in each of the spheres below.
Give your answers to one decimal place (you may use a calculator)

(a)

y

Volume = 50cm^3

(b)

y

Volume = 2360cm^3

(c)

y

Volume = 0.4m^3

Apply

Question 1: A metal cuboid measuring 4cm by 5cm by 12cm is melted down and a sphere is made.
Calculate the radius of the sphere.

Question 2: Calculate the volume of a hemisphere with base of radius 8cm.

8cm

Question 3: A solid sphere fits perfectly inside of a cube box of side length 10cm.
What percentage of the box is empty?

Question 4: A ball of gold has a radius of 9cm.
The density of gold is 19.3g/cm^3.
Work out the mass of the ball.

Stewards Academy

- **LI: I can calculate the volume of cones and pyramids**

Demonstration Videos:

http://corbettmaths.com/2013/03/03/volume-of-a-cone/

http://corbettmaths.com/2013/03/05/volume-of-a-pyramid/

https://corbettmaths.com/2019/04/24/volume-of-a-frustum/

Formulae:
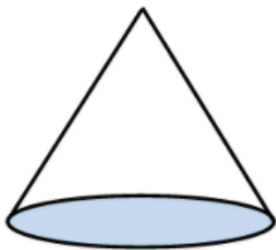
Volume of a Cone:

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

where r is the radius, and h is the perpendicular height of the cone.
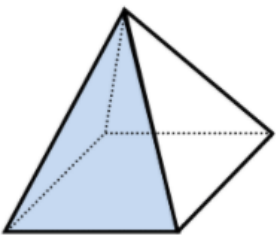
Volume of a Pyramid:

$$\frac{1}{3} \times \text{area of base} \times \text{height}$$

Question 1:   Work out the volumes of each of following cones.
Give each answer to one decimal place.

(a)   (b)   (c)

20cm   7cm   5cm   1.5cm   9cm   8cm
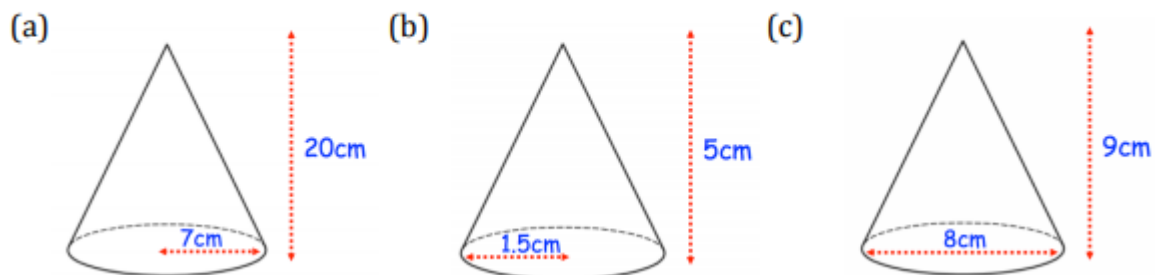
Question 2:   Work out the volumes of each of the following cones.
Give each answer in terms of π

(a)   (b)   (c)

20cm   9cm   15mm   12mm   50cm   30cm
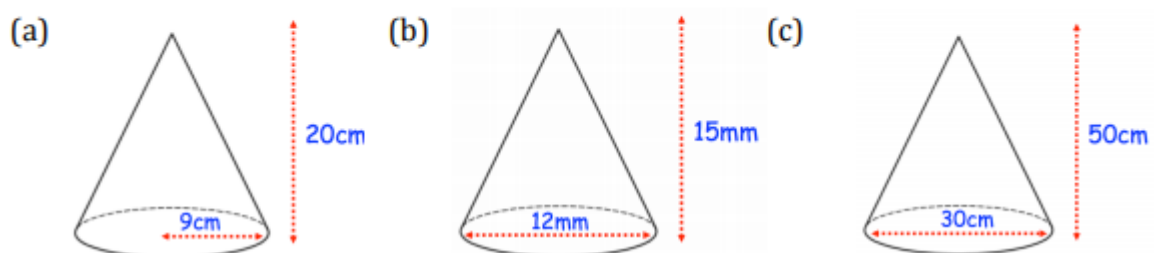
Question 3: Work out the vertical height of each cone.
Give each answer to a suitable degree of accuracy.

(a)

7cm

x

Volume = 1000cm³

(b)

2cm

x

Volume = 22cm³

(c)

2.8cm

x

Volume = 17cm³
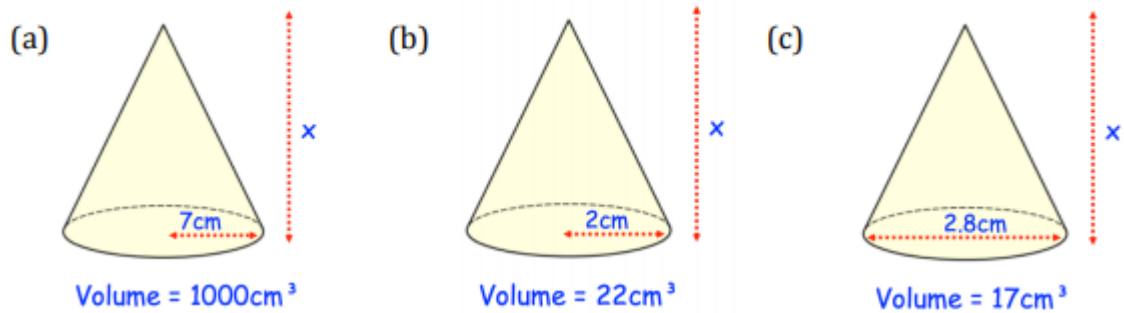
Question 4: Calculate the length of the radius for each of these cones.
Give each answer to a suitable degree of accuracy.

(a)

20cm

x

Volume = 195cm³

(b)

12cm

x

Volume = 300cm³

(c)

10cm

x

Volume = 880cm³
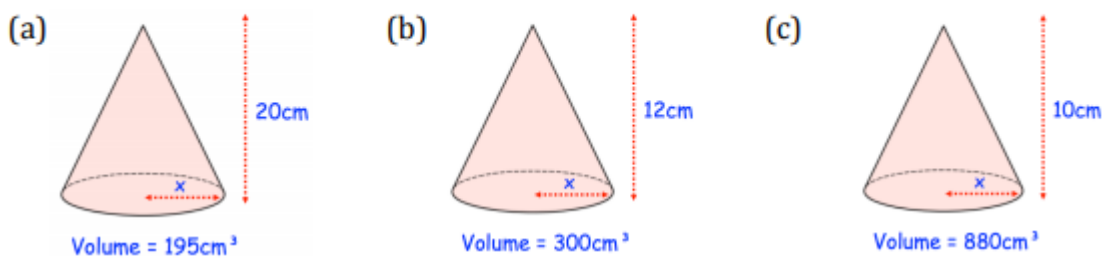
Question 1: Find the volume of each of these pyramids.
Give each answer to one decimal place (you may use a calculator)

(a)

7cm
6cm
9cm

(b)

8cm
6cm
6cm

(c)

3m
3cm
4cm

(d)

12cm
5cm
7cm

(e)

20.6cm
15cm
10cm
10cm

(f)

90cm
1.5m
2m
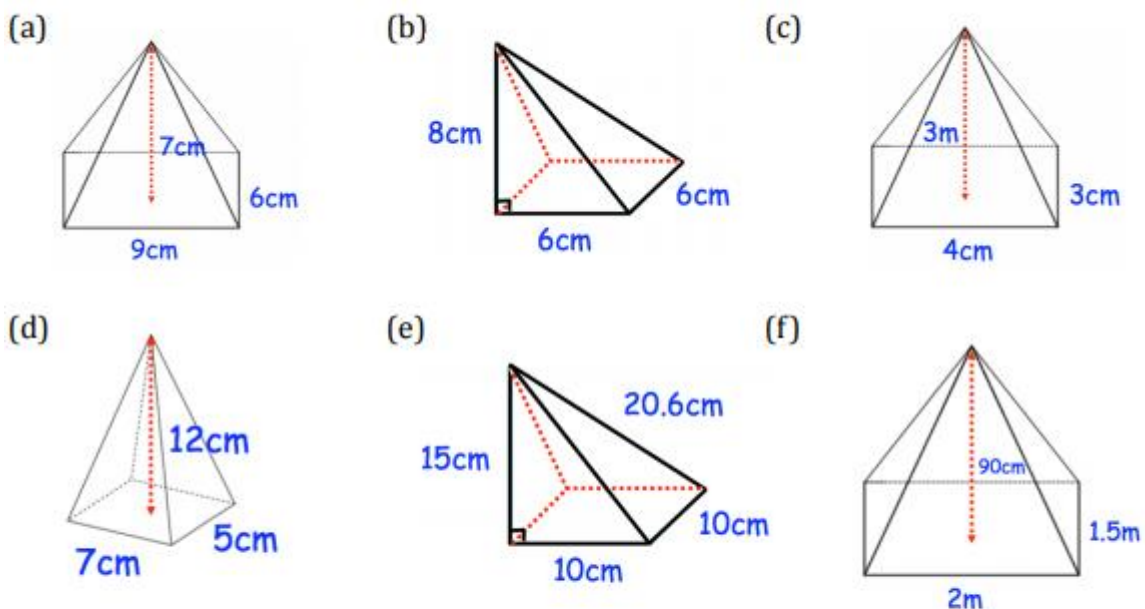
Question 2: A square-based pyramid has a base with side length 8cm.
The height of the pyramid is 11cm.
Calculate the volume of the pyramid.

Question 3: A rectangular-based pyramid has a base with length 12cm and width 6cm.
The height of the pyramid is 8cm.
Calculate the volume of the pyramid.

Question 4: An octagon-based pyramid has a height of 18cm.
The area of the octagon base is 20cm².
Calculate the volume of the pyramid

18cm
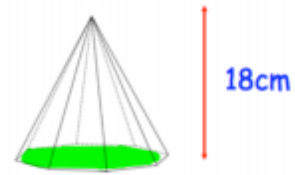
Question 5: A hexagon-based pyramid has a height of 54cm.
The volume of the pyramid is 1080cm³.
Calculate the area of the base of the pyramid.

54cm
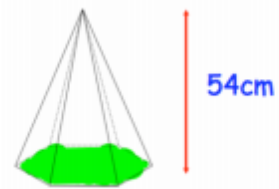
Challenges:

This frustum has been created by slicing off the top of a cone as shown. The radius of the frustum's smaller circular face is 6 cm and the diameter of its larger circular face is 20 cm. The height of the frustum is 8 cm. Find the volume of the frustum, in cm³, rounding your answer to 2 decimal places.

12 cm

8 cm

←6 cm→

20 cm
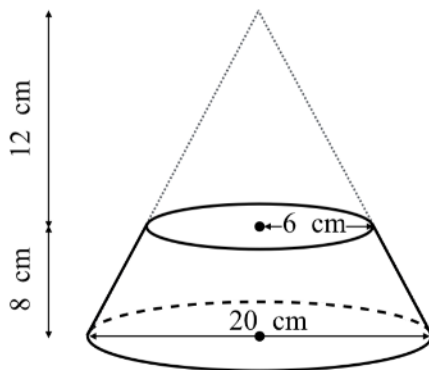
Formula

Volume of a cone

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

h

r
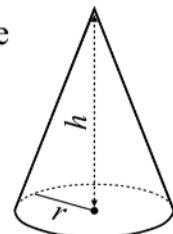
A cone is placed inside a sphere as shown. The sphere and the circular base of the cone have the same radius. The height of the cone is equal to the radius of the sphere.

What fraction of the sphere is occupied by the cone?

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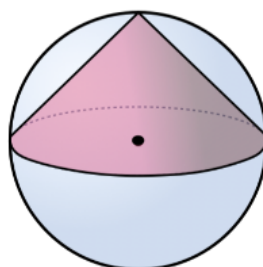
- **LI: I can calculate the surface area of spheres**

Demonstration Videos:

http://corbettmaths.com/2013/03/26/surface-area-of-a-sphere/

Formulae:
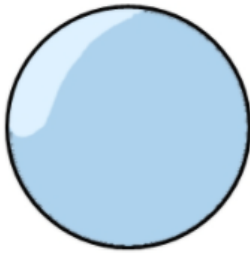
Surface Area of a Sphere:

$$4\pi r^2$$

where r is the radius of the sphere

Question 1: Work out the surface area of each of these spheres.
Give each answer to 2 decimal places (you may use a calculator)

(a)

5cm

(b)

14cm

(c)

6cm

(d)

1.3cm

(e)

27cm

(f)

0.9mm
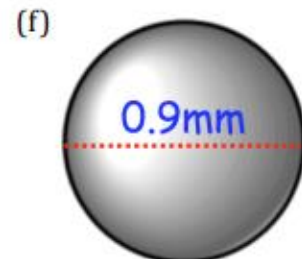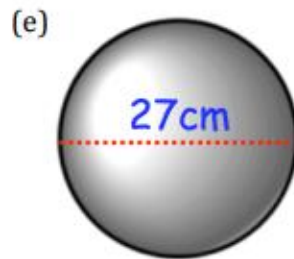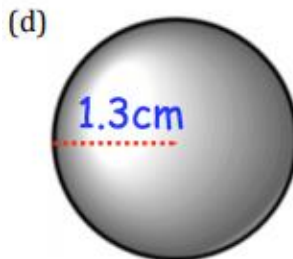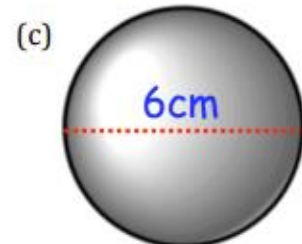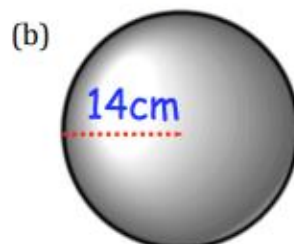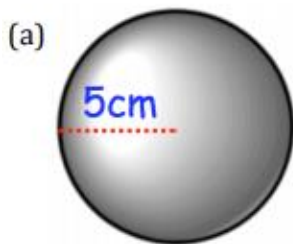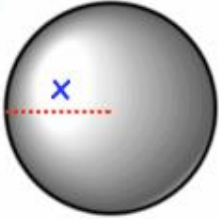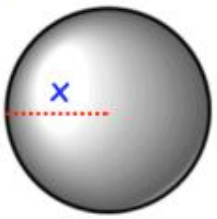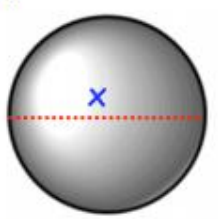
Question 2: Find the surface area of each of these spheres.
Give each answer in terms of π (you may not use a calculator)

(a)

7cm

(b)

8cm

(c)

1.1m
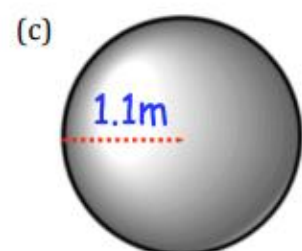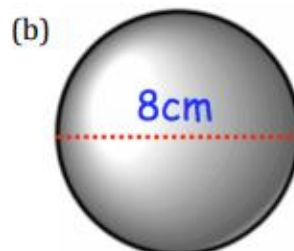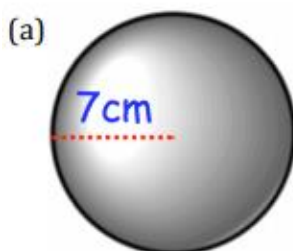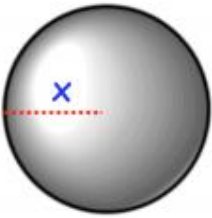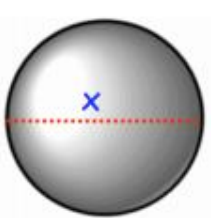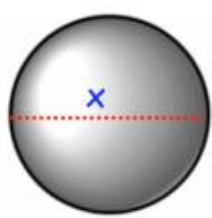
Question 3: Find the surface area of each of these spheres.
Give your answer to 3 significant figures (you may use a calculator)

(a) A sphere with diameter 2cm

(b) A sphere with radius 36mm

(c) A sphere with radius 0.4m

(d) A sphere with diameter 2.07 inches

Question 4: Find the size of x in each of the sphere below.
Give your answers to two decimal places (you may use a calculator)

(a)

(b)

(c)

Surface area = 50cm²

Surface area = 940cm²

Surface area = 4800cm²

Question 5: Find the size of x in each of the sphere below.
You may not use a calculator

(a)

(b)

(c)

Surface area = 16π cm²

Surface area = 100π cm²

Surface area = 3600π cm²

Apply

Question 1: A glass paperweight is shown below.
The paperweight is a hemisphere with diameter 9cm.
Find the surface area of the paperweight

9cm
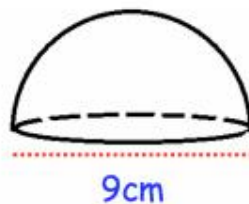
Question 2: The formula for the surface area of a sphere is $A = 4\pi r^2$
Make r the subject of the formula

- **LI: I can calculate the surface area of cones**

Demonstration Videos:

http://corbettmaths.com/2013/10/24/surface-area-of-cone/

Formulae:
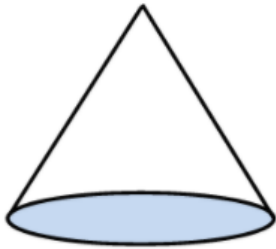
Curved Area of a Cone:

$$\pi r l$$

where r is the radius, and l is the slant height of the cone.

Question 1:   Work out the surface areas of each of the following cones. Give each answer in terms of π

(a)

11cm
6cm

(b)

17cm
15cm
8cm

(c)

53cm
45cm
56cm

Question 2:   Work out the surface areas of each of the following cones. Give each answer to one decimal place.

(a)

4.5mm
1.8mm

(b)

7cm
24cm
25cm

(c)

50cm
30cm
80cm
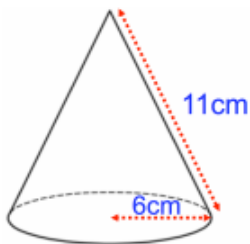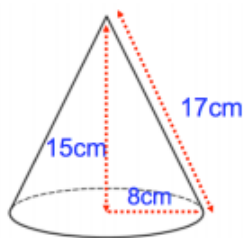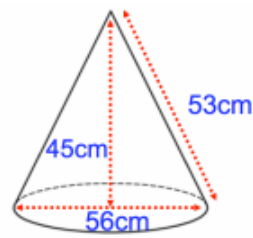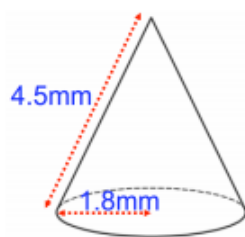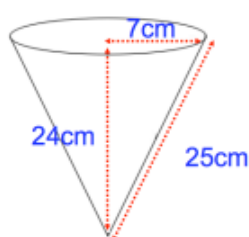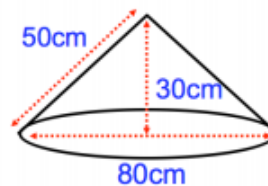
Question 3:   Work out the surface areas of each of the following cones. Give each answer to one decimal place.

(a)

5cm
4cm

(b)

21cm
20cm

(c)

5cm
7cm
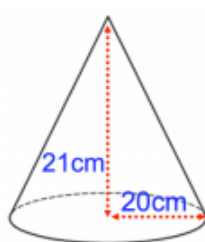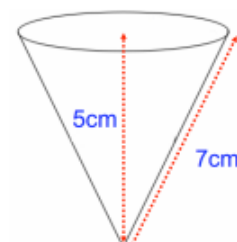
Question 4: Work out the surface area of each of the following cones. Give each answer in terms of π
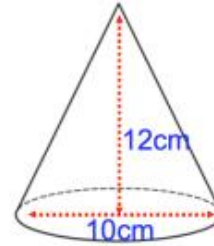
(a)

10cm

4cm

(b)

40cm

50cm

(c)

12cm

10cm
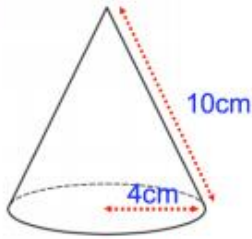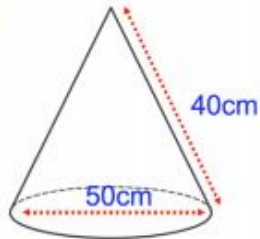
Question 5: Calculate the slant height for each of these cones

(a)

x

9cm
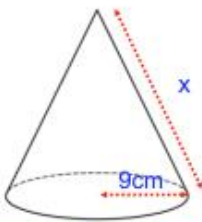
Total surface area = 216π cm²

(b)

11cm

x
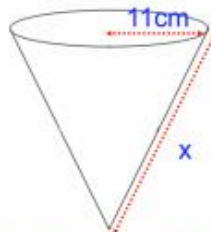
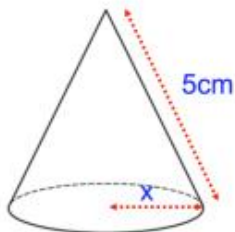Total surface area = 792π cm²

(c)

x
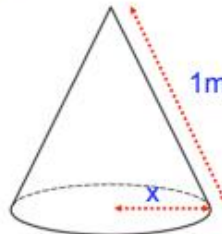
2cm
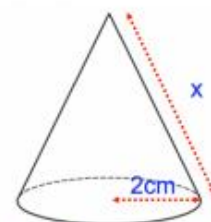
Total surface area = 100 cm²

Question 6: Calculate the lengths of the radius for each of these cones

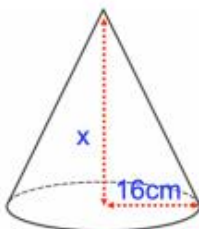**(a)**

5cm

x

Total surface area = 36π cm²

(b)

1m
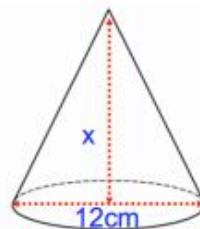
x

Total surface area = 9600π cm²

Question 7: Calculate the heights of these cones

(a)

x

16cm

Total surface area = 800π cm²

(b)

x

12cm

Total surface area = 750 cm²

- **LI: I can use the scale factor of similar shapes to find missing sides, areas, and volumes**
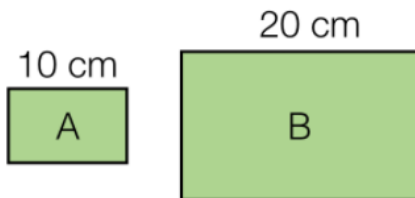
Demonstration Videos:

http://corbettmaths.com/2012/08/10/congruent-and-similar-shapes/

http://corbettmaths.com/2013/11/16/similarshapes/

http://corbettmaths.com/2013/11/16/similar-shapes-areas/

http://corbettmaths.com/2013/11/17/similar-shape-volumes/

Tasks:

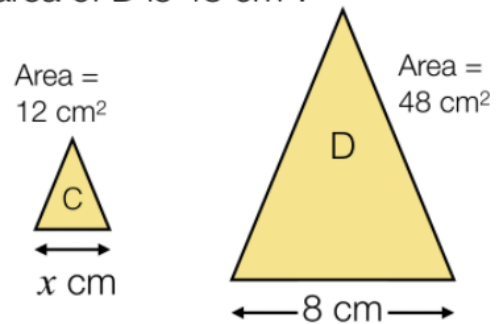Here are two similar rectangles. The perimeter of A is 32 cm and its area is 60 cm².

10 cm

20 cm

A

B

a) Find the perimeter of rectangle B.
b) Find the area of rectangle B.

Here are two similar triangles. The area of C is 12 cm² and the area of D is 48 cm².

Area = 12 cm²

Area = 48 cm²

C

D

x cm

←— 8 cm —→

c) Work out the value of x.

Here are two similar rectangles. The perimeter of A is 15 cm and the perimeter of B is 45 cm.

A

B

a) Given that the area of rectangle A is 12 cm², find the area of rectangle B.

Here are two similar shapes, with areas as shown.

Area = 10 cm²

Area = 250 cm²

x cm

←— 15 cm —→
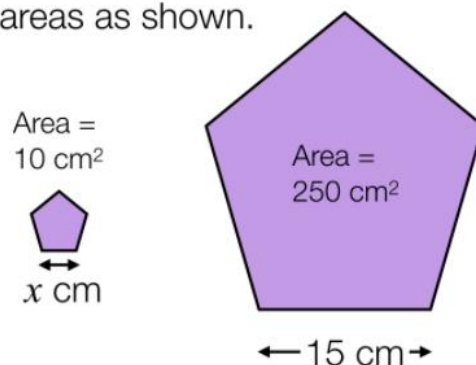
b) Work out the value of x.

Cuboid B is an enlargement of cuboid A with scale factor 2.
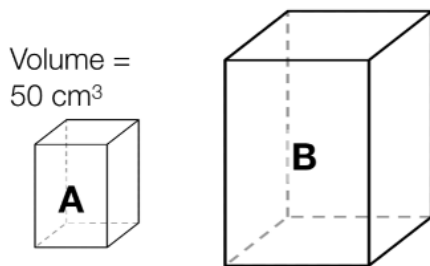

5 cm   3 cm   **A**   4 cm   **B**
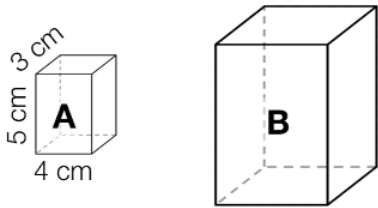
a) Compare the volumes of the two cuboids.
b) Compare the surface areas of the two cuboids.

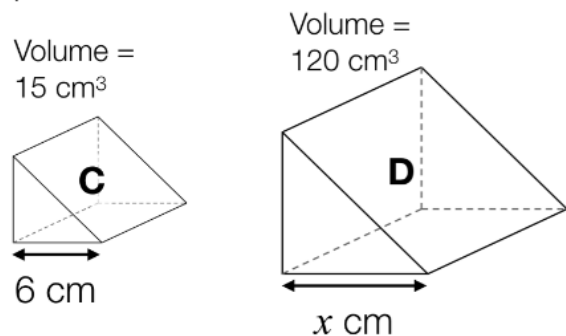Here are two similar prisms. The volume of C is 10 cm³ and the volume of D is 270 cm³.

C x cm   **D**   ←—12 cm—→
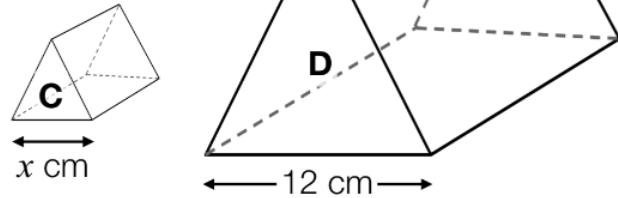
c) Work out the value of x.
d) Given that the surface area of D is 693 cm², work out the surface area of C.

Cuboids A and B are similar. Cuboid B is 3 times taller than A.

Volume = 50 cm³

A   **B**

a) Work out the volume of cuboid B.

Prism D is an enlargement of prism C.

Volume = 15 cm³   Volume = 120 cm³

C   6 cm   **D** x cm

b) Work out the value of x.

R and S are mathematically similar square-based pyramids. The surface area of R is 625 cm² and the surface area of S is 100 cm².

a) The length of one side of the square base of R is 12.5 cm. What is the length of one side of the square base of S?

b) The volume of S is 56 cm³. Work out the volume of R.

R   **S**

Stewards Academy
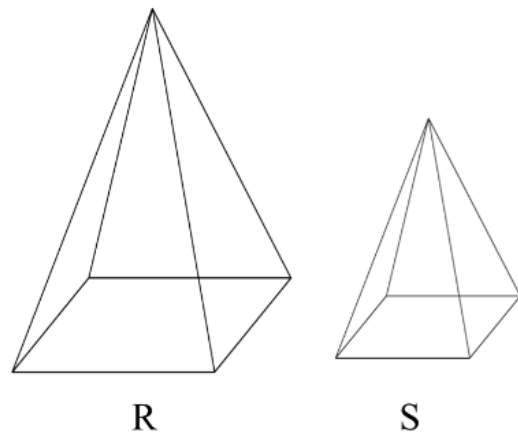
Questions	Question Title
1	Converting decimals to fractions
2	Writing a number as a percentage of another
3	Substituting into formulae
4	Units of density
5	Solving linear equations: brackets, x on both sides
6a	Inverse proportion graphs, prism volume
6b	Volume of a prism
7	Describing enlargements
8	Estimating the mean for grouped data
9	Right-angled trigonometry, finding angles
10	Finding the next term in a quadratic sequence
11	Simplifying algebraic fractions
12	Compound measure
13	Solving equations and straight lines
14a	Fractions of amounts
14b	Comparing fractions
15	Compound interest, exponential growth
16a	Factorising expressions
16b	Factorising quadratic expressions
17	Area of a parallelogram, trigonometry
18a/b	Shading sets in Venn diagrams
19	Area of a rectangle, writing and solving equations
20	Algebraic direct proportion
21a	Using a quadratic graph to solve a related quadratic equation
21b	Solving quadratic equations
22	Area of a semi-circles and sectors, percentages of amounts
23a	Drawing a histogram
23b	Calculating frequencies from a histogram
24	Drawing and reading a speed-time graph
25	Pressure, upper and lower bounds calculations
26	Vector proofs
27	Solving quadratic equations from algebraic fractions