

## Day 1: Indices

### Question 1

a Write down the value of

i  $5^0$

ii  $4^{-2}$

b Simplify  $16^{-\frac{3}{4}} \times 8^{\frac{1}{3}}$

### Question 2

Evaluate:

i  $27^{\frac{2}{3}}$

ii  $\left(\frac{3}{2}\right)^{-2}$

### Question 3

Work out

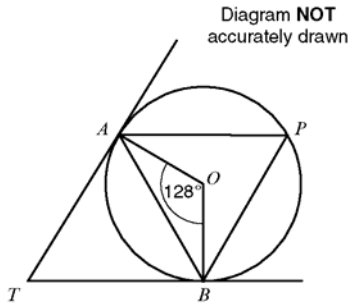
$$\frac{(3 - \sqrt{2})(2 + 3\sqrt{2})}{\sqrt{8}}$$

Give your answer in its simplest form

## Day 2: Angles

### Question 1

Two tangents are drawn from a point  $T$  to a circle centre  $O$ . They meet the circle at points  $A$  and  $B$ . Angle  $AOB$  is equal to  $128^\circ$ .



In this question you **MUST** give **reasons** for your answers.

Work out the size of the angles

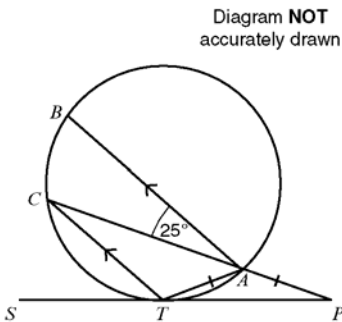
i  $APB$ ,

ii  $BAO$ ,

iii  $ABT$ .

### Question 2

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



Angle  $BAC = 25^\circ$ .

The line  $PTS$  is the tangent at  $T$  to the circle.

$AT = AP$ .  $AB$  is parallel to  $TC$ .

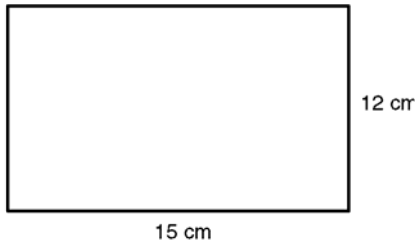
a Calculate the size of angle  $APT$ . Give reasons for your answer.

b Calculate the size of angle  $BTS$ . Give reasons for your answer.

## Day 3: Pythagoras & Trig

### Question 1

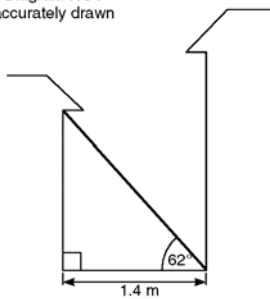
Calculate the length of a diagonal of this rectangle.  
Give your answer in centimetres correct to one decimal place.



### Question 2

The diagram shows a house and a garage on level ground.

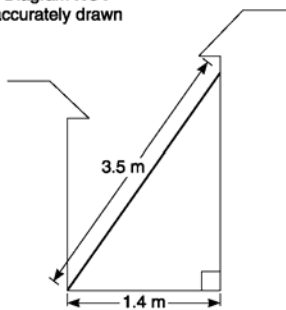
Diagram **NOT**  
accurately drawn



A ladder is placed with one end at the bottom of the house wall.  
The top of the ladder touches the top of the garage wall.  
The distance between the garage wall and the house is 1.4 m.  
The angle the ladder makes with the ground is  $62^\circ$ .

**a** Calculate the height of the garage wall.  
Give your answer correct to 3 significant figures.

Diagram **NOT**  
accurately drawn



A ladder of length 3.5 m is then placed against the house wall.  
The bottom of this ladder rests against the bottom of the garage wall.

**b** Calculate the angle that this ladder makes with the ground.  
Give your answer correct to 1 decimal place.

## Day 4: Proportion

### Question 1

Malika's father won £128.

He shared the £128 between his three children in the ratio 6:3:1.

Malika was given the biggest share.

**a** Work out how much money Malika received.

Malika saved  $\frac{2}{3}$  of her share.

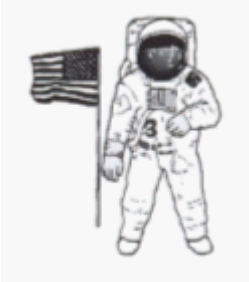
**b** Work out how much Malika saved.

### Question 2

A wax statue of a spaceman is on display in museum.

Wax models are to be sold in the museum shop.

The statue and the wax models are similar.



The height of the statue is 1.8m

The height of the model is 15cm.

The area of the flag in the model is 10cm<sup>2</sup>

**a)** Calculate the area of the statue's flag.

The volume of the wax of the original statue is 172.8 litres.

**b)** Calculate the volume of wax used to make the model.  
Give your answer in ml.

**Question 3**

$y$  is directly proportional to the square of  $x$ .

When  $x = 4$ ,  $y = 25$ .

a. Find an expression for  $y$  in terms of  $x$ .

b. Calculate  $y$  when  $x = 2$ .

c. Calculate  $x$  when  $y = 9$ .

**Day 5:  $y = mx + c$**

**Question 1**

A straight line has the equation  $y = 4x - 5$

**a.** Write down the equation of the straight line that is parallel to  $y = 4x - 5$  and passes through the point  $(0,3)$ .

**b.** Rearrange the equation  $y = 4x - 5$  to find  $x$  in terms of  $y$ .

**Question 2**

Here are the equations of 5 straight lines.

They are labeled from A to E.

<b>A</b>	$y = 2x + 1$	
<b>B</b>	$y = 1 - 2x$	
<b>C</b>	$2y = x - 1$	
<b>D</b>	$2x - y = 1$	
<b>E</b>	$x + 2y = 1$	

**a.** Put ticks in the table to show the two lines that are parallel.

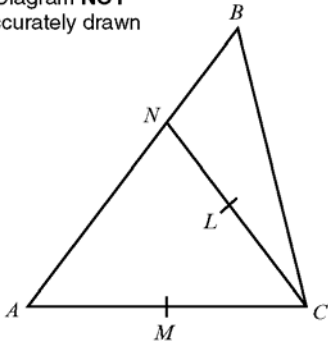
**b.** Write down the two lines that are perpendicular to line E.

## Day 6: Vectors

### Question 1

In triangle  $ABC$ ,  $M$  is the midpoint of  $AC$ .

Diagram **NOT**  
accurately drawn



$N$  is a point on  $AB$  so that  $AN = 2NB$ .

$L$  is the midpoint of  $CN$ .

$\mathbf{p}$  is the vector  $AB$ ,  $\mathbf{q}$  is the vector  $AC$ .

**a** Express in terms of  $\mathbf{p}$  and  $\mathbf{q}$  the vectors

**i**  $AM$ ,

**ii**  $AN$ ,

**iii**  $NL$ .

**b** Prove that the lines  $AB$  and  $LM$  are parallel.

### Question 2

$A$  is the point  $(2, 3)$  and  $B$  is the point  $(-2, 0)$ .

**(a) (i)** Write  $\vec{AB}$  as a column vector.

**(ii)** Find the length of the vector  $\vec{AB}$ .

$D$  is the point such that

$\vec{BD}$  is parallel to  $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$  and the length of  $\vec{AD} =$  the length of  $\vec{AB}$ .

$O$  is the point  $(0, 0)$ .

**(b)** Find  $\vec{OD}$  as a column vector.

$C$  is the point such that  $ABCD$  is a rhombus.

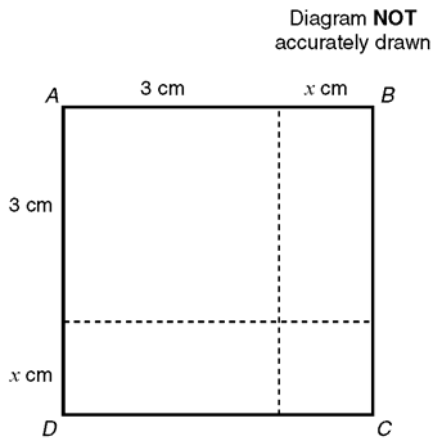
$AC$  is a diagonal of the rhombus.

**(c)** Find the coordinates of  $C$ .

## Day 7: Quadratics

### Question 1

In the diagram, each side of the square  $ABCD$  is  $(3 + x)$  cm.



- a Write down an expression in terms of  $x$  for the area, in  $\text{cm}^2$ , of the square  $ABCD$ .

The actual area of the square  $ABCD$  is  $10\text{cm}^2$ .

- b Show that  $x^2 + 6x = 1$

### Question 2

Solve the equations

i  $4y^2 - 81 = 0$

ii  $\frac{1}{x+2} + \frac{1}{3} = -1$

### Question 3

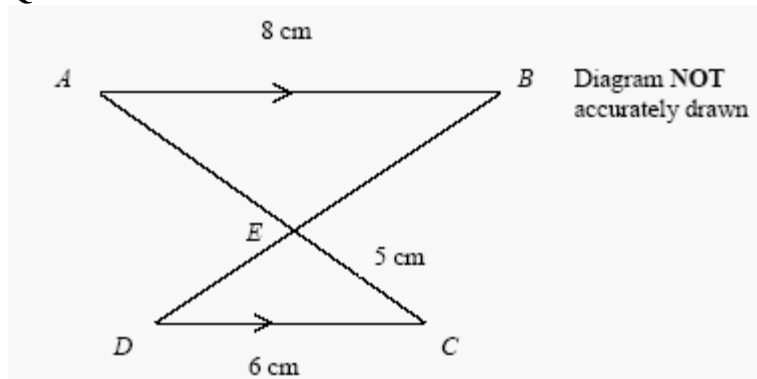
- a Show that the mean of five consecutive numbers with median  $n$  is also  $n$ .

- b Show that the mean of the squares of these 5 numbers exceeds the median of the squares by the number 2.



## Day 8: Similarity

### Question 1



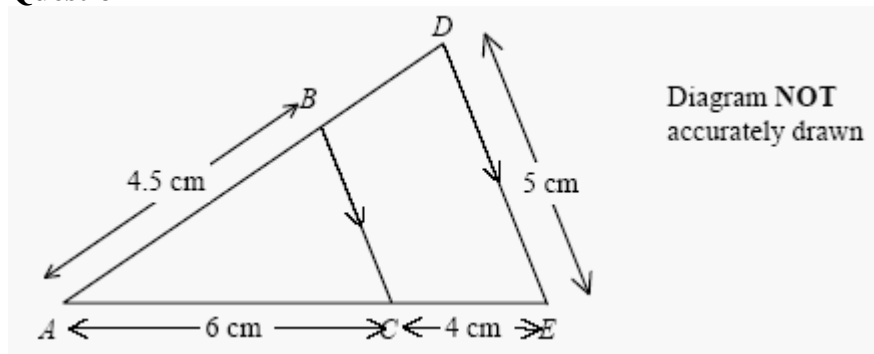
AB is parallel to DC.

The lines AC and BD intersect at E.

AB = 8cm      EC = 5cm      DC = 6cm

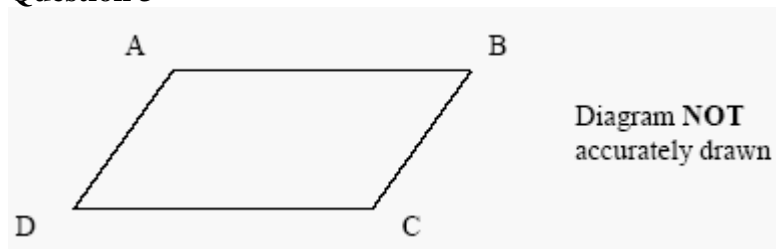
- Explain why triangle ABE and triangle CDE are similar.
- Calculate the length of AC.

### Question 2



- Work out the length AD.
- Work out the length BC.

### Question 3



ABCD is a parallelogram.

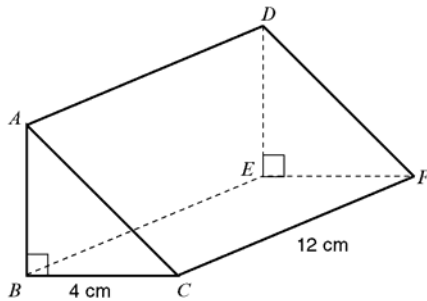
Prove that triangles ABD and BCD are congruent.

## Day 9: Volume

### Question 1

The diagram shows a triangular prism.

Diagram **NOT**  
accurately drawn



$BC = 4$  cm,  $CF = 12$  cm and angle  $ABC = 90^\circ$ .  
The volume of the triangular prism is  $84$  cm<sup>3</sup>.  
Work out the length of the side  $AB$  of the prism.

### Question 2

The diagram shows a solid wooden cone.

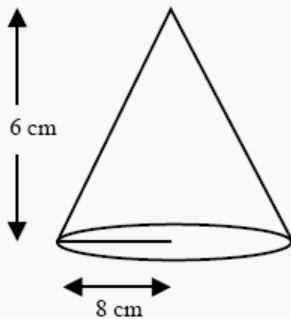
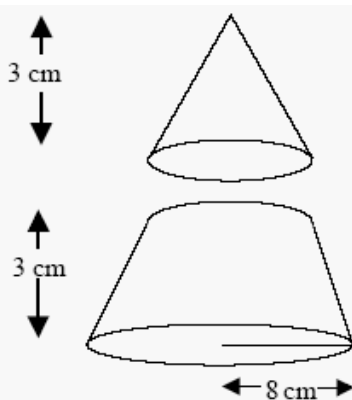


Diagram **NOT**  
accurately drawn

The height of the cone is 6 cm. The base radius of the cone is 8 cm.

a. Find the volume of the cone.

The cone is cut once to form a smaller cone and a frustum.



Diagrams **NOT**  
accurately drawn

The height of the smaller cone and the height of the frustum are both 3 cm.  
The base radius of the smaller cone is 4 cm.

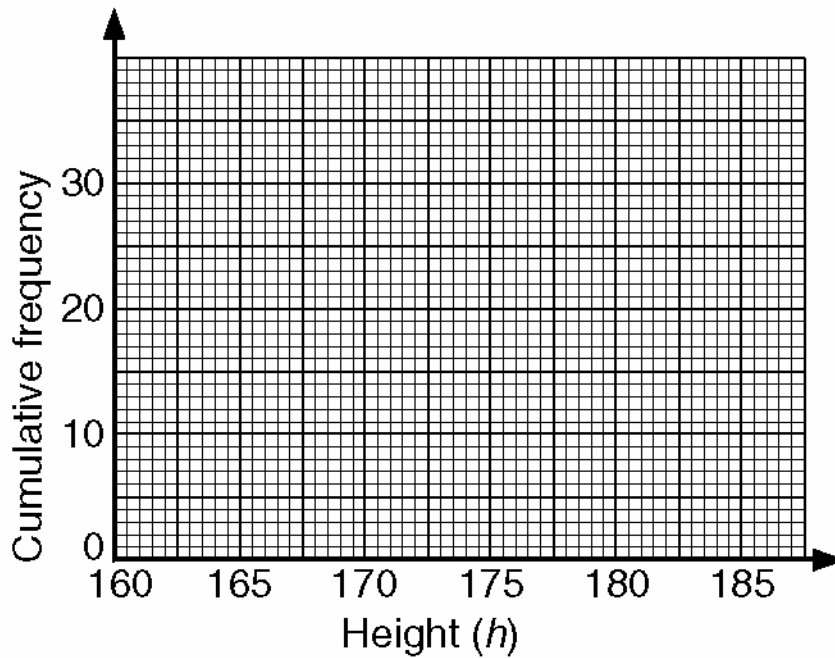
b. Show that the volume of the frustum is  $112\pi$  cm<sup>3</sup>

## Day 10: Cumulative Frequency

### Question 1

a Complete the cumulative frequency table and hence draw a cumulative frequency graph for the data.

Group	Frequency	Cumulative frequency
$160 \leq h < 165$	7	7
$160 \leq h < 170$	6	
$160 \leq h < 175$	2	
$160 \leq h < 180$	10	
$160 \leq h < 185$	5	



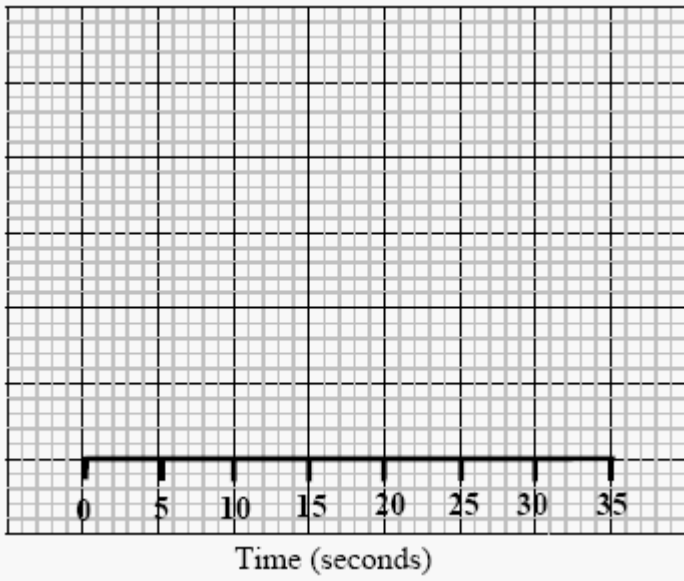
- b Use the cumulative frequency graph to calculate an estimate of
- median of the data
  - interquartile range of the data.

**Question 2**

The times, in seconds, taken by 11 teachers to solve a puzzle are listed in order

4    12    13    17    18    20    24    25    30    34

- a) Find
  - i) the lower quartile,
  - ii) the interquartile range.
- b) Draw a box plot for this data.



## Answers

### Day 1

#### Question 1

- a) i) 1  
ii) 1/16  
b)  $1/8 \times 2 = 1/4$

#### Question 2

- i) 9  
ii) 4/9

#### Question 3

3.5

### Day 2

#### Question 1

- i)  $\angle APB = 64^\circ$  (Angle subtended at the circumference is half that subtended at the centre)  
ii)  $\angle BAO = 26^\circ$  Triangle  $OAB$  is Isosceles so  $\angle BAO = (180 - 128) \div 2$   
iii)  $\angle ABT = 64^\circ$  ( $\angle OBT$  is  $90^\circ$  because BT is a tangent and OB is a radius;  $\angle ABT = 90 - \angle OBA = 90 - 26$ )

#### Question 2

- a)  $ACT = 25^\circ$  alt angle  
 $ATP = 25^\circ$  alt seg  
 $APT = 25^\circ$  isos triangle  
b)  $TAP = 130^\circ$   $\angle$ 's in triangle  
 $CAT = 50^\circ$   $\angle$ 's in straight line  
 $BTS = 75^\circ$  alt seg

### Day 3

#### Question 1

$$\sqrt{15^2 + 12^2} = 19.2 \text{ cm}$$

#### Question 2

- a)  $x/1.4 = \tan 62^\circ$   
 $x = 1.4 \times \tan 62^\circ (= 1.4 \times 1.8807...) = 2.63(30..)$   
b)  $\cos x = 1.4 / 3.5$   
 $x = 66.4218...$   
 $x = 66.4^\circ$

### Day 4

#### Question 1

- a)  $6 + 3 + 1 = 10$   
 $128 \div 10 = 12.8$   
 $6 \times 12.8 = 76.8 = \text{£}76.80$   
b)  $76.8 \div 3 \times 2 = \text{£}51.20$

#### Question 2

- a) linear ratio 1:12  
Area ratio 1:144  
Flag area 1440cm<sup>2</sup>  
b) Volume ratio 1:1728

100ml

#### Question 3

$$y = kx^2$$

- a)  $25 = 16k$   
 $y = \frac{25}{16}x^2$   
b) 6.25  
c)  $9 = \frac{25}{16}x^2$   
 $x = 2.4$

### Day 5

#### Question 1

- a)  $y = 4x + 3$   
b)  $4x = y + 5$   
 $x = \frac{y+5}{4}$

#### Question 2

- a) A and D selected  
c) A and D selected

### Day 6

#### Question 1

- a) i)  $\frac{1}{2}q$   
ii)  $\frac{2}{3}q$   
iii)  $\frac{1}{2}q - \frac{1}{3}q$   
b)  $AB \parallel LM$   
 $AB = 3LM$

#### Question 2

- (a) (i)  $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$

- (ii) 5

- (b)  $\begin{pmatrix} -2 \\ 6 \end{pmatrix}$

- (c)  $(-6, 3)$

### Day 7

#### Question 1

- a)  $(3+x)(3+x)$  or  $(3+x)^2 = (x+3)^2$   
b)  $(3+x)(3+x) = 10$   
 $9 + 3x + 3x + x^2 = 10$   
 $x^2 + 6x + 9 = 10$  and  
 $x^2 + 6x = 1$

#### Question 2

i)  $(2y + 9)(2y - 9) = 0$  so  $y = 4.5$  or  $y = -4.5$

ii)  $(3 + (x + 2))/(3(x + 2)) = -1$

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

$$x + 5 = -3x - 6$$

$$4x = -11 \text{ so } x = -2.75$$

### Question 3

a) If median is  $n$  the numbers must be  $n-2, n-1, n+1, n+2$

$$\text{Sum} = 5n \therefore \text{mean} = 5n \div 5 = n$$

b)  $(n - 2)^2 = n^2 - 4n + 4$

$$(n - 1)^2 = n^2 - 2n + 1$$

$$n^2 = n^2$$

$$(n + 1)^2 = n^2 + 2n + 1$$

$$(n + 2)^2 = n^2 + 4n + 4$$

$$\text{Sum} = 5n^2 + 10$$

$$\text{Mean} = n^2 + 2$$

$$\text{Median} = n^2$$

## Day 8

### Question 1

a)

Angle  $ABE =$  angle  $CDE$  (alternate angles)  
 Angle  $BAE =$  angle  $DCE$  (alternate angles)  
 Angle  $AEB =$  angle  $CED$  (vertically opposite angles)  
 So triangles  $ABE$  and  $CDE$  are similar

$$\frac{AE}{5} = \frac{8}{6}$$

$$AE = \frac{20}{3}$$

b)  $AC = \frac{20}{3} + 5$

$$AC = 11\frac{2}{3} \text{ cm}$$

### Question 2

a)  $3 : 5 = 4.5 : 7.5$  Ans = 7.5 cm

b)  $5 : 3$  Ans = 3 cm

### Question 3

angle  $ABD =$  angle  $BDC$  (alternate angles)

angle  $CBD =$  angle  $ADB$  (alternate angles)

$BD$  is common

Therefore triangles are congruent ASA

or equivalent method (other side, angle)

## Day 9

### Question 1

$$\text{Area of base} \times 12 = 84$$

$$\frac{1}{2} \times 4 \times h = 7$$

$$h = 3.5$$

### Question 2

a)  $\frac{1}{3}\pi \times 8^2 \times 6 = 128\pi$

b)  $128\pi - \frac{1}{3}\pi \times 4^2 \times 3 = 128\pi - 16\pi = 112\pi$

## Day 10

### Question 1

a) 7, 13, 15, 25, 30

b) Median = 175

Interquartile range = 17

### Question 2

a) i) 13

ii)  $25 - 13 = 12$

b) LQ(13) MEDIAN(19) UQ(25)

Whiskers at 4 and 34