

# N5

***ELGIN ACADEMY***

*Prelim Examination 2014 / 15*

**MATHEMATICS**  
**National Qualifications - National 5**  
**Paper 1 (non-calculator)**  
**Testing all units**

**Time allowed - 1 hour**

**Read carefully the information below:**

**Total marks - 40**

1. You may NOT use a calculator.
2. Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.
3. Write your working and answers on the blank paper provided.
4. Square ruled paper is provided.
5. Full credit will be given only where the solution contains appropriate working.
6. State the units for your answer where appropriate.

## FORMULAE LIST

The roots of  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$  or  $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle:  $\text{Area} = \frac{1}{2} ab \sin C$

Volume of a sphere:  $\text{Volume} = \frac{4}{3} \pi r^3$

Volume of a cone:  $\text{Volume} = \frac{1}{3} \pi r^2 h$

Volume of a Pyramid:  $\text{Volume} = \frac{1}{3} Ah$

Standard deviation:  $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$ , where n is the sample size.

**All questions should be attempted**

Marks

1. Multiply out the brackets and simplify

$$(3 - x)(5 - 3x) + 4x$$

3

2. (a) Factorise  $y = 2x^2 + 3x - 5$

2

- (b) Express  $x^2 - 6x - 4$  in the form  $(x + a)^2 + b$ .

2

3. Evaluate  $\frac{5}{8} \times \frac{4}{3} + \frac{4}{5}$

2

4. A company made a profit of £42 000 in 2014. This was 20% more than the profit they made in 2013.

How much profit did they make in 2013?

3

5. Vectors  $\mathbf{a}$  and  $\mathbf{b}$  have components as follows:

$$\mathbf{a} = \begin{pmatrix} 5 \\ -3 \\ 0 \end{pmatrix} \quad \text{and} \quad \mathbf{b} = \begin{pmatrix} 3 \\ -5 \\ 2 \end{pmatrix}$$

Find the components of the resultant vector  $3\mathbf{b} - \mathbf{a}$ .

2

6. By calculating the discriminant, state the nature of the roots of

$$y = x^2 - 5x - 4$$

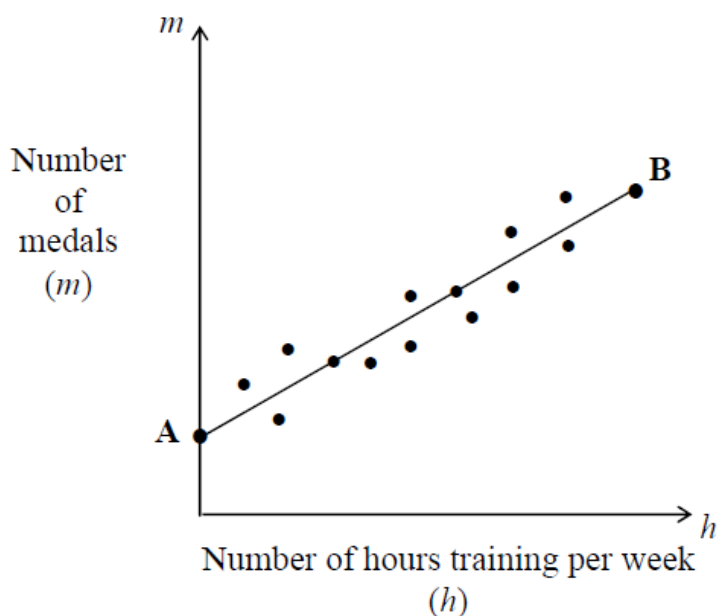
2

7. Find the equation of the line which is parallel to  $3y - 4x = 12$  and passes through the point  $(2, -3)$ .

Give your answer in the form  $ax + by = c$ .

3

8. The graph below shows the relationship between the number of hours ( $h$ ) a swimmer trains per week and the number of Championship medals ( $m$ ) they have won.



A best fitting straight line AB has been drawn.

Swimmer A does not train but has won 3 medals this year.

Swimmer B who trains for 14 hours per week has won 31 medals this year.

- (a) Find the equation of the straight line AB in terms of  $m$  and  $h$

4

- (b) How many medals would you expect a swimmer who trains 10 hours per week to have won?

1

9. Express  $\sqrt{6} \times \sqrt{8} - 3\sqrt{3}$  as a surd in its simplest form.

3

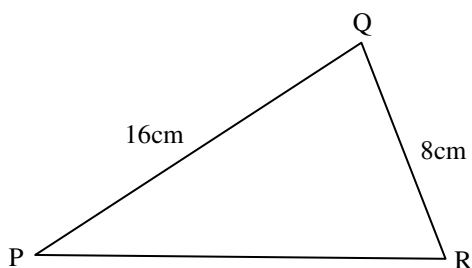
10. Simplify

$$\frac{3x^5 \times 4y^3}{6x^{-2}y^4}$$

expressing your answer with positive indices.

3

11.



In this triangle  $PQ = 16\text{cm}$  and  $QR = 8\text{cm}$ .

The value of  $\sin P = 0.4$ .

Find the exact value of  $\sin R$ .

3

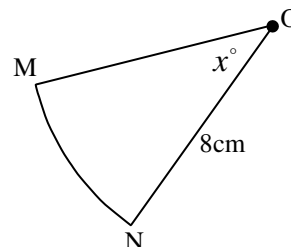
12. Given that  $P = \frac{3Q}{R^2}$ , change the subject of the formula to  $R$ .

3

13. A sector of a circle with radius 8cm is shown opposite.

Angle  $MON = x^\circ$

If the exact **length** of the arc  $MN$  is  $2\pi$  centimetres, calculate the size of the angle marked  $x$ .



4

Qu	Give one mark for each •	Illustrations for awarding mark
1	<b>ans:</b> $3x^2 - 10x + 15$ <b>3 marks</b> • <sup>1</sup> starts to multiply brackets • <sup>2</sup> completes multiplication • <sup>3</sup> simplifies	• <sup>1</sup> $15 - 9x \dots$ • <sup>2</sup> $\dots - 5x + 3x^2 = 3x^2 - 14x + 15$ • <sup>3</sup> $3x^2 - 10x + 15$
2a	<b>ans:</b> $(2x + 5)(x - 1)$ <b>2 marks</b> • <sup>1</sup> first correct factor • <sup>2</sup> second factor	• <sup>1</sup> $2x + 5$ • <sup>2</sup> $x - 1$
b	<b>ans:</b> $(x - 3)^2 - 13$ <b>2 marks</b> • <sup>1</sup> starts to complete the square • <sup>2</sup> completes square correctly	• <sup>1</sup> $(x - 3)^2 \dots$ • <sup>2</sup> $\dots - 13$
3	<b>ans:</b> $1\frac{19}{30}$ <b>2 marks</b> • <sup>1</sup> first operation • <sup>2</sup> second operation	• <sup>1</sup> $\frac{5}{8} \times \frac{4}{3} = \frac{5}{6}$ • <sup>2</sup> $\frac{5}{6} + \frac{4}{5} = \frac{49}{30} = 1\frac{19}{30}$
4	<b>ans:</b> <b>£35 000</b> <b>3 marks</b> • <sup>1</sup> realises 120% • <sup>2</sup> finds 20% • <sup>3</sup> finds 100%	• <sup>1</sup> $120\% = £42\ 000$ • <sup>2</sup> $£42\ 000 \div 6 = £7\ 000$ • <sup>3</sup> $£7\ 000 \times 5 = £35\ 000$
5	<b>ans:</b> $\begin{pmatrix} 4 \\ -12 \\ 6 \end{pmatrix}$ <b>2 marks</b> • <sup>1</sup> knows how to find components • <sup>2</sup> states components	• <sup>1</sup> $3 \begin{pmatrix} 3 \\ -5 \\ 2 \end{pmatrix} - \begin{pmatrix} 5 \\ -3 \\ 0 \end{pmatrix}$ • <sup>2</sup> $\begin{pmatrix} 4 \\ -12 \\ 6 \end{pmatrix}$

Qu	Give one mark for each •	Illustrations for awarding mark
6	ans: <b>real and distinct</b> <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows how and finds discriminant</li> <li>•<sup>2</sup> 2 descriptions of roots</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(-5)^2 - 4 \times 1 \times (-4) = 41</math></li> <li>•<sup>2</sup> real and distinct</li> </ul>
7	ans: <b><math>4x - 3y = 17</math></b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> rearranges equation and finds gradient</li> <li>•<sup>2</sup> subs into straight line equation</li> <li>•<sup>3</sup> rearranges to required form</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>y = \frac{4}{3}x + 4; m = \frac{4}{3}</math></li> <li>•<sup>2</sup> <math>y + 3 = \frac{4}{3}(x - 2) \quad y + 3 = \frac{4}{3}(x - 2)</math></li> <li>•<sup>3</sup> <math>4x - 3y = 17</math></li> </ul>
8a	ans: <b><math>m = 2h + 3</math></b> <b>4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> interpreting Information</li> <li>•<sup>2</sup> calculating Gradient</li> <li>•<sup>3</sup> identifying y-intercept</li> <li>•<sup>4</sup> correctly stating equation</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> Points (0,3) and (14,31)</li> <li>•<sup>2</sup> <math>\text{grad} = \frac{31 - 3}{14 - 0} = 2</math></li> <li>•<sup>3</sup> <math>c = 3</math></li> <li>•<sup>4</sup> <math>m = 2h + 3</math></li> </ul>
b	ans: <b>23 Medals</b> <b>1 mark</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> substituting into equation of line</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>m = 2(10) + 3 = 23</math></li> </ul>
9	ans: <b><math>\sqrt{3}</math></b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> first operation</li> <li>•<sup>2</sup> simplifies surd</li> <li>•<sup>3</sup> simplifies expressions</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\sqrt{6} \times \sqrt{8} = \sqrt{48}</math></li> <li>•<sup>2</sup> <math>\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}</math></li> <li>•<sup>3</sup> <math>4\sqrt{3} - 3\sqrt{3} = \sqrt{3}</math></li> </ul>
10	ans: <b><math>\frac{2x^7}{y}</math></b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct number</li> <li>•<sup>2</sup> correct <math>x</math> term</li> <li>•<sup>3</sup> correct <math>y</math> term</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 2</li> <li>•<sup>2</sup> <math>x^7</math></li> <li>•<sup>3</sup> <math>\frac{\dots}{y}</math></li> </ul>
11	ans: <b>0.8</b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> uses sine rule</li> <li>•<sup>2</sup> rearranges formula</li> <li>•<sup>3</sup> simplifies</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{16}{\sin R} = \frac{8}{0.4}</math></li> <li>•<sup>2</sup> <math>\sin R = \frac{16 \times 0.4}{8}</math></li> <li>•<sup>3</sup> 0.8</li> </ul>

Qu	Give one mark for each •	Illustrations for awarding mark
12	ans: $R = \sqrt{\frac{3Q}{P}}$ <b>3 marks</b>  • <sup>1</sup> cross multiplies • <sup>2</sup> divides both sides by $P$ • <sup>3</sup> takes square root	• <sup>1</sup> $PR^2 = 3Q$ • <sup>2</sup> $R^2 = \frac{3Q}{P}$ • <sup>3</sup> $R = \sqrt{\frac{3Q}{P}}$
13	ans: $45^\circ$ <b>4 marks</b>  • <sup>1</sup> uses correct diameter • <sup>2</sup> finds circumference of circle • <sup>3</sup> knows how to find angle • <sup>4</sup> answer	• <sup>1</sup> $d = 16$ [may be formula] • <sup>2</sup> $C = \pi \times 16 = 16\pi$ • <sup>3</sup> $x^\circ = \frac{2\pi}{16\pi} \times 360$ • <sup>4</sup> $45^\circ$
		<b>Total</b> <b>40 marks</b>



# N5

*ELGIN ACADEMY*

*Prelim Examination 2014 / 15*

**MATHEMATICS**  
**National Qualifications - National 5**  
**Paper 2 (Calculator)**  
**Testing all units**

**Time allowed - 1 hour and 30 minutes**

**Total marks - 50**

1. You may use a calculator.
2. Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.
3. Write your working and answers on the blank paper provided.
4. Square ruled paper is provided.
5. Full credit will be given only where the solution contains appropriate working.
6. State the units for your answer where appropriate.

## FORMULAE LIST

The roots of  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$  or  $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle:  $\text{Area} = \frac{1}{2} ab \sin C$

Volume of a sphere:  $\text{Volume} = \frac{4}{3} \pi r^3$

Volume of a cone:  $\text{Volume} = \frac{1}{3} \pi r^2 h$

Volume of a Pyramid:  $\text{Volume} = \frac{1}{3} Ah$

Standard deviation:  $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$ , where n is the sample size.

**All questions should be attempted**

Do not  
write in  
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margin.  
Marks

1. A painting was valued at £40 000 in 2012. The owner plans to sell it in 2015 and hopes that it will be worth £50 000.

If the painting increases in value at the rate of 8% per annum, will it be worth £50 000 in 2015?

You must show all your working and give a reason for your answer.

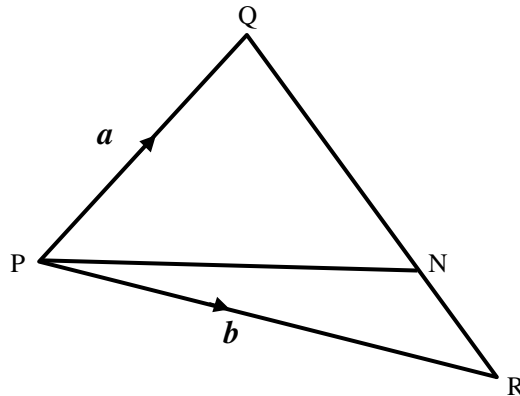
3

2. Write as a single fraction in its simplest form:

$$\frac{4b}{7x} \div \frac{b}{x^3}$$

3

3. In the diagram,  $QN = 2NR$ .  $\vec{PQ}$  represents vector  $a$  and  $\vec{PR}$  represents vector  $b$ .



- (a) Express  $\vec{QR}$  in terms of  $a$  and  $b$ .

2

- (b) Express  $\vec{QN}$  in terms of  $a$  and  $b$ .

1

4. A conical container has a capacity of 5 litres and height 18 cm.

Calculate its radius.

3

5. Find the point of intersection of the lines which have equations

$$3x - 4y = 17$$

$$5x = 2y + 19$$

4

6. Fiona Baxter discovered that to make the best mango chutney the mango should weigh as close to 230 grams as possible. Less than 230g the mango becomes sour and more than 230g the mango becomes too sweet.

Fruit-to-go have sent a sample of 8 mangoes, their weights are shown in the table below.

Mango	1	2	3	4	5	6	7	8
Average weight (g)	231	228	230	235	231	227	230	228

- (a) Calculate the mean and standard deviation of this batch of mangoes, giving your answers correct to 1 decimal place where necessary.

4

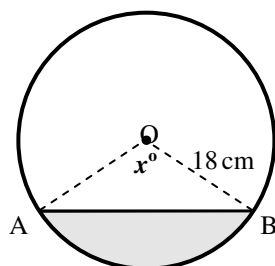
- (b) Burtlets Fruit also sent a sample of 8 mangoes. The mean weight of this batch is 230g and the standard deviation is 0.8.

Which company should Fiona choose to supply her with mangoes.

**You must give a reason for your answer!**

2

7. The diagram below shows the cross section of a cylindrical tank with radius 18cm. There is liquid in the tank and its surface, AB, measures 27cm.



Is angle AOB  $90^\circ$ ? **Show all your working to justify your answer.**

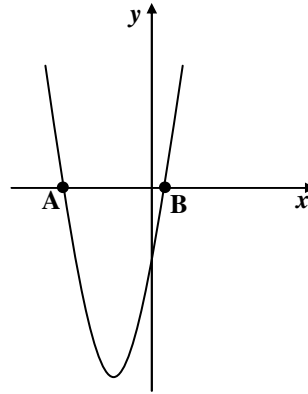
4

8. The graph in the diagram has equation

$$y = 3x^2 + 2x - 3$$

and cuts the  $x$ -axis at **A** and **B**.

Find the coordinates of the points **A** and **B** giving your answers correct to 1 decimal place.

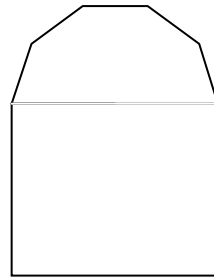


Marks

5

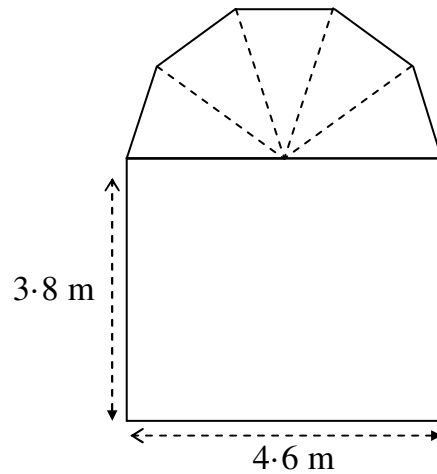
Do not write in this margin.

9. The gable end of a building is shaped as shown in *Diagram 1*.



*Diagram 1*

It consists of a rectangle and five congruent isosceles triangles and has dimensions as shown in *Diagram 2*.



*Diagram 2*

Calculate the area of the gable end.

5

10. The Stockholm Globe Arena is the largest hemispherical building in the world. The radius of the building is 110m.



Calculate the volume of the building in cubic metres, giving your answer in scientific notation correct to 3 significant figures.

4

11. Two forces acting on a rocket are represented by vectors  $\mathbf{u}$  and  $\mathbf{v}$ .

$$\mathbf{u} = \begin{pmatrix} -3 \\ 2 \\ 1 \end{pmatrix} \text{ and } \mathbf{v} = \begin{pmatrix} 6 \\ -4 \\ -5 \end{pmatrix}$$

Calculate  $|\mathbf{u} + \mathbf{v}|$ , the magnitude of the resultant force.

2

12. The national soft drink of Malta is called "Kinnie" and it is sold in various bottle sizes. Two are shown here:



6cm



9cm

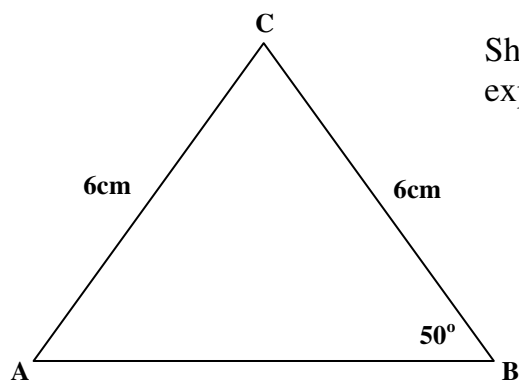
The smaller bottle has a base diameter of 6cm and holds 500ml.

The larger bottle has a base diameter of 9cm and it holds 1650ml.

The bottles look alike but could they actually be **mathematically** similar?  
(Show calculations to justify your answer.)

4

13. Isosceles triangle **ABC** is shown below.



Show that the length of **AB** can be given by the expression

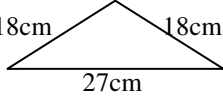
$$AB = \sqrt{72(1 - \cos 80^\circ)} \text{ cm.}$$

4

*End of Question Paper*

Qu	Give one mark for each •	Illustrations for awarding mark
1	ans: yes with reason <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct multiplier</li> <li>•<sup>2</sup> correct method</li> <li>•<sup>3</sup> conclusion</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 1.08</li> <li>•<sup>2</sup> <math>40\,000 \times 1.08^3 = \text{£}50\,388.48</math></li> <li>•<sup>3</sup> yes since <math>\text{£}50\,388.48 &gt; \text{£}50\,000</math></li> </ul>
2	ans: $\frac{4x^2}{7}$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> inverts divisor and multiplies</li> <li>•<sup>2</sup> multiplies</li> <li>•<sup>3</sup> simplifies</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> .....<math>\times \frac{x^3}{b}</math></li> <li>•<sup>2</sup> <math>\frac{4bx^3}{7xb}</math></li> <li>•<sup>3</sup> <math>\frac{4x^2}{7}</math></li> </ul>
3a	ans: $b - a$ <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> chooses correct path</li> <li>•<sup>2</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\vec{QR} = \vec{QP} + \vec{PR}</math></li> <li>•<sup>2</sup> <math>b - a</math> OR <math>-a + b</math></li> </ul>
b	ans: $\frac{2}{3}(b - a)$ <b>1 mark</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{2}{3}(b - a)</math> OR <math>\frac{2}{3}(-a + b)</math></li> </ul>
4	ans: <b>16.3cm</b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> changes to <math>\text{cm}^3</math> and subs into formula</li> <li>•<sup>2</sup> starts to solve for <math>r</math></li> <li>•<sup>3</sup> finds <math>r</math></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>5000 = \frac{1}{3} \times \pi \times r^2 \times 18</math></li> <li>•<sup>2</sup> <math>r^2 = \frac{5000}{6\pi}</math></li> <li>•<sup>3</sup> <math>r = \sqrt{\frac{5000}{6\pi}} = 16.3</math></li> </ul>
5	ans: <b>(3, -2)</b> <b>4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows to use system of equations</li> <li>•<sup>2</sup> finds value for <math>x</math></li> <li>•<sup>3</sup> finds value for <math>y</math></li> <li>•<sup>4</sup> states coordinates</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence of scaling equations</li> <li>•<sup>2</sup> <math>x = 3</math></li> <li>•<sup>3</sup> <math>y = -2</math></li> <li>•<sup>4</sup> <math>(3, -2)</math></li> </ul>
6a	ans: <b>230g and SD = 2.5</b> <b>4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> calculating mean</li> <li>•<sup>2</sup> knowing how to calculate SD</li> <li>•<sup>3</sup> correctly calculating SD</li> <li>•<sup>4</sup> rounding</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>1840 \div 8 = 230\text{g}</math></li> <li>•<sup>2</sup> <math>\sum x = 1840, \sum x^2 = 423244</math></li> <li>•<sup>3</sup> <math>sd = \sqrt{\frac{423244 - \frac{1840^2}{8}}{7}}</math></li> <li>•<sup>4</sup> 2.5</li> </ul>
b	ans: <b>Burtlets. Both have same mean but Burtlets mangoes much closer to 230g.</b> <b>2 marks</b> <ul style="list-style-type: none"> <li>•1 compares mean</li> <li>•2 compares SD</li> </ul>	<ul style="list-style-type: none"> <li>•1 same mean</li> <li>•2 interpret SD as spread of weights</li> </ul>



Qu	Give one mark for each •	Illustrations for awarding mark
7	<b>ans: angle not right with reason 4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> assembles facts in triangle</li> <li>•<sup>2</sup> knows condition for right angle</li> <li>•<sup>3</sup> tests both sides</li> <li>•<sup>4</sup> valid conclusion</li> </ul>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> <li>•<sup>1</sup></li> <li>•<sup>2</sup> statement e.g. if <math>18^2 + 18^2 = 27^2</math> angle is right</li> <li>•<sup>3</sup> <math>18^2 + 18^2 = 648</math>; <math>27^2 = 729</math></li> <li>•<sup>4</sup> since <math>18^2 + 18^2 \neq 27^2</math> angle is not right</li> </ul>
8	<b>ans : A(-1.4, 0); B(0.7, 0) 5 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> sets equation equal to zero</li> <li>•<sup>2</sup> calculates <math>b^2 - 4ac</math></li> <li>•<sup>3</sup> subs correctly into formula</li> <li>•<sup>4</sup> finds roots</li> <li>•<sup>5</sup> states coordinates of A and B</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>3x^2 + 2x - 3 = 0</math></li> <li>•<sup>2</sup> 40</li> <li>•<sup>3</sup> <math>\frac{-2 \pm \sqrt{40}}{2 \times 3}</math></li> <li>•<sup>4</sup> 0.7; -1.4</li> <li>•<sup>5</sup> A(-1.4, 0); B(0.7, 0)</li> </ul>
9	<b>ans : 25.3m<sup>2</sup> 5 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> finds area of rectangle</li> <li>•<sup>2</sup> correct radius</li> <li>•<sup>3</sup> realises to find area of one triangle</li> <li>•<sup>4</sup> finds area of all triangles</li> <li>•<sup>5</sup> total area</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>3.8 \times 4.6 = 17.48 \text{ m}^2</math></li> <li>•<sup>2</sup> <math>r = 2.3</math> [may be in subsequent formula]</li> <li>•<sup>3</sup> <math>A_{tri} = \frac{1}{2} \times 2.3 \times 2.3 \times \sin 36^\circ = 1.55469....</math></li> <li>•<sup>4</sup> <math>1.55469.... \times 5 = 7.77345....</math></li> <li>•<sup>5</sup> <math>25.3\text{m}^2</math></li> </ul>
10	<b>ans: 2.79 x 10<sup>6</sup> m<sup>3</sup> 4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> substitutes into formula and evaluates</li> <li>•<sup>2</sup> answer rounded to 3 sig. figs</li> <li>•<sup>3</sup> volume of hemisphere given</li> <li>•<sup>4</sup> answer in standard form</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{4}{3} \times \pi \times 110^3 = 5,575,297.763...</math></li> <li>•<sup>2</sup> 5,580,000</li> <li>•<sup>3</sup> 2,790,000</li> <li>•<sup>4</sup> <math>2.79 \times 10^6 \text{ m}^3</math></li> </ul>
11	<b>ans: 5.3851... 2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> adds vectors correctly</li> <li>•<sup>2</sup> finds one solution</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\begin{pmatrix} 3 \\ -2 \\ -4 \end{pmatrix}</math></li> <li>•<sup>2</sup> <math>\sqrt{29} = 5.3851...</math></li> </ul>
12	<b>ans: no, with valid reason 4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> finds linear scale factor</li> <li>•<sup>2</sup> finds volume scale factor</li> <li>•<sup>3</sup> finds volume of larger bottle</li> <li>•<sup>4</sup> valid conclusion</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> L.S.F. = <math>\frac{9}{6} = \frac{3}{2}</math></li> <li>•<sup>2</sup> V.S.F. = <math>\left(\frac{3}{2}\right)^3</math> [or equivalent]</li> <li>•<sup>3</sup> <math>\left(\frac{3}{2}\right)^3 \times 500 = 1687.5 \text{ ml}</math></li> <li>•<sup>4</sup> Not similar. Larger bottle would have volume of more than 1650ml</li> </ul>

Qu	Give one mark for each •	Illustrations for awarding mark
13	<b>ans: proof</b> <span style="float: right;"><b>4 marks</b></span> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct strategy</li> <li>•<sup>2</sup> uses Cosine Rule</li> <li>•<sup>3</sup> evaluates side</li> <li>•<sup>4</sup> simplifies answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> angle <math>ACB = 80^\circ</math></li> <li>•<sup>2</sup> <math>AB^2 = 6^2 + 6^2 - 2 \times 6 \times 6 \times \cos 80^\circ</math></li> <li>•<sup>3</sup> <math>AB^2 = 72 - 72 \cos 80^\circ</math></li> <li>•<sup>4</sup> <math>AB = \sqrt{72(1 - \cos 80^\circ)}</math></li> </ul>
		<b>Total 50 marks</b>