Credit Mathematics - Practice Examination F

Please note … the format of this practice examination is the same as the current format. The paper timings are the same, as are the marks allocated.
Calculators may only be used in Paper 2.

MATHEMATICS
Standard Grade   -   Credit Level

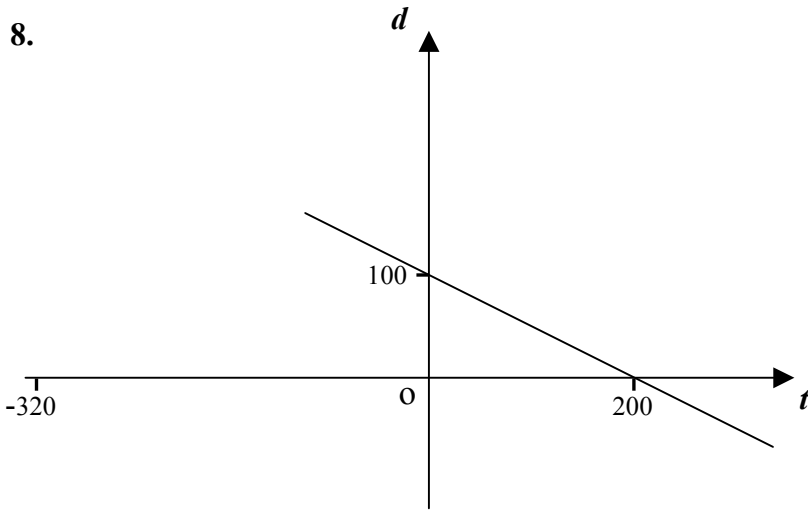## Paper I

Time allowed   -   55 minutes

Read Carefully

1.   Answer as many questions as you can.
2.   Full credit will be given only where the solution contains appropriate working.
3.   **You may not use a calculator**

	KU	RE

1. Evaluate $(16 - 10 \div 2)^2$ — KU: 2

2. Evaluate $4\frac{2}{3} - 2\frac{3}{4}$ — KU: 2

3. Light travels at 3×10^5 kilometres per **second**. How many kilometres will it travel in 1 **hour** ?
   Give your answer in **scientific notation**. — KU: 3

4. If $f(x) = 3x - 4x^2$, find the value of $f(-3)$. — KU: 2

5. A number pattern, involving the difference between a given number and its cube, is shown below:

$$1^3 - 1 = 1 \times 2 \times 0$$
$$2^3 - 2 = 2 \times 3 \times 1$$
$$3^3 - 3 = 3 \times 4 \times 2$$

   (a) Write down a similar expression for $6^3 - 6$. — RE: 1

   (b) Hence, write down an expression for $n^3 - n$. — RE: 2

   (c) By examining your answer to part (b), show that $10^3 - 10$ can **also** be expressed as
$$10^3 - 10 = \left(10^2 + 10\right) \times 9.$$
   — RE: 2

6. (a) Factorise completely $3x^2 - 12$. — KU: 1

   (b) Hence, simplify the fraction $\dfrac{3x^2 - 12}{x^2 + x - 6}$. — KU: 2

7. A function $f(x)$ is defined as $f(x) = (3x - 2)(x + 5)$.

   (a) Remove the brackets and express $f(x)$ in standard form i.e. $ax^2 + bx + c$. — KU: 2

   (b) Hence, solve the quadratic equation $f(x) = 20$. — KU: 4

8.

The straight line in the diagram above passes through 200 and 100 on the *t* and *d* axes respectively.

(a)   Find the equation of the line in terms of *t* and *d* .

(b)   If the line were continued, would it pass through the point P(-320, 250)?
        Give reasons for your answer.

9.   A survey was carried out amongst 200 4th year pupils in order to find out which flavour of crisps they preferred.
The results of the survey are shown in the table below :

	Salt & Vinegar	Prawn Cocktail	Cheese & Onion	Smokey Bacon	Others	TOTAL
BOYS	25	22	30	18	15	110
GIRLS	22	28	20	12	8	90

(a)   What is the probability that any pupil chosen at random prefers
        Cheese & Onion?

(b)   A **boy** is chosen at random. What is the probability that he prefers
        Prawn Cocktail?

(c)   What is the probability that any pupil chosen at random does **not**
        prefer Salt & Vinegar?

10.   Market research was carried out amongst 60 consumers to find out what type of cereal they usually ate for breakfast. The outcome of the research is shown below.

Cereal Type	Flakes	Puffs	Muesli	Porridge	Others/none
Number of consumers	21	15	4	11	9

Choose an appropriate statistical diagram and display these results.

End of question paper

KU	RE
4	
	2
1	
2	
2	
	4

	Give 1 mark for each •	Illustration(s) for awarding each mark
1.	**ans: 121** **2 KU** •1 know order of calculations •2 carry out calculations	•1 $(16 - 5)^2 = \dots$ •2 121
2.	**ans:** $\dfrac{23}{12}$ **2 KU** •1 changing to improper fractions and choosing suitable denominator •2 evaluate	•1 $= \dfrac{14}{3} - \dfrac{11}{4} = \dfrac{56}{12} - \dfrac{33}{12}$ •2 $= \dfrac{23}{12} \, or \, 1\dfrac{11}{12}$
3.	**ans:** 1.08×10^9 **3 KU** •1 change units •2 multiply •3 leave in scientific notation	•1 1 hour = 3600secs •2 $3 \times 10^5 \times 3.6 \times 10^3$ •3 1.08×10^9
4.	**ans -45** **2KU** •1 interpret function notation •2 evaluate function	•1 $3 \times (-3) - 4 \times (-3)^2$ •2 -45

5.	**(a) ans: 6x7x5** **1RE**
	
	 •1 interpret
	
	 (b) ans: n (n+1) (n-1) **2RE**
	
	 •1 for interpreting with n
	 •2 for n+1 and n-1
	
	 (c) ans: proof **2 RE**
	 •1 for interpreting n = 10
	 •2 for opening the brackets, etc
		(a) •1 6x7x5
		
		 (b) •1 n
		      •2 n+1 and n-1
		
		 (c) •1 $10^3 - 10 = 10 \times (10 + 1)x (10 - 1)$
		      •2 $= (10^2 + 10) \times 9$

6.	**See next page.**	

Give 1 mark for each •	**Illustration(s) for awarding each mark**

6.

(a) ans: $3(x - 2)(x + 2)$ **1 KU**

 •1   factorise fully

(b) ans; $\dfrac{3(x + 2)}{x + 3}$ **2KU**

 •1   factorise denominator
 •2   simplify *and stop.*

 •1 $= 3(x - 2)(x + 2)$

 •1 $(x+3)(x -2)$
 •2   answer.

7.

(a) ans: $f(x) = 3x^2 + 13x - 10$ **2 KU**

 •1 for partial answer
 •2 for fully correct answer

(b) ans: $x = 5/3$ or -6 **4 KU**

 •1 for standard form
 •2 for factorising
 •3 for one correct answer
 •4 for 2nd correct answer

 •1 $3x^2 \ldots -10$ or $\ldots + 13x$
 •2 $3x^2 + 13x - 10$

 •1 $3x^2 + 13x - 30 = 0$
 •2 $(3x-5)(x+6)$
 •3 $x = -6$
 •4 $x = 5/3$

8.

(a)   ans: $d = -1/2t + 100$ **4 KU**
 •1   for starting to find m
 •2   for calculating m
 •3   for finding c
 •4   for equation *with d and t*

(b) ans: **No - point does *not* satisfy   2 RE
          equation**
 •1   for substituting co-ordinates
 •2   for *consistent* conclusion

 •1 $m = (100-0) / (0-200)$
 •2 $\ldots = -\frac{1}{2}$ or equiv.
 •3 $c = 100$
 •4 $d = -1/2t + 100$

 •1 ? $250 = -1/2 \times (-320) + 100$
 •2 $250 \neq 160 + 100$, so point *not* on line.

9.

(a) **ans: 50/200 (= 1/4)**   **1 KU**
 •1 for choosing the 2 correct numbers

(b) **ans: 22/110 (= 1/5)**   **2 KU**
 •1 for knowing to select from *boys*
 •2 for completing answer
(c) **ans: 153/200 or equiv.**   **2 KU**
 •1   for correct number not preferring S/V
 •2 for completing answer

(a)   •1 50/200

(b)   •1 110 as denominator
       • 2 22 as numerator

(c)   •1   153 as denominator
       • 2   200 as numerator

10.

Barchart, Histogram or Pie-chart   4 RE

Take account of e.g. proper scales, correct height of bars, proper spacing etc

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Total :   KU 27   RE 11

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Credit Mathematics - Practice Examination F

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Calculators may be used in this paper.

MATHEMATICS
Standard Grade - Credit Level

Paper II

Time allowed - 80 minutes

Read Carefully

1.   Answer as many questions as you can.
2.   Full credit will be given only where the solution contains appropriate working.
3.   **You may use a calculator**

FORMULAE LIST

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

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

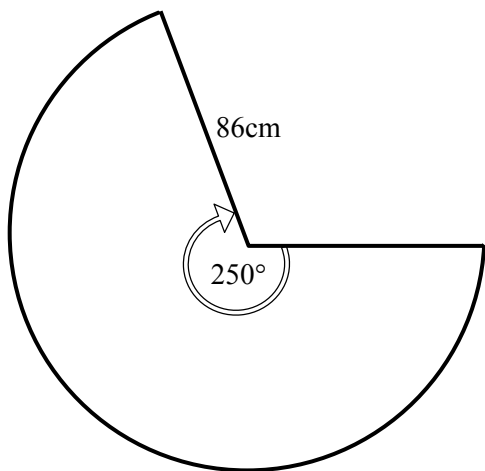**Cosine rule:** $a^2 = b^2 + c^2 - 2bc\cos A$ *or* $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

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

Standard Deviation: $s = \sqrt{\dfrac{\sum(x - \bar{x})^2}{n - 1}} = \sqrt{\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{n}}{n - 1}}$

**1.** Solve the equation $5(1-3x) = x - 43$.

2.

The logo of Cheeses-R-Us, a cheese superstore, is shown across. The logo is a sector of a circle of radius of 86 cm. The larger angle at the centre is 250°.

The manager decides to improve the sign by applying gold tape around the full perimeter of the logo.

What length of tape will be required?

3. During the French Revolution , Jacques LeMon and Co. made guillotines with which to cut off the heads of the aristocracy. His apprentice, Pierre Le Punk, brought Jacques a guillotine blade with dimensions as shown in the figure below.
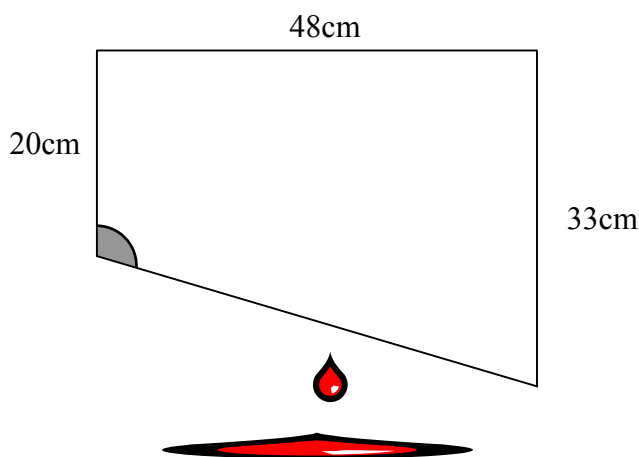
To ensure a quick and relatively clean decapitation, Jacques always made sure that the **obtuse** angle of the blade was **more** than 110$^\text{o}$.

Does Pierre's guillotine fulfil this condition?
Your answer must include appropriate working.

4. Carbon dioxide is the gas put into "fizzy" drinks to give the drink its "fizz". The makers of Steel-Bru, a soft drink, estimate that, by the end of a week, a bottle of their drink will have lost 2% of whatever volume of carbon dioxide that the bottle had contained at the **beginning** of that week.
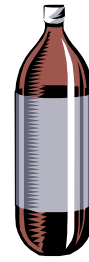
If the bottle loses **more than 15%** of its carbon dioxide, the contents have to be "re-carbonated" i.e. more carbon dioxide must be put into the drink.

If 250 cm^3 of carbon dioxide is put into a bottle at the beginning of a week, how many weeks can the bottle lie unused without needing to be re-carbonated? **(show your working)**
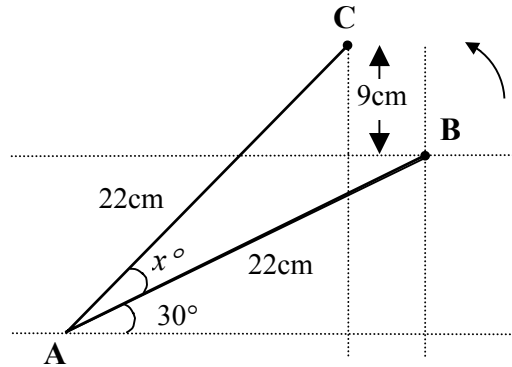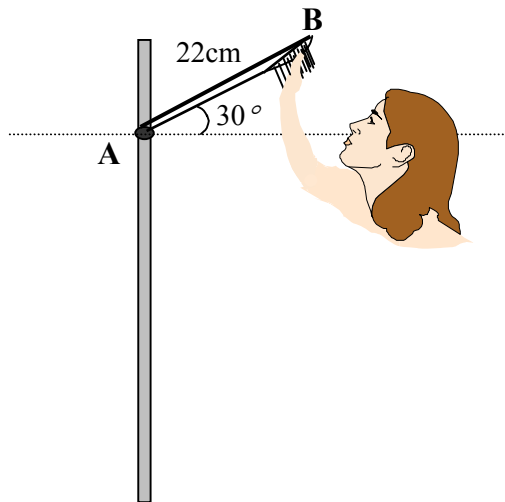
5.

Figure 2

A woman is having a shower but the sprinkler is a bit too close to her head. To give herself more headroom, she would like to increase the **vertical** height of the sprinkler by 9cm. This can be achieved by rotating the shower attachment AB by $x°$ in an anti-clockwise direction so that B is now at position C.

If the shower attachment is 22cm long and is, at present, at an angle of 30° to the horizontal, as shown in Figure 2 above, find the angle $x°$ required to produce this 9cm increase in height.

6. (a) Express $\dfrac{3}{x} - \dfrac{3}{x+1}$ as a single fraction in its simplest form $(x \neq 0, x \neq -1)$.

(b) Change the subject of the formula to v in $b = \dfrac{v-u}{c}$

KU	RE
4	
	5
3	
2	

7. A girl is using headless matches to construct hexagonal patterns, as shown in the three diagrams below.
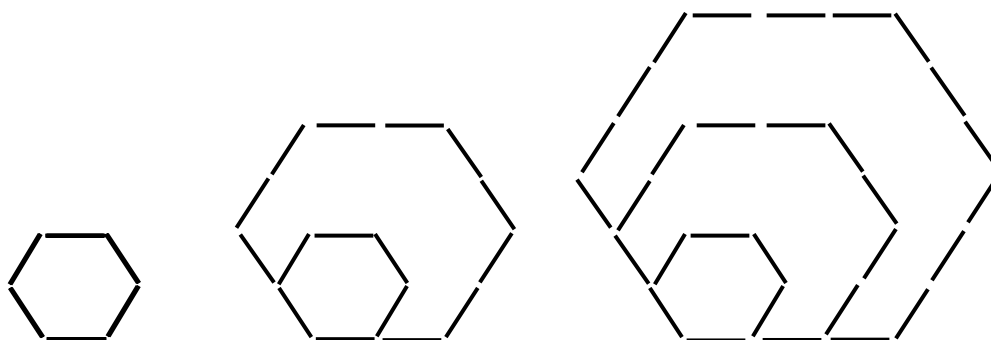
Pattern 1 (P = 1)   **P = 2**   **P = 3**
**Matches = 6 (m = 6)**   **m=16**   **m =30**

(a) How many matches will be needed for **P = 4**, i.e. Pattern 4?

2

(b) The number of matches, **m**, required to construct Pattern **P** is given by the formula

$$m = aP^2 + bP$$

Find **algebraically** the values of a and b.

4

8. After finishing a glass of lemonade, the drinker discovers that the circular area of the base of his glass is **half** of the **area** of the circular beer-mat on which the glass is resting.
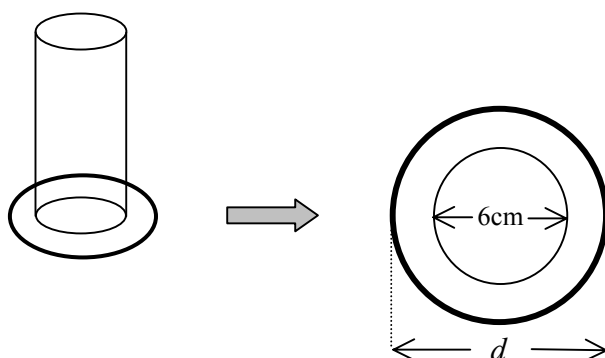

If the **diameter** of the base of the glass is 6cm, what is d, the diameter of the beer-mat?
(Give answer in centimetres, to 1 decimal place.)

4

9. Solve the equation $5x^2 - 2x - 9 = 0$.
Give your answers correct **to 2 significant figures**.

4

10. "HAPPY-COLA" have decided to issue a "limited edition" cone-shaped can to celebrate their 50th anniversary.
Their normal can is a cylinder whose height is $11 \cdot 5$ cm and whose **diameter** is $6 \cdot 5$ cm.

If the height of the cone is to be the same as the height of the cylinder, i.e. $11 \cdot 5$ cm, and the volume of the cone is to be the same as the volume of the cylinder, calculate the diameter of the cone?

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

(Answer in centimetres giving your answer correct **to 1 decimal place**)   **4**

11. The time, T minutes, taken to mow a square lawn varies **directly** as the square of its length s metres and **inversely** as the breadth b cm of the blade in the lawnmower.
A lawnmower whose blade is 30 cm in breadth takes 18 minutes to mow a square of length 6 metres.

(a) Find a formula connecting T , s and b.   **3**

(b) The gardener has just mowed a square lawn in 20 minutes. Another lawn has a side which is **twice** as long and the gardener wants to mow this lawn in the **same** time. By what number would the blade's length in the lawnmower have to be multiplied in order to achieve this?   **2**

12. The heights, in centimetres, of 30 pupils at the end of their 3rd year at secondary school were measured and the following data was obtained:

$$\sum x = 4545 \text{ and } \sum x^2 = 698450$$

(a) Calculate the mean and standard deviation.   **3**

(b) The previous year, a similar survey had been done. The mean had been 152 cm and the standard deviation had been 13.5cm. How do these figures compare with the present figures?   **2**
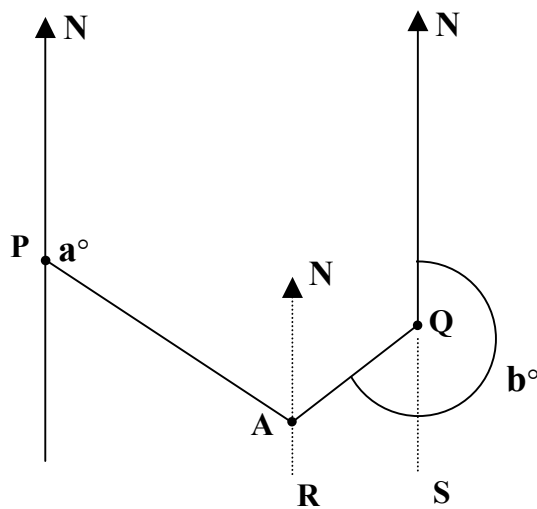
13. In a bearing diagram, the bearings of a ship from 2 different ports are often given. To make other useful calculations, it is often necessary to find the **angle** between the lines of these 2 bearings. In the diagram below, a ship A lies on a bearing of 102° from a port P and on a bearing of 235° from port Q.
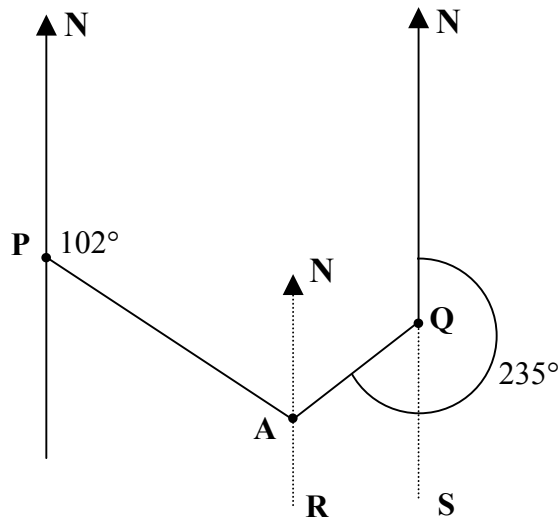
(a) In the diagram above, show that angle PAQ = 133°

(b) Show that , when A has a bearing of **a°** from P and **b°** from Q, as in the diagram above, then the angle between the bearings, angle PAQ, is always equal to **b°− a°**.

End of question paper

Credit Mathematics Practice Exam F   Marking Scheme - Paper 2

	Give 1 mark for each •	Illustration(s) for awarding each mark
1.	**ans: x = 3** **3 KU** •1 for opening brackets •2 for gathering terms •3 for solution	•1 5 - 15x •2 48 = 16x •3 3 = x
2.	**ans: 547.1cm** **4 RE** •1 for ratio •2 for C = π x 172 •3 for calculation •4 for adding 2x and completing calculation	•1 250/360 x… •2 172 x π •3 …= 375.1 •4 547.1cm
3.	**ans: No, angle = 105.2° < 110° 5 RE** •1 creating a R.A.T, sides = 13 and 48cm •2 for tanx° •3 for calculating x° •4 for adding to 90° •5 for clear conclusion	•1 e.g. diagram •2 tan x° = 13/48 •3 x° = 15.1° •4 angle = 105.2° •5 not big enough
4.	**ans: 8 weeks** **4 KU** e.g. •1 for 2% lost = 0.98 •2 for 250 x $(0.98)^8$, stated or implied. •3 for minimum volume •4 250 x $(0.98)^9$ < 212.5 and conclusion	•1 0.98 x … •2 212.69…cubic cm •3 212.5 cubic cm •4 208.4 < 212.5, so 8 weeks max. N.B. Pupils may simply use successive calculations <u>or</u> may solve ...... $0 \cdot 98^n \ < \ 0.85$
5.	**ans: 35.4°** **5RE** •1 for knowing *horizontal* dist. from A to B •2 for calculation •3 for finding horizontal dist. from A to C •4 for calculation •5 for subtraction to give answer	•1 sin30° = d / 22 •2 d = 11cm •3 11 + 9 = 20cm, sin (x+30)° = 20/22 •4 full amgle = 65.4 •5 required angle = 35.4°
6.	**(a) ans:** $\dfrac{3}{x(x+1)}$ **3 KU** •1 for numerator •2 for denominator •3 for simplifying numerator	•1 3(x+ 1) - 3x •2 x(x+1) •3 = 3

	Give 1 mark for each •	Illustration(s) for awarding each mark
6.	**(b) ans : v = u + bc** **2 KU** •1 for removing fractions •2 for transferring **u**	•1 bc = v-u •2 bc+u=v
7.	**(a) ans: 48 matches** **2 RE** •1 for correct answer, give 2/2 but… •2 for e.g.a sketch leading to *wrong* answer **(b) ans: a = 2, b = 4.** **4 RE** •1 for knowing to use sim.eqns. •2 for forming 2 eqns. •3 for calculating 1 letter's value •4 for calculating the other value	•1 48 matches •2 diagram •1 see working •2 e.g. 6 = a + b, 16 = 4a +2b •3 a = 2 •4 b= 4
8.	**ans: 8.5 cm** **4 RE** •1 for area of base and area of beermat •2 for r^2 •3 for r •4 for diameter *and* rounding **Ignore premature rounding**	•1 glass area= 28.6,beermat area = 56.52 •2 r^2 =56.52 / 3.14 =18 •3 r = 4.24 •4 D = 8.48 = 8.5cm
9.	**ans: x = 1.6 or -1.2** **4 KU** •1 for finding a,b and c for use in formula and for correct substitution •2 for square root calculation •3 for 2 answers *unrounded* •4 for correctly rounded answers	•1 a=5, b=-2,c=-9 and $x = \dfrac{2+\sqrt{4-4\times5\times-9}}{10}$ •2 184 = 4 - 4 x 5x (-9) •3 x = 1.56.. or - 1.16… •4 x = 1.6 or -1.2

10.	**ans: Diameter ≈ 11.2 cm** **4 RE**
	
	•1 for volume of cylinder
	•2 for vol. of cyl. =vol. of cone (strategy)
	•3 for calculating r^2
	•4 for final answer
		•1 volume of cyl. = 381.4 cm^3
		•2 381.4 = 1/3πr^2h
		•3 r^2 =31.7cm
		•4 D = 11.2cm
		
		*NB Ignore rounding, information to 1 d.p. is only
		    given as a guide to help the pupil through the
		    calculation.*

	Give 1 mark for each •	**Illustration(s) for awarding each mark**

11.	**(a) ans: T = 15s^2 / b** **3 KU**
	
	•1 for interpreting variation statement
	•2 for substituting
	•3 for finding k, then constant of variation.
	  No need for full equation
	  (b) ans: Blade x 4 **2 RE**
	
	•1 for interpreting " ..as the square of.."
	•2 for answer
		•1 T = ks^2/b
		•2 18 = kx6^2/30
		•3 k = 15
		
		•1 s x 2 $\Rightarrow$ b x 2^2
		•2 b x 4

12.	**(a) ans: mean = 151.5 and** **3 KU**
	  s.d. = 18.5 cm
	•1 for calculating mean
	•2 for correct substitution into standard form.
	•3 for answer
	
	**(b) ans: same average (or mean) height
	  but more spread than last year 2 RE**
	•1 for comparing means
	•2 for interpreting s.d. as the idea of "spread"
		•1 4545 / 30 = 151.5cm
		
		•2 $s.d. = \sqrt{\dfrac{698450 - (4545)^2 \div 30}{29}}$
		
		•3 = 18.5
		
		•1 mean or average the"same-ish" as at present.
		•2 last year's heights **less** spread out

13.	**(a) ans: 78° + 55° = 133°** **2KU**
	
	•1 for 180° - " alternate angle "
	•2 for bearing - 180° then adding to •1
	
	(b) ans; proof **3RE**
	e.g.
	•1 for angle PAN
	•2 for angle NAQ
	•3 for adding the 2 parts above and clearly
	  simplifying to get answer
	Accept -a° + b°
		•1 180° - 102° = 78°
		•2 235° - 180° = 55°. Then 55° + 78° = 133°
		
		•1 PAN = 180°- a°
		•2 NAQ = b° - 180°
		•3 PAQ = PAN + NAQ
		    = 180° - a° + b° - 180°
		    = -a° + b° i.e b° - a°
		
		or PAN = 180 − a , NAQ = 180 − (360 − b), etc.

Total : KU 24   RE 35

For PI & PII Totals : KU 51   RE 46