

# X101/11/01

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NATIONAL TUESDAY, 19 MAY  
QUALIFICATIONS 9.00 AM – 9.45 AM  
2015

MATHEMATICS  
INTERMEDIATE 2  
Units 1, 2 and  
Applications of Mathematics  
Paper 1  
(Non-calculator)

**Read carefully**

- 1 You may **NOT** use a calculator.
- 2 Full credit will be given only where the solution contains appropriate working.
- 3 Square-ruled paper is provided. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.



## FORMULAE LIST

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 cylinder:  $\text{Volume} = \pi r^2 h$

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.**

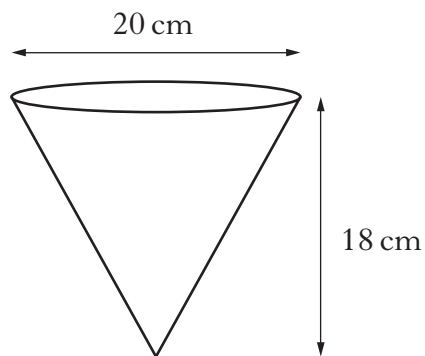
*Marks*

1. Multiply out the brackets and collect like terms.

$$(2x + 6)(5x - 3) + 9x$$

**3**

2. A hanging basket is in the shape of a cone.



The diameter is 20 centimetres and the height is 18 centimetres.  
Calculate the volume of the hanging basket.

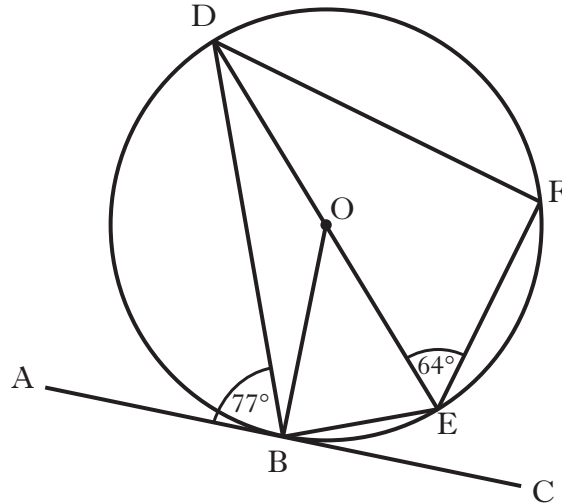
**Take  $\pi = 3.14$ .**

**2**

**[Turn over**

3.

Marks



AC is a tangent to the circle, centre O, with point of contact B.  
 DE is a diameter of the circle and F is a point on the circumference.  
 Angle ABD is  $77^\circ$  and angle DEF is  $64^\circ$ .  
 Calculate the size of angle BDF.

3

4. Michael Walker sells furniture. He earns a basic pay of £291.25 per week.  
 A copy of part of Michael's payslip is shown below for one week in February.

<b>Name</b>	<b>Employee No.</b>	<b>Tax Code</b>	<b>Week Ending</b>
M. Walker	153	640L	15/02/2015
<b>Basic Pay</b>	<b>Overtime Pay</b>	<b>Commission</b>	<b>Gross Pay</b>
£291.25	—		
<b>Nat. Insurance</b>	<b>Income Tax</b>	<b>Pension</b>	<b>Deductions</b>
£21.16	£47.58	£22.13	
			<b>Net Pay</b>

Michael earns commission of 2.5% on all his sales. If he sold furniture to the value of £1800 during that week, calculate his Net Pay.

3

5. The standard deviation of 1, 2, 2, 2, 8 is equal to  $\sqrt{a}$ .

Find the value of  $a$ .

3

6. A civil engineer uses the formula


$$A = \frac{1}{2}l(b+h)$$

to calculate a particular area,  $A$ .

Calculate  $A$  when  $l = 8$ ,  $b = 6$  and  $h = 12$ .

2

7. The diagram below shows part of Mrs Logan's marks spreadsheet.

	A	B	C	D	E
1		<b>Mathematics</b>	<b>English</b>	<b>Biology</b>	<b>Total</b>
2	Alex	87	56	74	
3	Ben	35	77	55	
4	Chiara	75		72	=SUM(B4:D4)
5	David	49	52	54	
6					
7		=AVERAGE(B2:B7)			
8					

- (a) When she types the formula shown into cell E4, it displays 225. What is the value in cell C4?

1

- (b) She wants to calculate the average Mathematics mark, but when she types the formula shown into cell B7 she gets an error message. What is the problem?

1

**[Turn over**

8. Using **graphical** means, solve the system of equations:

Marks

$$y = 2x + 5$$

$$y = 3x + 6.$$

**Use the squared paper provided.**

3

9. Write the following in order of size starting with the smallest.

$$\cos 90^\circ$$

$$\cos 100^\circ$$

$$\cos 360^\circ$$

Justify your answer.

2

10. A group of people were asked to record how much money (to the nearest pound) they each donated to charity in one year. The results are shown in the table below.

Money to charity ( $p$ pounds)	Frequency
$0 \leq p < 10$	52
$10 \leq p < 20$	56
$20 \leq p < 30$	44
$30 \leq p < 40$	20
$40 \leq p < 50$	8

(a) **Using the squared paper provided**, draw a histogram to illustrate this data.

2

(b) For the histogram you have drawn, estimate the modal amount to the nearest pound.

1

11. A straight line is represented by the equation  $y = mx + c$ .

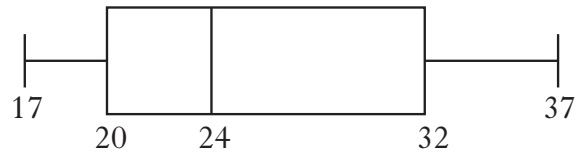
Sketch a possible straight line graph to illustrate this equation when  $m < 0$  and  $c > 0$ .

2

12. A book club has **seven** members.

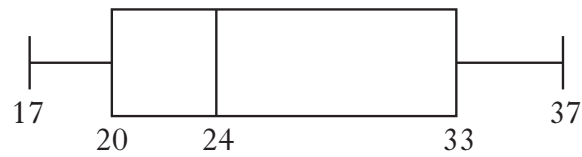
*Marks*

The ages of the members have been used to construct the following boxplot.



After an **eighth** member joins the club, a new boxplot is drawn.

This boxplot is shown below.



What age is the eighth member?

2

[END OF QUESTION PAPER]

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