

# X101/11/01

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NATIONAL TUESDAY, 6 MAY  
QUALIFICATIONS 9.00 AM – 9.45 AM  
2014

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

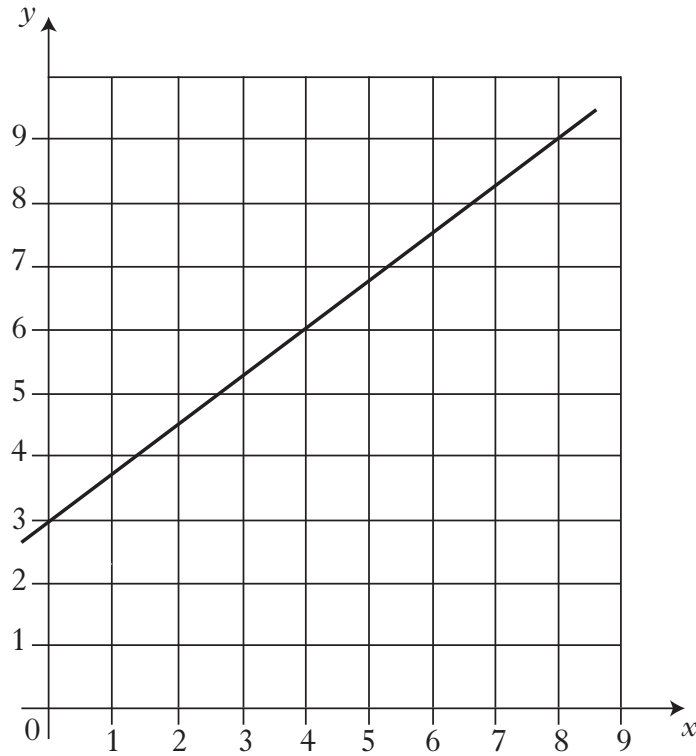
Volume of a cylinder:  $\text{Volume} = \pi r^2 h$

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.



Find the equation of the straight line shown in the diagram above.

**3**

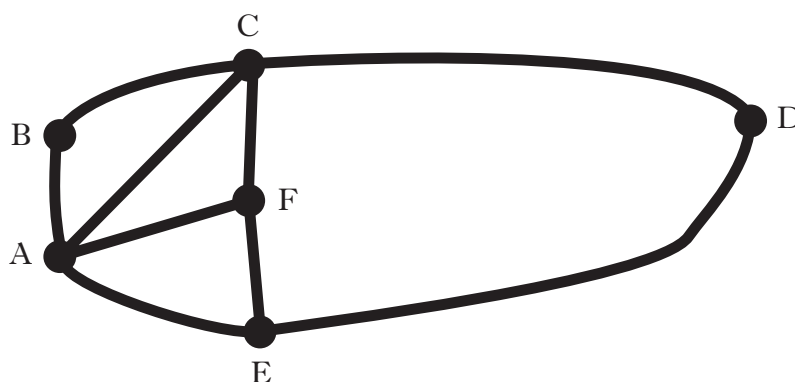
2. Multiply out the brackets and collect like terms.

$$(3x + 2)(x - 5) + 8x$$

**3**

**[Turn over**

3. A network diagram is shown below.



(a) Name an **odd** node. 1

(b) How many arcs are shown? 1

4. Woods Motors uses a spreadsheet to record the earnings for each employee.

An extract from their spreadsheet is shown below.

	A	B	C	D	E	F	G
1	<b>Name</b>	<b>Basic Salary</b>	<b>Commission Jan–Mar</b>	<b>Commission Apr–Jun</b>	<b>Commission Jul–Sept</b>	<b>Commission Oct–Dec</b>	<b>Total Earnings</b>
2	Ben	12 500	2000	2500	2750	1000	
3	Jasmine	14 000	1000	1000	1750	500	
4	Masha	16 750	1000	2000	2500	1250	
5	Umar	18 000	2500	1750	2750	2500	

Which **one** of the following is a correct formula that could be used in cell G3 to calculate Jasmine’s total earnings for the year?

A = SUM(B3 : F3)

B SUM = (B3 : F3)

C G3 = SUM(B3 : F3)

1

5. At a ski resort the temperature, in degrees Celsius, was recorded each day at noon for the first fortnight in February 2013.

0 -1 2 -5 4 2 -3 1 -4 8 -6 4 -2 1

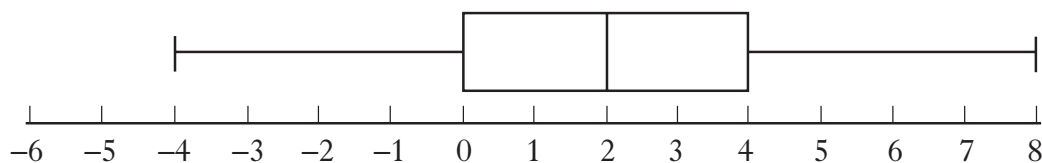
(a) Calculate:

- (i) the median temperature; 1
- (ii) the lower quartile; 1
- (iii) the upper quartile. 1

(b) Use the above data to construct a boxplot. 2

- (c) The temperature, in degrees Celsius, was recorded at the same ski resort each day at noon for the first fortnight in February 2014.

The following boxplot was constructed.



Compare the two boxplots and comment. 2

**[Turn over**

6. Below is a copy of Marta Ronaldo's credit card statement.

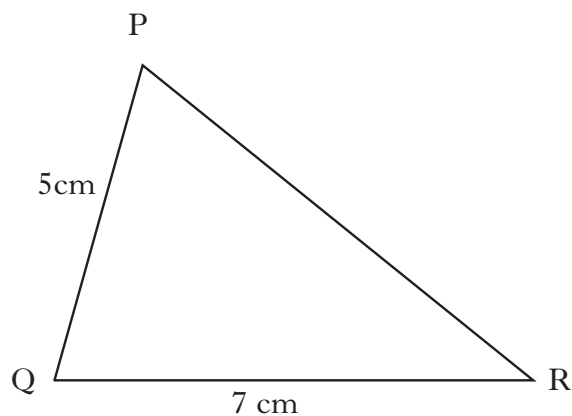
Western Bank Finance		
<b>Name:</b> Marta Ronaldo	<b>Account No</b> 1950 2114	
<b>Date:</b> 18th May 2014	<b>Credit limit:</b> £1500	
	<b>Interest rate:</b> 2% per month	
<i>Please ensure your payment arrives by 30th May 2014</i>		
18 April 2014	Balance brought forward	370.58
24 April 2014	Payment – <i>Thank you</i>	<u>– 50.00</u>
		320.58
	Interest (at 2%)	6.41
6 May 2014	Mi Esposa Gowns	440.00
10 May 2014	Las Tapas Deliciosas	52.60
12 May 2014	Briggs Service Station	<u>35.01</u>
	<b>Balance owed</b>	<b>854.60</b>
<i>Minimum payment: 5% of balance owed or £20, whichever is greater.</i>		
<i>Note: Interest is charged each month on outstanding balance after payment is deducted.</i>		

Marta makes the minimum payment.

How much is the minimum payment?

2

7.



In triangle PQR,  $PQ = 5$  centimetres,  $QR = 7$  centimetres and  $\cos Q = \frac{1}{5}$ .

Calculate the length of side PR.

Give your answer in the form  $\sqrt{a}$ .

3

8. An ellipse has equation

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

Its area is given by the formula

$$A = \pi ab.$$

Find the area of an ellipse with equation

$$\frac{x^2}{25} + \frac{y^2}{4} = 1.$$

Take  $\pi = 3.14$ .

2

[Turn over for Questions 9 and 10 on *Page eight*

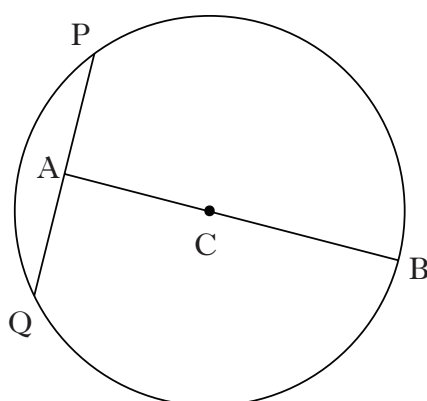
9. At a football match some spectators were asked how much money they spent at half-time.

The results of the survey are shown in the frequency table below.

<i>Money spent (£)</i>	<i>Frequency</i>
$0 \leq p < 2$	2
$2 \leq p < 4$	14
$4 \leq p < 6$	30
$6 \leq p < 8$	40
$8 \leq p < 10$	10

- (a) Using squared paper, draw a histogram to illustrate the results of the survey. 2
- (b) For the histogram you have drawn, estimate the mode. 1

10. The diagram below shows a circle, centre C.



The radius of the circle is 15 centimetres.

A is the mid-point of chord PQ.

The length of AB is 27 centimetres.

Calculate the length of PQ.

4

[END OF QUESTION PAPER]



# X101/11/02

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NATIONAL TUESDAY, 6 MAY  
QUALIFICATIONS 10.05 AM – 11.35 AM  
2014

MATHEMATICS  
INTERMEDIATE 2  
Units 1, 2 and  
Applications of Mathematics  
Paper 2

**Read carefully**

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## FORMULAE LIST

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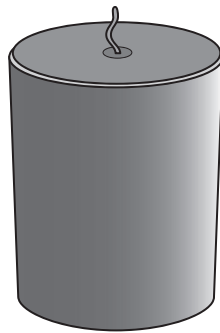
Volume of a cylinder:  $\text{Volume} = \pi r^2 h$

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1. There are 964 pupils on the roll of Aberleven High School.  
It is forecast that the roll will decrease by 15% per year.  
What will be the expected roll after 3 years?  
Give your answer to the nearest ten.

3

2. (a) A candle is in the shape of a cylinder with diameter 10 centimetres and height 15 centimetres.

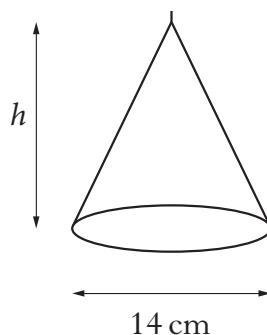


Calculate the volume of the candle.

Give your answer correct to 3 significant figures.

3

- (b) A second candle is in the shape of a cone with a circular base of diameter 14 centimetres and height  $h$  centimetres.



It has the same volume as the first candle.

Calculate  $h$ .

3

[Turn over

3. Factorise **fully**

$$3x^2 + 9x - 12.$$

3

## 4. Mr Smith and Mrs Curran both shop at the same store.

(a) Mr Smith bought 3 loaves and 2 packets of butter. The total cost was £4.73.

Let  $x$  pounds be the cost of a loaf and  $y$  pounds be the cost of a packet of butter.

Write down an equation in  $x$  and  $y$  which satisfies the above condition.

1

(b) Mrs Curran bought 5 loaves and 3 packets of butter. The total cost was £7.52.

Write down a second equation in  $x$  and  $y$  which satisfies this condition.

1

(c) Use the equations in parts (a) and (b) to find the cost of a loaf and the cost of a packet of butter.

4

## 5. A runner has recorded her times, in seconds, for six different laps of the running track.

53    57    58    60    55    56

(a) Calculate:

(i) the mean;

1

(ii) the standard deviation;

3

of these lap times.

**Show clearly all your working.**

(b) She changes her training routine hoping to improve her consistency. After this change, she records her times for another six laps.

The mean is 55 seconds and the standard deviation 3.2 seconds.

Has the new training routine improved her consistency?

**Explain clearly your answer.**

1

6. Gerry saves 2 pence, 5 pence and 10 pence coins in a jar.

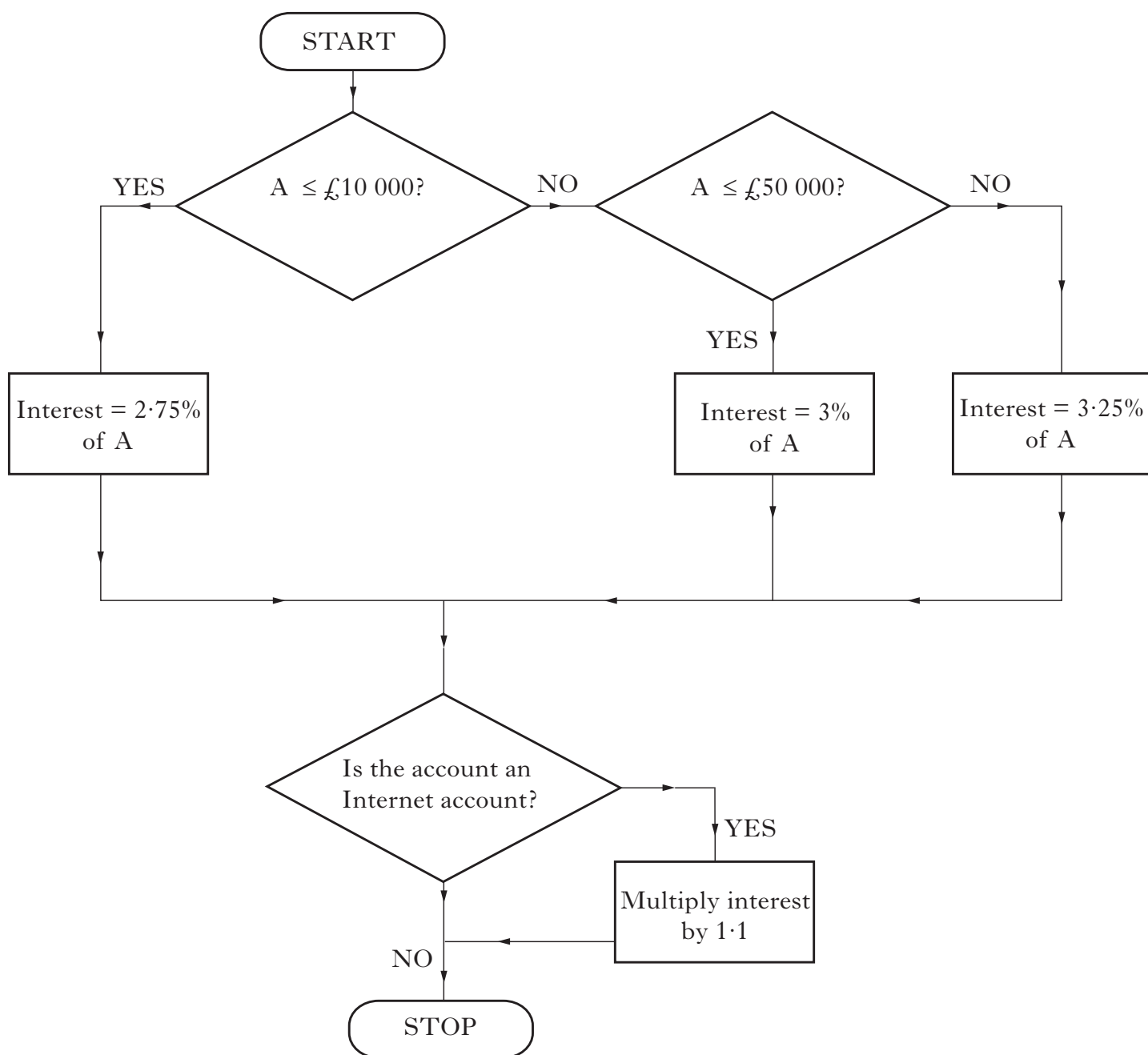
He thinks the probability of picking a 5 pence coin at random from the jar is  $\frac{25}{20}$ .

Why is he wrong?

1

7. A Building Society offers its customers a new Diamond Account.

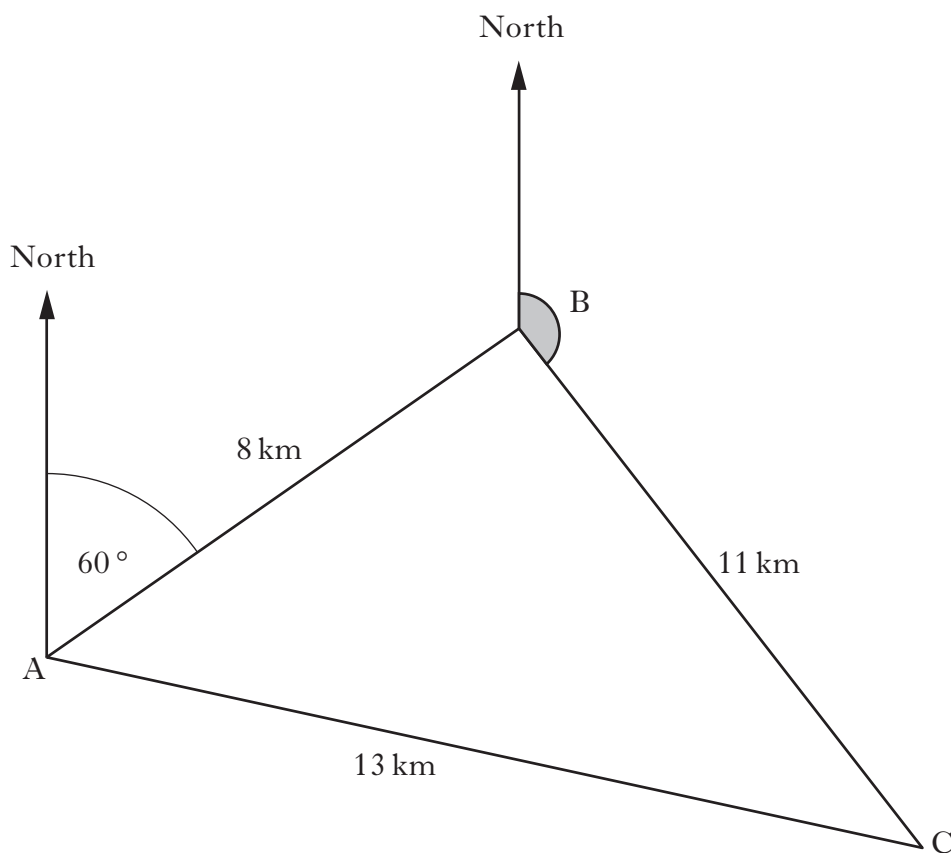
The flowchart below shows how to calculate the interest when a certain amount of money (£A) is invested for 1 year in this account.



Use the flowchart to calculate the interest earned on an amount of £65 000 invested in an Internet account for 1 year.

4

8. In a race, boats sail round three buoys represented by A, B and C in the diagram below.



B is 8 kilometres from A on a bearing of  $060^\circ$ .

C is 11 kilometres from B.

A is 13 kilometres from C.

(a) Calculate the size of angle ABC.

3

(b) Hence find the size of the shaded angle.

2

9. Thomas has borrowed £5000 from one of these banks to buy a car.

<b>Amount borrowed = £5000 borrowed over 5 years</b>	
<b>BANK</b>	<b>Monthly repayment</b>
Regular Bank	£109.45
Central Bank	£111.71
V.I.P. Bank	£113.99
South-Western Bank	£116.29

This loan will cost him £1702.60 over 5 years. From which bank did Thomas receive the loan?

3

10. Joan Simmons sells cosmetics. She earns a Basic Pay plus Commission of 3% on all her sales.

Her payslip for a week in February is only partially complete.

<b>Name</b>	<b>Employee No.</b>	<b>Tax Code</b>	<b>Week Ending</b>
J. Simmons	551	720L	15/02/2013
<b>Basic Pay</b>	<b>Bonus</b>	<b>Commission</b>	<b>Gross Pay</b>
£191.50	£0.00		
<b>Nat. Insurance</b>	<b>Income Tax</b>	<b>Pension</b>	<b>Deductions</b>
£27.86	£64.59	£27.53	
			<b>Net Pay</b>
			£352.02

Calculate Joan's sales for that week.

4

[Turn over

11. The table below illustrates the amount of money saved by 200 children over the past year.

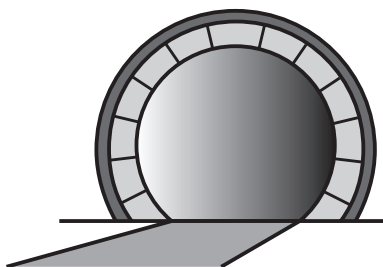
<i>Money saved (£)</i>	<i>Frequency</i>
0 – 9	20
10 – 19	40
20 – 29	36
30 – 39	44
40 – 49	13
50 – 59	22
60 – 69	10
70 – 79	15

Calculate the mean amount of money saved by the children.

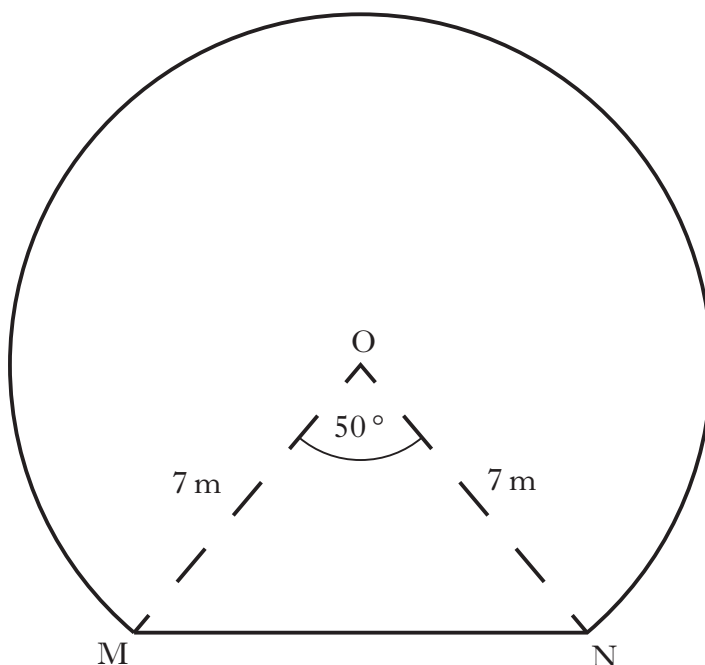
5



12. The picture shows the entrance to a tunnel which is in the shape of part of a circle.



The diagram below represents the cross-section of the tunnel.



- The centre of the circle is O.
- MN is a chord of the circle.
- Angle MON is  $50^\circ$ .
- The radius of the circle is 7 metres.

Calculate the area of the cross-section of the tunnel.

5

[END OF QUESTION PAPER]

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