

X101/11/02

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

- 1 **Calculators may be used in this paper.**
- 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: $\text{Volume} = \frac{1}{3}\pi r^2 h$

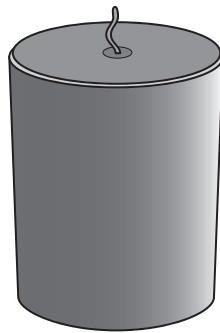
Volume of a cylinder: $\text{Volume} = \pi r^2 h$

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.

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.

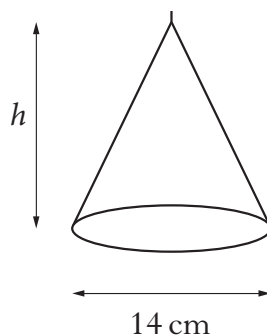


Calculate the volume of the candle.

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.

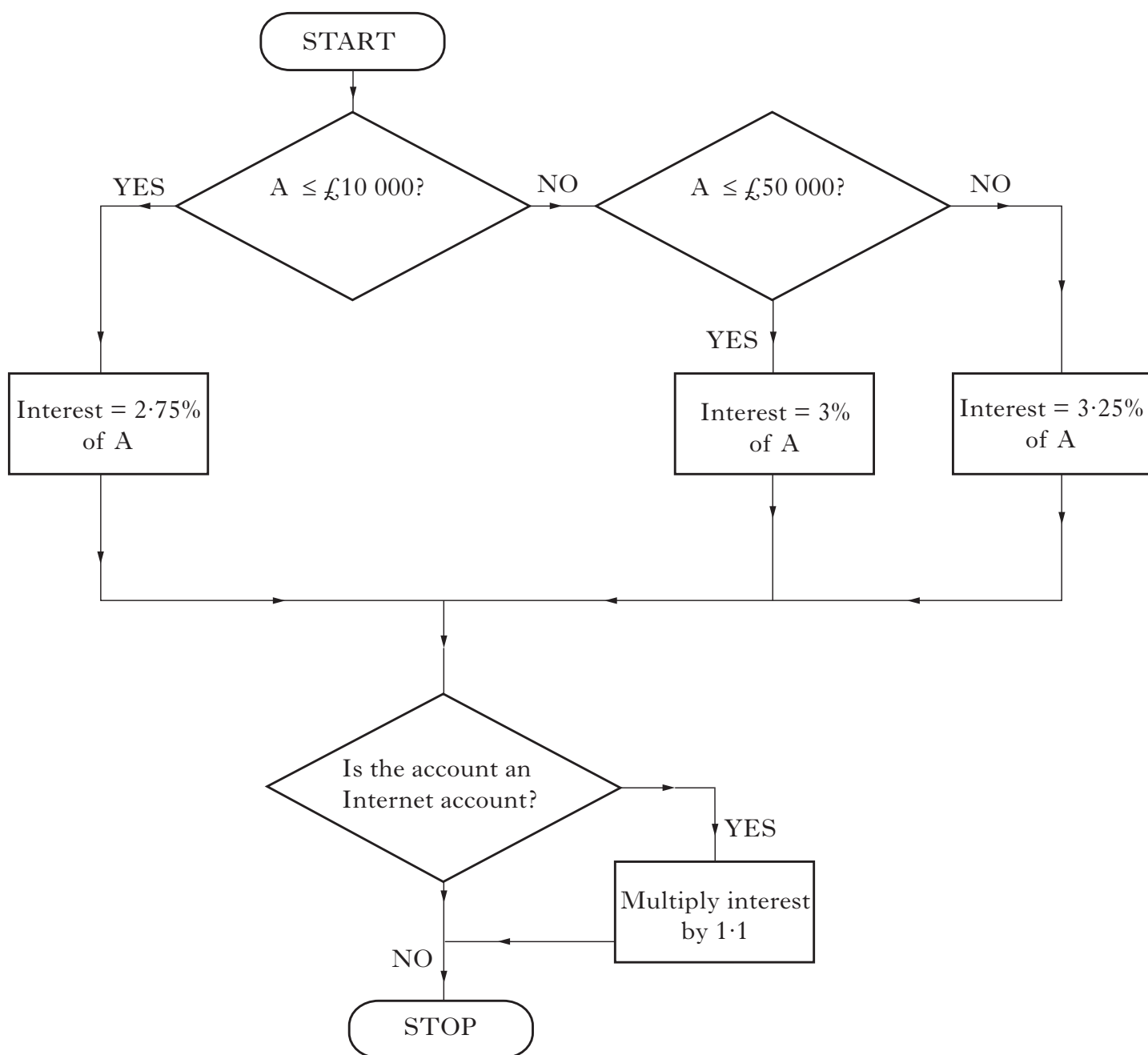
He thinks the probability of picking a 5 pence coin at random from the jar is $\frac{25}{20}$.

Why is he wrong?

1

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

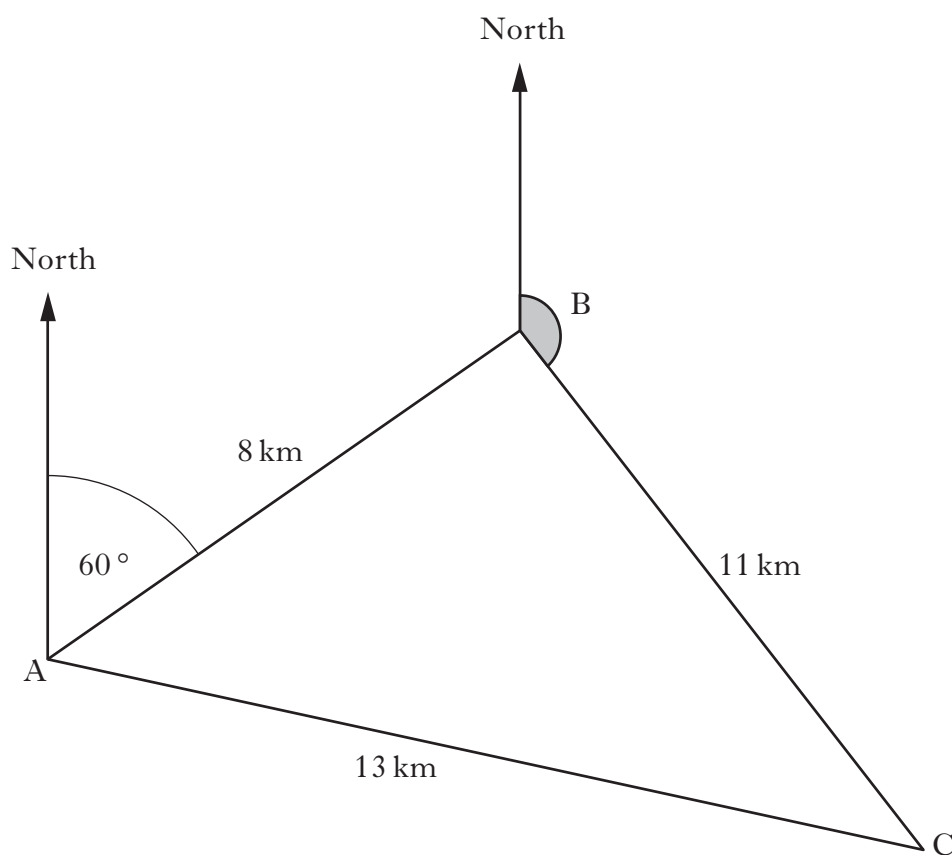
The flowchart below shows how to calculate the interest when a certain amount of money (£A) is invested for 1 year in this account.



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° .

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.

| Amount borrowed = £5000 borrowed over 5 years | |
|--|--------------------------|
| BANK | Monthly repayment |
| 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.

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

Calculate Joan's sales for that week.

4

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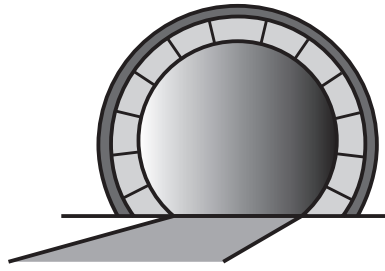
11. The table below illustrates the amount of money saved by 200 children over the past year.

| <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 |

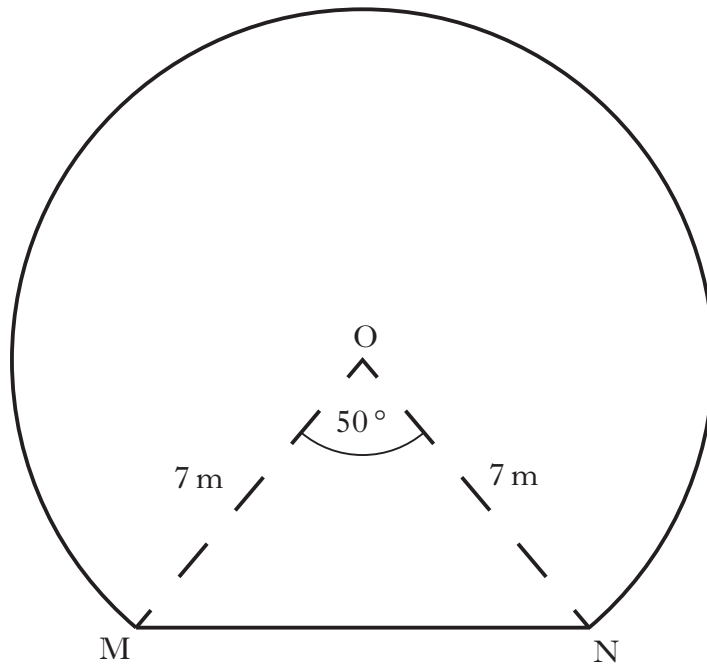
Calculate the mean amount of money saved by the children.

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° .
- The radius of the circle is 7 metres.

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

5

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