C

2500/405

WEDNESDAY, 5 MAY
1.30 PM – 2.25 PM

MATHEMATICS
STANDARD GRADE
Credit Level
Paper 1
(Non-calculator)

1 **You may NOT use a calculator**.

2 Answer as many questions as you can.

3 Full credit will be given only where the solution contains appropriate working.

4 Square-ruled paper is provided.

SQA

FORMULAE LIST

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

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

1. Evaluate

$$40\% \text{ of } £11{\cdot}50 - £1{\cdot}81.$$

2. Evaluate

$$\frac{2}{5} \div 1\frac{1}{10}.$$

3. Change the subject of the formula to s.

$$t = \frac{7s + 4}{2}.$$

4. Two functions are given below.

$$f(x) = x^2 - 4x$$

$$g(x) = 2x + 7$$

(*a*) If $f(x) = g(x)$, show that $x^2 - 6x - 7 = 0$.

(*b*) Hence find **algebraically** the values of x for which $f(x) = g(x)$.

[Turn over

5. A bag contains 27 marbles. Some are black and some are white.

The probability that a marble chosen at random is black is $\frac{4}{9}$.

(*a*) What is the probability that a marble chosen at random is white?

(*b*) How many white marbles are in the bag?

6. Cleano washing powder is on special offer.

Each box on special offer contains 20% more powder than the standard box.

A box on special offer contains 900 grams of powder.

How many grams of powder does the standard box contain?

7. A straight line has equation $y = mx + c$, where m and c are constants.

(*a*) The point (2, 7) lies on this line.

Write down an equation in m and c to illustrate this information. **1**

(*b*) A second point (4, 17) also lies on this line.

Write down another equation in m and c to illustrate this information. **1**

(*c*) Hence calculate the values of m and c. **3**

(*d*) Write down the gradient of this line. **1**

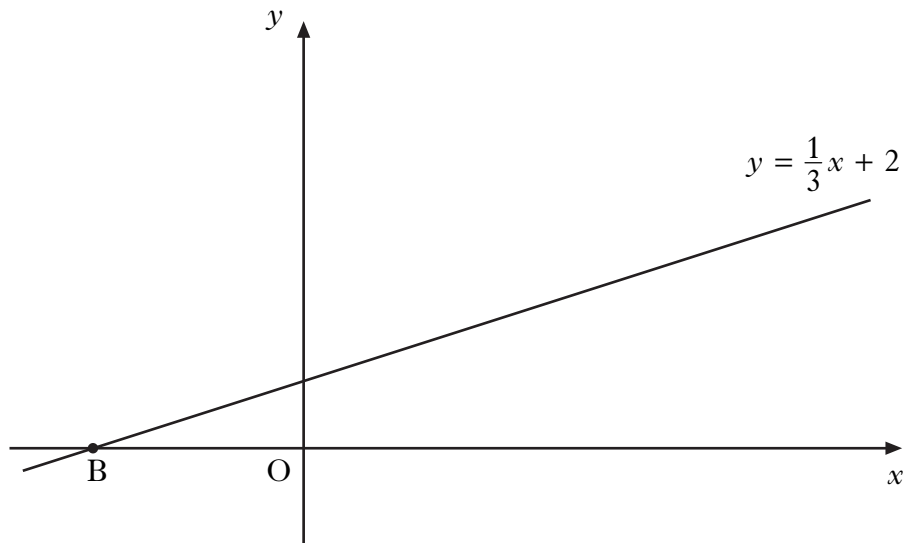**8.** (*a*) Simplify $\sqrt{2} \times \sqrt{18}$. **1**

(*b*) Simplify $\sqrt{2} + \sqrt{18}$. **1**

(*c*) Hence show that $\dfrac{\sqrt{2} \times \sqrt{18}}{\sqrt{2} + \sqrt{18}} = \dfrac{3\sqrt{2}}{4}$. **2**

[Turn over

9. Part of the graph of the straight line with equation $y = \frac{1}{3}x + 2$, is shown below.

(*a*) Find the coordinates of the point B.

(*b*) For what values of x is $y < 0$?

2

1

10. A number pattern is shown below.

$$1^3 = \frac{1^2 \times 2^2}{4}$$

$$1^3 + 2^3 = \frac{2^2 \times 3^2}{4}$$

$$1^3 + 2^3 + 3^3 = \frac{3^2 \times 4^2}{4}$$

(*a*) Write down a similar expression for $1^3 + 2^3 + 3^3 + 4^3 + 5^3$.

    1

(*b*) Write down a similar expression for $1^3 + 2^3 + 3^3 + \ldots + n^3$.

    2

(*c*) Hence **evaluate** $1^3 + 2^3 + 3^3 + \ldots + 9^3$.

    2

11. Two triangles have dimensions as shown.

The triangles are equal in area.

Calculate the value of x.

    4

[*END OF QUESTION PAPER*]

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NATIONAL QUALIFICATIONS 2010	WEDNESDAY, 5 MAY 2.45 PM – 4.05 PM	MATHEMATICS STANDARD GRADE Credit Level Paper 2

1 **You may use a calculator**.

2 Answer as many questions as you can.

3 Full credit will be given only where the solution contains appropriate working.

4 Square-ruled paper is provided.

FORMULAE LIST

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

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

1. It is estimated that an iceberg weighs 84 000 tonnes.

   As the iceberg moves into warmer water, its weight decreases by 25% each day.

   What will the iceberg weigh after 3 days in the warmer water?

   Give your answer **correct to three significant figures**.

   4

2. Expand fully and simplify

$$x(x - 1)^2.$$

   2

3. A machine is used to put drawing pins into boxes.

   A sample of 8 boxes is taken and the number of drawing pins in each is counted.

   The results are shown below:

   102   102   101   98   99   101   103   102

   (*a*) Calculate the mean and standard deviation of this sample.

   3

   (*b*) A sample of 8 boxes is taken from another machine.

   This sample has a mean of 103 and a standard deviation of 2·1.

   Write down two valid comparisons between the samples.

   2
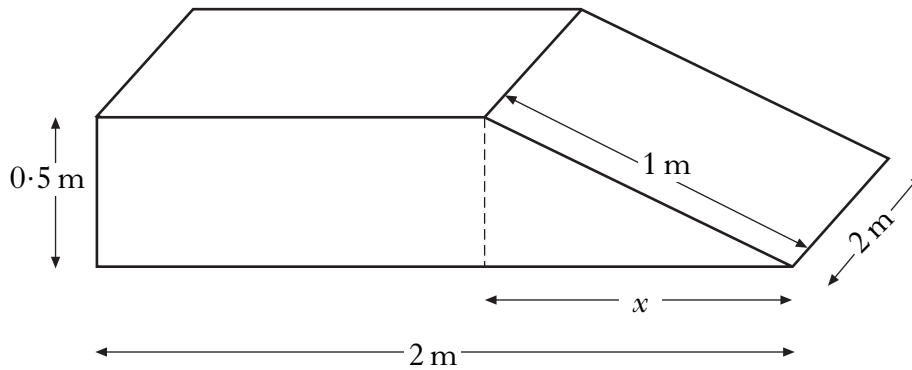
4. Use the quadratic formula to solve the equation,

$$3x^2 + 5x - 7 = 0.$$

   Give your answers correct to **1 decimal place**.

   4

[Turn over

5. A concrete ramp is to be built.

The ramp is in the shape of a cuboid and a triangular prism with dimensions as shown.

(*a*) Calculate the value of *x*.

(*b*) Calculate the volume of concrete required to build the ramp.
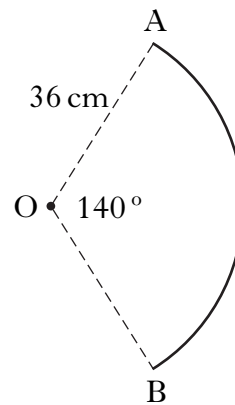
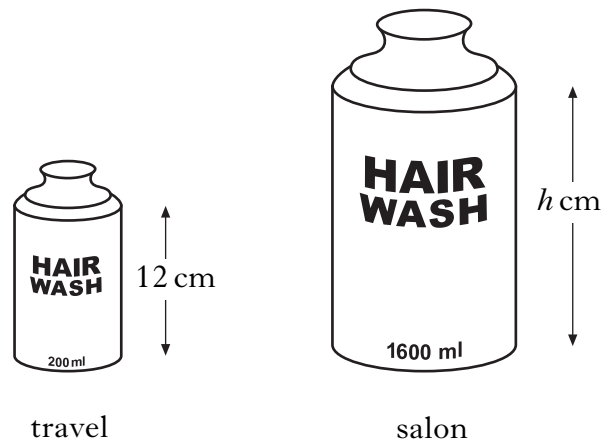**6.** A circle, centre O, has radius 36 centimetres.

Part of this circle is shown.

Angle AOB = 140°.

Calculate the length of arc AB.

7. Shampoo is available in travel size and salon size bottles.

The bottles are mathematically similar.

travel   salon

The travel size contains 200 millilitres and is 12 centimetres in height.
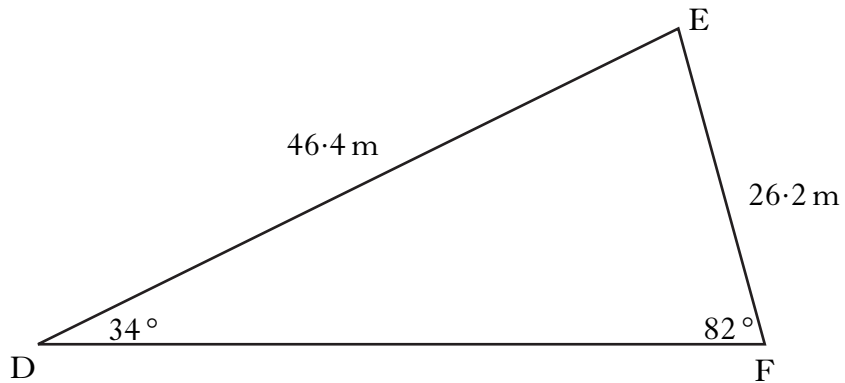
The salon size contains 1600 millilitres.

Calculate the height of the salon size bottle.

3

[Turn over

8. As part of their training, footballers run around a triangular circuit DEF.

- ∠EDF = 34°

- ∠DFE = 82°

- DE = 46·4 metres

- EF = 26·2 metres

How many **complete** circuits must they run to cover **at least** 1000 metres?

4

9. The ratio of sugar to fruit in a particular jam is 5 : 4.

It is decided to:

- **decrease** the sugar content by 20%

- **increase** the fruit content by 20%.

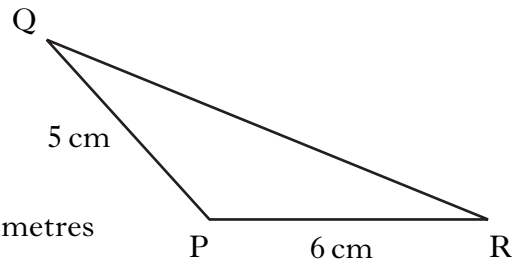Calculate the new ratio of sugar to fruit.

Give your answer in its simplest form.

4

10. In triangle PQR:

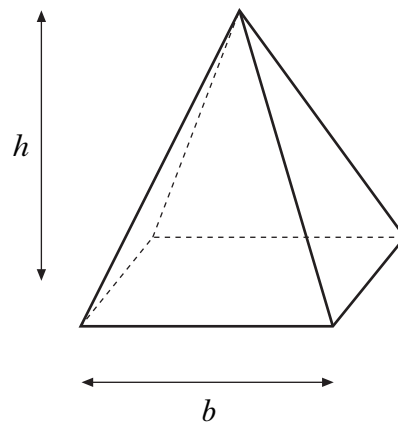- PQ = 5 centimetres

- PR = 6 centimetres

- area of triangle PQR = 12 square centimetres

- angle QPR is **obtuse**.

Calculate the size of angle QPR.

Q

5 cm

P   6 cm   R

4

11. The height, h, of a square-based pyramid varies directly as its volume, V, and inversely as the square of the length of the base, b.

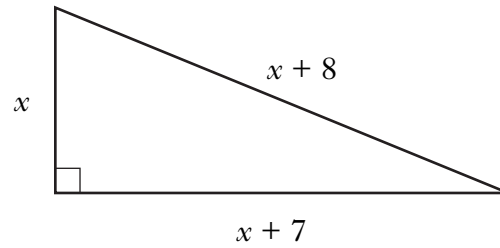(*a*) Write down an equation connecting h, V and b.

h

b

2

A square-based pyramid of height 12 centimetres has a volume of 256 cubic centimetres and length of base 8 centimetres.

(*b*) Calculate the height of a square-based pyramid of volume 600 cubic centimetres and length of base 10 centimetres.

3

[Turn over for Questions 12 and 13 on *Page eight*

12. A right-angled triangle has dimensions, in centimetres, as shown.

Calculate the value of x.

5

13. The depth of water, D metres, in a harbour is given by the formula

$$D = 3 + 1 \cdot 75 \sin 30 h^\circ$$

where h is the number of hours after midnight.

(*a*) Calculate the depth of water at 5 am.

2

(*b*) Calculate the maximum difference in depth of the water in the harbour.

Do not use a trial and improvement method.

2

[*END OF QUESTION PAPER*]