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National 5 Practice Paper H

Paper 1

Duration – 1 hour

Total marks – 40

- o You may NOT use a calculator
- o Attempt all the questions.
- o Use **blue** or **black** ink.
- o Full credit will only be given to solutions which contain appropriate working.
- o State the units for your answer where appropriate.

FORMULAE LIST

The roots of are

$$ax^2 + bx + c = 0 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule:

$$a^2 = b^2 + c^2 - 2bc \cos A \quad \text{or} \quad \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

Area of a triangle:

$$A = \frac{1}{2} ab \sin C$$

Volume of a Sphere:

$$V = \frac{4}{3} \pi r^3$$

Volume of a cone:

$$V = \frac{1}{3} \pi r^2 h$$

Volume of a pyramid:

$$V = \frac{1}{3} Ah$$

Standard deviation:

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

1. Evaluate

    $$4\frac{1}{3} - 1\frac{1}{2}$$

    2

2. Expand and simplify

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

    3
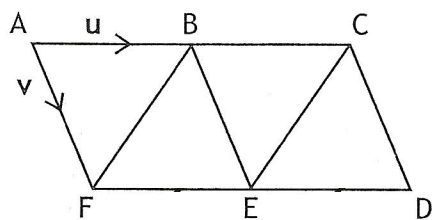
3. Change the subject of the formula to m.

    $$L = \frac{\sqrt{m}}{k}$$

    2

4. The diagram shows a tiling of congruent triangles.

    Vectors **u** and **v** are represented by $\overrightarrow{AB}$ and $\overrightarrow{AF}$ respectively.
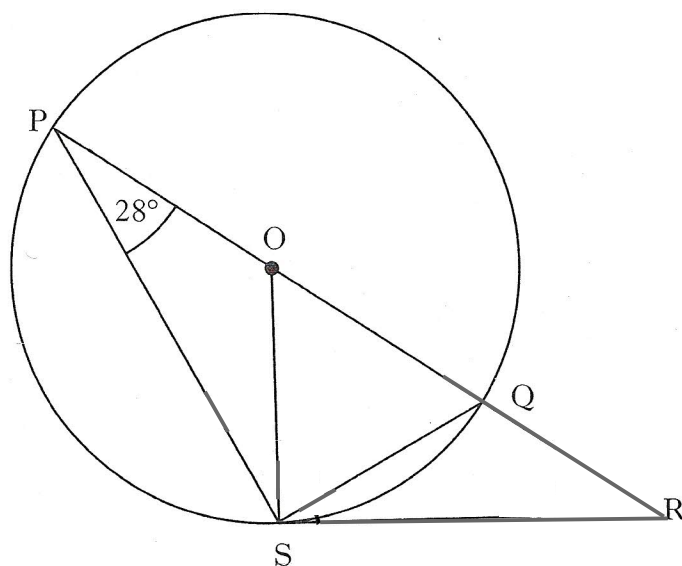

    (a) Express $\overrightarrow{AD}$ in terms of **u** and **v**.

    (b) Express $\overrightarrow{CE}$ in terms of **u** and **v**.   1

                                                        Total marks   2

5.

In the above diagram,

 * O is the centre of the circle
 * PQ is a diameter of the circle
 * PQR is a straight line
 * RS is a tangent to the circle at S
 * angle QPS is 28°
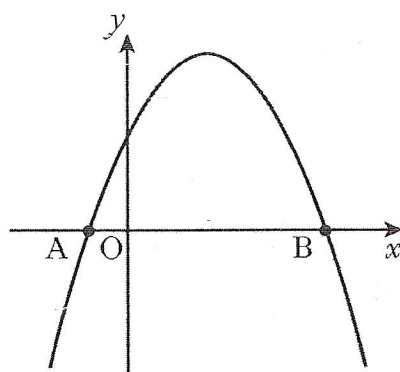
Calculate the size of angle QRS.   3

6. Express $\dfrac{3y^2-6y}{y^2+y-6}$ in its simplest form.

3

7. Evaluate $9^{-\frac{3}{2}}$.

2

8. The diagram shows part of the graph of $y=5+4x-x^2$.

$$y=5+4x-x^2$$

A is the point (-1, 0).

B is the point (5, 0).

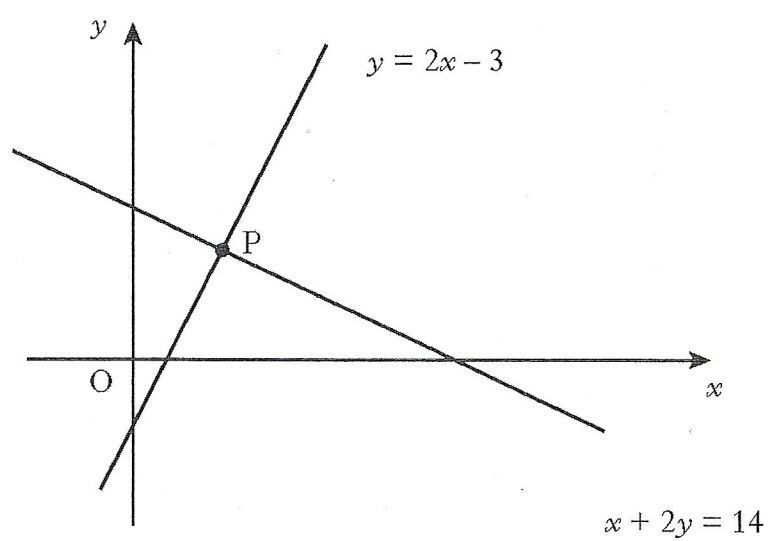(a) State the equation of the axis of symmetry of the graph.

2

(b) Hence, find the maximum value of $y=5+4x-x^2$.

2

Total marks   4

9. The graph below shows two straight lines.
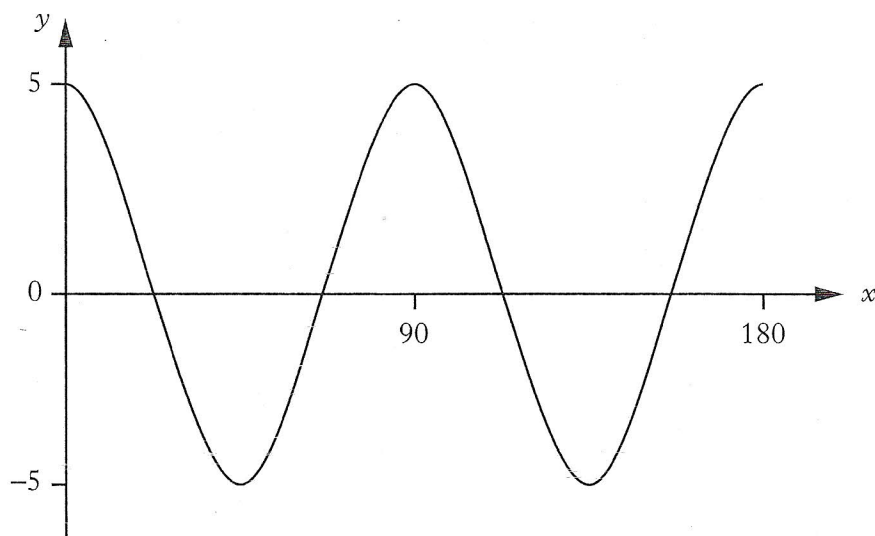
   ○ $y = 2x - 3$

   ○ $x + 2y = 14$

The lines intersect at the point P.

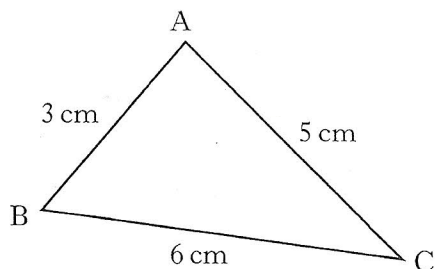Find, **algebraically**, the coordinates of P.

4

10. Part of the graph of $y = a\cos bx^\circ$ is shown in the diagram.
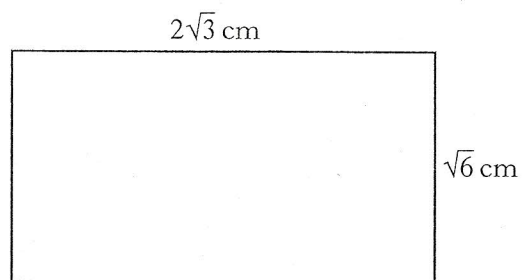

State the values of a and b.

2

11.

In triangle ABC, show that $\cos B = \dfrac{5}{9}$.

3

12.

$2\sqrt{3}$ cm

$\sqrt{6}$ cm

The rectangle above has length $2\sqrt{3}$ centimetres and breadth $\sqrt{6}$ centimetres.

Calculate the area of the rectangle.

Express your answer as a surd in its simplest form. 3

13. Simplify $\dfrac{3}{m} + \dfrac{4}{m+1}$. 3

14. Prove that the roots of the equation $2x^2 + 8x + 5 = 0$ are real and irrational. 4

[END OF PRACTICE QUESTION PAPER]

National 5 Practice Paper H

Paper 2

Duration – 1 hour and 30 minutes

Total marks – 50

- o You may use a calculator
- o Attempt all the questions.
- o Use **blue** or **black** ink.
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FORMULAE LIST

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Volume of a pyramid: $V = \dfrac{1}{3}Ah$

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. Alistair buys an antique chair for £600.

   It is expected to increase in value at the rate of 4·5% each year.

   How much is it expected to be worth in 3 years?   3

2. A rugby team scored the following points in a series of matches.

   | 13 | 7 | 0 | 9 | 7 | 8 | 5 |

   (a) For this sample calculate the mean and the standard deviation.   3

   The following season the team appoints a new coach.

   A similar series of matches produces a mean of 27 and a standard deviation of 3·25.

   (b) Make two valid comparisons about the performance of the team under the new coach.   2

   Total marks   5

3. The diagram shows a cuboid OPQR,STUV relative to the coordinate axes.

   P is the point (4, 0, 0), Q is (4, 2, 0) and U is (4, 2, 3).
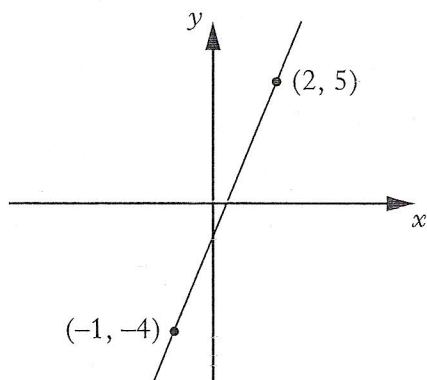
   M is the midpoint of OR.

   N is the point on UQ such that UN = $\dfrac{1}{3}$ UQ.
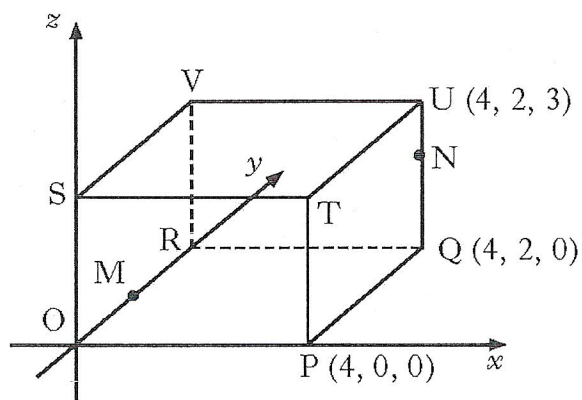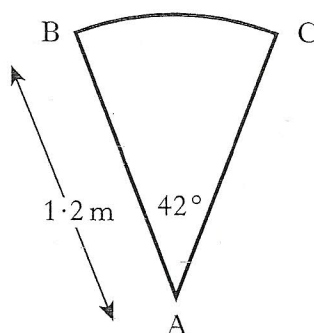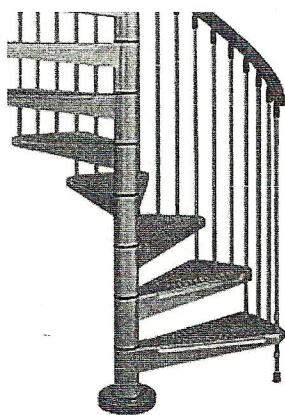

   State the coordinates of M and N.

2

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

3

Page four

5. A spiral staircase is being designed.

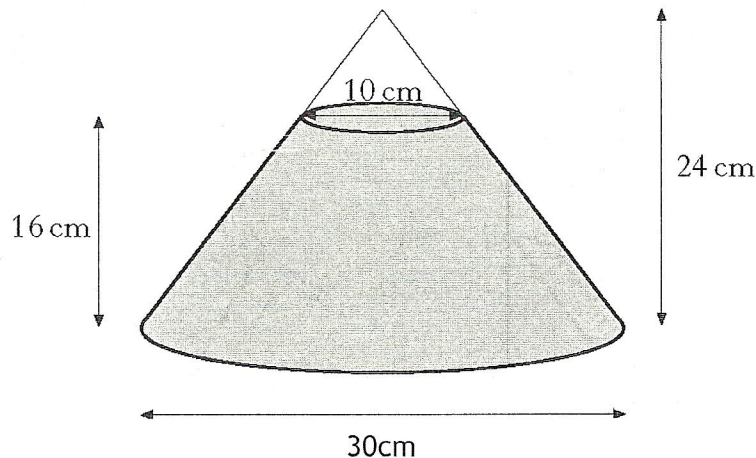Each step is made from a sector of a circle as shown.

The radius is 1·2 metres.

Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0·9 metres.

Will the staircase pass safety regulations?

4

6. A glass ornament is in the shape of a cone partly filled with coloured water.

The cone is 24 centimetres high and has a base of diameter 30 centimetres.

The water is 16 centimetres deep and measures 10 centimetres across the top.

What is the volume of the water.

Give your answer correct to 2 significant figures.

5

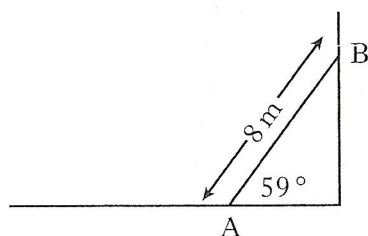7. The price for Paul's summer holiday is £894·40.

   The price includes a 4% booking fee.

   What is the price of his holiday without the booking fee?
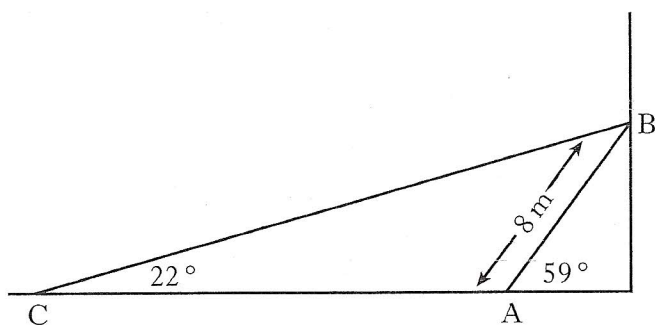
   3

8. A heavy metal beam, AB, rests against a vertical wall as shown.

   The length of the beam is 8 metres and it makes and angle of 59° with the ground.

   A cable, CB, is fixed to the ground at C and is attached to the top of the beam at B.
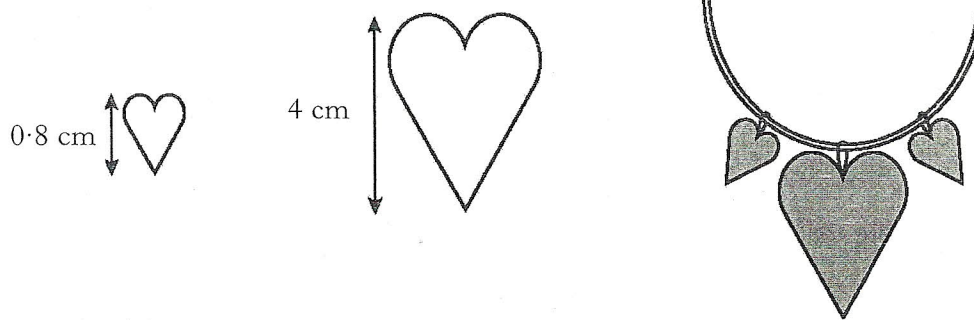
   The cable makes an angle of 22° with the ground.

   Calculate the length of cable CB.
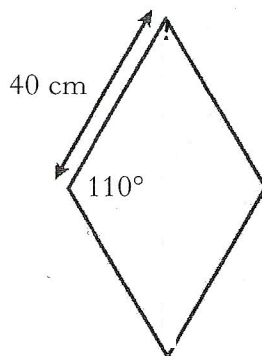
   4

9. A necklace is made of beads which are mathematically similar.

0·8 cm

4 cm

The height of the smaller bead is 0·8 centimetres and its area is 0·6 square centimetres. The height of the larger bead is 4 centimetres. Find the area of the larger bead.

3

10. Paving stones are in the shape of a rhombus.

40 cm

110°

The side of each rhombus is 40 centimetres long.

The The obtuse angle is 110°.

Find the area of one paving stone.

4

11. $f(x) = 3\sin x^o$, $0 \le x \le 360$.

(a) Find $f(270)$.
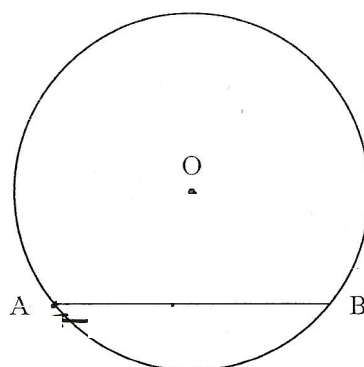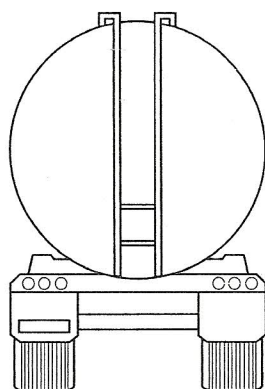
1

(b) $f(t) = 0 \cdot 6$.

Find the two possible values of t.

4

Total marks 5

12. A tanker delivers oil to garages.

The tanker has a circular cross-section as shown in the diagram below.
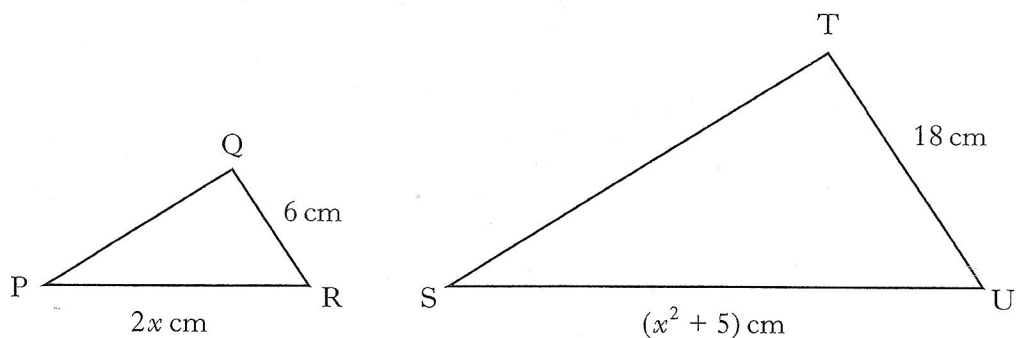

The radius of the circle, O, is 1·9 metres.

The width of the surface of the oil, represented by AB in the diagram, is 2·2 metres.

Calculate the depth of the oil in the tanker.

4

13. Triangles PQR and STU are mathematically similar.

The scale factor is 3 and PR corresponds to SU.

(a) Show that $x^2 - 6x + 5 = 0$. **2**

(b) Given that QR is the shortest side of triangle PQR, find the value of x. **3**

Total marks **5**

[END OF PRACTICE QUESTION PAPER]