SAMPLE PAPER

MATHEMATICS

SCHOLARSHIP EXAMINATION 16+

Candidate Number:

Time: 1 hour (Calculator)

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Instructions to Candidates:

- Attempt all questions

- Write all your answers in the spaces provided on this question paper

- Rough paper is NOT provided

- Some formulae you may need are given on the first page

- Calculators **MAY** be used on this paper

- The number of marks for each part of each question is shown.

- This paper contains 12 questions.
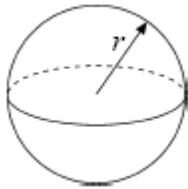
- Maximum mark: 65

Instructions to Invigilator:

- There is no reading time allowed.

Some formulae you may need.

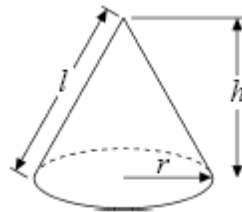**Do NOT write on this page – no credit will be given for anything on this page**

Volume of sphere $\frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

Volume of cone $\frac{1}{3}\pi r^2 h$

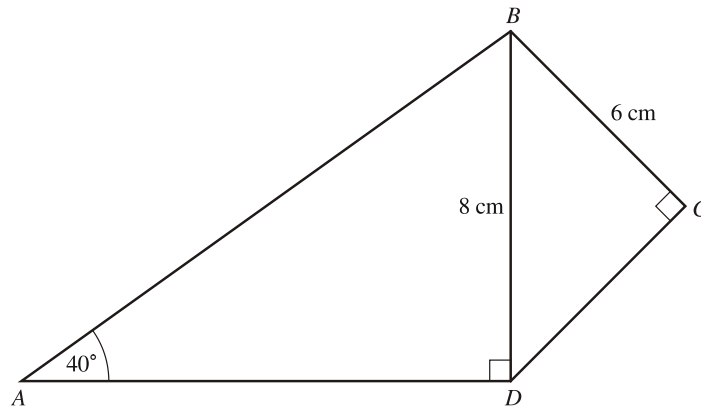**Curved surface area of cone** $= \pi r l$

1.

Diagram **NOT** accurately drawn.

ABCD is a quadrilateral.

Angle *BDA* = 90°, angle *BCD* = 90°, angle *BAD* = 40°.

BC = 6 cm, *BD* = 8 cm.

(a) Calculate the length of *DC*. Give your answer correct to 3 significant figures.

.... cm (3)

(b) Calculate the size of angle *DBC*. Give your answer correct to 3 significant figures.

.... °(3)

(c) Calculate the length of *AB*. Give your answer correct to 3 significant figures.

.... cm (3)

[Total 9 marks]

2. $(5x + 3)(x - 2) = 1$

(a) Show that $5x^2 - 7x - 7 = 0$.

(2)

(b) Solve the equation $5x^2 - 7x - 7 = 0$.

Give your answer correct to 3 significant figures.

x =.............................

x =.............................

(3)

[Total 5 marks]

3.   Solve the inequality

                         $7 \leq 2x + 3 \leq 25$

....

[Total 3 marks]

4. *P* is inversely proportional to d^3

        P = 10 000 when *d* = 0.4

        Find the value of *P* when *d* = 0.8

....

[Total 3 marks]

5.   Some women walked one mile.
        The time taken by each was recorded.
        The results are as follows:

Time t minutes	$12 \leq t < 16$	$16 \leq t < 20$	$20 \leq t < 24$	$24 \leq t < 28$	$28 \leq t < 32$
Number of women	1	9	43	22	5

    (a)   (i) What is the modal class for the time taken?

.....................................(1)

         (ii) Calculate an estimate of the mean time taken.

.....................................(4)

[Total 5 marks]

6. (a) In Britain there are 6.5×10^7 people.

The number of retired people is 1.9×10^7.
What percentage of people in Britain are retired?
Give your answer correct to 3 significant figures.

......................................(2)

(b) 12.6% of the world's population live in Europe.

The population of the world is 7.2×10^9
Calculate the population of Europe.
Give your answer in standard form to 2 significant figures.

......................................(2)

[Total 4 marks]

7. (a) The sides of a rectangle have dimensions 20cm and 30cm, each measured to the nearest centimetre.
Calculate the smallest possible area of the rectangle.

.................................cm^2 (2)

(b) The sides of a square have length x cm measured to the nearest centimetre.

Write down and simplify an expression, in terms of x, for the difference between the largest and smallest possible areas of the square.

.................................cm^2 (3)

[Total 5 marks]
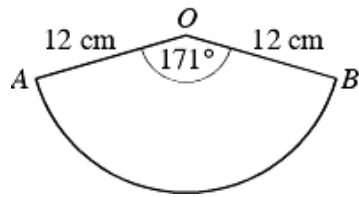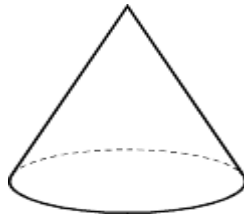
8.

12 cm   *O*   12 cm
171°
A   *B*

Diagram **NOT**
accurately drawn

The diagram shows a sector *OAB* of a circle of centre *O*.
The radius of the circle is 12 cm.
Angle *AOB* = 171°.

(a) Calculate the length of the arc AB.
Give your answer correct to 3 significant figures.

.... cm² (3)

OA and *OB* are joined to make a cone.

(b) Calculate the vertical height, in centimetres, of the cone.
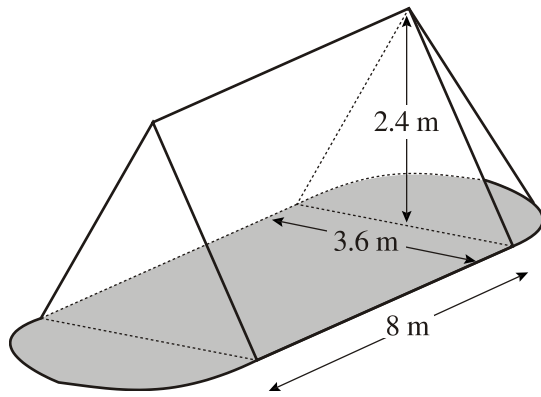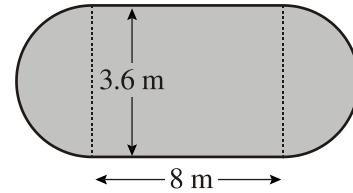Give your answer correct to 3 significant figures.

.... cm(6)
[Total 9 marks]

9.

A tent has a groundsheet as its horizontal base.

The shape of the tent is a triangular prism of length 8 metres, with two identical half right-circular cones, one at each end.

The vertical cross-section of the prism is an isosceles triangle of height 2.4 metres and base 3.6 metres.

(a) Calculate the area of the groundsheet.
Give your answer, in m², correct to one decimal place.

………………………………….. m² (3)

(b) Calculate the total volume of the tent.
Give your answer, in m³, correct to one decimal place.

……………………………………………… m³(4)

[Total 7 marks]

10. The mean of the five consecutive integers 1, 2, 3, 4, 5 is 3.

So the square of the mean of the consecutive integers 1, 2, 3, 4, 5 is 9.
The mean of the squares of those five consecutive integers 1^2, 2^2, 3^2, 4^2, 5^2 is 11.

Show algebraically that the square of the mean of **any** five consecutive integers is **always** 2 less than the mean of the squares of those five consecutive integers.

[Total 6 marks]

11.   This is a sketch of the curve with equation $y = f(x)$.

        It passes through the origin O.
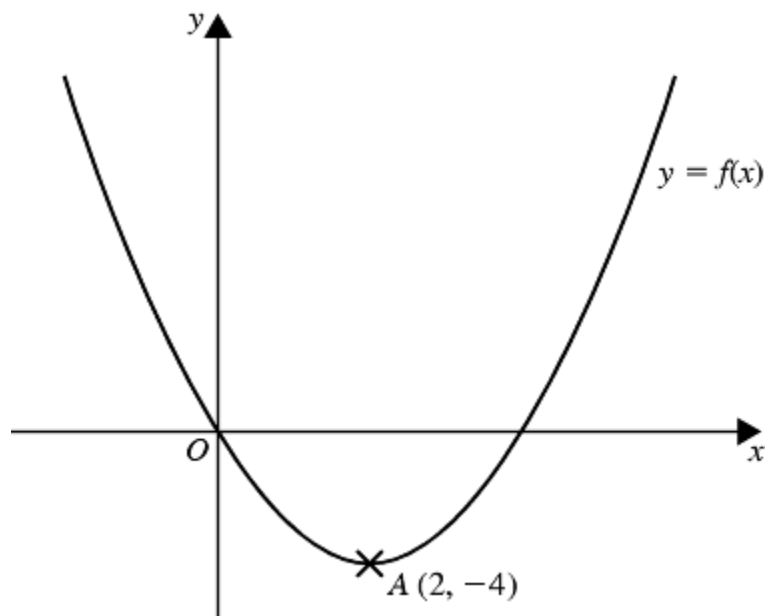
The only vertex of the curve is at A (2, -4)

(a) Write down the coordinates of the vertex of the curve with equation

    (i) $y = f(x - 3)$,   (............. , ...)

    (ii) $y = f(x) - 5$,   (............. , ...)

    (iii) $y = -f(x)$,   (............. , ...)

    (iv) $y = f(2x)$.   (............. , ...)

                                                           [Total 4 marks]

12.
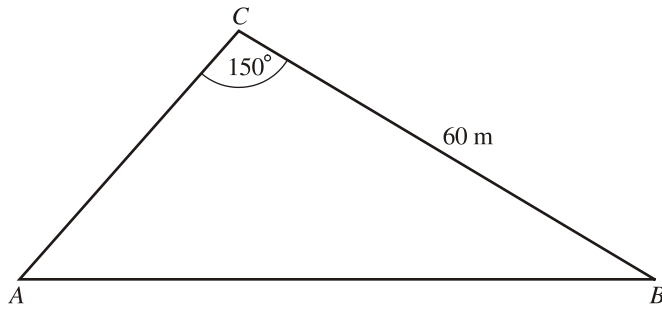
Angle *ACB* = 150°.
BC = 60 m.

The area of triangle *ABC* is 450 m².

Calculate the perimeter of triangle *ABC*.
Give your answer correct to 3 significant figures.

.... m
[Total 5 marks]

END OF TEST – GO BACK AND CHECK YOUR ANSWERS