

CANDIDATE
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MATHEMATICS (US)

0444/23

Paper 2 (Extended)

October/November 2015

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Center number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

CALCULATORS MUST NOT BE USED IN THIS PAPER.

All answers should be given in their simplest form.

If work is needed for any question it must be shown in the space provided.

The number of points is given in parentheses [] at the end of each question or part question.

The total of the points for this paper is 70.

This document consists of **12** printed pages.

Formula List

For the equation

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Lateral surface area, A , of cylinder of radius r , height h .

$$A = 2\pi rh$$

Lateral surface area, A , of cone of radius r , sloping edge l .

$$A = \pi rl$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of pyramid, base area A , height h .

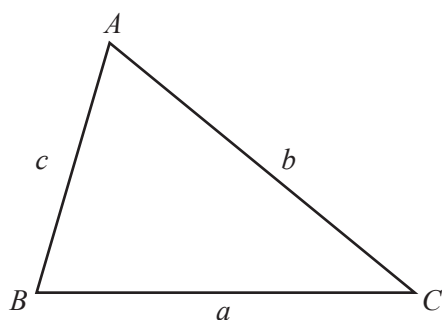
$$V = \frac{1}{3}Ah$$

Volume, V , of cone of radius r , height h .

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

Volume, V , of sphere of radius r .

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



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

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

1 Write 168.9 correct to 2 significant digits.

Answer [1]

2 Work out $8 - 3 \times (7 - 2)$.

Answer [1]

3 Write 1.7×10^{-4} as an ordinary number.

Answer [1]

4 The probability that it will rain on any day is $\frac{1}{5}$.

Work out the expected number of days it will rain in a month with 30 days.

Answer [1]

5 11 12 13 14 15 16

From the list of numbers, write down

(a) the factors of 60,

Answer(a) [1]

(b) the prime numbers.

Answer(b) [1]

6 Simplify.

$$1 - 2u + u + 4$$

Answer [2]

7 Factor completely.

$$2x - 4x^2$$

Answer [2]

8 Find the sum of the interior angles of a 12-sided polygon.

Answer [2]

9 $f(x) = 2 \cos\left(\frac{1}{2}x\right)$

Write down the amplitude and period of $f(x)$.

Answer Amplitude =

Period = [2]

10 Find the value of

(a) $(\sqrt{5})^6$,

Answer(a) [1]

(b) 3^{-3} .

Answer(b) [1]

11 Write the following as single fractions.

(a) $x + \frac{x}{2}$

Answer(a) [1]

(b) $x + \frac{2}{x}$

Answer(b) [1]

12 Work out $6 \times 10^{12} - 6 \times 10^{11}$.

Give your answer in scientific notation.

Answer [2]

13 Solve the inequality.

$$3 - 2x > -1$$

Answer [2]

- 14 Two containers are mathematically similar.
Their volumes are 27 cm^3 and 64 cm^3 .
The height of the smaller container is 4.5 cm.

Work out the height of the larger container.

Answer cm [3]

- 15 Work out $\frac{2}{3} + \frac{1}{6} - \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Answer [3]

- 16 Solve for a .

$$s = ut + \frac{1}{2}at^2.$$

Answer $a =$ [3]

17 Simplify.

$$\left(\frac{x^{64}}{16y^{16}}\right)^{\frac{1}{4}}$$

Answer [3]

18 y varies inversely as $(x + 2)^2$.
When $x = 1, y = 2$.

Find y when $x = 4$.

Answer $y =$ [3]

19 (a) $2\sqrt{3} = \sqrt{x}$

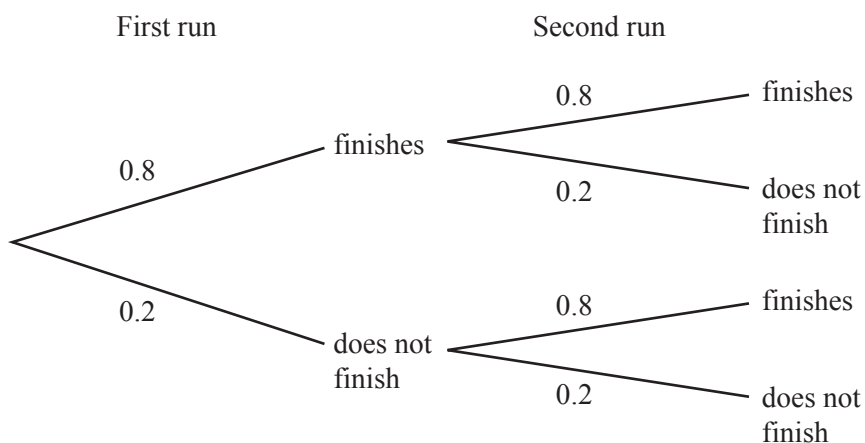
Find the value of x .

Answer(a) $x =$ [1]

(b) Simplify.
 $\sqrt{24} + \sqrt{54}$

Answer(b) [2]

- 20 Samira takes part in two charity runs.
The probability that she finishes each run is 0.8 .



Find the probability that Samira finishes at least one run.

Answer [3]

- 21 The solutions of the equation $3x^2 + 4x - 5 = 0$ are $\frac{p + \sqrt{19}}{q}$ and $\frac{p - \sqrt{19}}{q}$.

Find the value of p and the value of q .

Answer $p =$

$q =$ [3]

22 Simplify.

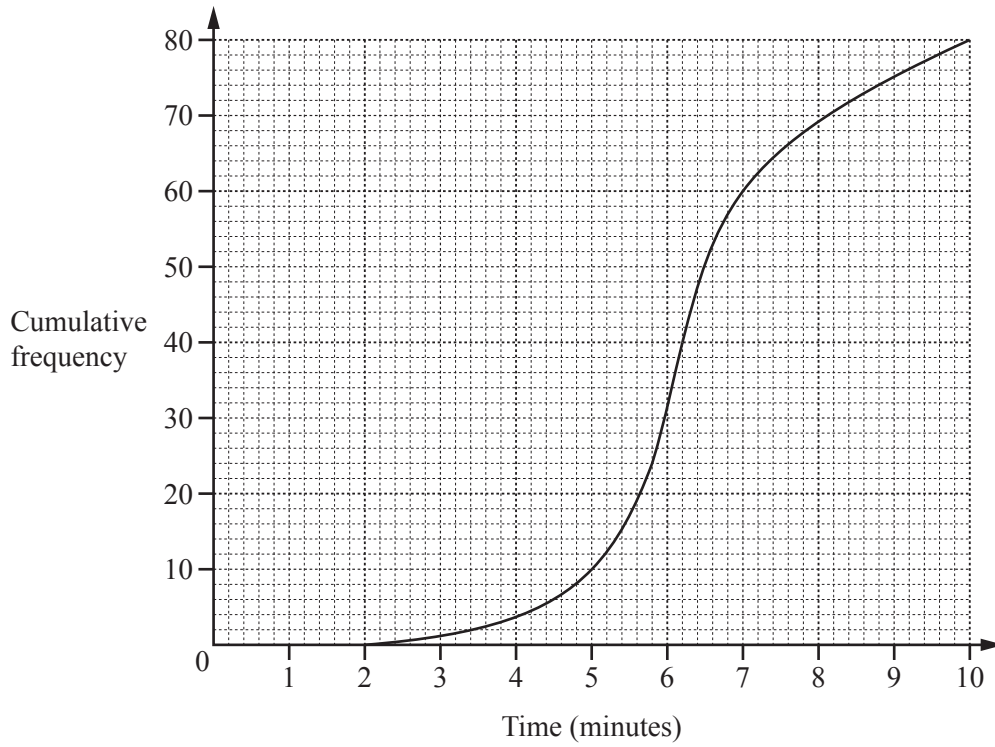
$$\frac{4 + 10w}{8 - 50w^2}$$

Answer [4]

23 The straight line L has equation $2x + 5y = 10$ and intersects the y -axis at A .

Find the equation of the straight line which is perpendicular to L and passes through A .

Answer [4]



The cumulative frequency diagram shows information about the times, in minutes, taken by 80 students to complete a short test.

Find

(a) the median,

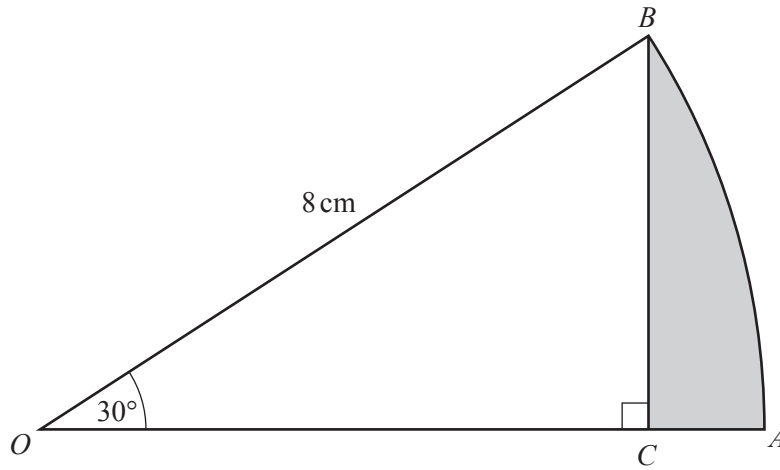
Answer(a) min [1]

(b) the 30th percentile,

Answer(b) min [2]

(c) the number of students taking more than 5 minutes.

Answer(c) [2]



NOT TO SCALE

OAB is the sector of a circle, center O , with radius 8 cm and sector angle 30° .
 BC is perpendicular to OA .

Show that the area of the region shaded on the diagram is $\left(\frac{16\pi}{3} - 8\sqrt{3}\right) \text{ cm}^2$.

Answer

[5]

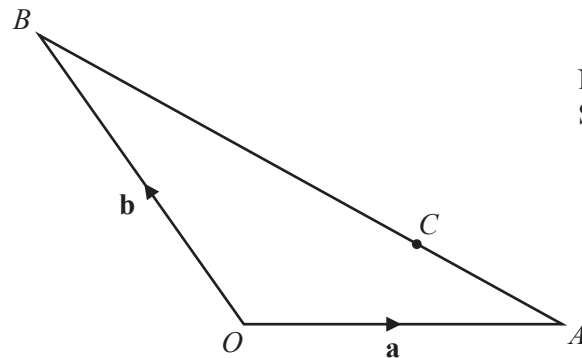
Question 26 is printed on the next page.

26 (a) $\mathbf{v} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$

Find $|\mathbf{v}|$.

Answer(a) [2]

(b)



In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
 C is on the line AB so that $AC : CB = 1 : 2$.

Find, in terms of \mathbf{a} and \mathbf{b} , in its simplest form,

(i) \overrightarrow{AC} ,

Answer(b)(i) $\overrightarrow{AC} = \dots\dots\dots$ [2]

(ii) \overrightarrow{OC} .

Answer(b)(ii) $\overrightarrow{OC} = \dots\dots\dots$ [2]

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