Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME **SOLVED BY SMART EXAM RESOURCES/SMART EDU HUB**

CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre 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.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **11** printed pages and **1** blank page.

1 One day, at noon in Maseru, the temperature was 17 °C.
At midnight the temperature was 20 °C lower.

0580/22/O/N/17

Work out the temperature at midnight.

Expl: Note: 20°C lower than 17°C means 17 - 20 = -3

-3 °C [1]

2 Write 5.17×10^{-3} as an ordinary number.

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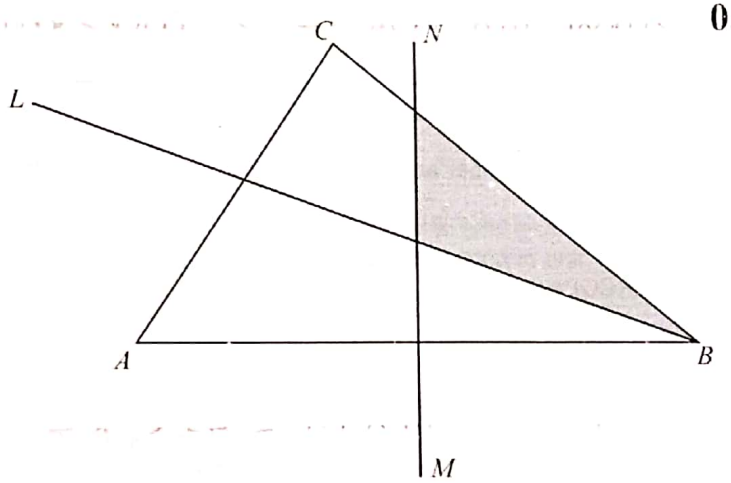
Since it is $\times 10^{-3}$, we need to divide the number by 1000

$\therefore 5.17 \times 10^{-3} = \frac{5.17}{1000} = 0.00517$

0.00517 [1]

3

0580/22/O/N/17



In the diagram, BL is the bisector of angle ABC and MN is the perpendicular bisector of AB.

Complete the statement.

The shaded region contains the points, inside triangle ABC, that are

- nearer to B than to A

and

- nearer to BC than to AB [1]

4 (a) 1 and 12 are factors of 12.

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Write down all the other factors of 12.

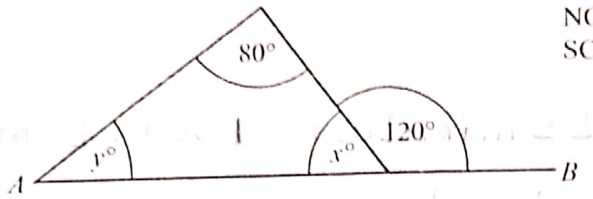
Factors of 12 are all those numbers that divide 12 completely ∴ Numbers are: 2, 3, 4, 6 .]

(b) Write down the multiples of 9 between 20 and 40.

Multiples of 9 mean all numbers that come in the table of 9

27, 36 [1]

5



NOT TO SCALE

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In the diagram, AB is a straight line.

Find the value of x and the value of y.

$x + 120 = 180 \rightarrow$ Linear Pair

$\therefore x = 180 - 120 = 60°$

$80 + x + y = 180°$ [$\angle$'s in a Δ total 180]

$\therefore 80 + 60 + y = 180 \Rightarrow y = 180 - 140 = 40$

$x =$ 60

$y =$ 40 [2]

---

6 Write 55 g as a percentage of 2.2 kg.

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Step 1: Change 2·2 kg into g $\therefore 2.2 \times 1000 = 2200$ g

Step 2: $\frac{55}{2200} \times 100 = 2.5$

★ Always use same units for calculations ★

2·5 % [2]

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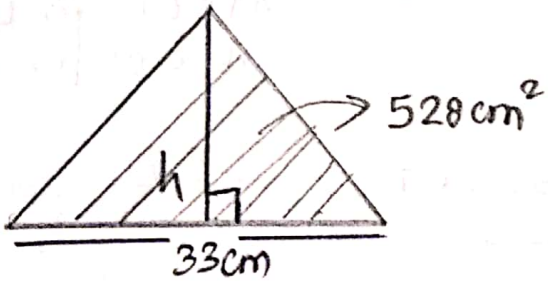
7 The area of a triangle is 528 cm^2.
The length of its base is 33 cm.

0580/22/O/N/17

Calculate the perpendicular height of the triangle.



Area of a $\Delta = \frac{1}{2} \times$ base $\times$ height

$\therefore 528 = \frac{1}{2} \times 33 \times h$

$\therefore h = \frac{528 \times 2}{33} = 32$ cm

32 cm [2]

---

8 Amar cycles at a speed of 18 km/h.
It takes him 55 minutes to cycle between two villages.

0580/22/O/N/17

Calculate the distance between the two villages.

Step1: Convert 55 minutes in hours by multiplying by $\frac{1}{60}$

$\therefore 55 \text{ minutes} = 55 \times \frac{1}{60} = \frac{55}{60}$

Step 2: Speed = Distance ÷ Time

$\therefore$ Distance = Speed × Time $= 18 \times \frac{55}{60} = 16.5$ 16.5 ..... km [2]

---

9 Work out, giving your answer in standard form.

0580/22/O/N/17

$1.2 \times 10^{40} + 1.2 \times 10^{41}$

★ It says "Work Out". So do not write direct calculator display ★

$\therefore 1.2 \times 10^{40} + 1.2 \times 10^{41}$

$= 1.2 \times 10^{40} + 12 \times 10^{40}$

$= (1.2 + 12) \times 10^{40} = 1.32 \times 10^{40}$

1.32×10^{41} ..... [2]

---

10 The sides of a triangle are 5.2 cm, 6.3 cm and 9.4 cm, each correct to the nearest millimetre.

Calculate the lower bound of the perimeter of the triangle.

change mm → cm

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★ 1 cm = 10 mm

∴ 1 mm = 0.1 cm ★

∴ Add 0.05 for UB

Sub 0.05 for LB

Side length = 5.2 < LB = 5.15 cm, UB = 5.25 cm

Side length = 6.3 < LB = 6.25 cm, UB = 6.35 cm

Side length = 9.4 < LB = 9.35 cm, UB = 9.45 cm

$\therefore$ Perimeter (LB) $= 5.15 + 6.25 + 9.35 = 20.75$ 20.75 ..... cm [2]

---

11 Write the recurring decimal $0.\dot{4}\dot{8}$ as a fraction.
Show all your working.

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Let $x = 0.\dot{4}\dot{8}$

$\therefore 100x = 48.\dot{4}\dot{8}$

$\therefore 100x - x = 48$

$\therefore 99x = 48$

$\therefore x = \frac{48}{99}$

$\frac{48}{99}$ ..... [2]

12 Expand the brackets and simplify.

$(5-n)(3+n)$ **0580/22/O/N/17**

$(5-n)(3+n)$

$= 5(3+n) - n(3+n)$

$= 15 + 5n - 3n - n^2$

$= 15 + 2n - n^2$

$15+2n-n^2$ [2]

13 (a) Write $\frac{11}{3}$ as a mixed number. **0580/22/O/N/17**

$\frac{11}{3} = 3\frac{2}{3}$

$3\frac{2}{3}$ [1]

(b) **Without using a calculator**, work out $\frac{1}{4}+\frac{5}{12}$.
Show all the steps of your working and give your answer as a fraction in its lowest terms.

$\frac{1}{4} + \frac{5}{12}$

Equalise the denominator

$\therefore \frac{12\times1 + 5\times4}{4\times12} = \frac{12+20}{48} = \frac{32}{48} = \frac{2}{3}$

★[Note: To reduce $\frac{32}{48}$, we have divided both numbers by 16]

$\frac{2}{3}$ [2]

14 Find the integers which satisfy the inequality. **0580/22/O/N/17**

$-5 < 2n - 1 \leqslant 5$

To do this; take pairs at a time and then Combine.

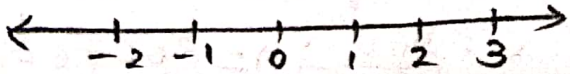
Example:

I
$-5 < 2n - 1$
$\therefore -5+1 < 2n$
$\therefore -4 < 2n$
$\therefore -\frac{4}{2} < n$
$\therefore -2 < n$

II
$2n - 1 \leq 5$
$\therefore 2n \leq 5+1$
$\therefore 2n \leq 6$
$\therefore n \leq \frac{6}{2}$
$\therefore n \leq 3$

$\therefore$ Combining I and II
$\therefore -2 < n \leq 3$
$\therefore$ Integers are: $-1, 0, 1, 2, 3$

$-1, 0, 1, 2, 3$ [3]



15 Write as a single fraction in its simplest form. 0580/22/O/N/17

$\frac{x+1}{x} - \frac{y-1}{y}$

$\frac{x+1}{x} - \frac{y-1}{y}$

Finding the LCM

$\therefore \frac{y(x+1)-x(y-1)}{xy}$

$= \frac{xy+y-xy+x}{xy}$

$= \frac{y+x}{xy}$

$\frac{y+x}{xy}$ [3]

16 Here are the first four terms of a sequence. 0580/22/O/N/17

23 17 11 5

(a) Find the next term.

23 (−6) 17 (−6) 11 (−6) 5 (−6) → −1

−1 [1]

(b) Find the nth term.

This is a linear sequence of the form $a+(n-1)d$

$\therefore 23+(n-1)(-6)$

$23-6n+6 = 29-6n$

$-6n+29$ [2]

17 0580/22/O/N/17

NOT TO SCALE

The diagram shows part of a regular polygon.
The exterior angle is $x°$.
The interior angle is $29x°$.

Work out the number of sides of this polygon.

$29x+x = 180$

$\therefore 30x = 180$

$\therefore x = 180 \div 30 = 6$

$\therefore$ Interior Angle $= 29x = 29 \times 6 = 174$

and Exterior Angle $= x = 6°$

$\therefore$ Measure of each exterior $\angle = \frac{360}{n}$

$\therefore 6 = \frac{360}{n} \therefore n = 360 \div 6 = 60$

$\therefore n$ = number of sides $= 6$

60 [3]

18 Solve the simultaneous equations.
You must show all your working.

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$y = \frac{x}{2}$ ---> ①

$2x - y = 1$ ---> ②

$y = \frac{x}{2}$

$\therefore x = 2y$

Substitute $x = 2y$ in Equ^{n} 2

$\therefore 2x - y = 1$ becomes

$2(2y) - y = 1$

$\therefore 4y - y = 1$

$\therefore 3y = 1$

$\therefore y = \frac{1}{3}$

$y = \frac{x}{2}$

$\therefore x = 2y$

$= 2(\frac{1}{3})$

$\therefore x = \frac{2}{3}$

$x =$ $\frac{2}{3}$

$y =$ $\frac{1}{3}$ [3]

19 Make x the subject of the formula.

$y = \sqrt{x^2 + 1}$

0580/22/O/N/17

Given: $y = \sqrt{x^2+1}$

Squaring both sides;

$\therefore y^2 = x^2 + 1$

$\therefore y^2 - 1 = x^2$

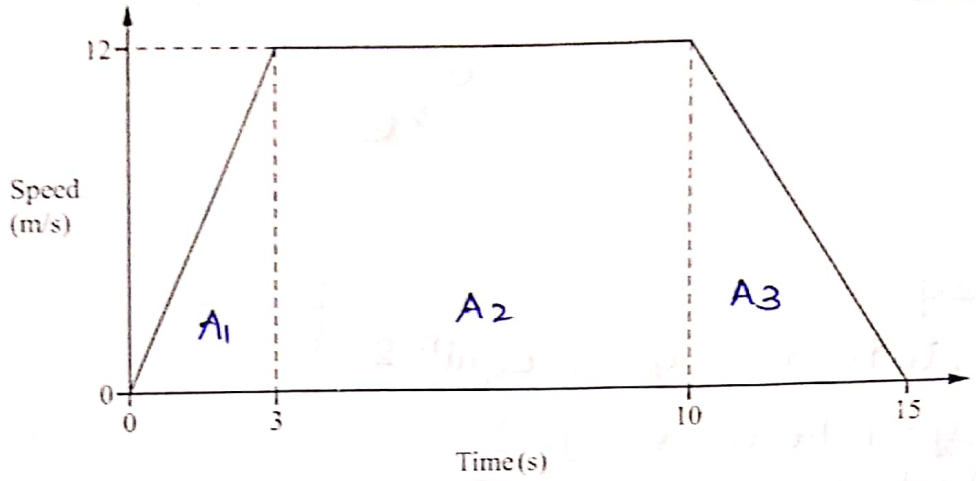
Taking square root of both sides;

$\pm \sqrt{y^2 - 1} = x$

$\therefore x = \pm\sqrt{y^2 - 1}$

$x =$ $\pm\sqrt{y^2-1}$ [3]

20



The diagram shows a speed-time graph.

Calculate the total distance travelled.

Total distance travelled = Area below the graph

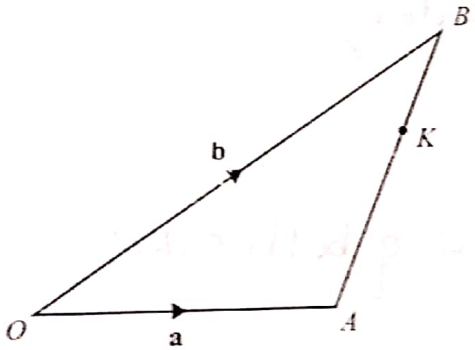
$\therefore = A_1 + A_2 + A_3$

$= \left[\frac{1}{2} \times (3)(12)\right] + [(7)(10)] + \left[\frac{1}{2}(5)(12)\right]$

$= 132\text{m}$

132 m [3]

21



O is the origin and K is the point on AB so that $AK : KB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find the position vector of K.
Give your answer in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} = -a + b$

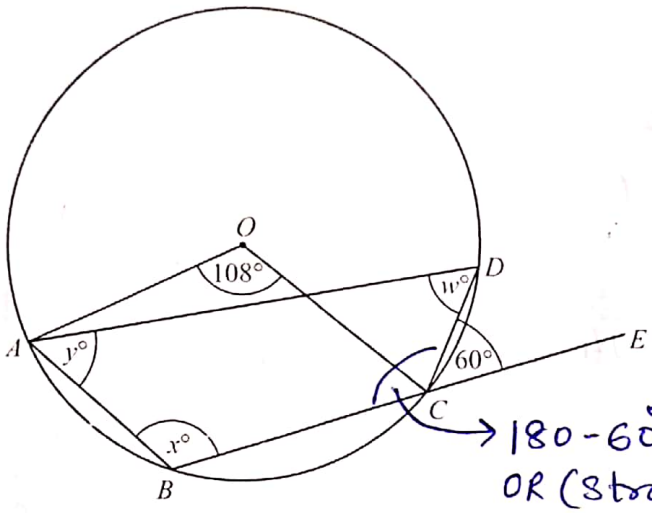
Also, $\overrightarrow{AK} = \frac{2}{3}(\overrightarrow{AB}) = \frac{2}{3}(-a+b)$

$\therefore$ Position vector of $K = \overrightarrow{OK}$

and $\overrightarrow{OK} = \overrightarrow{OA} + \overrightarrow{AK} = a + \frac{2}{3}(-a+b) = \frac{3a-2a}{3} + \frac{1}{3}b = \frac{a}{3} + \frac{2b}{3}$

$\frac{1}{3}a + \frac{2}{3}b$ [3]

22



NOT TO SCALE

180-60° (linear pair) OR (Straight line angles)

A, B, C and D are points on the circle, centre O.
BCE is a straight line.
Angle $AOC = 108°$ and angle $DCE = 60°$.

Calculate the values of w, x and y.

$w = \frac{1}{2}$(central angle) $= \frac{1}{2}(108) = 54$

$w + x = 180°$ (∠s of a cyclic quadrilateral

$\therefore x = 180 - w = 180 - 54 = 126$

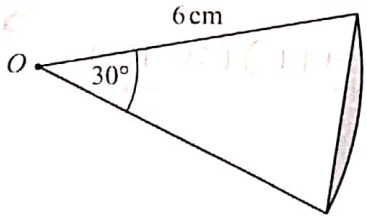
$y = (180 - 120°) = 60$ (opp ∠s of cyclic quadrilateral)

$w =$ 54

$x =$ 126

$y =$ 60 [3]

23



NOT TO SCALE

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The diagram shows a sector of a circle, centre O and radius 6 cm.
The sector angle is 30°.
The area of the shaded segment is $(k\pi - c)$ cm^2, where k and c are integers.

Find the value of k and the value of c.

Area of shaded region $= (k\pi - c) = A(\text{sector}) - A(\Delta)$

$A(\text{sector}) = \frac{30}{360} \times \pi(6)^2 = \frac{303}{360} \times 36 \times \pi = 3\pi$

$A(\Delta) = \frac{1}{2}ab\sin 30 = \frac{1}{2}(6)^2 \sin 30 = 9$

$\therefore A(\text{shaded region}) = (3\pi - 9)\text{ cm}^2$

$k =$ 3

$c =$ 9 [3]

24 Solve the equations.

0580/22/O/N/17

(a) $7-3n=11n+2$

$7-3n=11n+2$

$-3n-11n=2-7$

$-14n=-5$

$\therefore n=\frac{-5}{-14}=\frac{5}{14}$

$n=$ $\frac{5}{14}$ [2]

(b) $\frac{p-3}{5}=3$

$\frac{p-3}{5}=3$

$\therefore p-3=15$

$\therefore p=15+3=18$

$p=$ 18 [2]

25 Factorise completely.

0580/22/O/N/17

(a) $x^2-x-132$

$x^2-x-132$

Addition $=-1$ / multiplication $=132$

$\therefore x^2-12x+11x-132$

$=x(x-12)+11(x-12)=(x+11)(x-12)$

$(x-12)(x+11)$ [2]

(b) x^3-4x

x^3-4x

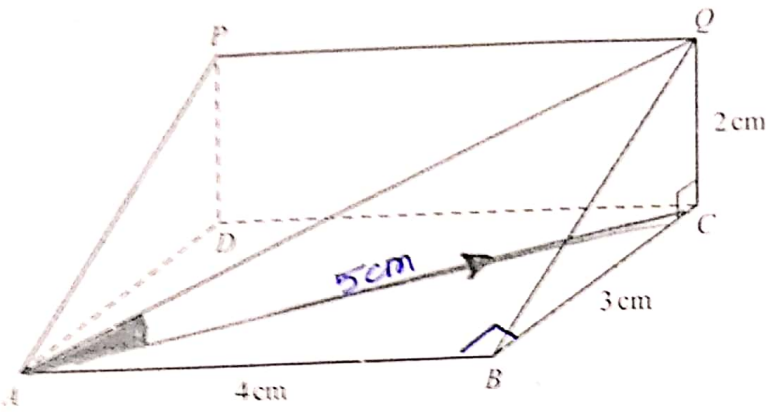
$x(x^2-4)$

$=x[x^2-2^2]$

$=x[(x+2)(x-2)]$

$x(x+2)(x-2)$ [2]

26



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The diagram shows a prism of length 4 cm.
The cross section is a right-angled triangle.
$BC = 3$ cm and $CQ = 2$ cm.

Calculate the angle between the line AQ and the base, $ABCD$, of the prism.

The shaded angle is the required angle

$\therefore AC = \sqrt{4^2+3^2} = \sqrt{16+9} = \sqrt{25} = 5$

In ΔACQ;

$\tan A = \frac{2}{5}$

$\therefore A = \tan^{-1}\frac{2}{5} = 21.8^\circ$

21.8° [4]

27 Simplify.

0580/22/O/N/17

(a) $81^{\frac{3}{4}}$

$81^{\frac{3}{4}} = \left[(81)^{\frac{1}{4}}\right]^3 = \left(\sqrt[4]{81}\right)^3 = (3)^3 = 27$

27 [1]

(b) $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

$\frac{x^{\frac{2}{3}}}{x^{-\frac{4}{3}}} = x^{\frac{2}{3}+\frac{4}{3}} = x^{\frac{6}{3}} = x^2$

x^2 [1]

(c) $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$

$\left(\frac{8}{y^6}\right)^{-\frac{1}{3}} = \frac{8^{-\frac{1}{3}}}{(y^6)^{-\frac{1}{3}}} = \frac{8^{-1/3}}{y^{-2}} = \frac{1}{\sqrt[3]{8}} \times y^2 = \frac{y^2}{2}$

$\frac{y^2}{2}$ [2]

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