Please check the examination details below before entering your candidate information

Candidate surname Solved by Mr. Pabitra | Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Thursday 16 May 2024

Morning (Time: 2 hours) | Paper reference **4MA1/1HR**

Mathematics A

PAPER 1HR

Higher Tier

SOLVED BY MR. PABITRA



You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Solved by Mr. Pabitra | Math Tonic

Turn over

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International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

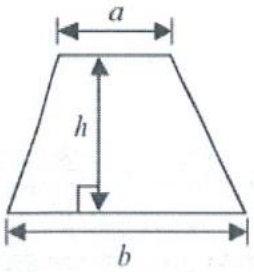
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

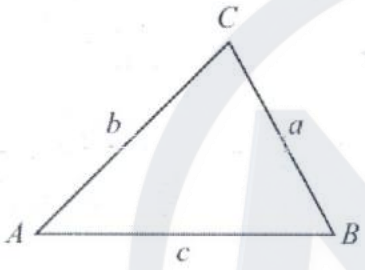
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

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

Area of trapezium $= \frac{1}{2}(a + b)h$



Trigonometry



In any triangle ABC

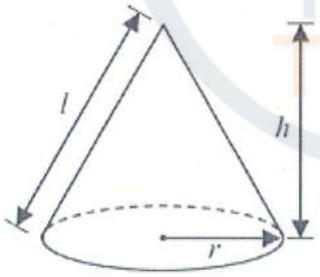
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

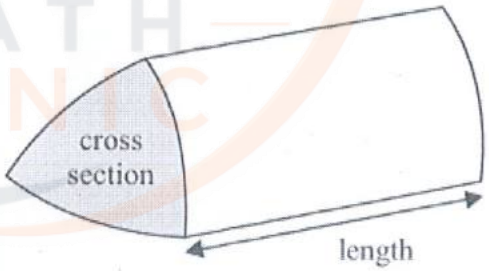
Area of triangle $= \frac{1}{2}ab\sin C$

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

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

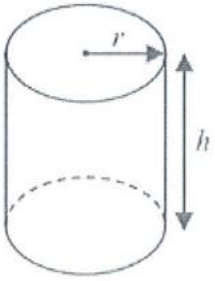


Volume of prism
= area of cross section × length



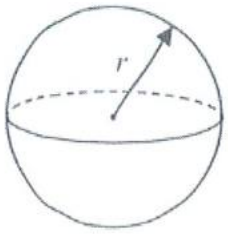
Volume of cylinder $= \pi r^2 h$

Curved surface area of cylinder $= 2\pi r h$



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

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



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Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Here are six cards.

Five of the cards have a number written on them.

16	15	3	2	9	

Work out the number that should be written on the last card so that the mean of the six numbers will be 11

$$\frac{16+15+3+2+9+x}{6} = 11$$

$$\frac{45+x}{6} = 11$$

$$45+x = 6\times 11$$

$$45+x = 66$$

$$x = 66-45$$

$$\boxed{x = 21}$$

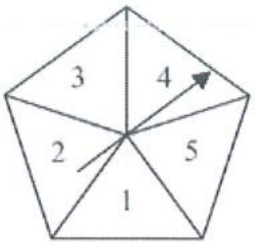
21

(Total for Question 1 is 3 marks)

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2 Here is a biased spinner.



The table gives information about the probability that, when the spinner is spun once, it will land on each number.

Number	1	2	3	4	5
Probability	$2x$	0.27	0.04	x	0.12

Alexis is going to spin the spinner 400 times.

Work out an estimate for the number of times the spinner will land on an odd number.

$2x + 0.27 + 0.04 + x + 0.12 = 1$

$3x + 0.43 = 1$

$3x = 1 - 0.43$

$3x = 0.57$

$x = \frac{0.57}{3}$

$x = 0.19$

$P(1) = 2x = 2 \times 0.19 = 0.38$

$P(\text{Odd Number}) = P(1) + P(3) + P(5)$

$= 0.38 + 0.04 + 0.12$

$= 0.54$

216

(Total for Question 2 is 4 marks)

No. of times $= 400 \times 0.54 = 216$

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3 Norberto sells white loaves of bread and brown loaves of bread.

He sells a total of 200 loaves such that

the number of white loaves sold : the number of brown loaves sold = 3 : 2

Norberto sells the white loaves for £1.50 each.
He sells the brown loaves for £1.75 each.

40% of the price of a white loaf is profit.
60% of the price of a brown loaf is profit.

Work out Norberto's total profit when he sells all 200 loaves.

Total Sold = 200

white Sold : Brown Sold

3 : 2

$\frac{3}{5}$ $\frac{2}{5}$

$\frac{3}{5} \times 200 = 120$ ✓

$\frac{2}{5} \times 200 = 80$ ✓

1 white Cost = 1.50

120 white = 120 × 1.50

= £180

1 brown Cost = £1.75

80 brown = 80 × 1.75

= £140

40% of 180 = $\frac{40}{100} \times 180$

= £72

60% of 140 = $\frac{60}{100} \times 140$

= £84

72 + 84 = £156

£ 156

(Total for Question 3 is 5 marks)

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DO NOT WRITE IN THIS AREA

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4 Show that $2\frac{1}{3} \div 5\frac{1}{4} = \frac{4}{9}$

$2\frac{1}{3} \div 5\frac{1}{4}$

$\frac{7}{3} \div \frac{21}{4}$

$\frac{7}{3} \times \frac{4}{21}$

$\frac{28}{63} = \frac{4}{9}$

(Total for Question 4 is 3 marks)

5 Slavomir invests 5200 euros in a savings account for 4 years.
He gets 2.5% per year compound interest.

Work out how much money Slavomir will have in the savings account at the end of 4 years.
Give your answer correct to the nearest euro.

$5200\left(1+\frac{2.5}{100}\right)^4$

5740

5740 euros

(Total for Question 5 is 3 marks)

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Solved by Mr. Pabitra

6 The diagram shows a solid wooden cylinder.

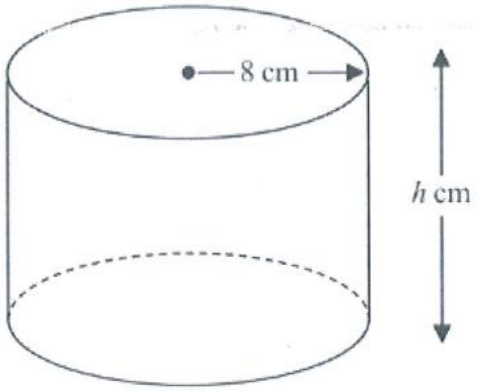


Diagram **NOT** accurately drawn

The cylinder has radius 8 cm and height h cm.
The volume of the cylinder is 1208 cm^3

(a) Work out the value of h
Give your answer correct to the nearest whole number.

volume = 1208

$\pi \times 8^2 \times h = 1208$

$h = \frac{1208}{\pi \times 8^2}$

$h =$ 6

(2)

The density of the wood is 1.25 g/cm^3

(b) Work out the mass of the cylinder.
Give your answer in kilograms.

Density = $\frac{mass}{volume}$

$mass = D \times V$

$mass = 1208\ cm^3 \times 1.25\ g/cm^3$

$= 1510\ g \longrightarrow \frac{1510}{1000}\ kg$

$= 1.51$

1.51 kilograms

(2)

(Total for Question 6 is 4 marks)

Solved by Mr. Pabitra

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7 (a) Simplify $g^9 \div g^2$

g^7

(1)

(b) Expand $5k^2(k^3 + 4)$

$5k^5 + 20k^2$

(2)

(c) (i) Factorise $x^2 - 2x - 63$

$-9 \times 7 = -63$

$-9 + 7 = -2$

$(x+7)(x-9)$

(2)

(ii) Hence, solve $x^2 - 2x - 63 = 0$

$x = -7, 9$

(1)

(d) Solve the inequality $7 - 2y < 3y - 12$

$7 - 2y < 3y - 12$

$7 < 5y - 12$

$19 < 5y$

$\frac{19}{5} < y$

$y > 19/5$

$y > 19/5$

(3)

(Total for Question 7 is 9 marks)

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MATH TONIC

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8 The diagram shows a trapezium, $ABCD$

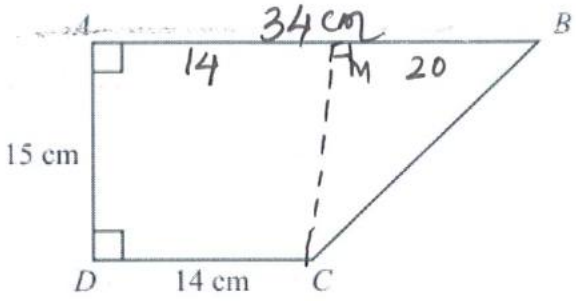


Diagram **NOT** accurately drawn

DAB and ADC are right angles.

$AD = 15$ cm $DC = 14$ cm

The area of the trapezium is 360 cm^2

Work out the perimeter of the trapezium.

$\frac{(AB + CD) \times \text{height}}{2}$ = Area of trapezium

$\frac{(AB + 14) \times 15}{2} = 360$

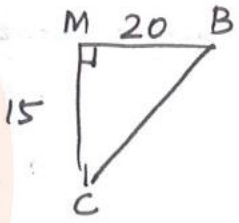
$(AB + 14) \times 15 = 720$

$AB + 14 = \frac{720}{15}$

$AB + 14 = 48$

$AB = 48 - 14$

$AB = 34$ cm



$CB = \sqrt{20^2 + 15^2}$

$CB = 25$

Perimeter = $AB + BC + CD + AD$

$= 34 + 25 + 14 + 15$

$= 88$

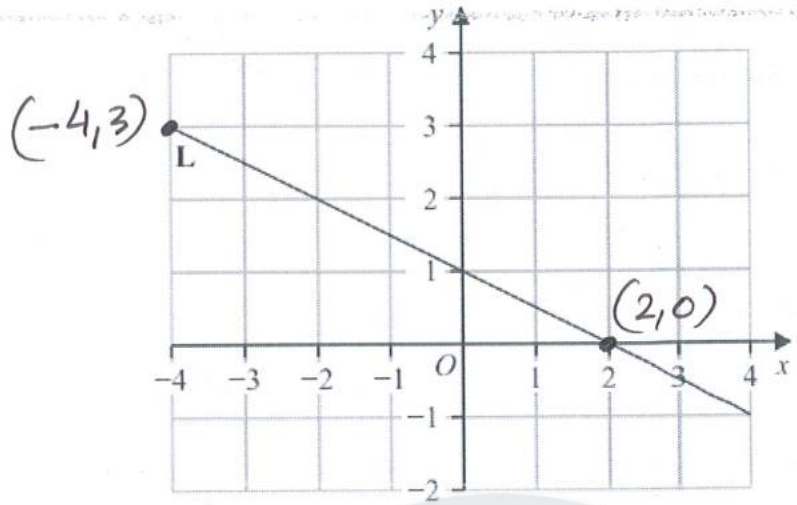
88 cm

(Total for Question 8 is 6 marks)

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Solved by Mr. Pabitra

9 Line **L** is drawn on the grid.



Find an equation for **L**
Give your answer in the form $y = mx + c$

y-intercept = 1

$c = 1$

$y = mx + c$

$y = -0.5x + 1$

gradient $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{3 - 0}{-4 - 2}$

$= \frac{3}{-6} = -\frac{1}{2}$

$y = -0.5x + 1$

(Total for Question 9 is 3 marks)

10 Here are the numbers of goals scored by a hockey team in its 11 games this season.

0 1 2 2 3 4 4 6 7 9 11

Work out the interquartile range of the numbers of goals.

$IQR = Q_3 - Q_1$

$\left(\frac{3}{4} \times 11\right)^{th} - \left(\frac{1}{4} \times 11\right)^{th}$

$8.25^{th} - 2.75^{th}$

$9^{th} - 3^{rd}$

$7 - 2 = 5$

5

(Total for Question 10 is 2 marks)

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Solved by Mr. Pabitra

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11 $A = 2^5 \times 5 \times 7^2$

$B = 2^3 \times 5^3 \times 7^4$

(a) Write down the highest common factor (HCF) of $5A$ and $2B$
Give your answer as a product of prime factors.

$5A = 2^5 \times 5^2 \times 7^2$

$2B = 2^4 \times 5^3 \times 7^4$

$HCF = 2^4 \times 5^2 \times 7^2$

$2^4 \times 5^2 \times 7^2$

(2)

$A = 2^5 \times 5 \times 7^2$

$B = 2^3 \times 5^3 \times 7^4$

(b) Work out the value of $(AB)^2$
Give your answer as a product of prime factors.

$(AB)^2 = (2^5 \times 5 \times 7^2 \times 2^3 \times 5^3 \times 7^4)^2$

$= (2^8 \times 5^4 \times 7^6)^2$

$= 2^{16} \times 5^8 \times 7^{12}$

$2^{16} \times 5^8 \times 7^{12}$

(2)

(Total for Question 11 is 4 marks)

Solved by Mr. Pabitra

12 Solve the simultaneous equations

$$4x + 3y = 9.6 \quad \text{(i)}$$
$$6x + 5y = 16.8 \quad \text{(ii)}$$

Show clear algebraic working.

(i) × 5 ⟹ $20y + 15y = 48$

(ii) × 3 ⟹ $18x + 15y = 50.4$

$2x = -2.4$

$x = -1.2$

$4x + 3y = 9.6$

$4 \times (-1.2) + 3y = 9.6$

$-4.8 + 3y = 9.6$

$3y = 9.6 + 4.8$

$3y = 14.4$

$y = 4.8$

$x =$ −1.2

$y =$ 4.8

(Total for Question 12 is 4 marks)

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MATH TONIC

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13

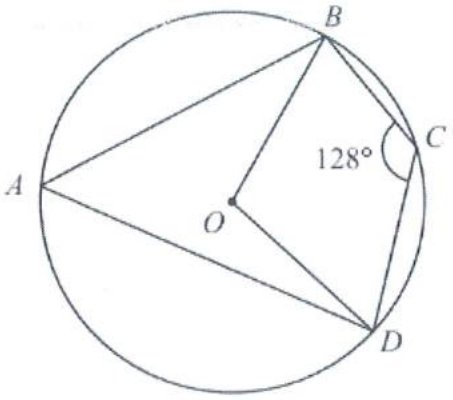


Diagram **NOT** accurately drawn

A, B, C and D are points on a circle, centre O

Angle $BCD = 128°$

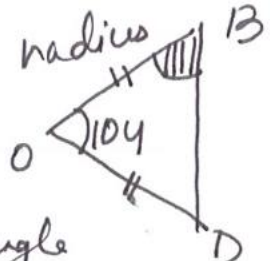
Work out the size of angle OBD
Give a reason for each stage of your working.

$B\hat{A}D = 180 - 128 = 52°$

(opposite angles in a Cyclic Quadrilateral add up to 180)

$B\hat{O}D = 2 \times 52° = 104$

(Angle at the centre is twice the angle at Circumference)



$O\hat{B}D = \frac{180 - 104}{2} = 38°$

(Angles at the base of isosceles triangle are equal)

angle OBD = 38° °

(Total for Question 13 is 5 marks)

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Solved by Mr. Pabitra

14 (a) Expand and simplify $(3x + 1)(2 - x)(4 + x)$

$(3x+1)(8+2x-4x-x^2)$

$(3x+1)(-x^2-2x+8)$

$-3x^3-6x^2+24x-x^2-2x+8$

$-3x^3-7x^2+22x+8$

$-3x^3-7x^2+22x+8$

(3)

(b) Simplify fully $\left(\frac{a^3b}{a^9b^5}\right)^{-\frac{1}{2}}$

$\left(\frac{a^9b^5}{a^3b}\right)^{1/2}$

$\left(a^{9-3}\,b^{5-1}\right)^{1/2}$

$(a^6b^4)^{1/2}$

$(a^6)^{1/2}\times(b^4)^{1/2}$

a^3b^2

a^3b^2

(3)

(Total for Question 14 is 6 marks)

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MATH TONIC

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15 The diagram shows isosceles triangle EFG

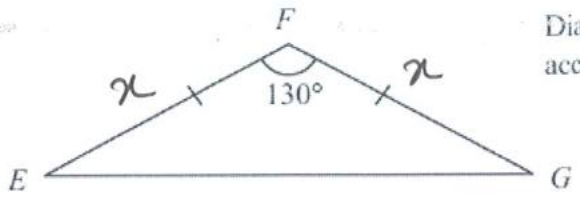


Diagram **NOT** accurately drawn

$EF = GF$
Angle $EFG = 130°$
The area of triangle EFG is 74 cm²

Work out the length of EF
Give your answer correct to 3 significant figures.

$$\frac{1}{2} \times x \times x \times \sin 130 = 74$$

$$\frac{1}{2} x^2 \times \sin 130 = 74$$

$$x^2 = \frac{2 \times 74}{\sin 130}$$

$$x = \sqrt{\frac{2 \times 74}{\sin 130}}$$

13.9 cm

(Total for Question 15 is 3 marks)

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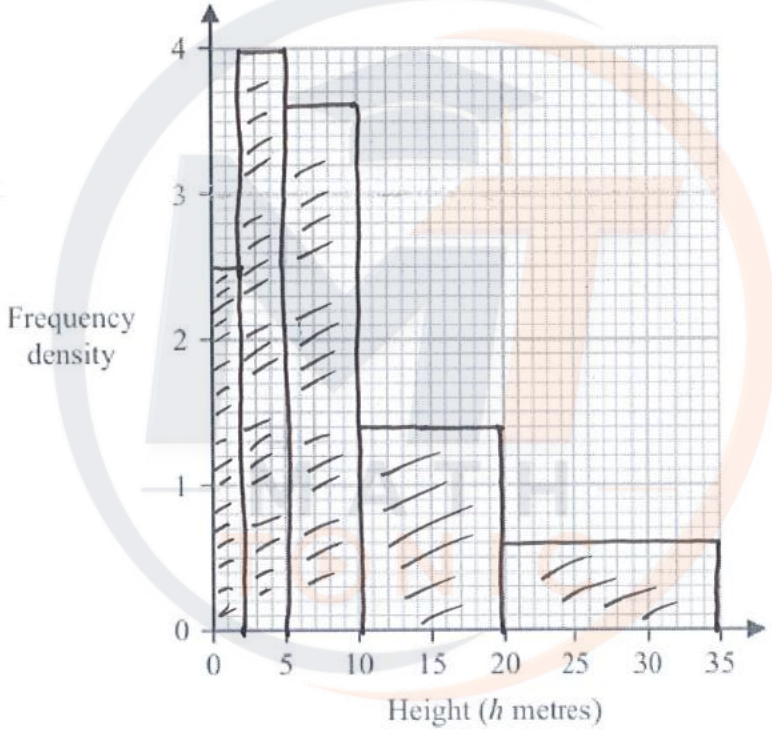
MATH TONIC

Solved by Mr. Pabitra

16 The table gives information about the heights, in metres, of the trees in a park.

Height (h metres)	Frequency	Class width	Freq. Density
$0 < h \leqslant 2$	5	2	$\frac{5}{2} = 2.5$
$2 < h \leqslant 5$	12	3	$\frac{12}{3} = 4$
$5 < h \leqslant 10$	18	5	$\frac{18}{5} = 3.6$
$10 < h \leqslant 20$	14	10	$\frac{14}{10} = 1.4$
$20 < h \leqslant 35$	9	15	$\frac{9}{15} = 0.6$

On the grid, draw a histogram for this information.



(Total for Question 16 is 3 marks)

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17 (a) $\left(\sqrt[4]{k^{12}}\right)^5 = k^n$

Find the value of n

$$\left[(k^{12})^{1/4}\right]^5$$

$$(k^3)^5 = k^{15}$$

$n =$ 15

(1)

(b) Express $\frac{7}{2-\sqrt{3}}$ in the form $\sqrt{c} + d$ where c and d are integers.

Show your working clearly.

$$\frac{7(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})} = \frac{14+7\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}-3}$$

$$= \frac{14+7\sqrt{3}}{1}$$

$$= 14+7\sqrt{3}$$

$$= 14+\sqrt{147}$$

$7\sqrt{3}$

$\sqrt{49} \times \sqrt{3}$

$\sqrt{49 \times 3}$

$\sqrt{147}$

$\sqrt{147}+14$

(3)

(Total for Question 17 is 4 marks)

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Solved by Mr. Pabitra

18 The diagram shows two similar vases, **A** and **B**

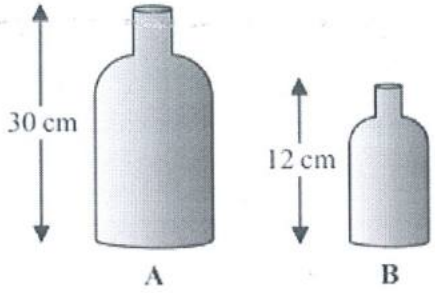


Diagram **NOT** accurately drawn

Let S.A of B = x

The height of vase **A** is 30 cm
The height of vase **B** is 12 cm

Given that

surface area of vase **A** – surface area of vase **B** = 178.5 cm²

find the surface area of vase **A**

Length scale factor = $30/12$

Area scale factor = $\left(\frac{30}{12}\right)^2 = 6.25$

S.A of A = $6.25 \times$ S.A of B (x)

S.A of A − S.A of B = 178.5

$6.25x - x = 178.5$

$5.25x = 178.5$

$x = \frac{178.5}{5.25}$

$x = 34$ cm² (S.A of B)

S.A of A = $6.25 \times 34 = 212.5$

212.5 cm²

(Total for Question 18 is 4 marks)

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Solved by Mr. Pabitra

19 A curve C has equation $y = x^3 - 8x^2 - 12x + 5$

Curve C has exactly two stationary points, one at point A and one at point B such that

x coordinate of point $A > x$ coordinate of point B

Find the coordinates of point A
Show clear algebraic working.

$$\frac{dy}{dx} = 3x^2 - 16x - 12$$

at stationary Points $\frac{dy}{dx} = 0$

$$3x^2 - 16x - 12 = 0$$

$$(3x + 2)(x - 6) = 0$$

$3x + 2 = 0$ $\quad$ $x - 6 = 0$

$x = -2/3$ $\quad$ $x = 6$

B $\quad$ A

$$y = 6^3 - 8 \times 6^2 - 12 \times 6 + 5$$

$$y = -139$$

(6 , -139)

(Total for Question 19 is 5 marks)

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Solved by Mr. Pabitra

20 (a) Express $2x^2 - 11x + 9$ in the form $a(x - b)^2 - c$ where a, b and c are numbers to be found.

$$2\left[x^2 - \frac{11}{2}x\right] + 9$$

$$2\left[\left(x - \frac{11}{4}\right)^2 - \left(\frac{11}{4}\right)^2\right] + 9$$

$$2\left[\left(x - 11/4\right)^2 - \frac{121}{16}\right] + 9$$

$$2\left(x - 11/4\right)^2 - \frac{121}{8} + 9$$

$$2\left(x - 11/4\right)^2 - 49/8$$

$2\left(x - 11/4\right)^2 - 49/8$

(3)

The curve **C** has equation $y = 2(x - 3)^2 - 11(x - 3) + 9$

The point P is the minimum point on **C**

(b) Find the coordinates of P

$$f(x) = 2x^2 - 11x + 9$$

$$f(x-3) = 2(x-3)^2 - 11(x-3) + 9$$

↳ Translation of 3 units right

From

$2\left(x - 11/4\right)^2 - 49/8$

minimum

$\left(\frac{11}{4}, -49/8\right)$

After translation.

minimum

$\left(\frac{11}{4} + 3, -49/8\right)$

$\left(\frac{23}{4}, -49/8\right)$

$\left(\frac{23}{4}, -\frac{49}{8}\right)$

(2)

(Total for Question 20 is 5 marks)

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Solved by Mr. Pabitra

21 There are 25 counters in a bag such that

6 counters are blue
x counters are orange, where $x > 9$
the rest of the counters are pink

O - orange
P - pink

Maalam takes at random two of the counters from the bag.

The probability that Maalam takes one orange counter and one pink counter is $\frac{22}{75}$

Calculate the probability that Maalam takes 2 pink counters from the bag.
Show clear algebraic working.

$$P(OP) + P(PO) = \frac{22}{75}$$

$$\frac{x}{25} \times \frac{19-x}{24} + \frac{19-x}{25} \times \frac{x}{24} = \frac{22}{75}$$

$$\frac{x(19-x)}{600} + \frac{x(19-x)}{600} = \frac{22}{75}$$

$$\frac{2x(19-x)}{600} = \frac{22}{75}$$

$$\frac{x(19-x)}{300} = \frac{22}{75}$$

$$19x - x^2 = \frac{22}{75} \times 300$$

$$19x - x^2 = 88$$

$$x^2 - 19x + 88 = 0$$

$$(x-11)(x-8) = 0$$

$x - 11 = 0$ | $x - 8 = 0$

$x = 11$ (Accept) | $x = 8$ (Ignore)

$x = 11$

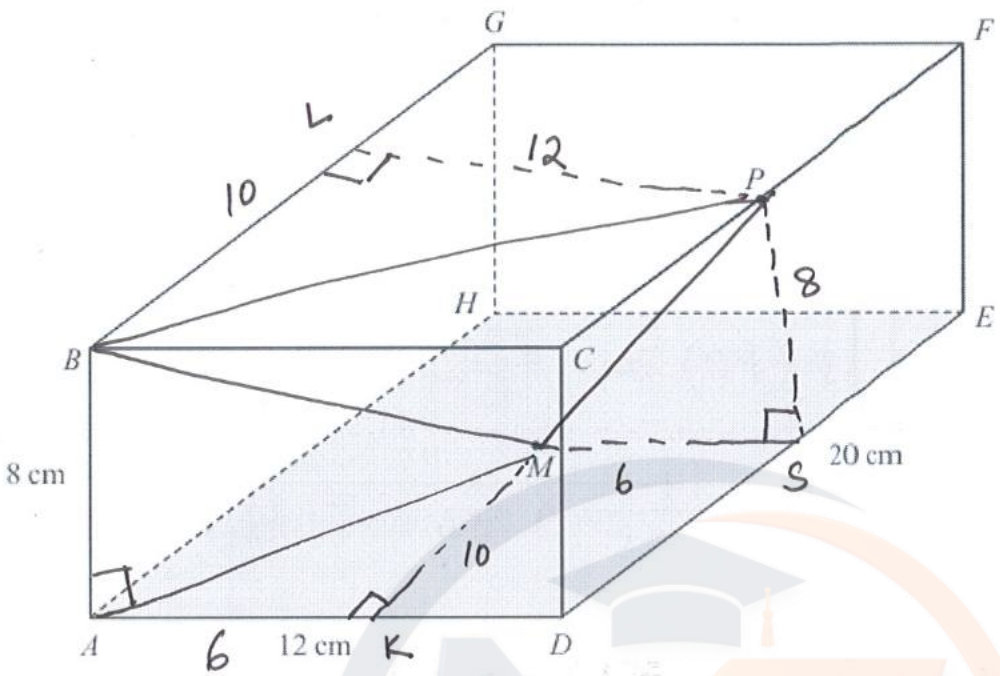
(Total for Question 21 is 5 marks)

Solved by Mr. Pabitra

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22 The diagram shows a cuboid $ABCDEFGH$ with horizontal base $ADEH$

Diagram **NOT** accurately drawn



$AB = 8$ cm $\quad AD = 12$ cm $\quad DE = 20$ cm

M is the midpoint of the base $ADEH$ and P is the midpoint of the edge CF

Work out the size of angle BMP
Give your answer correct to one decimal place.

✓ $MP = \sqrt{8^2+6^2} = 10$ $\quad (MP = \sqrt{MS^2+SP^2})$

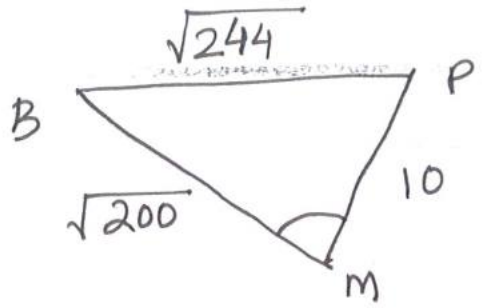
$AM = \sqrt{6^2+10^2} = \sqrt{136}$ $\quad (AM = \sqrt{AK^2+KM^2})$

✓ $BM = \sqrt{8^2+(\sqrt{136})^2} = \sqrt{200}$ $\quad (BM = \sqrt{BA^2+AM^2})$

✓ $BP = \sqrt{12^2+10^2} = \sqrt{244}$ $\quad (BP = \sqrt{BL^2+PL^2})$

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Solved by Mr. Pabitra



$(\sqrt{244})^2 = 10^2 + (\sqrt{200})^2$

$$\cos m = \frac{10^2 + (\sqrt{200})^2 - (\sqrt{244})^2}{2 \times 10 \times \sqrt{200}}$$

$$m = \cos^{-1}\left[\frac{10^2 + 200 - 244}{2 \times 10 \times \sqrt{200}}\right]$$

$\hat{m} = 78.6°$

78.6 °

(Total for Question 22 is 6 marks)

Turn over for Question 23

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MATH TONIC

Solved by Mr. Pabitra

23 Here are the first three terms of an arithmetic sequence.

$(4x-14)$, $(x+2)$, $(7x-9)$

Find, as an integer, the sum of the first 40 terms of the sequence.
Show clear algebraic working.

$a = 4x - 14$

$a = 4\times3 - 14$

$a = 12 - 14$

$\boxed{a = -2}$

$t_3 - t_2 = t_2 - t_1$

$7x - 9 - (x+2) = x+2 - (4x-14)$

$7x - 9 - x - 2 = x + 2 - 4x + 14$

$6x - 11 = -3x + 16$

$6x + 3x = 16 + 11$

$9x = 27$

$x = \frac{27}{9} = 3$

$\boxed{x = 3}$

$d = x+2 - (4x-14)$

$d = 3+2 - 12 + 14$

$d = 7$

$S_{40} = \frac{40}{2}\left[2\times(-2) + (40-1)7\right]$

$= 20\left[-4 + 39\times7\right]$

$= 20 \times 269$

$= 5380$

5380

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Solved by Mr. Pabitra