



**BEATTY SECONDARY SCHOOL  
END-OF-YEAR EXAMINATION 2021**

**SUBJECT : Mathematics**

**LEVEL : Sec 1 Express**

**DURATION : 2 hours**

**DATE : 07 Oct 2021**

<b>CLASS :</b>	<b>NAME :</b>	<b>REG NO :</b>
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**READ THESE INSTRUCTIONS FIRST**

Write your name, class and index number in the spaces on the top of this page.

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.

Answer **all** questions.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

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  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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

The total number of marks for this paper is 80.

<b>For Examiner's</b>
<b>80</b>

This paper consists of 18 printed pages (including this cover page)

1 (a) Calculate  $\frac{286 + \sqrt{1720}}{\sqrt{440} - 6.65}$ .

Write down the first five digits on your calculator display.

Answer ..... [1]

(b) Write your answer to part (a) correct to 2 decimal places.

Answer ..... [1]

2 (a) By rounding off each number to 1 significant figure, estimate the value of

$$\frac{\sqrt{\quad} \times \quad}{1.56 + 2.49^3}$$

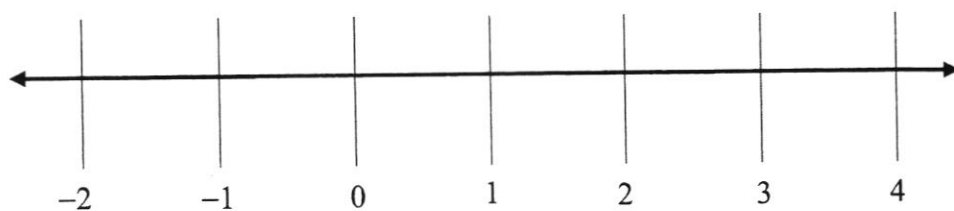
Answer ..... [2]

(b) Represent the following numbers on the number line below.

$$1.\dot{3}, 350\%, -(0.5)^2, -\frac{3}{2}$$

Answer

[2]



3 (a) (i) Express 1764 as a product of its prime factors in index notation.

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Answer ..... [1]

(ii) Using your answer in part (a)(i), explain why 1764 is a perfect square.

Answer.....

.....

..... [1]

(b) Written as a product of its prime factors,  $756 = 2^2 \times 3^3 \times 7$ .

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(i) Find the smallest positive integer  $k$  such that  $\frac{756}{k}$  is a perfect square.

Answer  $k =$  ..... [1]

(ii) Find the greatest integer that will divide both 1764 and 756 exactly.

Answer ..... [1]

[Turn over

4 The first four terms of a sequence are 3, 7, 11 and 15.

(a) (i) Find an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

*Answer* ..... [1]

(ii) Is 105 a term in the sequence? Explain your answer.

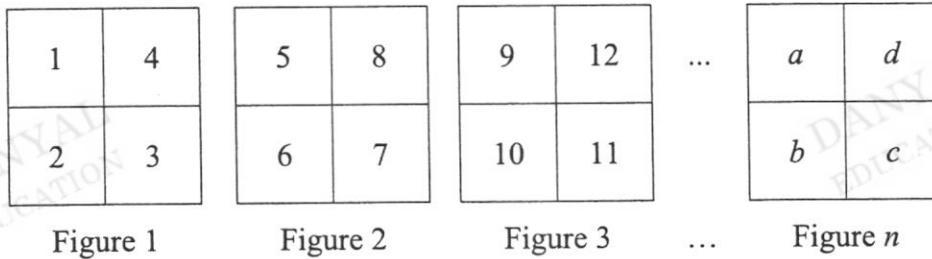
*Answer* ..... [2]

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(b) Consider the pattern below.



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Find the sum of the four numbers in Figure 10.

*Answer* ..... [1]

- 5 (a) Expand and simplify  $x + 3y - 4(5x - 2y)$ .

Answer ..... [2]

- (b) Factorise the following expressions.

(i)  $xy - 2x^2$ ,

Answer ..... [1]

(ii)  $2b(9a + 2) - 3c(9a + 2)$ .

Answer ..... [1]

- (c) **Without the use of a calculator**, evaluate  $835 \times 54 - 835 \times 44$ .  
Show your working.

Answer ..... [2]

[Turn over

- 6 (a) If  $x = \sqrt{b^2 - a^2}$ , find the value of  $x$  when  $a = 3$  and  $b = -5$ .

*Answer*  $x = \dots\dots\dots$  [2]

- (b) Given that  $\frac{3}{2x-y} = \frac{5}{3x+y}$ , find the value of  $\frac{x}{y}$ .

*Answer*  $\frac{x}{y} = \dots\dots\dots$  [3]

7 Solve each of the following equations.

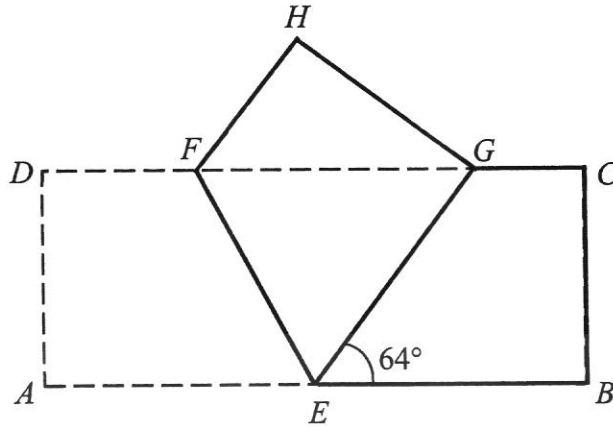
(a)  $4(x-5)+3=2x$

*Answer*  $x = \dots\dots\dots$  [2]

(b)  $\frac{2y-1}{4} + \frac{2y-3}{6} = 4$

*Answer*  $y = \dots\dots\dots$  [3]

- 8 In the diagram,  $ABCD$  is a rectangular strip of paper. The corner  $A$  is folded up to meet the edge  $CD$  at  $G$  and the crease  $EF$  is formed. It is given that angle  $BEG = 64^\circ$ .



- (a) Find angle  $FGE$ .

Answer ..... [1]

- (b) Show that angle  $GEF = 58^\circ$ .

[1]

Answer

- (c) Calculate the reflex angle  $HFE$ .  
Give a reason for each step of your working.

Answer ..... [2]



- 9 Three companies Alpha, Better and Comfort, offer cars for hire. Their charges, based on the number of days a car is hired and the number of kilometres the car is driven, are shown in the following table.

	Cost per day	Cost per kilometre
Alpha	\$75	Nil
Better	Nil	45¢
Comfort	\$35	25¢

- (a) John wishes to hire a car for 2 days to drive 400 km.  
Should he rent from Better cars or Comfort cars? Explain your answer.

*Answer*

[2]

- (b) Each year, Peter hires a car for 4 days from Alpha Cars. Last year, he paid \$360. Calculate the percentage decrease in the rental charge this year.

*Answer* ..... % [3]

[Turn over

- 10** Andy, Ben and Caden went on holiday to Malaysia.  
The exchange rate between Singapore dollars (S\$) and Malaysia ringgit (RM) was S\$1 to RM3.125.

(a) If Andy bought RM3000, calculate the amount of Singapore dollars he paid.

*Answer* S\$ ..... [1]

- (b) The bank charged S\$5 plus 2% of the amount of ringgit changed as administration fee. Ben was charged S\$12 to change his money. Calculate the amount of ringgit he changed. Give your answer correct to the nearest ringgit.

*Answer* RM ..... [3]

- (c) While in Malaysia, they spent a total of RM1200 on food.  
The amounts spent by Andy, Ben and Caden were in the ratio 5 : 4 : 6.  
How much more did Caden spend on food than Ben?

*Answer* RM ..... [2]

- (d) Ben bought a watch for RM242. The price included a tax of 10%. Calculate the tax that was paid.

*Answer* RM ..... [2]

- 11 A farmer has 60 cows and chickens.

- (a) Given that there are  $x$  cows, find an expression, in terms of  $x$ , for the number of chickens.

*Answer* ..... [1]

- (b) The total number of legs the animals have is 156. Form an equation in terms of  $x$ .

*Answer* ..... [1]

- (c) Hence, solve the equation and find the number of chickens.

*Answer* ..... [3]

- 12 The charge \$ $y$  of an electrician attending a house call job is given by  $y = 35 + 15x$  where  $x$  is the number of hours spent on the job.  
Some corresponding values of  $x$  and  $y$  are given in the table below.

$x$	0	1	2	3	4
$y$	35	50	65	$a$	95

- (a) Find the value of  $a$ .

*Answer*  $a = \dots\dots\dots$  [1]

- (b) On the grid given on the next page, complete the axes and draw the graph of  $y = 35 + 15x$  for  $0 \leq x \leq 4$ .

[3]

- (c) Suggest what the  $y$ -intercept represents.

*Answer*.....

..... [1]

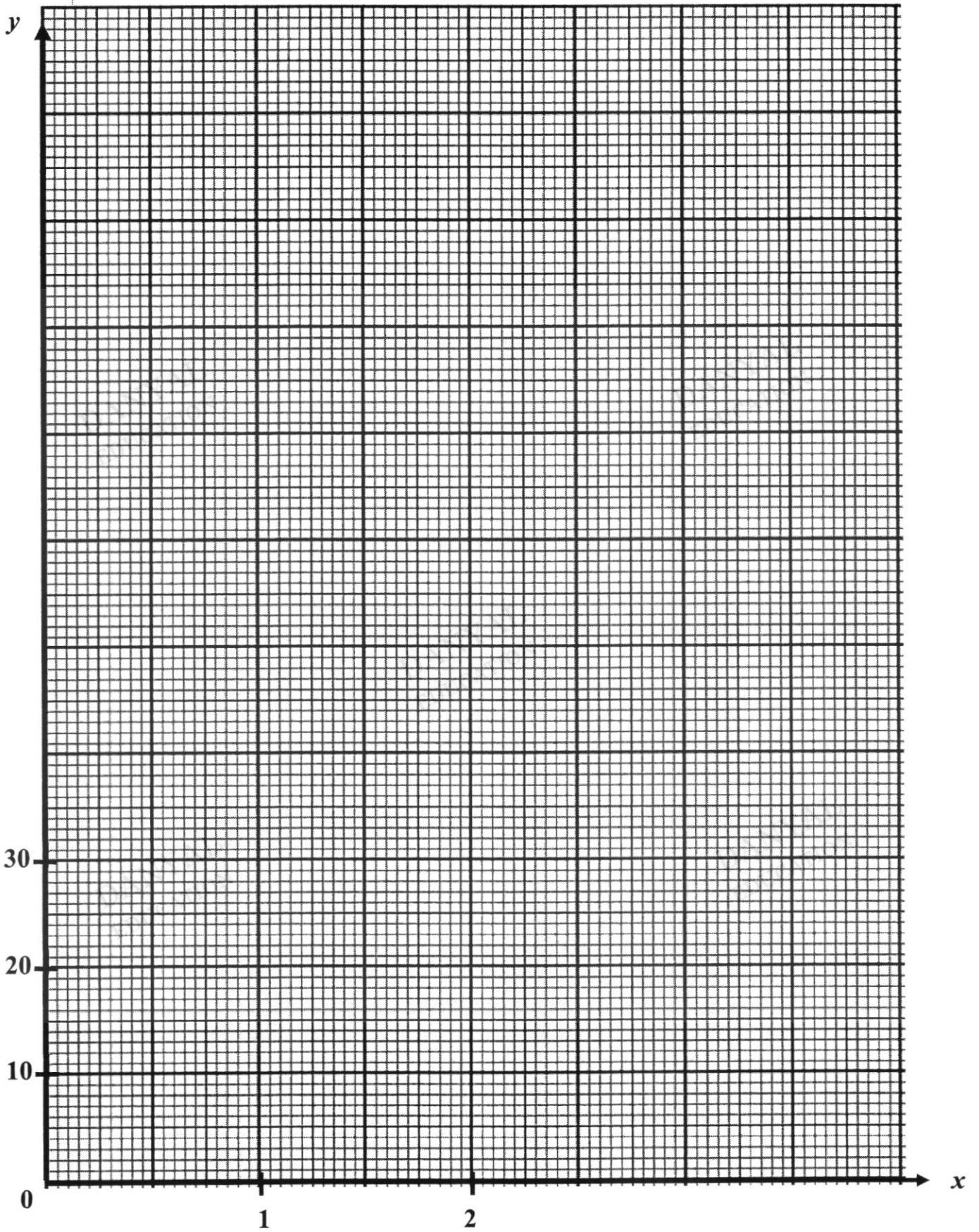
- (d) Using your graph, find

- (i) the charge for a job lasting 1.5 hours,

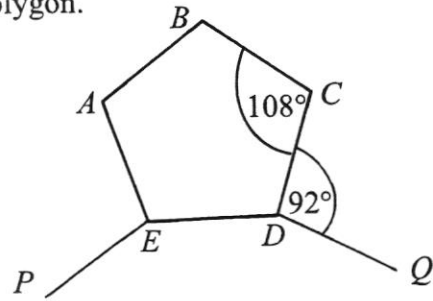
*Answer* \$..... [1]

- (ii) the time taken to complete a job that charges \$90.

*Answer* ..... hours [1].



- 13 (a) The diagram below shows a regular pentagon,  $ABCDE$ , and three of the sides,  $PE$ ,  $ED$  and  $DQ$ , of another regular polygon. Angle  $BCD = 108^\circ$  and angle  $CDQ = 92^\circ$ .



Find the number of sides in the second regular polygon.

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Answer ..... [3]

- (b) (i) Construct a trapezium  $ABCD$  such that  $AC = 8$  cm,  $BC = 4.5$  cm, angle  $DAB = 110^\circ$  and  $AB$  is parallel to  $DC$ .  $AB$  has already been drawn.

Answer ..... [3]

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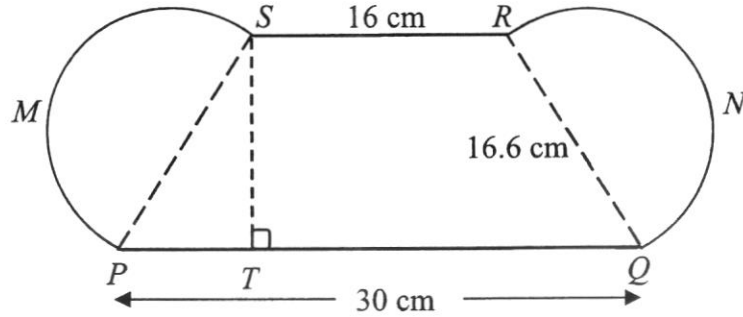
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- (ii) Measure and write down the size of angle  $ABC$ .

Answer angle  $ABC =$  ..... [1]

- 14 The diagram below shows the design of a mickey mouse hat which is made up of a trapezium  $PQRS$  and two identical semicircles  $PMS$  and  $QNR$ . It is given that  $SR = 16$  cm,  $PQ = 30$  cm and  $PS = RQ = 16.6$  cm.  $T$  is on  $PQ$  such that  $ST$  is perpendicular to  $PQ$ .



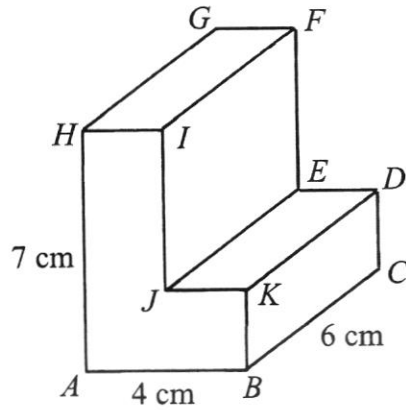
- (a) Find the perimeter of the design of the hat.

Answer ..... cm [2]

- (b) Given that the area of the trapezium  $PQRS$  is  $345$  cm<sup>2</sup>, find the length of  $ST$ .

Answer ..... cm [2]

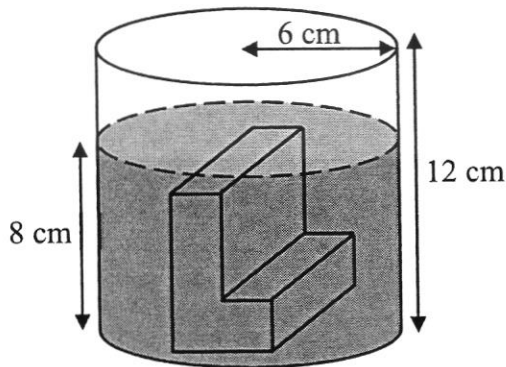
- 15 The diagram shows a solid prism,  $ABCDEFGHJK$ , made up of two solid cuboids. It is given that  $HA = 7$  cm,  $AB = 4$  cm,  $BC = 6$  cm and  $HI = JK = KB$ .



- (a) Calculate the uniform cross-sectional area of the prism.

Answer ..... cm<sup>2</sup> [2]

The prism is fixed to the middle of the base of a cylindrical container with a base radius of 6 cm and height of 12 cm. Water is then poured into the container until it reaches a height of 8 cm.





- (b) (i) Show that the volume of water in the container, correct to 3 significant figures, is  $797 \text{ cm}^3$ .

*Answer*

[3]

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- (ii) Express  $797 \text{ cm}^3$  in cubic metres.

*Answer* .....  $\text{m}^3$  [1]

- (b) (iii) Find the surface area of the prism and the container in contact with the water.

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Answer ..... cm<sup>2</sup> [4]

~ End of Paper ~

<b>Answers (BTY EOY Sec 1E 2021)</b>						
1	(a)	20.799	1(b)	20.80		
2	(a)	4				
	(b)					
3	(a)(i)	$1764 = 2^2 \times 3^2 \times 7^2$	3(b)(i)	21		
	(a)(ii)	Because the powers of 1764's prime factors are multiples of 2/ even numbers	(b)(ii)	252		
4	(a)	$-1 + 4n$	4(c)	154		
5	(a)	$-19x + 11y$	5(b)(i)	$x(y - 2x)$	5(c)	8350
			(b)(ii)	$(9a - 2)(2b + 3c)$		
6	(a)	4	6(b)	8		
7	(a)	8.5	7(b)	5.7		
8	(a)	$64^\circ$	8(b)	$238^\circ$		
9	(a)	Comfort Cars as $\$170 < \$180$	9(b)	$16\frac{2}{3}\%$		
10	(a)	960	10(b)	1094		
	(c)	160	10(d)	22		
11	(a)	$60 - x$	11(b)	$4x + 2(60 - x) = 156$	11(c)	42
12	(a)	80	12(d)(i)	57.50		
	(c)	Fixed cost, transport cost, etc	12(d)(ii)	3.65		
13	(a)	18	13(b)(i)		13(b)(ii)	$85^\circ (\pm 1^\circ)$
14	(a)	98.2	14(b)	15		
15	(a)	18	15(b)(i)	0.000 797	15(b)(iii)	535

[Turn over

<b>MARKING SCHEME</b>
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**BEATTY SECONDARY SCHOOL  
END-OF-YEAR EXAMINATION 2021**

**SUBJECT : Mathematics****LEVEL : Sec 1 Express****DURATION : 2 hours****SETTER : Mdm See Huey Yi****DATE : 07 Oct 2021**

<b>CLASS :</b>	<b>NAME :</b>	<b>REG NO :</b>
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For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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

The total number of marks for this paper is 80.

<b>For Examiner's</b>
<b>80</b>

1 (a) Calculate  $\frac{286 + \sqrt{1720}}{\sqrt{440} - 6.65}$ .

Write down the first five digits on your calculator display.

Answer 20.799 [B1] ..... [1]

(b) Write your answer to part (a) correct to 2 decimal places.

Answer 20.80 [B1] ..... [1]

2 (a) By rounding off each number to 1 significant figure, estimate the value of

$$\frac{\sqrt{20.85 \times 79.3}}{1.56 + 2.49^3}$$

$$\frac{\sqrt{20.8 \times 80}}{1.56 + 2.49^3}$$

$$\approx \frac{\sqrt{20 \times 80}}{2 + 2^3} \quad \text{[B1 - at least 2 correct]}$$

$$= 4 \quad \text{[A1]}$$

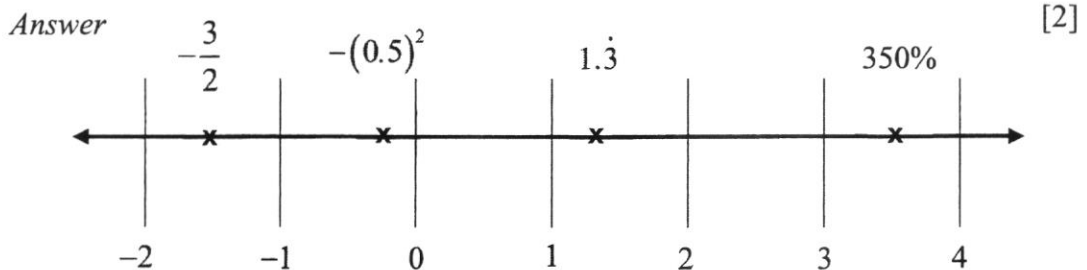
Answer ..... [2]

(b) Represent the following numbers on the number line below.

$$1.\dot{3}, 350\%, -(0.5)^2, -\frac{3}{2}$$

**[B1 - at least 2 correct]**  
**[B2 - all correct]**

Do not penalize if students write eg 3.5 instead of 350%



- 3 (a) (i) Express 1764 as a product of its prime factors in index notation.

$$1764 = 2^2 \times 3^2 \times 7^2 \quad \text{[B1]}$$

Answer ..... [1]

- (ii) Using your answer in part (a)(i), explain why 1764 is a perfect square.

Answer.....

Since the powers/ indices of its prime factors are multiples of 2/ even  
.....  
numbers, 1764 is a perfect square. [B1]

[1]

- (b) Written as a product of its prime factors,  $756 = 2^2 \times 3^3 \times 7$ .

- (i) Find the smallest positive integer  $k$  such that  $\frac{756}{k}$  is a perfect square.

$$\frac{756}{k} = \frac{2^2 \times 3^3 \times 7}{3 \times 7}$$

$$k = 21 \quad \text{[B1]}$$

Answer  $k =$  ..... [1]

- (ii) Find the greatest integer that will divide both 1764 and 756 exactly.

$$\text{HCF} = 2^2 \times 3^2 \times 7$$

$$= 252 \quad \text{[B1]}$$

Answer ..... [1]

[Turn over

4 The first four terms of a sequence are 3, 7, 11 and 15.

(a) (i) Find an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

$-1 + 4n$ [B1]
----------------

Answer ..... [1]

(ii) Is 105 a term in the sequence? Explain your answer.

Answer ..... [2]

$-1 + 4n = 105$  [M1 - ECF]  
 $4n = 106$   
 $n = 26.5$

Since  $n$  is not a positive integer/ whole number, 105 is not a term in the sequence. [A1]

(b) Consider the pattern below.

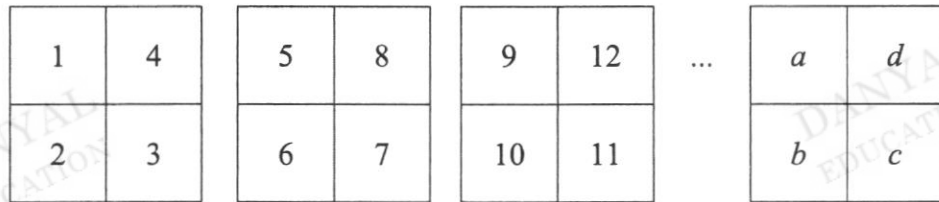


Figure 1      Figure 2      Figure 3      ...      Figure  $n$

Find the sum of the four numbers in Figure 10.

$4(10 \times 4) - 1 - 2 - 3 = 154$  [B1]

Or  $c = -1 + 4(10) = 39$   
 Sum =  $37 + 38 + 39 + 40$   
 $= 154$  [B1]

Answer ..... [1]

- 5 (a) Expand and simplify  $x+3y-4(5x-2y)$ .

$$\begin{aligned} & x+3y-4(5x-2y) \\ & = x+3y-20x+8y \quad \text{[M1 – correct expansion]} \\ & = -19x+11y \quad \text{[A1]} \end{aligned}$$

Answer ..... [2]

- (b) Factorise the following expressions.

(i)  $xy-2x^2$ ,

$$xy-2x^2=x(y-2x) \quad \text{[B1]}$$

Answer ..... [1]

(ii)  $2b(9a+2)-3c(9a+2)$ .

$$\begin{aligned} & 2b(9a+2)-3c(9a+2) \\ & = (9a+2)(2b-3c) \quad \text{[B1]} \end{aligned}$$

Answer ..... [1]

- (c) Without the use of a calculator, evaluate  $835 \times 54 - 835 \times 44$ .  
Show your working.

$$\begin{aligned} & 835 \times 54 - 835 \times 44 \\ & = 835(54 - 44) \quad \text{[M1 – factorise 835]} \\ & = 8350 \quad \text{[A1 – no mark if there is no working]} \end{aligned}$$

Answer ..... [2]

[Turn over



- 6 (a) If  $x = \sqrt{b^2 - a^2}$ , find the value of  $x$  when  $a = 3$  and  $b = -5$ .

$$x = \sqrt{b^2 - a^2}$$

$$= \sqrt{(-5)^2 - 3^2} \quad [\text{M1 - correct substitution, do not accept } -5^2]$$

$$= 4 \quad [\text{A1}]$$

Answer  $x = \dots\dots\dots$  [2]

- (b) Given that  $\frac{3}{2x-y} = \frac{5}{3x+y}$ , find the value of  $\frac{x}{y}$ .

$$\frac{3}{2x-y} = \frac{5}{3x+y}$$

$$3(3x+y) = 5(2x-y) \quad [\text{M1 - remove denominator}]$$

$$9x+3y = 10x-5y$$

$$-x = -8y \quad [\text{M1 - correct simplification}]$$

$$\frac{x}{y} = 8 \quad [\text{A1}]$$

Answer  $\frac{x}{y} = \dots\dots\dots$  [3]

7 Solve each of the following equations.

(a)  $4(x-5)+3=2x$

$$4(x-5)+3=2x$$

$$4x-20+3=2x \quad \text{[M1 - expansion]}$$

$$2x=17$$

$$x=8.5 \quad \text{[A1]}$$

Answer  $x = \dots\dots\dots$  [2]

(b)  $\frac{2y-1}{4} + \frac{2y-3}{6} = 4$

$$\frac{2y-1}{4} + \frac{2y-3}{6} = 4$$

$$\frac{3(2y-1)}{12} + \frac{2(2y-3)}{12} = 4 \quad \text{[M1 - common denominator]}$$

$$\frac{6y-3+4y-6}{12} = 4$$

$$\frac{10y-9}{12} = 4 \quad \text{[M1 - expand and simplify numerator]}$$

$$10y-9=48$$

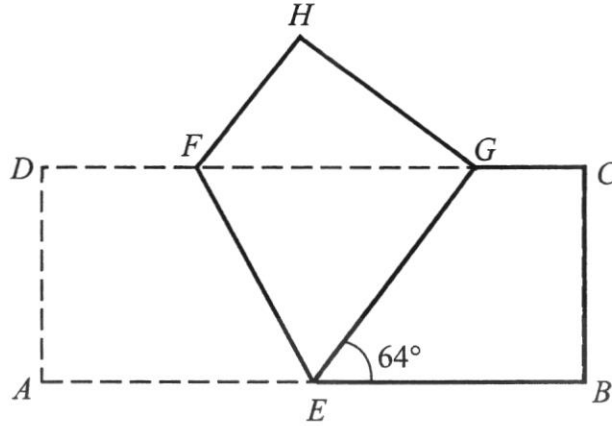
$$10y=57$$

$$y=5.7 \quad \text{[A1]}$$

Answer  $y = \dots\dots\dots$  [3]

[Turn over

- 8 In the diagram,  $ABCD$  is a rectangular strip of paper. The corner  $A$  is folded up to meet the edge  $CD$  at  $G$  and the crease  $EF$  is formed. It is given that angle  $BEG = 64^\circ$ .



- (a) Find angle  $FGE$ .

angle  $FGE = 64^\circ$  (alternate angles,  $DC \parallel AB$ )  
**[B1 – do not need to write reason]**

Answer ..... [1]

- (b) Show that angle  $GEF = 58^\circ$ .

Answer

angle  $GEF = (180^\circ - 64^\circ) \div 2$  (adjacent angles on a straight line)  
 $= 58^\circ$  (shown)  
**[B1 – do not need to write reason]**

[1]

- (c) Calculate the reflex angle  $HFE$ .  
 Give a reason for each step of your working.

angle  $HFE = 180^\circ - 58^\circ$  (interior angles,  $HF \parallel GE$ ) **[M1 – o.e.]**  
 $= 122^\circ$   
 reflex angle  $HFE = 360^\circ - 122^\circ$  (angles at a point)  
 $= 238^\circ$  **[A1]**  
**[No reason or wrong reason - minus 1 mark]**

Answer ..... [2]

- 9 Three companies Alpha, Better and Comfort, offer cars for hire. Their charges, based on the number of days a car is hired and the number of kilometres the car is driven, are shown in the following table.

	Cost per day	Cost per kilometre
Alpha	\$75	Nil
Better	Nil	45¢
Comfort	\$35	25¢

- (a) John wishes to hire a car for 2 days to drive 400 km.  
Should he rent from Better cars or Comfort cars? Explain your answer.

*Answer*

[2]

Rental cost for Better Cars = $400(0.45)$ = \$180	}	[M1 – either one]
Rental cost for Comfort Cars = $2(35) + 400(0.25)$ = \$170		
Since $\$170 < \$180$ , John should rent from Comfort Cars.		[A1]

- (b) Each year, Peter hires a car for 4 days from Alpha Cars. Last year, he paid \$360. Calculate the percentage decrease in the rental charge this year.

Difference = $360 - 4(75)$ = \$60	[M1]
Percentage decrease = $\frac{60}{360} \times 100\%$	[M1]
= $16\frac{2}{3}\%$	[A1]

*Answer* ..... % [3]

[Turn over

- 10** Andy, Ben and Caden went on holiday to Malaysia.  
The exchange rate between Singapore dollars (S\$) and Malaysia ringgit (RM) was S\$1 to RM3.125.

- (a) If Andy bought RM3000, calculate the amount of Singapore dollars he paid.

$$\frac{3000}{3.125} = \text{S\$}960 \quad \text{[B1]}$$

Answer S\$ ..... [1]

- (b) The bank charged S\$5 plus 2% of the amount of ringgit changed as administration fee. Ben was charged S\$12 to change his money. Calculate the amount of ringgit he changed. Give your answer correct to the nearest ringgit.

S\$7 -----	$7 \times 3.125 = \text{RM}21.875$	[M1 - conversion]
Amount of ringgit =	$\frac{21.875}{2} \times 100$	[M1 - amount in RM]
	= 1093.75	
	= 1094 (nearest ringgit)	[A1 - A0 if did not round correctly]
<b>OR</b>		
Amount =	$\frac{7}{2} \times 100$	[M1 - amount in S\$]
	= S\$350	
	= RM 350 $\times$ 3.125	[M1 - conversion]
	= 1093.75	
	= 1094 (nearest ringgit)	[A1 - A0 if did not round correctly]

Answer RM ..... [3]

- (c) While in Malaysia, they spent a total of RM1200 on food.  
The amounts spent by Andy, Ben and Caden were in the ratio 5 : 4 : 6.  
How much more did Caden spend on food than Ben?

$$\begin{aligned} \text{Difference} &= \frac{1200}{15} \times 2 && \text{[M1 - o.e.]} \\ &= 160 && \text{[A1]} \end{aligned}$$

Answer RM ..... [2]

- (d) Ben bought a watch for RM242. The price included a tax of 10%. Calculate the tax that was paid.

$\text{Tax} = \frac{242}{110} \times 10 \quad [\text{M1} - \text{o.e.}]$ $= \text{RM } 22 \quad [\text{A1}]$
--

*Answer* RM ..... [2]

- 11 A farmer has 60 cows and chickens.

- (a) Given that there are  $x$  cows, find an expression, in terms of  $x$ , for the number of chickens.

$60 - x$	[B1]
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*Answer* ..... [1]

- (b) The total number of legs the animals have is 156. Form an equation in terms of  $x$ .

$4x + 2(60 - x) = 156$	[B1 - o.e.]
------------------------	-------------

*Answer* ..... [1]

- (c) Hence, solve the equation and find the number of chickens.

$4x + 2(60 - x) = 156$ $4x + 120 - 2x = 156 \quad [\text{M1} - \text{ECF}]$ $2x = 36$ $x = 18 \quad [\text{M1} - \text{ECF}]$ $\text{Number of chickens} = 42 \quad [\text{A1}]$
--

*Answer* ..... [3]

[Turn over

- 12 The charge \$ $y$  of an electrician attending a house call job is given by  $y = 35 + 15x$  where  $x$  is the number of hours spent on the job.  
Some corresponding values of  $x$  and  $y$  are given in the table below.

$x$	0	1	2	3	4
$y$	35	50	65	$a$	95

- (a) Find the value of  $a$ .

Answer  $a = \dots\dots\dots$  80 [B1] [1]

- (b) On the grid given on the next page, complete the axes and draw the graph of  $y = 35 + 15x$  for  $0 \leq x \leq 4$ .

[3]

- (c) Suggest what the  $y$ -intercept represents.

Answer Transport cost or fixed cost  
[B1 – accept any reasonable answer] [1]

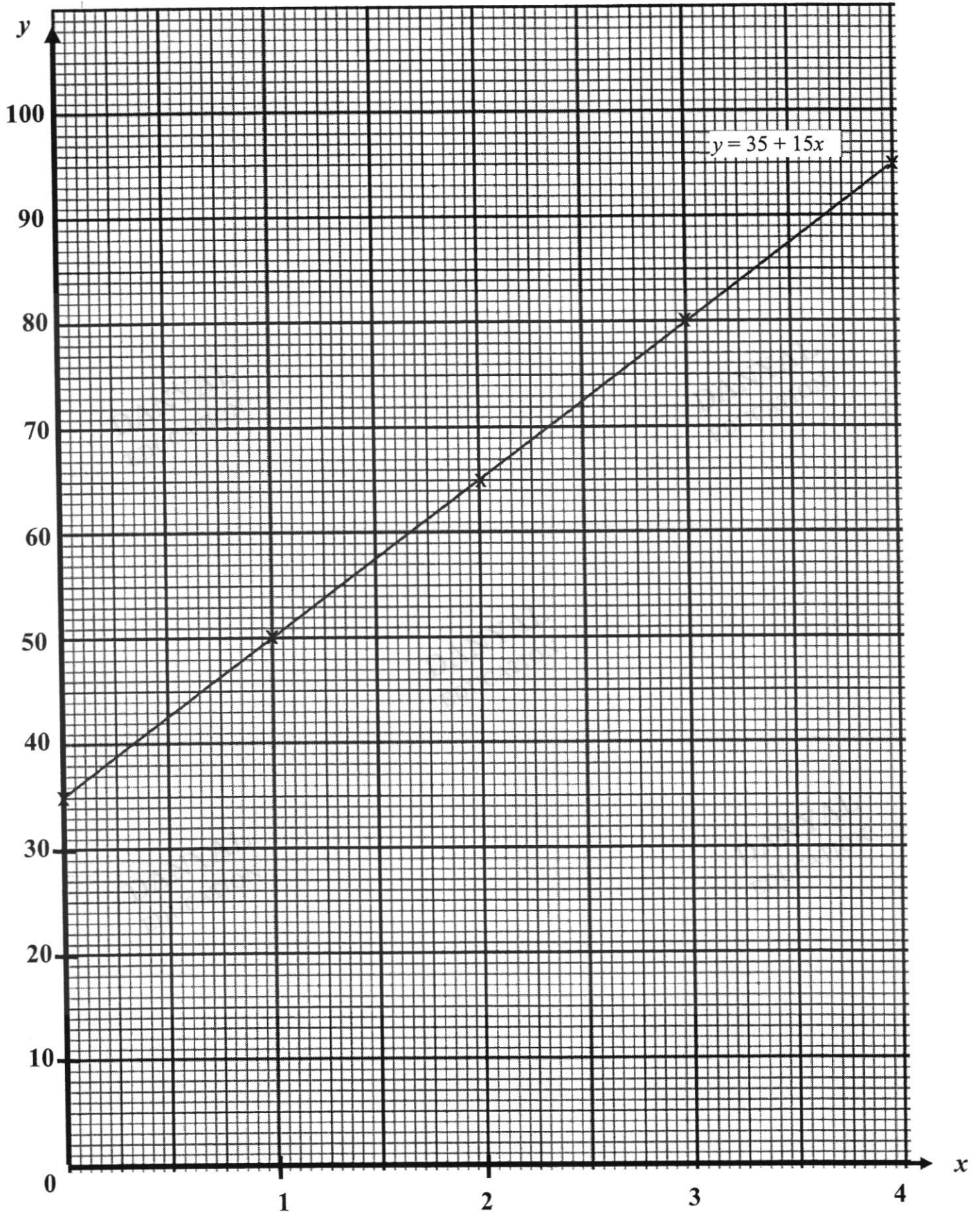
- (d) Using your graph, find

- (i) the charge for a job lasting 1.5 hours,

Answer \$ 57, 57.50 or 58 [B1 – do not accept 57.5] [1]

- (ii) the time taken to complete a job that charges \$90.

Answer 3.65, 3.675 or 3.7 [B1] hours [1]

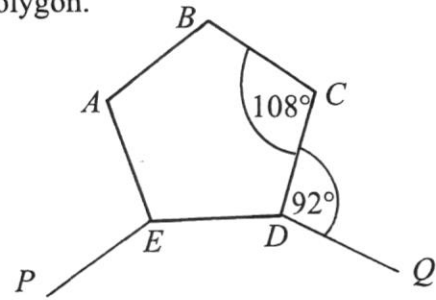


[G1 – both scales correct]  
[G1 – ECF : plot at least 3 points correctly]  
[G2 – ECF : plot all points correctly and join with a straight line]

[Turn over



- 13 (a) The diagram below shows a regular pentagon,  $ABCDE$ , and three of the sides,  $PE$ ,  $ED$  and  $DQ$ , of another regular polygon. Angle  $BCD = 108^\circ$  and angle  $CDQ = 92^\circ$ .



Find the number of sides in the second regular polygon.

Each exterior angle = $108^\circ + 92^\circ - 180^\circ$ [M1] $= 20^\circ$	
Number of sides = $\frac{360}{20}$ [M1]	
$= 18$ [A1]	
<b>OR</b> Each interior angle = $360^\circ - 108^\circ - 92^\circ$ [M1] $= 160^\circ$	
$(n-2) \times 180^\circ = 160^\circ n$ [M1]	
$180^\circ n - 360^\circ = 160^\circ n$	
$20^\circ n = 360^\circ$	
$n = 18$ [A1]	
Answer .....	[3]

- (b) (i) Construct a trapezium  $ABCD$  such that  $AC = 8$  cm,  $BC = 4.5$  cm, angle  $DAB = 110^\circ$  and  $AB$  is parallel to  $DC$ .  $AB$  has already been drawn.

Answer [3]

[B1 – correct point D where  $AB \parallel DC$ ]

[B1 – correct point C With 2 arcs]

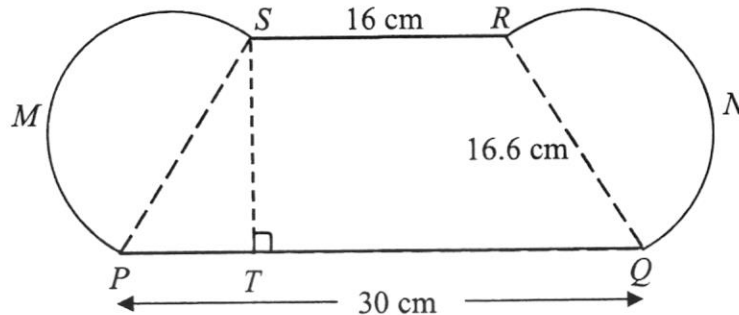
[B1 – correct angle  $DAB$ ]

- (ii) Measure and write down the size of angle  $ABC$ .

$85^\circ (\pm 1^\circ)$  [B1 – exact is  $85.2^\circ$ ]

Answer angle  $ABC =$  ..... [1]

- 14 The diagram below shows the design of a mickey mouse hat which is made up of a trapezium  $PQRS$  and two identical semicircles  $PMS$  and  $QNR$ . It is given that  $SR = 16$  cm,  $PQ = 30$  cm and  $PS = RQ = 16.6$  cm.  $T$  is on  $PQ$  such that  $ST$  is perpendicular to  $PQ$ .



- (a) Find the perimeter of the design of the hat.

$$\begin{aligned} \text{perimeter} &= \pi(16.6) + 16 + 30 && \text{[M1 - for } \pi(16.6)\text{]} \\ &= 98.1504 \\ &= 98.2 \text{ cm} && \text{[A1]} \end{aligned}$$

Answer ..... cm [2]

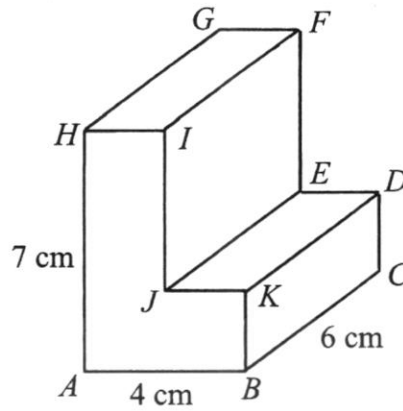
- (b) Given that the area of the trapezium  $PQRS$  is  $345 \text{ cm}^2$ , find the length of  $ST$ .

$$\begin{aligned} \frac{1}{2}(16 + 30)(ST) &= 345 && \text{[M1 -o.e.]} \\ TR &= 15 \text{ cm} && \text{[A1]} \end{aligned}$$

Answer ..... cm [2]

[Turn over

- 15 The diagram shows a solid prism,  $ABCDEFGHJK$ , made up of two solid cuboids. It is given that  $HA = 7$  cm,  $AB = 4$  cm,  $BC = 6$  cm and  $HI = JK = KB$ .

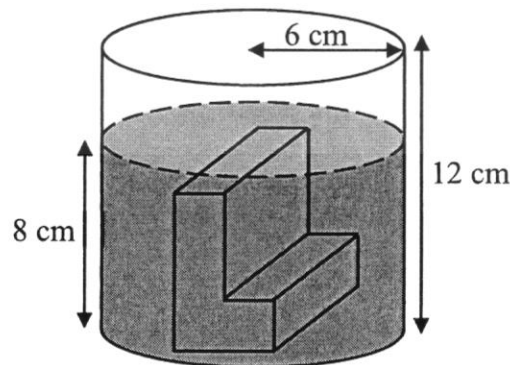


- (a) Calculate the uniform cross-sectional area of the prism.

$$\begin{aligned} \text{cross-sectional area} &= (7 \times 4) - (5 \times 2) \quad \text{[M1 - o.e.]} \\ &= 18 \text{ cm}^2 \quad \text{[A1]} \end{aligned}$$

Answer ..... cm<sup>2</sup> [2]

The prism is fixed to the middle of the base of a cylindrical container with a base radius of 6 cm and height of 12 cm. Water is then poured into the container until it reaches a height of 8 cm.



- (b) (i) Show that the volume of water in the container, correct to 3 significant figures, is  $797 \text{ cm}^3$ .

*Answer*

[3]

$\begin{aligned} \text{volume of water} &= \pi(6^2)(8) - (18 \times 6) \\ &= 796.778 \\ &= 797 \text{ cm}^3 \text{ (3 s.f.) (shown)} \end{aligned}$	<p>[M1 – cylinder] [M1 – prism]</p> <p style="font-size: 2em;">}</p> <p>[A1 – must show 796.77(at least 4 digits)]</p>
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- (ii) Express  $797 \text{ cm}^3$  in cubic metres.

*Answer* ..... 0.000 797 [B1]  $\text{m}^3$  [1]

- (b) (iii) Find the surface area of the prism and the container in contact with the water.

Surface area = $2\pi(6)(8)$	[M1 – $2\pi rh$ ]
+ $[\pi(6^2) - 4 \times 6]$	[M1 – base]
+ $(2 \times 18) + (7 + 7 + 4)(6)$	[M1 – 2 cross sectional + lateral face]
= 534.690	
= 535 cm <sup>2</sup> (3 s.f)	[A1]

Answer ..... cm<sup>2</sup> [4]

~ End of Paper ~

<b>Answers (BTY EOY Sec 1E 2021)</b>						
1	(a)	20.799	1(b)	20.80		
2	(a)	4				
	(b)					
3	(a)(i)	$1764 = 2^2 \times 3^2 \times 7^2$	3(b)(i)	21		
	(a)(ii)	Because the powers of 1764's prime factors are multiples of 2/ even numbers	(b)(ii)	252		
4	(a)	$-1 + 4n$	4(c)	154		
5	(a)	$-19x + 11y$	5(b)(i)	$x(y - 2x)$	5(c)	8350
			(b)(ii)	$(9a - 2)(2b + 3c)$		
6	(a)	4	6(b)	8		
7	(a)	8.5	7(b)	5.7		
8	(a)	$64^\circ$	8(b)	$238^\circ$		
9	(a)	Comfort Cars as $\$170 < \$180$	9(b)	$16\frac{2}{3}\%$		
10	(a)	960	10(b)	1094		
	(c)	160	10(d)	22		
11	(a)	$60 - x$	11(b)	$4x + 2(60 - x) = 156$	11(c)	42
12	(a)	80	12(d)(i)	57.50		
	(c)	Fixed cost, transport cost, etc	12(d)(ii)	3.65		
13	(a)	18	13(b)(ii)	$85^\circ (\pm 1^\circ)$		
14	(a)	98.2	14(b)	15		
15	(a)	18	15(b)(i)	0.000 797	15(b)(iii)	535