Full Name	Class Index No	Class

Anglo-Chinese School (Barker Road)

END OF YEAR EXAMINATION 2022
SECONDARY THREE EXPRESS

MATHEMATICS
4052
PAPER 1

1 HOUR 45 MINUTES

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.

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

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.

For Examiner's Use

This question paper consists of **16** printed pages and **2** blank pages.

1 Solve $2x+8=-6$.

Answer $x=$ _____ [1]

2 **(a)** Calculate $\dfrac{\sqrt{1680}+34^2}{24.98-\sqrt[3]{15002}}$.
Write your answer correct to 3 significant figures.

Answer _____ [1]

(b) Write your answer to part **(a)** in standard form.

Answer _____ [1]

3 Factorise completely
(a) $2xy+y-4x-2$,

Answer _____ [2]

(b) $72y^4-50x^4$.

Answer _____ [2]

4 Simplify

(a) $\dfrac{6xy^2}{24x^3yz^2}$,

Answer _____ [2]

(b) $\dfrac{x+3}{(x^2+6x+9)}$.

Answer _____ [2]

5 The curved surface area of two solid spheres are in the ratio 16 : 25.
Given that the mass of the smallest sphere is 40g, find the mass of the larger sphere.

Answer _____g [2]

6 When written as the product of their prime factors,
p is $2^2 \times 3^3$,
q is $2^4 \times 3^2 \times 5^2$,
r is $2^2 \times 3^2 \times 7$.

Find

(a) the value of the square root of q,

Answer _____ [1]

(b) the lowest common multiple of q and r,

Answer _____ [1]

(c) the highest common factor of p, q and r.

Answer _____ [1]

7 **(a)** Solve the inequality $2-\frac{x}{6}\geq-\frac{2}{5}$.

Answer _____ [2]

(b) Hence, write down the largest prime number that satisfy the inequality in part **(a)**.

Answer _____ [1]

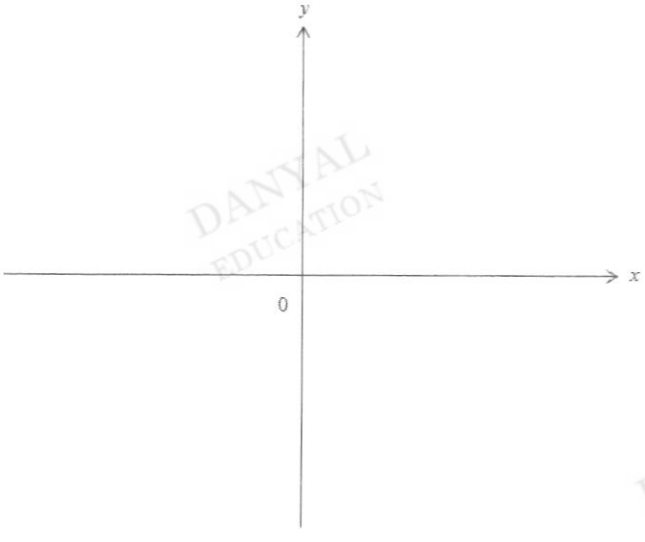
8 Solve the following equation $4^{18}=\frac{2^x}{32}$.

Answer $x=$_____ [2]

9 **(a)** Express $x^2 - 8x + 7$ in the form of $k + (x + h)^2$.

Answer _____ [2]

9 **(b)** Sketch the graph of $y = x^2 - 8x + 7$ on the axes below.
Indicate clearly the coordinates of the point where the graph crosses the axes and the minimum point on the curve.

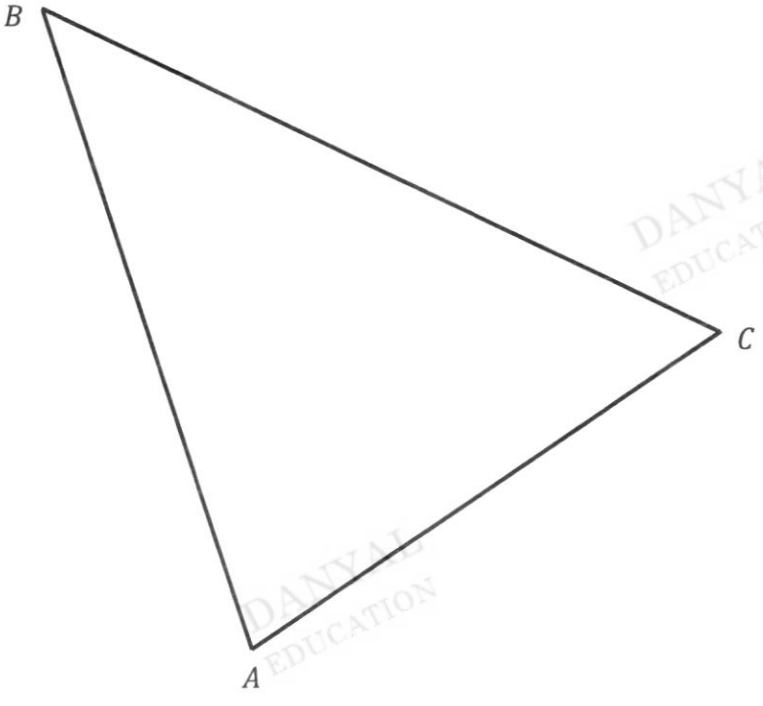


[3]

(c) Write down the equation of the line of symmetry of the graph of $y = x^2 - 8x + 7$.

Answer _____ [1]

10 The diagram shows triangle ABC.



(a) Construct a perpendicular bisector of BC. [1]

(b) Construct the bisector of angle BAC. [1]

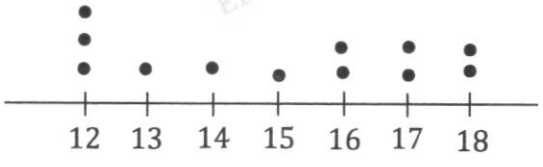
(c) Point X is equidistant from AB and AC and lie on the line BC. Mark the point X on the diagram. [1]

11 Leon, Nicholas, and Justin each has an amount of money. The ratio of Leon's amount to Justin's amount is 7:3 and the ratio of Leon's amount to Nicholas' amount is 5:4. Leon then gave \$30 to Justin and their ratio became 2:3. Calculate the total amount of money.

Answer \$_____ [4]

12 The dot diagram represents the test scores a class of students. The full marks for the test is 20 marks.

Students' test scores



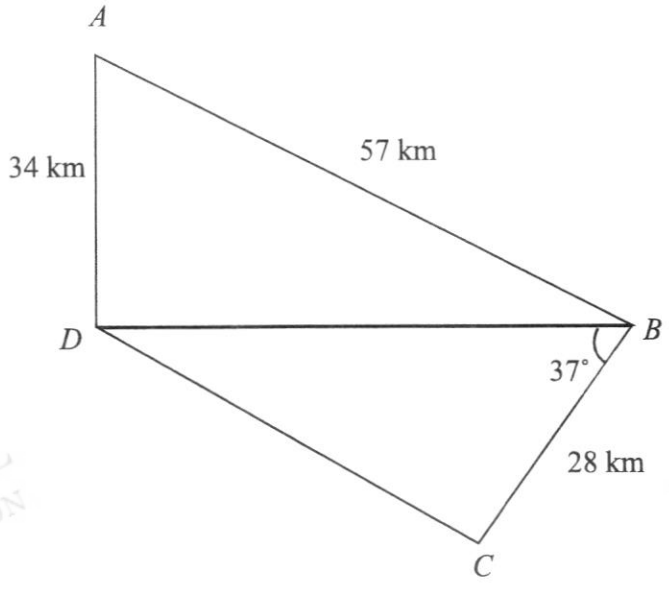
Marks

Joan's score is not recorded in the test scores. She claimed that with her score, the mean score of the class will increase by at least 1 mark. Do you agree with her? Explain your answer with clear working.

Answer _____

_____ [3]

13 The diagram shows a town, $ABCD$. The airport, A, is due north of D, and B is due east of D. $\angle DBC = 37°$, $AD = 34$ km, $AB = 57$ km and $BC = 28$ km.



(a) Calculate the bearing of B from A.

Answer _____ ° [2]

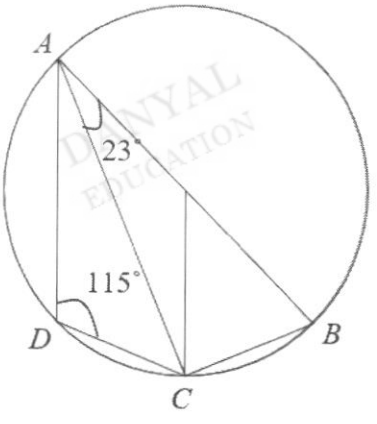
(b) A straight cycling path is to be constructed from C to BD. Calculate the shortest possible length of the cycling path.

Answer _____ km [2]

13 **(c)** A boy cycles along this path of shortest distance from C to BD at a speed of 12km/h. Calculate the time he takes to complete this road in minutes.

Answer _____ min [2]

14 **(a)** The diagram shows a circle passing through A, B, C and D. $\angle BAC = 23°$ and $\angle ADC = 115°$. Determine if AB is the diameter of the circle.
Explain your answer.



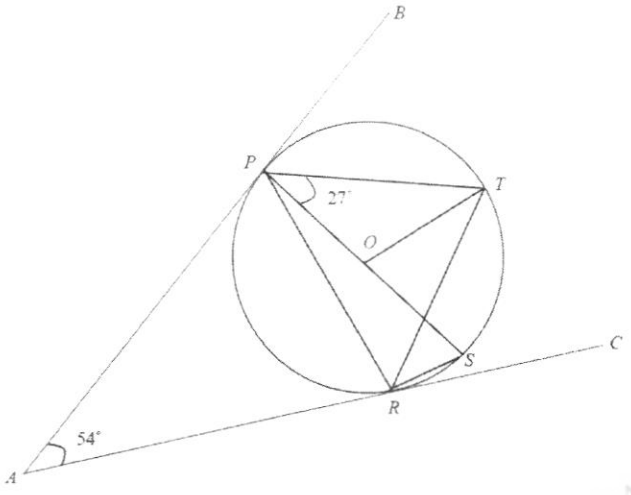
Answer

_____

_____

_____ [2]

14 (b)



In the diagram, the circle, centre O, passes through the points P, R, S and T.
APB and ARC are tangents to the circle at P and R respectively.
Angle $PAR = 54°$ and angle $SPT = 27°$.
Find

(i) angle SRT,

Answer _____° [1]

(ii) angle TOS,

Answer _____° [1]

(iii) angle RPS.

Answer _____° [2]

15 The maximum speed, s km/h at which a race car can travel round a circular race circuit is directly proportional to the square root of the radius, r km of the race circuit. It has been found that the maximum speed of the race car is 168 km/h when the radius of the circuit is 16 km.

(a) Find the equation connecting s and r.

Answer _____ [2]

(b) Calculate the radius when the speed is 100 km/h.

Answer _____ km [1]

16 Timothy has a bag of red, blue and yellow balloons. He uses it to decorate the school hall for an event. $\frac{1}{3}$ of the balloons are red, 40% of the remaining balloons are blue. There are 48 yellow balloons.
How many balloons are there in the bag altogether?

Answer _____ [3]

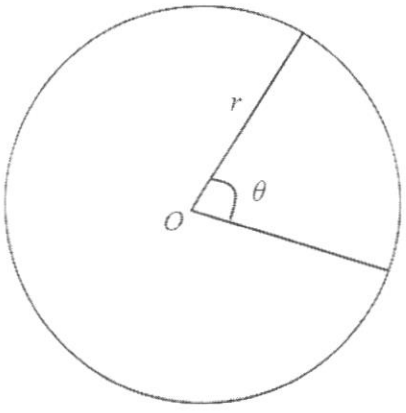
17 **(a)** Line P passes through $(-2, 2)$ and $(1, -4)$.
Find the equation of the line P.

Answer _____ [2]

(b) The equation of line q is $2y + x = 5$. Find the coordinates of the point of intersection of line P and line q.

Answer $x =$ _____, $y =$ _____ [3]

18

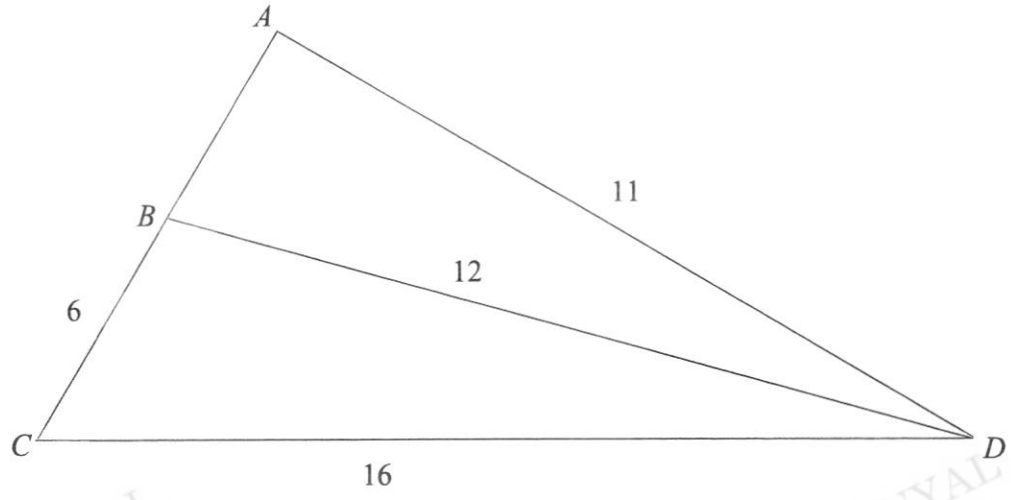


The diagram shows a circle with radius r cm. The circle is divided into two sectors. The angle of the minor sector is θ radians. The perimeter of the minor sector is $\frac{1}{3}$ that of the major sector.

Find, in terms of π, the value of θ. Give your answer in the form $a\pi + b$

Answer $\theta =$_____ [4]

19



In the diagram, ABC is a straight line. $BC = 6$ cm, $BD = 12$ cm , $CD = 16$ cm and $AD = 11$ cm.
Find angle BDA.

Answer _____ ° [6]

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PAPER 2

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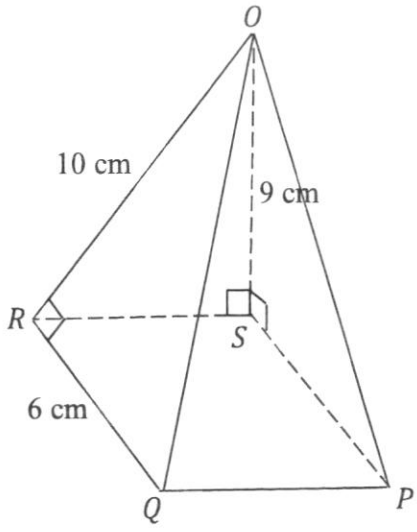
For Examiner's Use

This question paper consists of **19** printed pages and **1** blank page.

1 **(a)** The area of a triangular plot of land ABC is 56.8 m^2. AB is 18.7 m and BC is 12.8 m. Find the possible sizes of angle ABC.

Answer _____° or _____° [3]

1 **(b)** The diagram below shows a pyramid $OPQRS$. The base of the pyramid is a rectangle and O is vertically above vertex S of the rectangular base. $OS = 9$ cm, $OR = 10$ cm, $QR = 6$ cm and angle OSP = angle OSR = angle $ORQ = 90°$.



(i) Show that $\angle OPQ = 90$.

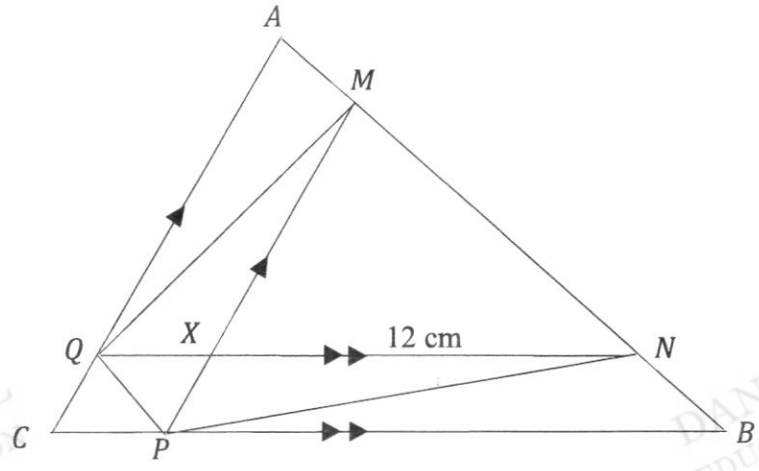
Answer

[3]

1 **(b)** **(ii)** Calculate the total surface area of the pyramid.

Answer _____ cm^2 [3]

2 In the diagram shown below, ABC is a triangle. The points M and P lie on AB and BC respectively, such that PM is parallel to CA. The points N and Q are on AB and AC respectively, such that QN is parallel to CB. NQ and MP meet at the point X, such that $QXPC$ is a rhombus and $MX = 3XP$.



(a) Given that $AM = BN$, prove that ΔANQ and ΔMBP are congruent.

Answer

[3]

2 **(b)** Show that ΔMNX and ΔMBP are similar.
Answer

[2]

(c) Given that $XN = 12$ cm, find the length of PB.

Answer _____cm [2]

3 **(a)** Express as a single fraction in its simplest form

$$\frac{5x}{4x-3y}-\frac{7y}{6y-8x}.$$

Answer _____ [2]

(b) It is given that $p=a+\frac{bx^2}{3k}$.

(i) Find the value of p when $a=-1$, $b=2$, $k=1$ and $x=-3$.

Answer $p=$_____ [1]

(ii) Express x in terms of a, b, k and p.

Answer _____ [2]

4 The heights of a class of students are shown in the following stem-and-leaf diagram.

Stem	Height of class
14	1 5 5 6 7 9
15	1 3 3 3 4 4 5 5 5 5
16	0 0 1 1 2 2 4 7

Key: 14 | 1 means 141 cm

(a) Write down

(i) the median height,

Answer _____ cm [1]

(ii) the modal height.

Answer _____ cm [1]

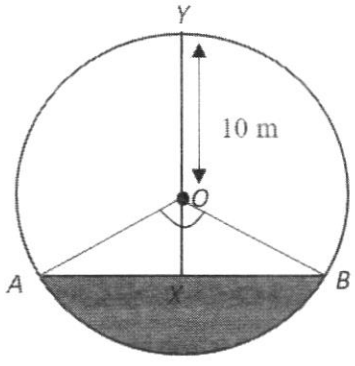
(b) 25% of the students are at least x cm tall.
Find the value of x.

Answer x= _____ [2]

(c) Student below the height of 145cm are in a program where they will be given packet milk daily by the school. Find the probability that a student chosen at random is in the program.

Answer _____ [1]

5 The diagram shows the cross-section of a circular underground train tunnel.
AB represents the horizontal track surface, where the shaded region beneath is covered in concrete. Arc AYB represents the metal ceiling of the tunnel. O is the centre of the circle with radius 10 metres.
X is the mid-point of AB and is vertically below Y. Given that $AB = XY = 16$ m.



(a) Show that $\angle AOB = 106.3^\circ$.
Answer

[2]

5 **(b)** Calculate the volume of concrete used for the tunnel, if the length of the tunnel is 900 m.

Answer _____ m^3 [5]

(c) A similar model of the tunnel is made. The radius of the model's cross-section is 5 cm. Calculate the curved surface area of the model's ceiling.

Answer _____ cm^2 [3]

6 The variables x and y are connected by the equation $y = \frac{5}{x} + x - 6.5$.

Some corresponding values of x and y are given below.

x	0.5	1	2	3	4	5	6	7
y	4	−0.5	p	−1.83	−1.25	−0.5	0.33	1.21

(a) Find the value of p.

Answer $p =$ _____ [1]

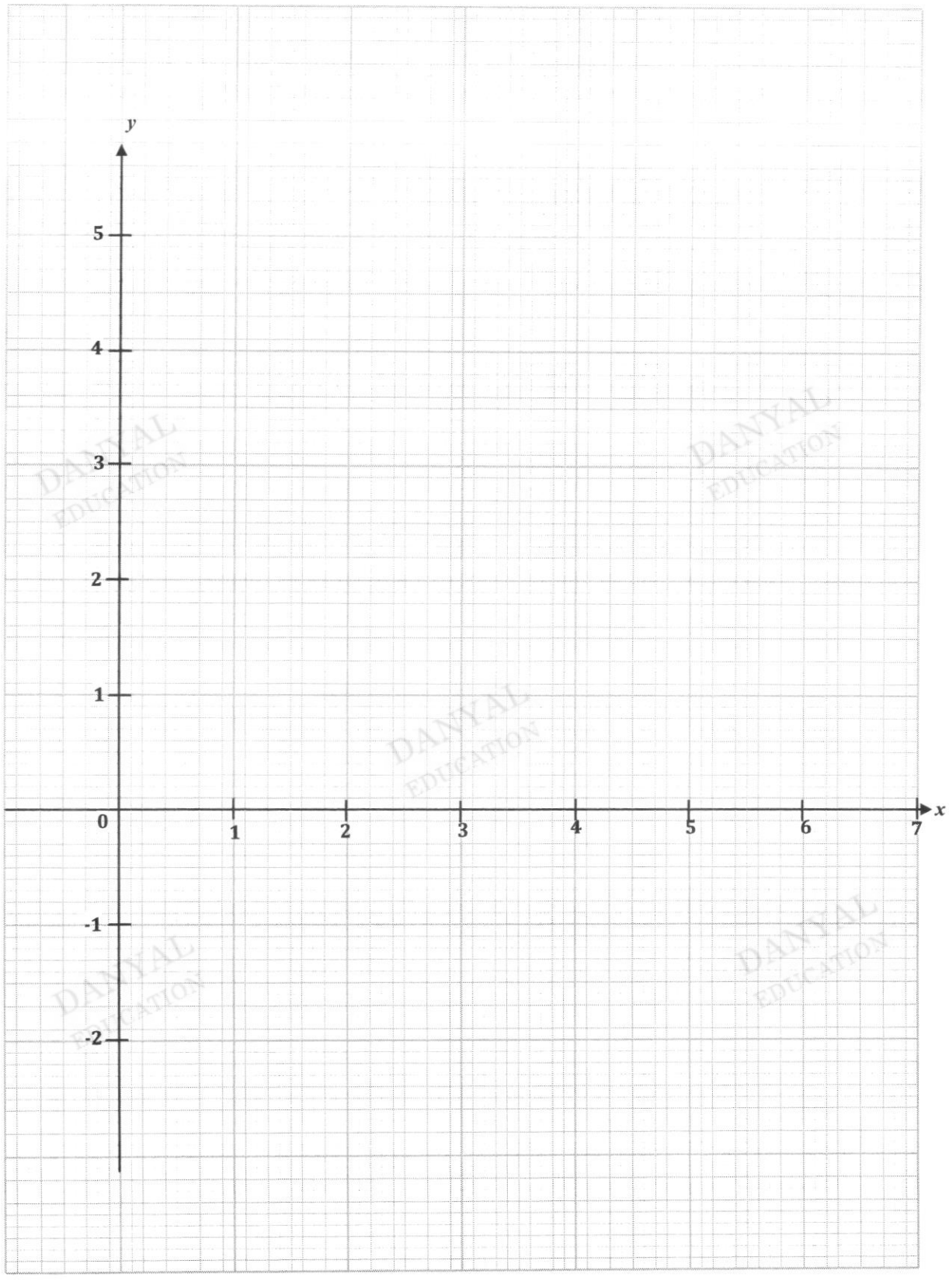
(b) On the grid opposite, draw the graph of $y = \frac{5}{x} + x - 6.5$ for $0.5 \leq x \leq 7$. [3]

(c) By adding a suitable straight line on the same grid, solve the equation $\frac{5}{x} + x = 7 + 2x$.

Answer $x =$ _____ [3]

(d) By drawing a tangent on the graph, find the gradient of the curve when $x = 1$.

Answer _____ [2]


y
5
4
3
2
1
0
-1
-2
1
2
3
4
5
6
7
x

7 James and Timothy went on a cycling expedition using different routes. James travelled by route A which is 115km long, at an average speed of x km/h. At the same time, Timothy travelled by route B which is 5 km shorter but has more undulating routes and terrain. He covered the distance at an average speed that was 3 km/h slower than James.

(a) Write down an expression, in terms of x, for the number of hours

(i) James took to reach the destination,

Answer _____ [1]

(ii) Timothy took to reach the destination.

Answer _____ [1]

(b) James waited for 40 minutes at the destination before Timothy arrived. Write down an equation to represent this information and show that it reduces to

$$2x^2 + 9x - 1035 = 0.$$

Answer

[3]

7 **(c)** Solve the equation of $2x^2 + 9x - 1035 = 0$, giving your answers correct to 2 decimal places.

Answer $x =$ _____ or _____ [3]

(d) Explain why one of the solutions in part **(c)** must be rejected.

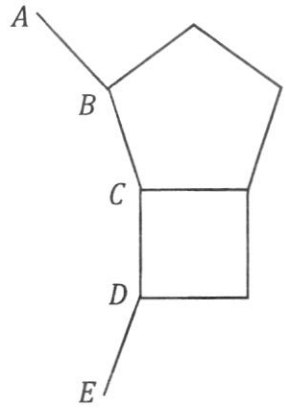
Answer _____

_____ [1]

(e) Find the time taken by Timothy to complete the cycling expedition. Give your answer in hours, minutes and seconds, to the nearest second.

Answer ____ h, _____ min, _____sec [3]

8 The diagram is made up of a square, a regular pentagon and part of a regular n-sided polygon $ABCDE\ldots$.



Find

(a) angle BCD,

Answer _____ ° [2]

(b) the value of n.

Answer $n =$ _____ [2]

9 Mr Azhar is planning a trip to New Zealand with his wife. Due to Covid, many places only accept cashless transactions. He has decided to use a multi-currency credit card. The exchange rates of two cards are shown in the table below.

I-trip Card	Resolute Card
1 SGD = 1.154 NZD	1 NZD = 0.8722SGD

(a) Mr Azhar would like to exchange 500 SGD to NZD, which card should he choose and why? Please support your answer with mathematical working.

Answer: He should choose _____ because

_____

_____ [3]

9 **(b)** Mr Azhar needs to set aside a budget for the trip to New Zealand with his wife. He intends to spend 14 days in New Zealand and in this trip fulfil his dream of doing bungee jumping with his wife. He plans to take a bungee jump package with video to capture the experience. The following information below will help him work out a feasible budget for the trip.

Daily Estimated Cost for a Couple

Item	Estimated cost
Food	$40
Accommodation	$100
Car rental	$45
Petrol	$20

Other Expenses

Air ticket (round trip)	$1780 per person
Shopping	$300 per person

JUMPFREE Bungee Packages	Price
1 individual jump only	300 NZD
1 individual with video	360 NZD
2 individual jump only	600 NZD
2 individuals with video	660 NZD

THRILLJUMP Bungee Packages	Price
1 individual jump only	320 NZD
1 individual jump with video	380 NZD
15% discount for 2 person and above.	

Using your answer in part **(a)**, suggest a minimum budget in dollars for Mr Azhar to set aside for his trip. Justify any decision that you make and show your calculation clearly.

Continuation of working space for question 9(b)

Answer _____

_____

_____

_____ [6]

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1		$2x+8=-6$			
		$2x=-14$			
		$x=-7$			
2	(a)	3780			
	(b)	3.78×10^{3}			
3	(a)	$12xy+6y-24x-12$			
		$=6y(2x+1)-12(2x+1)$			
		$=6(y-2)(2x+1)$			
3	(b)	$72y^4-50x^4$			
		$=2(36y^4-25x^4)$			
		$=2[(6y^2)^2-(5x^2)^2]$			
		$=2(6y^2-5x^2)(6y^2+5x^2)$			
4	(a)	$\frac{6xy^2}{24x^3yz^2}$			
		$=\frac{6xy(y)}{6xy(4x^2z^2)}$			
		$=\frac{y}{4x^2z^2}$			
	(b)	$\frac{x+3}{(x^2+6x+9}$			
		$=\frac{x+3}{(x+3)(x+3)}$			
		$=\frac{1}{x+3}$			
5		$\frac{l_1}{l_2}=\frac{4}{5}$			
		$(\frac{5}{4})^3\times40=78.1258$			
		=78.1			
6	(a)	$\sqrt{q}=2^2\times3^1\times5^1$			

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		$= 60$			
	(b)	LCM $= 2^4 \times 3^3 \times 5^2 \times 7$			
		$=75600$			
	(c)	HCF $= 2^2 \times 3^2$			
		$= 36$			
7	(a)	$2 - \frac{x}{6} \geq -\frac{2}{5}$			
		$-\frac{x}{6} \geq -\frac{2}{5} - 2$			
		$\frac{x}{6} \leq \frac{12}{5}$			
		$x \leq \frac{72}{5}$ or $x \leq 14\frac{2}{5}$			
	(b)	13			
8		$4^{18} = \frac{2^x}{32}$			
		$2^{36} = \frac{2^x}{2^5}$			
		$36 = x - 5$			
		$x = 41$			
9	(a)	$y = x^2 - 8x + 7$			
		$y = (x-4)^2 - 16 + 7$			
		$y = -9 + (x-4)^2$			

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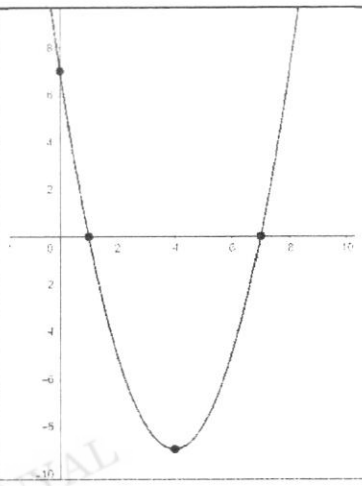
	(b)				
	(c)	$x = 4$			
10	(a)	Correct bisector drawn			
	(b)	Correct angle bisector drawn			
	(c)	The point where a and b intersect			
11		Leon: Nic: Justin 35 : 28 : 15			
		Leon : Justin 35 : 15 20:30			
		15 units = \$30			
		1unit = \$2			
		78units= \$156			
		Or			
		$\frac{7x-30}{3x+30} = \frac{2}{3}$			
		$21x - 90 = 6x + 60$			
		$15x = 150$			
		$x = 10$			
		Leon = \$70			
		Nicholas = $\frac{4}{5} \times \$70$			
		= \$56			
		Total = \$56+\$70+\$30			

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		=S156			
12		Average score of class = $\frac{(12\times3)+13+14+15+(16\times2)+(17\times2)+(18\times2)}{12}$			
		=15			
		To score at least one mark higher, total score must be (16×13) =208			
		Total score of class without Joan = =180			
		Statement is false because Joan must score 28 marks which is impossible as the test is 20 marks.			
13	(a)	$\cos DAB = \frac{34}{57}$			
		$DAB = \cos^{-1}\frac{34}{57}$			
		$DAB = 53.4^{\circ}$			
		Bearing of B from A $= 180^{\circ} - 53.4^{\circ}$ $=126.6^{\circ}$			
	(b)	Let shortest distance be marked with x is perpendicular to line DB from C			
		$\sin 37^{\circ} = \frac{cx}{28}$			
		$28\sin 37 = cx$			
		$cx = 16.850$			
		$cx = 16.9$ km			
	(c)	Time taken to complete the road $= 16.850 \div 12$			
		=1.404 hrs =1 hr 24.24min =84.2 min			
14	(a)	$\angle ABC = 65$ (angles in opp seg)			
		$\angle ACB = 180 - 23 - 65$			
		$\angle ACB = 92^{\circ}$			

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		Since angle ACB is not 90°, AB cannot be diameter of circle as right angle in semi-circle property is not valid in this case			
	b(i)	$\angle SRT = 27^\circ$ (angles in the same segment)			
	bii	$\angle TOS = 27^\circ \times 2$ $= 54^\circ$ (angle in centre is 2 times angle are circumference)			
	biii	$\angle APR = \frac{180-54}{2}$ (tangent from an external point)			
		$= 63^\circ$			
		$\angle RPS = 90^\circ - 63^\circ$ (tangent perpendicular to radius)			
		$= 27^\circ$			
15	(a)	$s = k\sqrt{r}$			
		When $s = 168$, $r = 16$ $168 = k\sqrt{16}$			
		$k = 42$			
		Equation is $s = 42\sqrt{r}$			
	(b)	When S=100 $s = 42\sqrt{r}$			
		$100 = 42\sqrt{r}$			
		$\sqrt{r} = \frac{100}{42}$			
		$r = 5.67$ (3s.f)			
16		Red balloons= $\frac{40}{100} \times \frac{2}{3}$			
		$= \frac{4}{15}$			
		Yellow balloons = $1 - \frac{4}{15} - \frac{1}{3}$			

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		$=\frac{6}{15}$			
		Total number of balloons $=\frac{15}{6}\times 48$ $=120$			
		Or			
		Let total number of balloons be x			
		Number of blue balloons$=\frac{4}{15}x$			
		Number of red balloons $=\frac{1}{3}x$			
		Number of yellow balloons $=\frac{6}{15}x$			
		$\frac{6}{15}x=48$			
		$x=120$			
17	(a)	Gradient of line $=\frac{-4-2}{1+2}$			
		$=-2$			
		$2=-2(-2)+c$			
		$c=-2$			
		$y=-2x-2$			
	(b)	$y=-2x-2$			
		$2y+x=5$			
		$2(-2x-2)+x=5$			
		$-4x-4+x=5$			
		$x=-3$			
		$y=4$			
18	(a)	Either major arc$=r(2\pi-\theta)+2r$ or Minor arc$=r\theta+2r$ seen			
		$\frac{1}{3}$ Perimeter of major sector = perimeter of minor sector			

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		$\frac{1}{3}[r(2\pi-\theta)+2r]=r\theta+2r$			
		$3r\theta+6r=2\pi r-r\theta+2r$			
		$4r\theta=2\pi r-4r$			
		$\theta=\frac{2\pi r-4r}{4r}$			
		$=\frac{1}{2}\pi-1$			

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19		$16^2 = 6^2 + 12^2 - 2(6)(12)\cos\angle CBD$			
		$\cos\angle CBD = \dfrac{6^2 + 12^2 - 16^2}{2(6)(12)}$			
		$= -\dfrac{19}{36}$			
		$\angle CBD = 121.855$			
		$\angle ABD = 58.1445$			
		$\dfrac{\sin BAD}{12} = \dfrac{\sin 58.1445^\circ}{11}$			
		$\sin BAD = \dfrac{12\sin 58.1445^\circ}{11}$			
		$\sin BAD = 0.926599$			
		$BAD = 67.9^\circ$			
		$BDA = 180^\circ - 67.9^\circ - 58.1445$ $= 53.9^\circ$			

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1	(a)	$\frac{1}{2}\times AB\times BC\times\sin ABC=56.8$			
		$\frac{1}{2}\times 18.7\times 12.8\times\sin ABC=56.8$			
		$\sin ABC=\frac{56.8}{\frac{1}{2}\times 18.7\times 12.8}$			
		$\angle ABC=28.3^\circ$ or 151.7°			
1	(bi)	$(OP)^2=9^2+6^2$			
		$=117$			
		$(RS)^2=10^2-9^2$			
		$=19$			
		$(RS)^2=(QP)^2$			
		$(OQ)^2=10^2+6^2$			
		$=136$			
		$OP^2+QP^2=OQ^2$			
		$117+19=136$			
		By converse of Pythagoras theorem, $\angle OPQ=90^\circ$			
1	(bii)	$(\frac{1}{2}\times 10\times 6)+(\frac{1}{2}\times 9\times\sqrt{19})+(\frac{1}{2}\times 9\times 6)$ $+(\frac{1}{2}\times\sqrt{117}\times\sqrt{19})+6\times\sqrt{19}$			
		$=126\ \text{cm}^2$			
2	(a)	$\angle QAN=\angle PMB$ (corresponding angle parallel lines) $PM//CA$			
		$\angle AQN=\angle MPB$ (corresponding angle parallel lines)			
		$AN=MB$ (because $AM=MB$)			
		$\triangle ANQ\equiv\triangle MBP$ (AAS)			
2	(bi)	$\angle PMB=XMN$ (shared angle)			
		$\angle MNX=\angle MBP$ (corresponding angle)			

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		$\angle MXN = \angle MPB$ (corresponding angle)			
		$\triangle MNX$ is similar to $\triangle MBP$ by AAA			
	(bii)	$MX:MP = 3:4$			
		$\frac{MX}{MP} = \frac{XN}{PB}$			
		$\frac{3}{4} = \frac{12}{PB}$			
		$PB = \frac{12 \times 4}{3}$			
		$PB = 16$ cm			
3	(a)	$\frac{5x}{4x-3y} - \frac{7y}{6y-8x}$ $= \frac{5x(-2)}{(6y-8x)} - \frac{7y}{(6y-8x)}$ $= \frac{-10x-7y}{(6y-8x)}$ or $\frac{10x+7y}{(8x-6y)}$			
	(bi)	sub $a=-1$, $b=2$, $k=1$ and $x=-3$ into equation			
		$p = (-1) + \frac{2(-3)^2}{3(1)}$			
		$p = 5$			
	(bii)	$p = a + \frac{bx^2}{3k}$			
		$3k(p-a) = bx^2$			
		$\frac{3k(p-a)}{b} = x^2$			
		$x = \pm\sqrt{\frac{3k(p-a)}{b}}$			
4	(ai)	$\frac{154+155}{2} = 154.5$			
	(aii)	155			
	(b)	$\frac{25}{100} \times 24 = 6$			

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		$=161\text{cm}$			
	(c)	Identifying 1 students			
		$\frac{1}{24}$			
5	(a)	Let r be the radius.			
		$\sin\angle AOX = \frac{8}{10}$			
		$\angle AOX = 53.1301$			
		$\angle AOB = 53.1301\times 2$			
		$\angle AOB = 105.2602$ $=106.3^{8}$			
	(b)	Area of concrete used = Area of Sector $-$ Area of ΔAOB			
		$=\frac{106.3}{360}\times\pi(10)^2 - \frac{1}{2}\times(10)^2\sin(106.3)$			
		$=44.7295$			
		Volume used $=44.7295\times 900$			
		$=40256.55$			
		$\approx 40300\ \text{m}^3$			
	(c)	$5\text{ cm}:10\text{ m}$ $1\ :200$			
		Curved surface area of ceiling AYB			
		$=\frac{360-2(53.1301)}{360}\times 2\pi(1000)(90000)$			
		$=398573860\ cm^2$			
		Curved surface area of model's ceiling			
		$=\left(\frac{1}{200}\right)^2\times 398573860$			
		$=9964.35$			
		$\approx 9960\ \text{cm}^2$			
		Or			
		$\frac{360-106.3}{360}\times 2\pi(5)(450)$			

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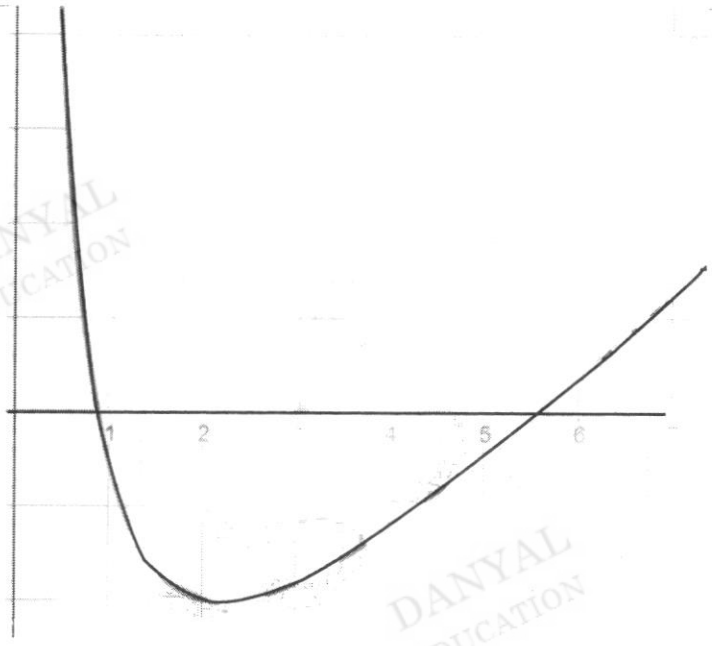
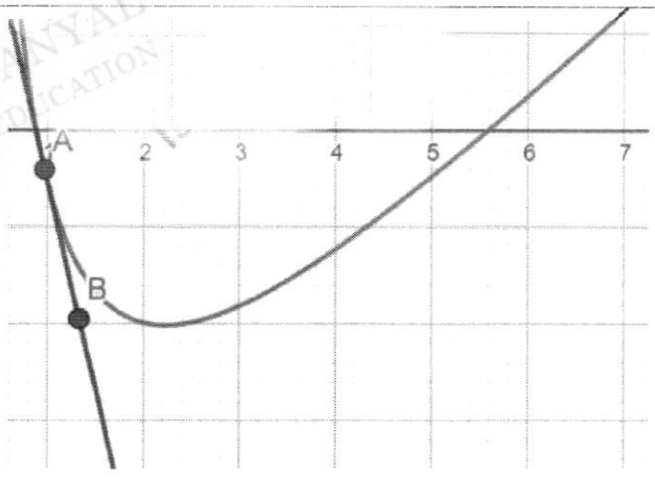
		$=22.14299\times(450)$			
		$=9960$			
6	(a)	$p=-2$			
	(b)				
	(c)	$y = 2x + 0.5$			
		$x = 0.65$			
	(d)				
		Gradient = -4			

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7	(ai)	$\frac{115}{x}$			
	(aii)	$\frac{110}{x-3}$			
	(b)	$\frac{110}{x-3}-\frac{115}{x}=\frac{40}{60}$			
		$\frac{110x-115x+345}{x(x-3)}=\frac{2}{3}$			
		$3(345-5x)=2x^2-6x$			
		$2x^2-6x+15x-1035 \quad 0$			
		$2x^2+9x-1035=0$			
	(c)	$x=\frac{-9\pm\sqrt{9^2-4(2)(1035)}}{2(2)}$			
		$x=\frac{-9\sqrt{8361}}{4}$			
		$x \quad 20.61$ or $x=-25.11$			
	(d)	Speed cannot be negative			
	(e)	Time taken by Timothy $=\frac{110}{(20.610-3)}$			
		= 6 hrs 14 min and 47 s			
8	(a)	$360^\circ-90^\circ-\frac{(5-2)180^\circ}{5}$			
		$=162^\circ$			
	(b)	$\frac{(n-2)180^\circ}{n}=162^\circ$			
		$180^\circ n-360^\circ=162n$			

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		$18n = 360$ $n = 20$			
		or			
		$\frac{(5-2)180^{\circ}}{5} = 108^{\circ}$			
		$108^{\circ} - 102^{\circ} = 18$			
		$\frac{360}{18} = 20$			
9	(a)	I-trip card exchange $= 500 \times 1.154$			
		$= 577$ NZD			
		Resolute card exchange $\frac{500}{0.8722}$ $= 573.26$NZD			
		He should choose I-trip because it gives him more New Zealand dollar.			
	(b)	Total expenses			
		$14(40 + 100 + 45 + 20) = 2870$			
		$2 + (1780 + 300)$			
		Package with video for thrilljump $= 380 \times 2 \times 0.85$			
		$=646$NZD$=\$559.79$			
		Package with video for jumpfree $= 660 \div 1.154$			
		$= \$571.92$			
		Total cost $= \$2870 + \$4160 + \$559.79$			
		$=\$7589.79$(with video from jumpfree)			
		Or			
		Total cost $= \$2870 + \$4160 + \$571.92$			
		$=\$7601.92$(with video from thrilljump)			
		For justification and rationale.			