2020 SA2

2E

CONVENT OF THE HOLY INFANT JESUS SECONDARY
Secondary 2 Express
End-of-Year Examination 2020

CANDIDATE NAME

CLASS 2/ REGISTER NUMBER

MATHEMATICS 4048/01

Paper 1

5 October 2020

Candidates answer on the Question Paper.

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces provided.
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 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 number of marks for this paper is 50.

For examiner's use only

Question number	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

This document consists of **10** printed pages and **2** blank pages.

[Turn over

Answer **all** the questions.

1 Expand

(a) $(x+3)(4x-5)$,

Answer ..... [1]

(b) $2(5-x)-(2x+3)^2$.

Answer ..... [2]

---

2 John is twice as old as Peter this year.
10 years ago, John was four times as old as Peter.
How old is John this year?

Answer .....years old [2]

---

3 Simplify

(a) $\dfrac{(ab)^2}{3bc} \div 2a$,

Answer ..... [2]

(b) $\dfrac{x^2-4}{x+2} \times \dfrac{x+1}{x^2-3x-4}$.

Answer ..... [2]

---

4 **(a)** Simplify $(x-y)^2+2xy$,

Answer ..... [1]

(b) Hence, solve $(299)^2 + 2(300)$.

Answer ..... [1]

---

5 **(a)** Solve the inequality $\frac{x}{2}+1 \leq x+3 < 7$.

Answer ..... [2]

(b) Write down the largest possible prime number, x.

Answer ..... [1]

---

6 $X = \frac{z(y+3)}{4-y}$

(a) Calculate the value of X when $z = -1$ and $y = -4$.

Answer $X =$ ..... [1]

(b) Rearrange the formula to make y the subject.

Answer ..... [2]

---

7 Factorise the following completely.

(a) $6xy+1-3x-2y$,

Answer ..... [2]

(b) $4x^2-14xy-8y^2$.

Answer ..... [2]

---

8 Solve

(a) $7p^2=77p$,

Answer ..... [2]

(b) $\frac{p}{p+1}=\frac{1}{2p}$.

Answer ..... [2]

---

9 Simplify

(a) $\frac{3}{x+1} - \frac{4}{x+2}$,

Answer ..... [2]

(b) $\frac{y}{y-1} + \frac{y-1}{2(1-y)^2}$.

Answer ..... [3]

10 In December, Grace bought $(2x - 1)$ cups for \$300.

(a) Write down, in terms of x, an expression for the cost price of each cup.

Answer \$ ..... [1]

In January, she sold $(x + 2)$ of the cups for \$300.

(b) Write down, in terms of x, an expression for the selling price of each cup.

Answer \$ ..... [1]

(c) Given that Grace only made a profit of \$10 on each cup, form an equation that represents this information and show that it reduces to $2x^2 - 27x + 88 = 0$.

Answer

[3]

(d) Solve the equation $2x^2 - 27x + 88 = 0$.

Answer ..... [2]

(e) Find the number of cups left unsold.

Answer ..... cups [1]

11 The variables x and y are connected by the equation $y = -2 - \frac{5x}{2} + \frac{x^2}{4}$.

The table below gives some values of x and the corresponding values of y.

x	–2	0	2	4	6	8	10	12
y	4	–2	–6	–8	–8	–6	–2	4

(a) Write down the equation of the line of symmetry of the curve.

Answer ..... [1]

(b) Using a scale of 1 cm to represent 1 unit, draw a horizontal x-axis for $-2 \le x \le 12$.
Using a scale of 1 cm to represent 1 unit, draw a vertical y-axis for $-9 \le y \le 4$.
On your graph, plot the points given in the table and join them with a smooth curve. [3]

(c) Using your graph, find

(i) the minimum value of $-2 - \frac{5x}{2} + \frac{x^2}{4}$,

Answer ..... [1]

(ii) the values of x when $y = -3$,

Answer $x =$ ..... or ..... [2]

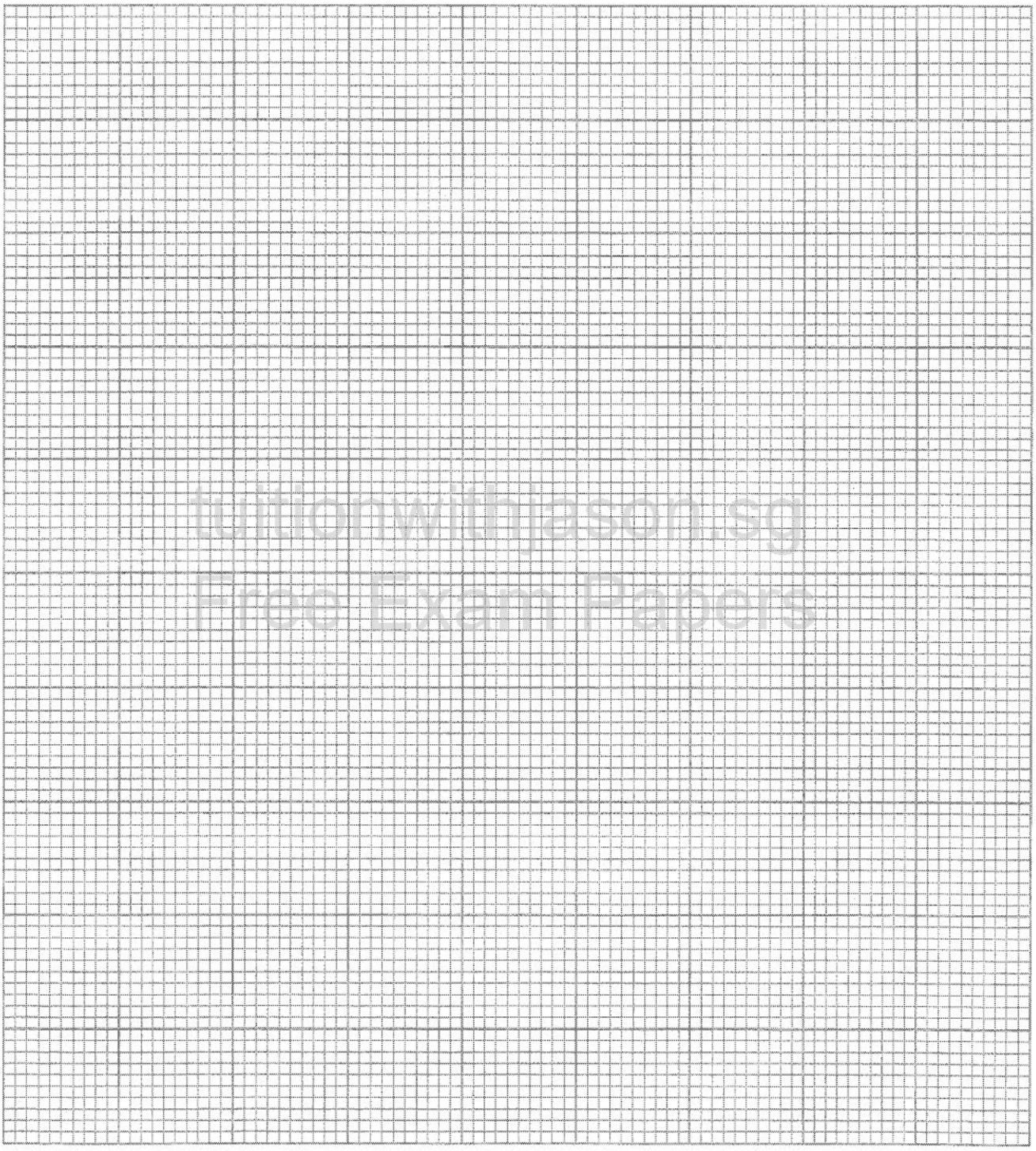
(d) By drawing a tangent, find the gradient of the curve at the point (2, –6).

Answer ..... [2]

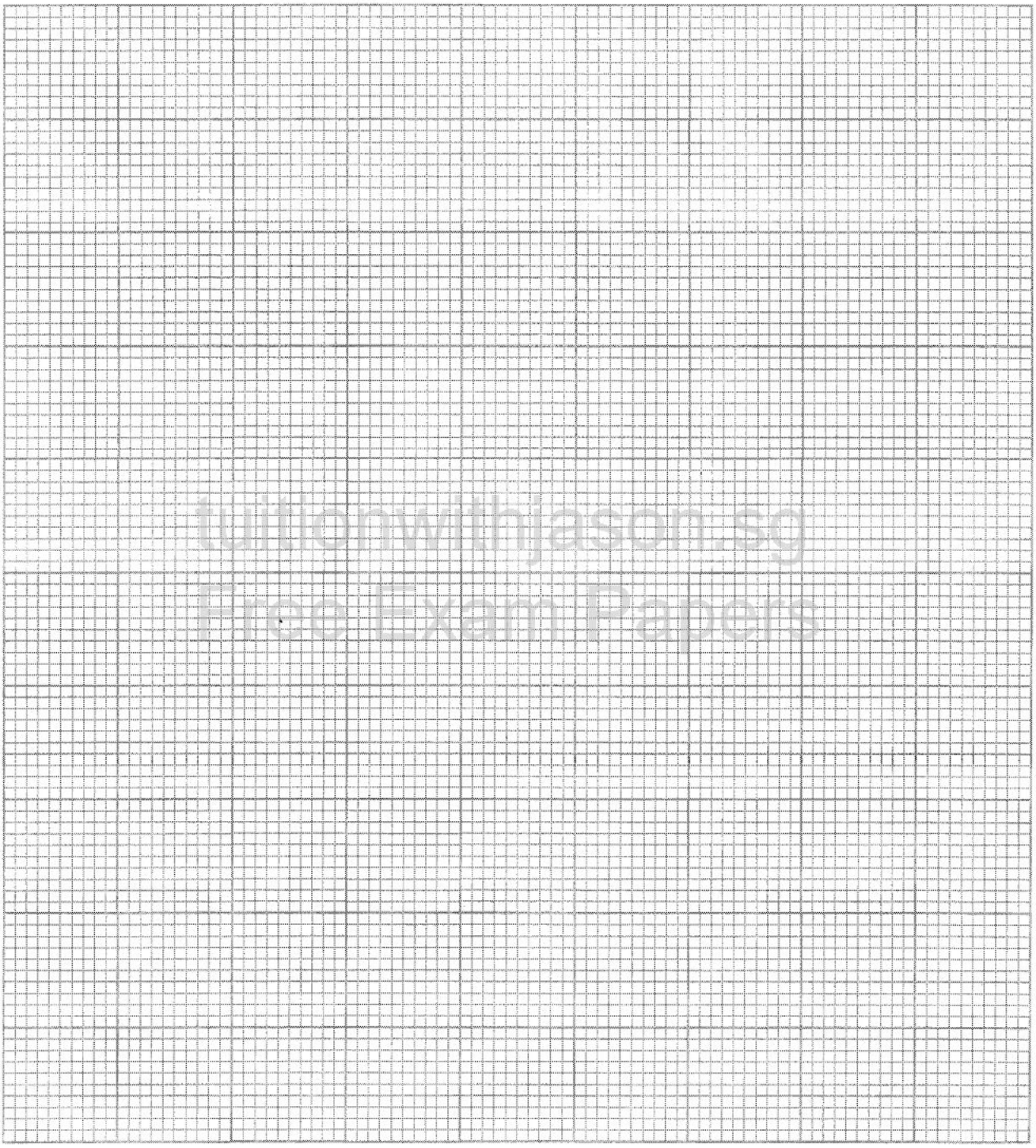
(e) **(i)** On the same axes, draw the line $y = 3 - \frac{x}{4}$ for $-2 \le x \le 12$. [1]

(ii) Write down the x-coordinates of the points where the line intersects the curve.

Answer $x =$ ..... or ..... [2]



Use this graph paper only if you need additional graph paper for Question 11.



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CONVENT OF THE HOLY INFANT JESUS SECONDARY
Secondary 2 Express
End-of-Year Examination 2020

CANDIDATE NAME

CLASS 2/ ☐ REGISTER NUMBER ☐☐

MATHEMATICS

4048/02

Paper 2

06 October 2020

Candidates answer on the Question Paper.

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces provided.
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1	
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5	
6	
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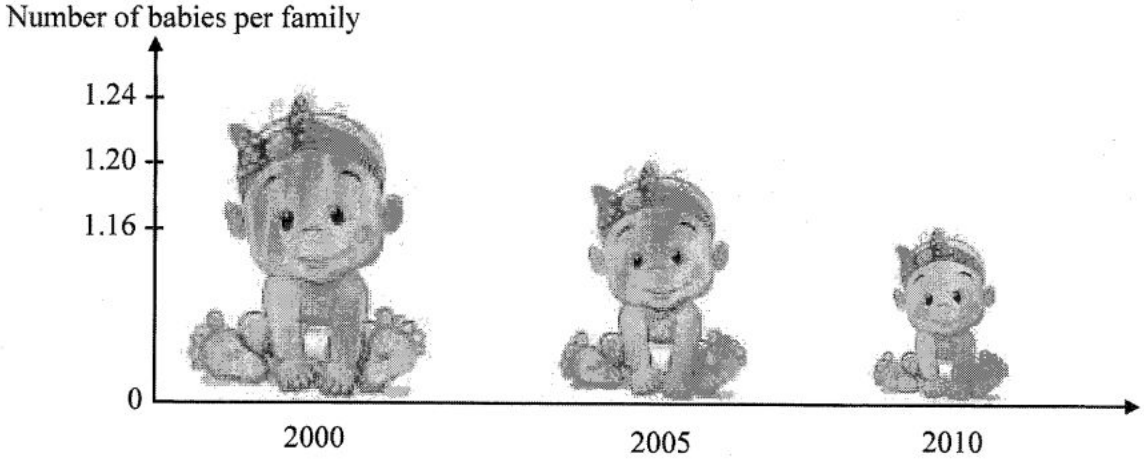
9	
10	
11	
12	
13	
14	
15	
Total	

Answer **all** the questions.

1 The graph shows the birthrate of babies born in Singapore.

Declining Birth Rate in Singapore

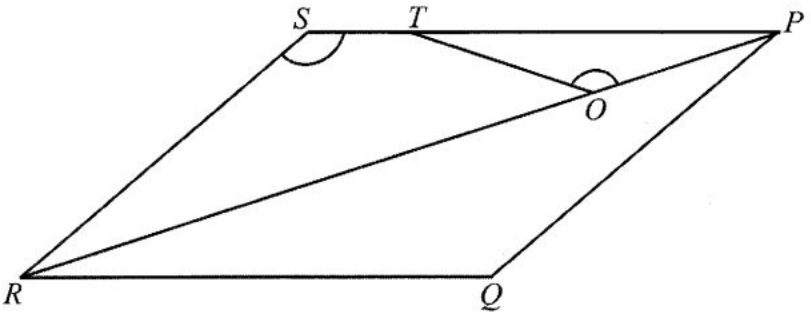


State two aspects of this graph that may be misleading and explain how each may lead to a misinterpretation of the graph.

Answer

[2]

2



$PQRS$ is a parallelogram.
O is a point on diagonal PR such that $\angle PSR = \angle POT$.

(a) Name a pair of congruent triangles.

Answer Δ..... ≡ Δ..... [1]

(b) Name a pair of triangles that are similar but not congruent.

Answer Δ..... is similar to Δ..... [1]

3

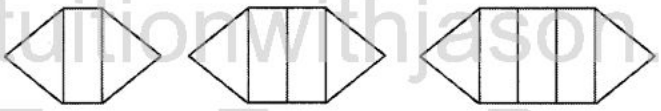


Figure 1 | Figure 2 | Figure 3 | Figure 4 | Figure 5

The second, third and fourth figures of a sequence are shown.

(a) Draw in the first and fifth figures. [2]

(b) Write down, the number of rectangles and the number of triangles in the n^{th} figure.

Answer ..... rectangles and ..... triangles [1]

---

4 An area of 2 cm^2 on map A represents a land of area 50 m^2.
A bridge on map A is 3 cm long.

(a) Find the actual length, in m, of the bridge.

Answer ..... m [2]

(b) A length of 2 cm on map B represents the length of the same bridge.
Find the scale of map B in the form 1 : n.

Answer ..... : ..... [1]

---

5 The first four terms of a sequence are 29, 17, 5, –7...

(a) Write down an expression in terms of n, for the nth term of this sequence.

Answer ..... [1]

(b) Evaluate T_{67}.

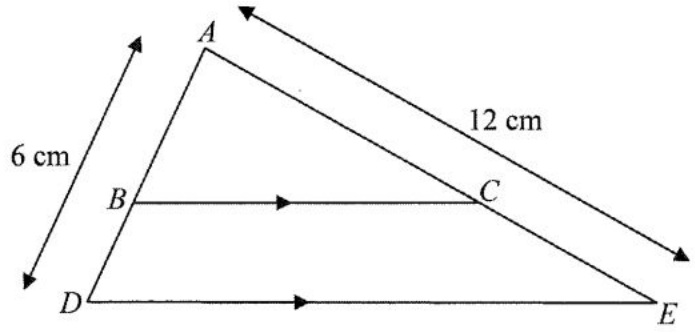
Answer ..... [1]

(c) Is –1287 a term of this sequence? Explain your answer.

Answer ..... [1]

---

6 In triangle ADE, B and C are points on AD and AE such that $BC//DE$.
$AD = 6$ cm, $AE = 12$ cm and $AB = CE$.



(a) Fill in the blanks.

$\angle ABC = \angle$_____ (corresponding $\angle$s, $BC//DE$)

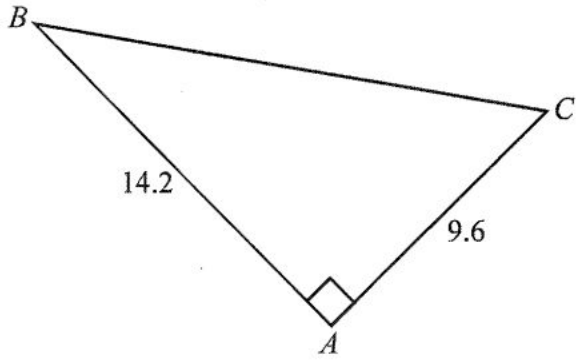
$\angle A$ is _____

$\therefore$ ΔABC is similar to _____ [1]

(b) Calculate CE.

Answer..... cm [2]

7



Buoys A, B and C are at sea level.
AB is perpendicular to AC. $AB = 14.2$ km and $AC = 9.6$ km.

(a) Calculate BC.

Answer..... km [1]

(b) A boat, T, travels in a straight line from B to C.
Calculate the shortest distance of T from A during this journey.

Answer..... km [2]

8 In triangle PQR, $PQ = 53$ cm, $QR = 45$ cm and $PR = 28$ cm.

(a) Explain why triangle PQR is right-angled.

Answer

[2]

(b) Explain why angle $PRQ = 90°$.

Answer

[1]

---

9 Adele has 3 cards labelled 19, 20 and 25.
She has another 3 cards labelled X, Y and Z.
The mean and median of the six cards is 21.5 and 21 respectively and its mode is an even number.
Given that $X < Y < Z$, find the value of X, Y and Z.

Answer $X =$ ..... [1]

$Y =$ ..... [1]

$Z =$ ..... [1]

---

10 **(a)** p is directly proportional to q^2.
It is known that $p = 6$ when $q = 4$.

(i) Express p in terms of q.

Answer..... [2]

(ii) Find q when $p = 24$.

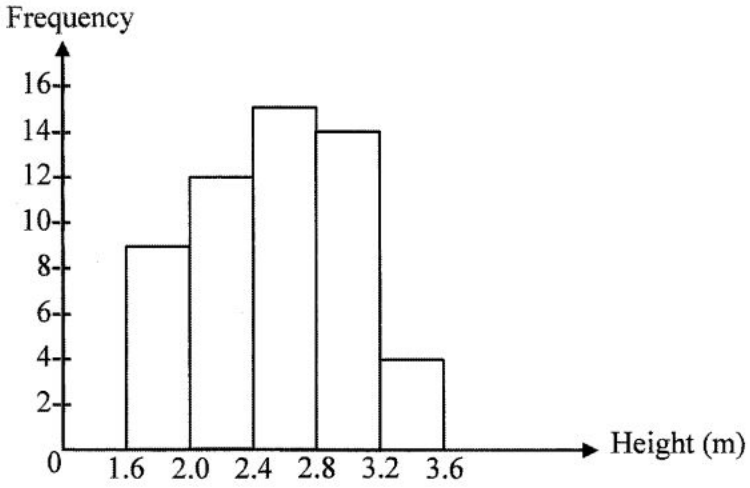
Answer..... [1]

(b) y is inversely proportional to the square root of x.
It is known that $y = 64$ for a particular value of x.

Find the value of y when this value of x is increased by 300%.

Answer..... [2]

11 A histogram showing the heights of a group of apple trees.



(a) Complete the frequency table for the heights of the apple trees.

Height (m)	$1.6 \leq x < 2.0$	$2.0 \leq x < 2.4$	$2.4 \leq x < 2.8$		
Frequency	9	12			

[1]

(b) Write down the modal class of the distribution.

Answer..... [1]

(c) Calculate the estimated mean height of the apple trees.

Answer..... m [2]

12 The times, in seconds, taken by 20 students each from Class A and Class B in a Rubik's puzzle competition were recorded.
The results are shown in the stem-and-leaf diagram.

Class A						Class B				
					11	1	2			
					12					
	9	9	8	8	13	8	9			
5	5	3	3	3	14	4	4	5	9	9
9	7	7	2	2	15	0	6	6	8	
	8	6	5	4	16	3	6	8		
			3	2	17	4	5	7	8	

Key: 8 | 13 represents 13.8 seconds Key: 12 | 1 represents 12.1 seconds

(a) Find the median for

(i) Class A,

Answer.....seconds [1]

(ii) Class B.

Answer.....seconds [1]

(b) Mrs Tang says that the range for each class is the same. Do you agree?

Answer

I _____ with Mrs Tang because _____

_____

[1]

(c) Would mean or median be a better average to use to compare the performance of the classes?
Give a reason for your answer.

Answer

_____ would be a better average because _____

_____

[1]

13

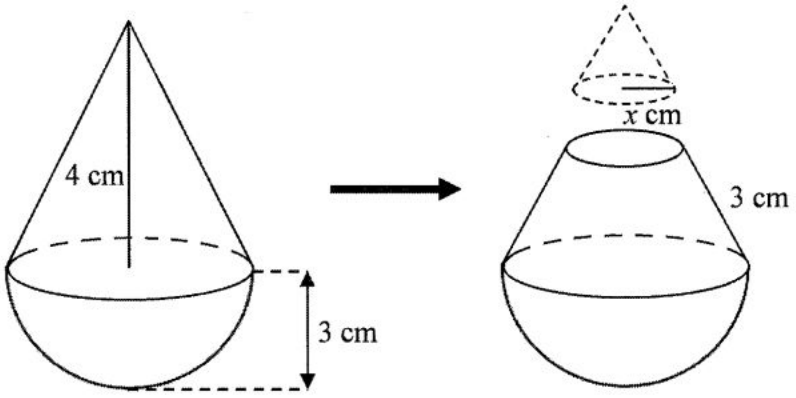


Figure 1 Figure 2

Figure 1 shows a solid made from a cone of height 4 cm and a hemisphere of radius 3 cm.
Mr Lee makes a roly-poly toy by cutting a small cone of base radius x cm from the top of the solid as shown in Figure 2.
The slant height of the frustum is 3 cm.

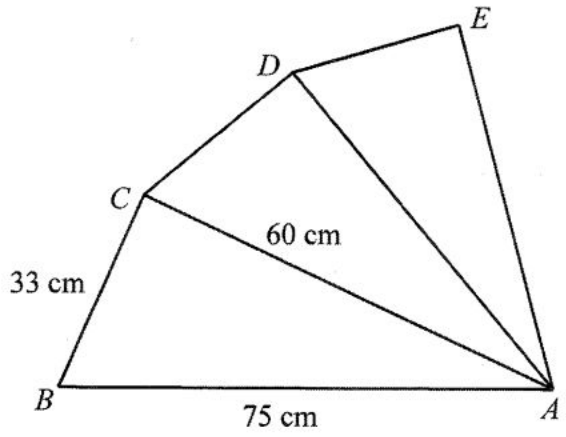
(a) Show that $x = 1.2$ cm.
Answer

[1]

(b) The toy is to be painted and a tin of paint can cover an area of 1000 cm^2.
How many tins of paint must Mr Lee purchase to paint 200 roly-poly toys?

Answer..... tins [3]

14



In the diagram, triangle ABC is similar to triangle ACD and triangle ADE.
Angle $BAE = 75°$, $AB = 75$ cm, $BC = 33$ cm and $AC = 60$ cm.

(a) Calculate angle BCD.

Answer..... [1]

(b) **(i)** Show that $AD = 48$ cm.

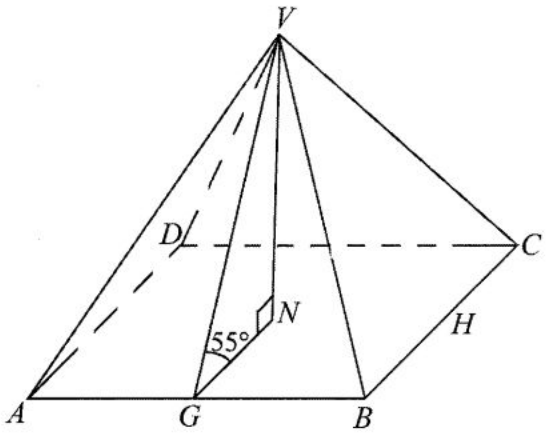
Answer

[1]

(ii) Calculate DE.

Answer..... cm [2]

15



The diagram shows a pyramid *VABCD* with a square base and vertical height *VN*.
G and *H* are midpoints of *AB* and *BC* respectively.
VG is 25 m and angle *VGN* =55°.
Calculate the volume of the pyramid.

Answer..... m^3 [4]

CHIJ

Sec 2 Express End-of-Year Examination 2020 Answer Key

Paper 1		Paper 2	
1	(a) $4x^2+7x-15$ (b) $-4x^2-14x+1$	1	Vertical scale/Missing years in horizontal axis/Misleading title/Width of 'bars'
2	30 years old	2	(a) $\Delta SPR \equiv \Delta QRP$/(a)$\Delta PRS \equiv \Delta RPQ$/(a)$\Delta RSP \equiv \Delta PQR$ (b) ΔPOT *is similar to* $\Delta PSR/\Delta RQP$
3	(a) $\frac{ab}{6c}$ (b) $\frac{x-2}{x-4}$	3	(b) $n-1$ rectangles and 2 triangles
		4	(a) 15m (b) 1:750
		5	(a) $41-12n$ (b) -763 (c) $n=110\frac{2}{3}$. Since n is not an integer, -1287 is not a term of this sequence
4	(a) x^2+y^2 (b) 90001	6	(a) $\angle ADE$, *common/ shared*, ΔADE (b) 4 cm
5	(a) $-4 \le x < 4$	7	(a) 17.1km (b) 7.95km
	(b) 3	8	(a) $PQ^2 = 53^2 = 2809$ $PR^2 + QR^2 = 28^2 + 45^2 = 2809$ Since $PQ^2 = PR^2 + QR^2$, by converse of Pythagoras' Theorem, ΔPQR is right-angled. (b) For any triangle, the longest side is opposite the largest angle. For a right-angled triangle, the longest side is the hypotenuse and is opposite the largest angle, 90°. Thus, $\angle PRQ = 90°$.
6	(a) $X=\frac{1}{8}$ (b) $y=\frac{4X-3z}{z+X}$		
7	(a) $(2y-1)(3x-1)$ (b) $2(2x+y)(x-4y)$	9	$X=20, Y=22, Z=23$
		10	(a)(i) $p=\frac{3}{8}q^2$ (a)(ii) $q=8$ (b) 32
8	(a) $p=0$ or $p=11$ (b) $p=-\frac{1}{2}$ or $p=1$	11	(a) 15 $2.8 \le x < 3.2$, 14 $3.2 \le x < 3.6$, 4 (b) $2.4 \le x < 2.8$ (c) 2.54m
9	(a) $\frac{2-x}{(x+1)(x+2)}$ (b) $\frac{2y+1}{2(y-1)}$ or $\frac{-(2y+1)}{2(1-y)}$	12	(a)(i) 15.2sec (a)(ii) 15.3sec (b) Disagree. Range for A = 3.5s. Range for B = 6.7s (c) Median. There are outliers in Class B which would affect the mean
10	(a) $\$\frac{300}{2x-1}$ (b) $\$\frac{300}{x+2}$ (d) $x=5\frac{1}{2}$ or $x=8$ (e) 5 cups	13	(b) 21
		14	(a) 155° (b)(i) 48cm (b)(ii) 21.12cm
11	(a) $x=5$ (c)(i) $-8.2, -8.25, -8.3$ (c)(ii) 0.3 to 0.5 or 9.5 to 9.7 (d) -1.5 (e)(ii) $x=-1.9$ to -1.8 or 10.75 to 10.9	15	$5610m^3$