

[2]

Answer **all** the questions.

1 Calculate $\frac{\sqrt[3]{1.2} - 0.98^2}{\sqrt{82.1 - 71.4}}$.

Write your answer in standard form.

Answer [1]

2 Consider the following numbers.

$0.\dot{5}$

1

$2\sqrt{3}$

π

5

$\frac{22}{7}$

$\sqrt{289}$

Write down **all** the

(a) prime number(s),

Answer [1]

(b) irrational number(s).

Answer [1]

3 Solve $x(15x - 29) = 14$.

Answer $x =$ or [2]

[3]

- 4 (a) A sum of money was shared equally among Amy, Betty and Cindy.
If Cindy gives Amy \$30, the ratio of the money they have would then
become 4 : 3 : 2.

Find the total sum of money.

Answer \$..... [2]

- (b) The interior angles of a pentagon are in the ratio 1 : 2 : 2 : 3 : 4.

Calculate the largest exterior angle of the pentagon.

Answer° [2]

- 5 A block of wood has a mass of 238 g, correct to the nearest gram.

- (a) Find the greatest possible mass of the block of wood.

Answer g [1]

- (b) The volume of the block of wood is 36 cm^3 , correct to the nearest cubic
centimeters.

Find the least possible mass of 1 cubic centimeter of the block of wood.

Answer g [2]

[4]

- 6 (a) The n^{th} term of a sequence is given by $(n+1)(n+2)$.

Write down the first four terms of the sequence.

Answer , , , [1]

- (b) The first four terms of another sequence are 4, 7, 11 and 16.

- (i) Write down the next term.

Answer [1]

- (ii) Hence or otherwise, write down the n^{th} term of this sequence.

Answer [1]

- 7 Factorise $3(q-2p)^2 - 3p(5p-4q)$ completely.

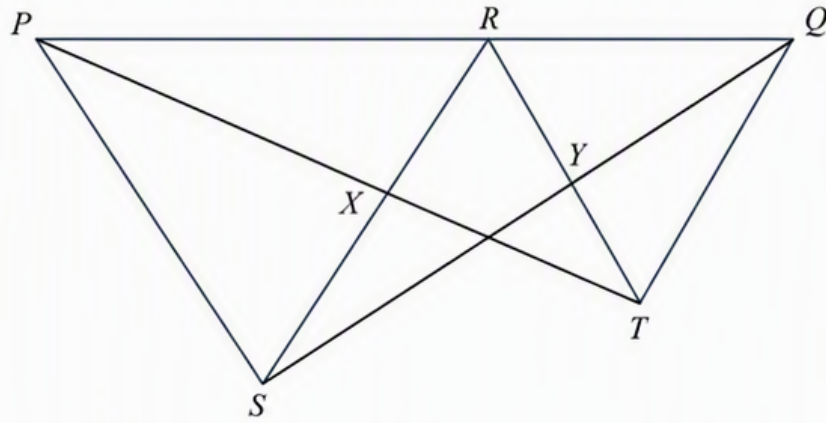
Answer [3]

8 Simplify $(81p^{-3}) \div \left(-\frac{27}{p^6}\right)^{-\frac{1}{3}}$.

Answer [2]

9 Simplify $\frac{24a^2 + 40a - 50}{24ax + 15y - 20x - 18ay}$.

Answer [3]



In the figure, PRS and RQT are equilateral triangles.

PT and RS intersect at X .

SQ and RT intersect at Y .

Show that triangle PRT and triangle SRQ are congruent.

Answer

- 11 (a) Express 252 as a product of its prime factors.

Answer [1]

- (b) Written as a product of its prime factors, $588 = 2^2 \times 3 \times 7^2$.

Find the greatest integer that will divide both 252 and 588.

Answer [1]

- (c) Muesli Bars are sold in packets of 252.
Fruit Candies are sold in packets of 588.
Mr. Tan buys the same number of Muesli Bars and Fruit Candies.

Find the least number of packets of Fruit Candies that Mr. Tan could have bought.

Answer [2]

[8]

- 12** The area of a plot of land on the map is 64 cm^2 .
The actual area of the plot of land on ground is 25 km^2 .

(a) A length on the map measures 28 cm.

Find the actual distance, in kilometers, on ground.

Answer km [2]

(b) Find the area, in cm^2 , on another map if the scale of that map is 1 : 200 000.

Answer cm^2 [2]

- 13 The line PQ is drawn in the answer space below.

Answer

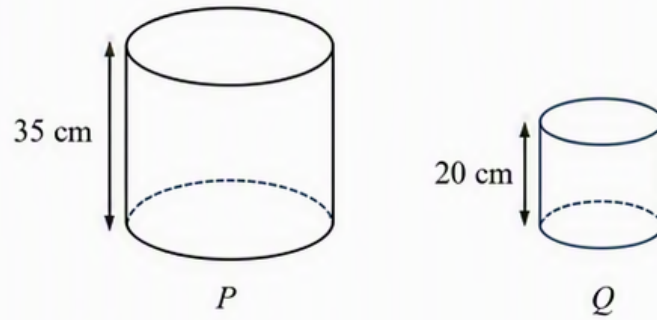


- (a) Construct and label a kite $PQRS$ in which $PQ = PS$, $QR = SR$, $PR = 9$ cm and angle $PQR = 120^\circ$. [2]
- (b) Construct the perpendicular bisector of PQ . [1]
- (c) Construct the bisector of angle QRS . [1]

The point X , inside the kite $PQRS$, is equidistant from RS and RQ and is nearer to P than to Q .

- (d) Label a possible position of point X . [1]
-

- 14 The heights of two geometrically similar containers P and Q are 35 cm and 20 cm respectively.



Container P is filled with water.

James wishes to transfer all the water from container P to container Q .

Assuming James fills each container Q to its brim where possible, determine how many containers Q are needed to contain all the water from container P .

Answer [3]

- 15 A bag contains 3 red cards, 2 green cards and 1 blue card.
Two cards are taken from the bag at random, **without replacement**.

Find the probability that

- (a) both cards taken are red,

Answer [1]

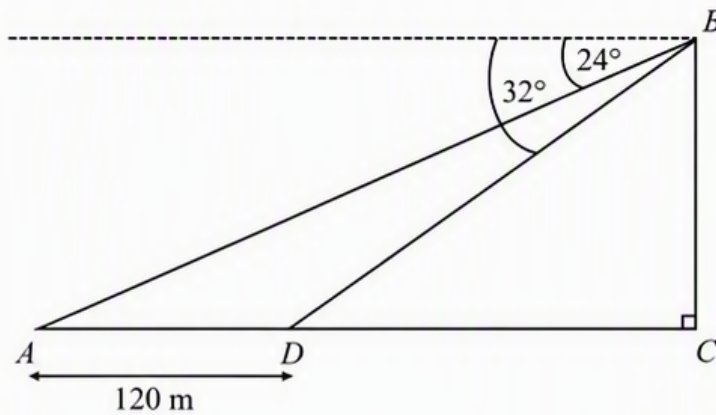
- (b) the two cards taken are of the same colour,

Answer [2]

- (c) the two cards taken are of different colours.

Answer [1]

16



The diagram represents a building, BC , built on horizontal ground.

A , D and C are points on a straight line.

D is 120 m from A .

The angles of depression of A and D from B are 24° and 32° respectively.

Find the height of the building BC .

Answer m [4]

- 17 (a) $\xi = \{\text{integers } x : 25 \leq x < 50\}$
 $A = \{\text{multiples of } 5\}$
 $B = \{26, 30, 34, 40, 44, 48\}$

List the elements in

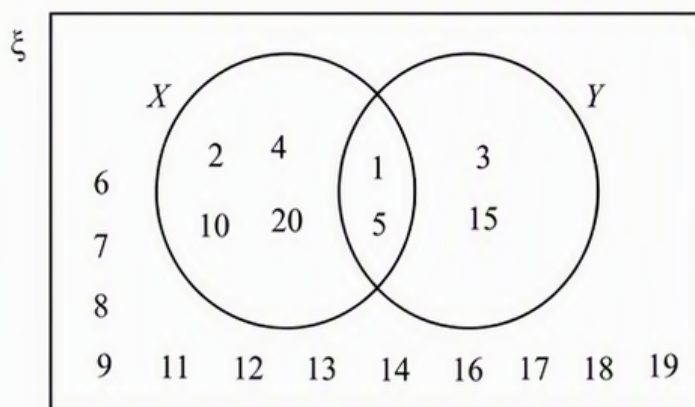
- (i) A ,

Answer [1]

- (ii) $A' \cap B$.

Answer [1]

- (b) The Venn diagram shows the elements of $\xi = \{\text{integers } x : 1 \leq x \leq 20\}$.



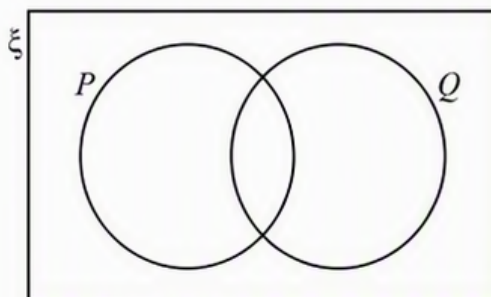
- (i) Describe the elements of set X .

Answer [1]

- (ii) Find the number of elements in $(X \cap Y) \cup (X' \cap Y')$.

Answer [1]

- (c) On the Venn diagram, shade the region which represents $P' \cup Q'$.



[1]

- 18 The expression $11 - 10x - x^2$ can be written as $a - (x + b)^2$.

(a) Find the value of a and of b .

Answer $a = \dots\dots\dots$

$b = \dots\dots\dots$ [2]

- (b) Explain why when $x = -b$, the expression $11 - 10x - x^2$ has a maximum value.

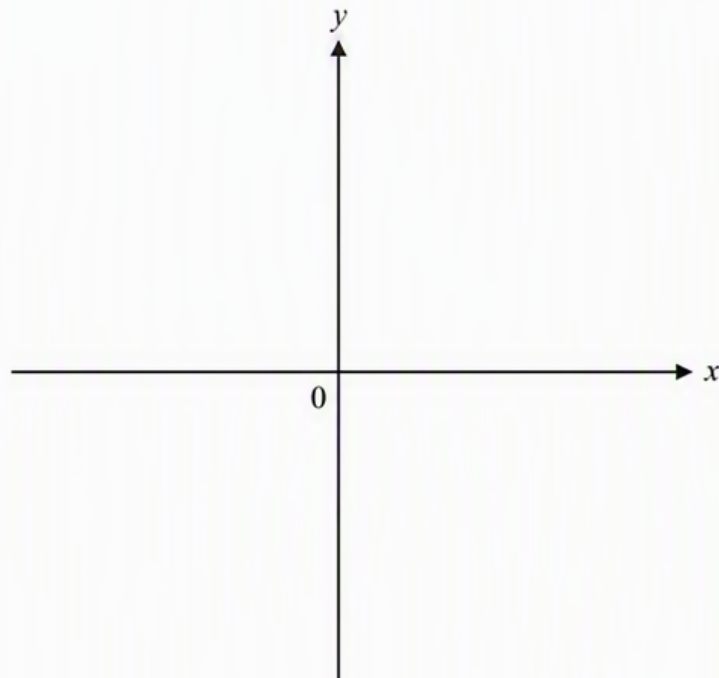
Answer $\dots\dots\dots$

$\dots\dots\dots$

$\dots\dots\dots$ [1]

- (c) Sketch the graph of $y = 11 - 10x - x^2$, indicating the coordinates of all the intercepts and the turning point clearly.

Answer



[2]

19

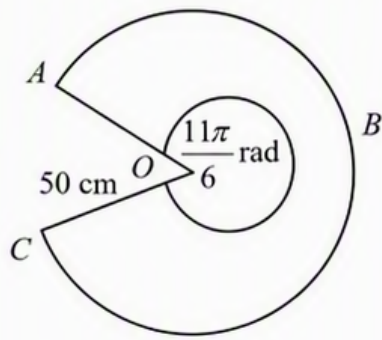


Diagram I

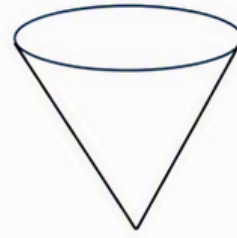


Diagram II

Diagram I shows a sector of a circle of radius 50 cm and reflex angle $AOC = \frac{11\pi}{6}$ radians. It is then folded to form a cone as shown in Diagram II.

- (a) Find, in terms of π , the length of the major arc ABC .

Answer cm [1]

- (b) Show that the radius of the cone in Diagram II is $45\frac{5}{6}$ cm.

Answer

[1]

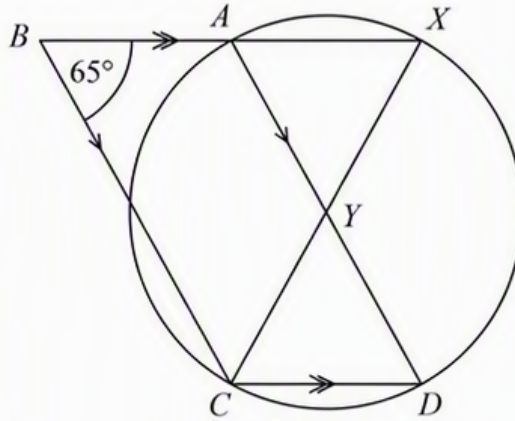
(c) Find the height of the cone.

Answer cm [2]

(d) Find the volume of the cone.

Answer cm³ [1]

- 20 In the diagram, A , C , D and X are points on the circumference of a circle. Angle $ABC = 65^\circ$, $ABCD$ is a parallelogram and BAX is a straight line. AD intersects CX at Y .



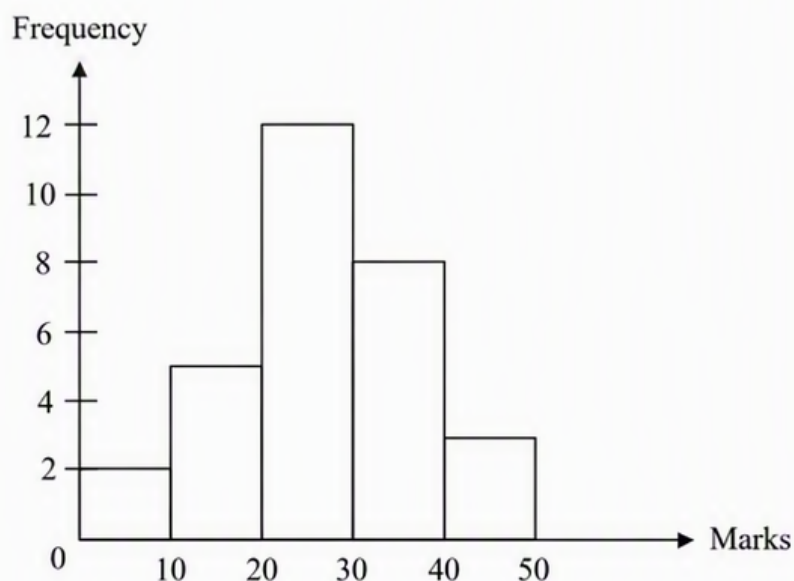
- (a) Calculate angle AXC .
Give a reason for each step of your answer.

Answer $^\circ$ [3]

- (b) Given that $\triangle AYX \equiv \triangle CYD$, find angle CAD .

Answer $^\circ$ [2]

- 21** 30 students of class A took a Mathematics test.
The distribution of their marks is shown in the histogram below.



- (a)** Calculate an estimate for

- (i)** the mean marks,

Answer [1]

- (ii)** the standard deviation of the marks.

Answer [1]

Another 30 students of class B took the same Mathematics test.
The mean marks and the standard deviation obtained by class B are 30 marks and 11.5 marks respectively.

- (b)** Make two comparisons between the performance of class A and class B in the Mathematics test.

Answer

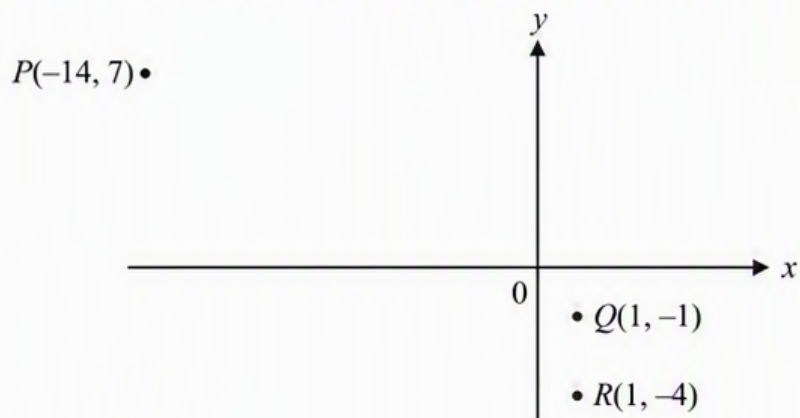
1

.....

2

..... [2]

- 22 The diagram shows three points $P(-14, 7)$, $Q(1, -1)$ and $R(1, -4)$.



Find

- (a) the exact value of $\cos \angle PQR$,

Answer [1]

- (b) the length of PR ,

Answer units [1]

- (c) the perpendicular distance from Q to PR .

Answer units [2]

- 23 The table below shows the number of cups of drinks sold by three different shops in a single day.

	Coffee	Tea	Juice	Matcha
Shop A	62	90	21	32
Shop B	40	56	18	28
Shop C	86	64	32	30

- (a) Represent the above information by a 3×4 matrix **M**.

Answer **M** = [1]

Each shop sells the drinks at a standard price of \$4.50, \$3.60, \$2 and \$3 for a cup of coffee, tea, juice and matcha respectively.

- (b) Represent the selling prices of the drinks by a 4×1 matrix **N**.

Answer **N** = [1]

- (c) Evaluate **T** = **MN**.

Answer **T** = [2]

- (d) Evaluate **S** = $(1 \ 1 \ 1)\mathbf{T}$.

Answer **S** = [1]

- (e) Explain what the element(s) of **S** represent.

Answer
 [1]

- 24 Figure I shows a regular hexagon of sides 7 cm.

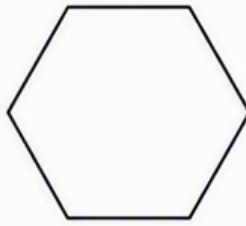


Figure I

- (a) Show that the area of the hexagon in Figure I, correct to the nearest whole number, is 127 cm^2 .

Answer

[1]

Figure II shows a right solid pyramid of height 24 cm.

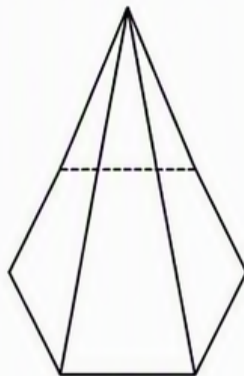


Figure II

The base of the pyramid is a regular hexagon of sides 7 cm.

- (b) Find the volume of the pyramid, giving your answer correct to 2 decimal places.

Answer cm^3 [1]

- (c) Calculate the cost of painting the pyramid if the cost of painting is 40 cents per cm^2 .

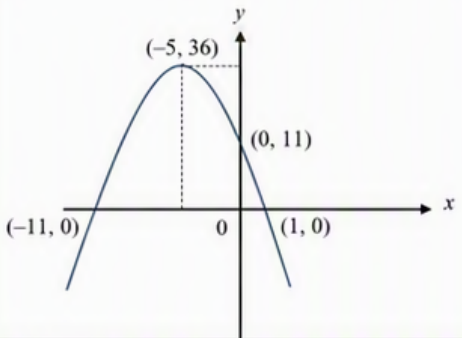
Answer \$..... [4]

End of Paper

Solutions

Question No.	Solution
1	$0.031261 \approx 3.13 \times 10^{-2}$
2a	$5, \sqrt{289}$
2b	$2\sqrt{3}, \pi$
3	$x = -\frac{2}{5}$ or $x = \frac{7}{3}$
4a	\$270
4b	135°
5a	238.4 g
5b	238.5g
6a	238.49
6b(i)	6.5 g
6a	6, 12, 20, 30
6b(i)	22
b(ii)	$T_n = \frac{(n+1)(n+2)}{2} + 1$
7	$3(q-p)(q+p)$
8	$-\frac{243}{p^5}$
9	$\frac{2(2a+5)}{4x-3y}$
10	$\triangle PRT \cong \triangle SRQ$ (SAS Congruency Test)
11a	$252 = 2^2 \times 3^2 \times 7$
11b	84
11c	3
12a	Actual distance = 17.5 km
12b	Area on map = 6.25 cm^2
13	
14	6(round up)
15a	$\frac{1}{5}$
15b	$\frac{4}{15}$
15c	$\frac{11}{15}$
16	186 m
17a(i)	$A = \{25, 30, 35, 40, 45\}$

17a(ii)	$A' \cap B = \{26, 34, 44, 48\}$
17b(i)	The elements of set X are the factors of 20.
17b(ii)	14
17c	
18a	$a = 36, b = 5$
18b	36

18c	
19a	$\frac{275\pi}{3} \text{ cm}$
19c	20.0 cm
19d	44000 cm ³
20a	65°
20b	25°
21a(i)	$26\frac{2}{3}$
21a(ii)	10.4
21b	1. Class B generally did better as their mean marks (30 marks) was higher than that of Class A ($26\frac{2}{3}$ marks). 2. The marks scored by Class A were more consistent than Class B as its value of standard deviation (10.4 marks) is lower than that of Class B (11.5 marks).
22a	$-\frac{8}{17}$
22b	18.6 unit
22c	2.42 units
23a	$\mathbf{M} = \begin{pmatrix} 62 & 90 & 21 & 32 \\ 40 & 56 & 18 & 28 \\ 86 & 64 & 32 & 30 \end{pmatrix}$
23b	$\mathbf{N} = \begin{pmatrix} 4.50 \\ 3.60 \\ 2 \\ 3 \end{pmatrix}$

23c	$\begin{pmatrix} 741 \\ 501.60 \\ 771.40 \end{pmatrix}$
23d	(2014)
23e	The element of S represents the total sales of drinks made by the 3 shops in a single day.
24a	$\begin{aligned} \text{Area} &= \frac{1}{2} \times 7 \times 7 \times \sin 60^\circ \times 6 \\ &= 127.3057 \\ &= 127 \text{ cm}^2 \text{ (nearest whole no.)} \end{aligned}$ 127 cm²
24b	1018.45 cm³ Other answers accepted (based on correct calculations): 1016.00 cm³, 1018.40 cm³, 1018.42 cm³, 1018.43 cm³, 1018.44 cm³, 1018.48 cm³
24c	$\begin{aligned} \text{Cost} &= 647.1334 \times \$0.40 \\ &= \$258.85 \text{ (2 d.p.)} \end{aligned}$ Other answers accepted (based on correct calculations): \$258.86, \$258.73