Solutions to CSEC Maths P2 January 2018

Question 1(a)(i)

Required to calculate $5\frac{1}{2} \div 3\frac{2}{3} + 1\frac{4}{5}$, giving your answer as a fraction in its lowest terms.

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

$= \left(\frac{11}{2} \div \frac{11}{3}\right) + \frac{9}{5}$

$= \left(\frac{11}{2} \times \frac{3}{11}\right) + \frac{9}{5}$

$= \frac{3}{2} + \frac{9}{5}$

$= \frac{15}{10} + \frac{18}{10}$

$= \frac{33}{10}$ as a fraction in its lowest terms.

Question 1(a)(ii)

Required to calculate 165×0.38^2, giving your answer in EXACT value.

$165 \times 0.38^2 = 165 \times 0.38 \times 0.38$

$= 23.826$ (in exact form)

Question 1(b)(i)

Required to write the answer in (a)(ii) correct to two decimal places.

$23.826 = 23.83$ (to two decimal places)

Question 1(b)(ii)

Required to write the answer in (a)(ii) correct to three significant figures.

$23.826 = 23.8$ (to three significant figures)

Question 1(b)(iii)

Required to write the answer in (a)(ii) correct to the nearest whole number.

$23.826 = 24$ (to the nearest whole number)

Question 1(c)(i)

Required to determine the simple interest earned.

Simple Interest earned = Amount received – Principal amount

$= \$5810 - \$5000$

$= \$810$

Question 1(c)(ii)

Required to determine the annual interest paid by the credit union.

$$SI = \frac{P \times R \times T}{100}$$

$$810 = \frac{5000 \times R \times 3}{100}$$

$$810 = 150R$$

$$R = \frac{810}{150}$$

$$R = 5.4\%$$

∴ The annual interest paid by the credit union is 5.4%

Question 1(c)(iii)

Required to determine the length of time it would take for Mr. Adam's investment to be doubled, at the same rate of interest.

The investment is $5000. For the investment to be doubled, the interest amount will have to be $5000.

$$SI = \frac{P \times R \times T}{100}$$

$$5000 = \frac{5000 \times 5.4 \times T}{100}$$

$$100 = 5.4T$$

$$T = \frac{100}{5.4}$$

$T = 18.52$ years (to 2 decimal places)

Question 2(a)(i)

Required to determine the value of $1 * 2$.

$a * b = \sqrt{a + 4b}$

$1 * 2 = \sqrt{1 + 4(2)}$

$= \sqrt{1 + 8}$

$= \sqrt{9}$

$= 3$

Question 2(a)(ii)

Required to determine whether the operation $*$ is commutative and justify your answer.

$a * b = \sqrt{a + 4b}$

$b * a = \sqrt{b + 4a}$

Since $a * b \neq b * a$, then the operation $*$ is not commutative.

Question 2(b)(i)

Required to solve the inequality $3 - 2x > 5$.

$3 - 2x > 5$

$-2x > 5 - 3$

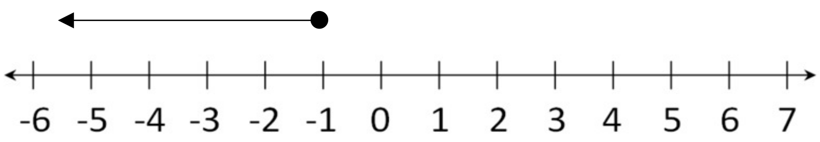
$-2x > 2$

$x < \frac{2}{-2}$

$x < -1$

Question 2(b)(ii)

Required to represent your answer in (b)(i) on the number line.



Question 2(c)(i)

Required to write two equations in x and y to represent the information above.

Let x represent the cost of an adult ticket.

Let y represent the cost of a child ticket.

Since 2 adult tickets at \$$x$ each and 3 children tickets at \$$y$ each cost \$43.00, then the equation is : $2x + 3y = 43$

Since 1 adult ticket at \$$x$ each and 1 child ticket1 at \$$y$ each cost \$18.50, then the equation is : $x + y = 18.50$

Question 2(c)(ii)

Required to solve the equations simultaneously to determine the cost of one adult ticket.

$2x + 3y = 43$ → Equation 1

$x + y = 18.50$ → Equation 2

Multiplying Equation 2 by 3 gives:

$3x + 3y = 55.50$ → Equation 3

Equation 3 – Equation 1 gives:

$x = 12.50$

∴ The cost of 1 adult ticket is $12.50.

Question 3(a)(i)

Required to state the value of $n(P \cup R)$.

$P \cup R = \{b, v, s, d, e, f, i, g\}$

$n(P \cup R) = 8$

Question 3(a)(ii)(a)

Required to list the members of $M \cap P$.

$M \cap P = \{b, d\}$

Question 3(a)(ii)(b)

Required to list the members of $M \cup R'$.

$M = \{k, b, i, d\}$

$R' = \{k, b, v, s, t, w\}$

$M \cup R' = \{k, b, i, d, v, s, t, w\}$

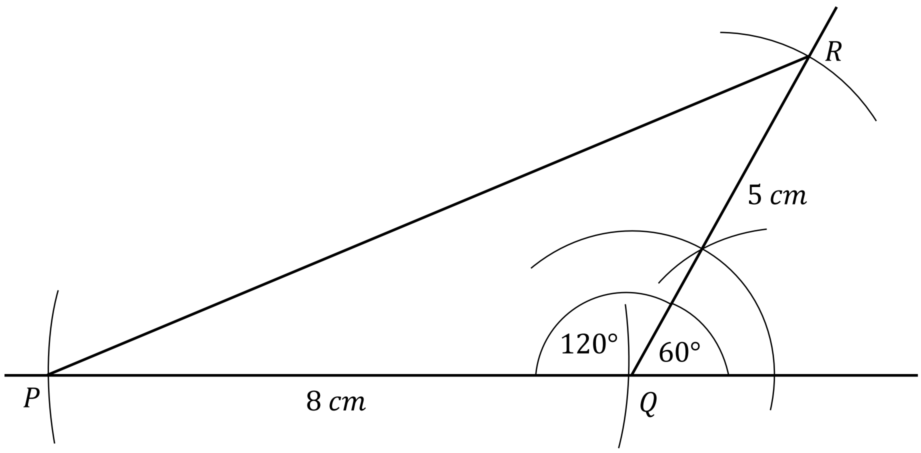
Question 3(b)(i)

Required to use a ruler, a pencil and a pair of compasses to construct triangle PQR.

$PQ = 8\ cm$

Angle $PQR = 120°$

$QR = 5\ cm$



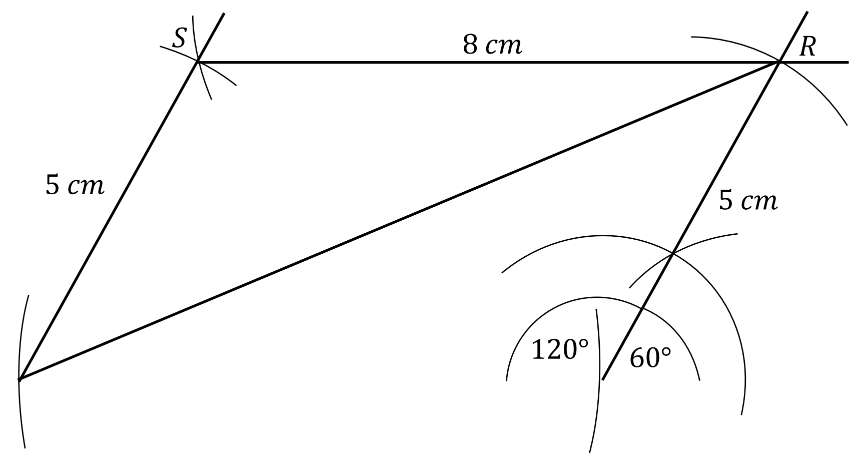
Question 3(b)(ii)

Required to measure and state the length of the side PR.

Acceptable answers for the length of PR are within the range $11.3 \leq PR \leq 11.4\ cm$.

Question 3(b)(iii)

Required to construct the point S, such that $PQRS$ is a parallelogram.



Question 4(a)(i)

Required to write the equation of the line, l, in the form $y = mx + c$.

$3x - 4y = 5$

$-4y = -3x + 5$

Dividing throughout by -4 gives:

$y = \frac{3}{4}x - \frac{5}{4}$

which is of the form $y = mx + c$, where $m = \frac{3}{4}$ and $c = -\frac{5}{4}$.

Question 4(a)(ii)

Required to determine the gradient of the line, l.

$y = \frac{3}{4}x - \frac{5}{4}$

The gradient of the line, $l = \frac{3}{4}$.

Question 4(a)(iii)

Required to determine the value of r.

$y = \frac{3}{4}x - \frac{5}{4}$

Substituting point $P(r, 2)$ gives:

$2 = \frac{3}{4}r - \frac{5}{4}$

$8 = 3r - 5$

$3r = 8 + 5$

$3r = 13$

$r = \frac{13}{3}$

Question 4(a)(iv)

Required to find the equation of the straight line passing through the point $(6, 0)$ which is perpendicular to l.

The gradient of $l = \frac{3}{4}$.

The gradient of the line perpendicular to $l = \frac{-1}{\frac{3}{4}}$

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

Recall: $y - y_1 = m(x - x_1)$

Substituting $m = -\frac{4}{3}$ and the point $(6, 0)$ gives:

$y - 0 = -\frac{4}{3}(x - 6)$

$y = -\frac{4}{3}x + 8$

$\therefore$ The equation of the required line is $y = -\frac{4}{3}x + 8$.

Question 4(b)(i)

Required to draw straight lines $x + y = 10$ and $y = x$ on the grid.

Consider $x + y = 10$.

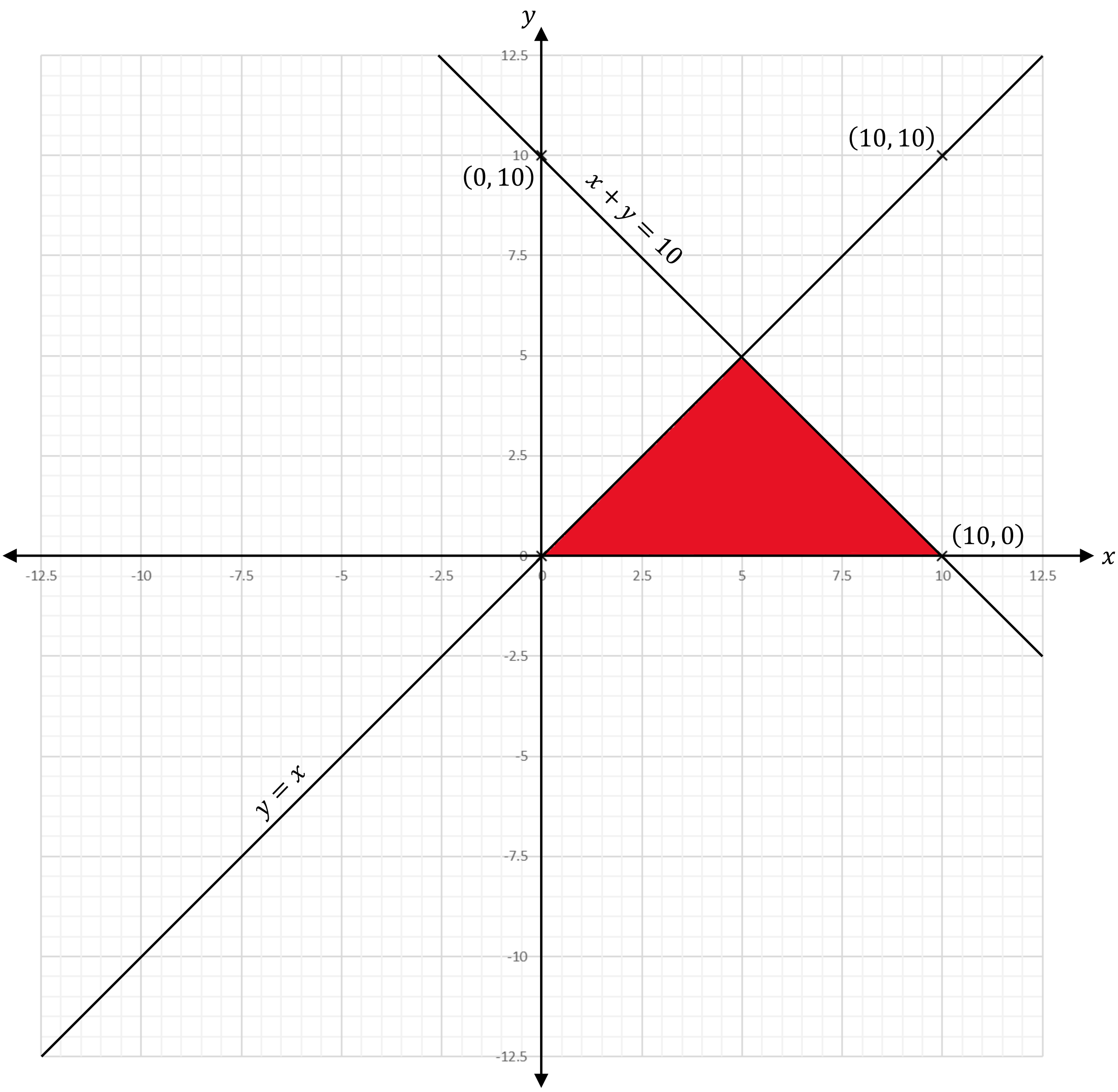
When $x = 0, y = 10$.

When $y = 0, x = 10$.

Consider $y = x$.

When $x = 0, y = 0$.

When $x = 10, y = 10$.



Question 4(b)(ii)

Required to shade the region which satisfies the four inequalities.

Inequalities: $x \geq 0$, $y \geq 0$, $x + y \leq 10$, $x \geq y$

(See graph above)

Question 5(a)(i)

Required to state the name of the polygon given.

The polygon has 6 sides.

Hence, it is a hexagon.

Question 5(a)(ii)

Required to calculate the perimeter of the polygon $EFGHIJ$.

Perimeter of $EFGHIJ = 6 \times 5$

$= 30\ cm$

Question 5(a)(iii)

Required to determine the size of each interior angle of the polygon.

The sum of the interior angles of a polygon of n sides $= 180°(n - 2)$.

The sum of the 6 interior angles of the given hexagon $= 180°(6 - 2)$

$= 180°(4)$

$= 720°$

Each interior angle of the hexagon $= \frac{720°}{6}$

$= 120°$

Question 5(a)(iv)

Required to show that the area of the polygon, to the nearest whole number, is 65 cm^2.

Area of $\Delta OEF = \frac{1}{2}(OE)(OF)\sin E\hat{O}F$

$= \frac{1}{2}(5)(5)\sin 60°$

The hexagon comprises of 6 of these triangles.

$\therefore$ Area of hexagon $= 6 \times \frac{1}{2}(5)(5)\sin 60°$

$= 64.95$

$= 65\ cm^2$ (to the nearest whole number)

Question 5(b)(i)

Required to determine the capacity of the tank, in litres.

Cross-sectional area of the tank = Area of the hexagon

$= 64.95\ cm^2$

After 52 seconds, the volume of water poured $= 75 \times 52$

$= 3900\ cm^3$

The tank is $\frac{2}{5}$ full.

Hence,

$\frac{2}{5}V = 3900$

$V = \frac{3900}{\frac{2}{5}}$

$V = 9750\ cm^3$

Now,

$1000\ cm^3 = 1\ l$

$1\ cm^3 = \frac{1}{1000}$

$9750\ cm^3 = \frac{1}{1000} \times 9750$

$= 9.75\ l$

∴ The capacity of the tank is 9.75 litres.

Question 5(b)(ii)

Required to calculate the height, h, in metres, of the tank.

$V =$ Cross-sectional area $\times h$

$V = 64.95h$

Now,

$\frac{2}{5}V = 3900$

$\frac{2}{5} \times 64.95 \times h = 3900$

$25.98 \times h = 3900$

$h = \frac{3900}{25.98}$

$h = 150\ cm$ (to the nearest whole number)

$100\ cm = 1\ m$

$1\ cm = \frac{1}{100}$

$150\ cm = 1.50\ m$ (to 2 decimal places)

$\therefore$ The height, h, of the tank is $1.50\ m$.

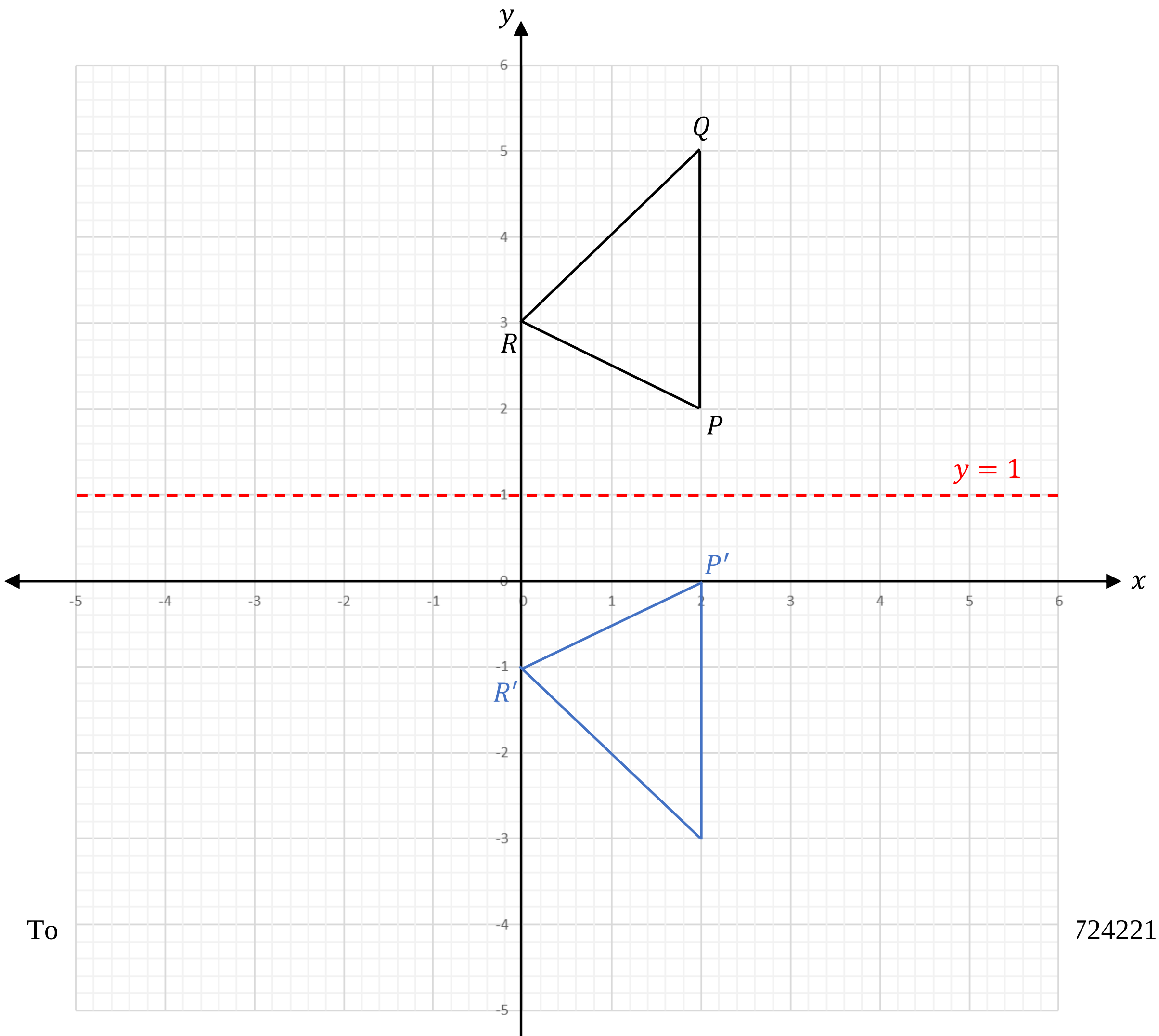
Question 6(a)

Required to state the coordinates of R.

The coordinates of R are $(0, 3)$.

Question 6(b)(i)

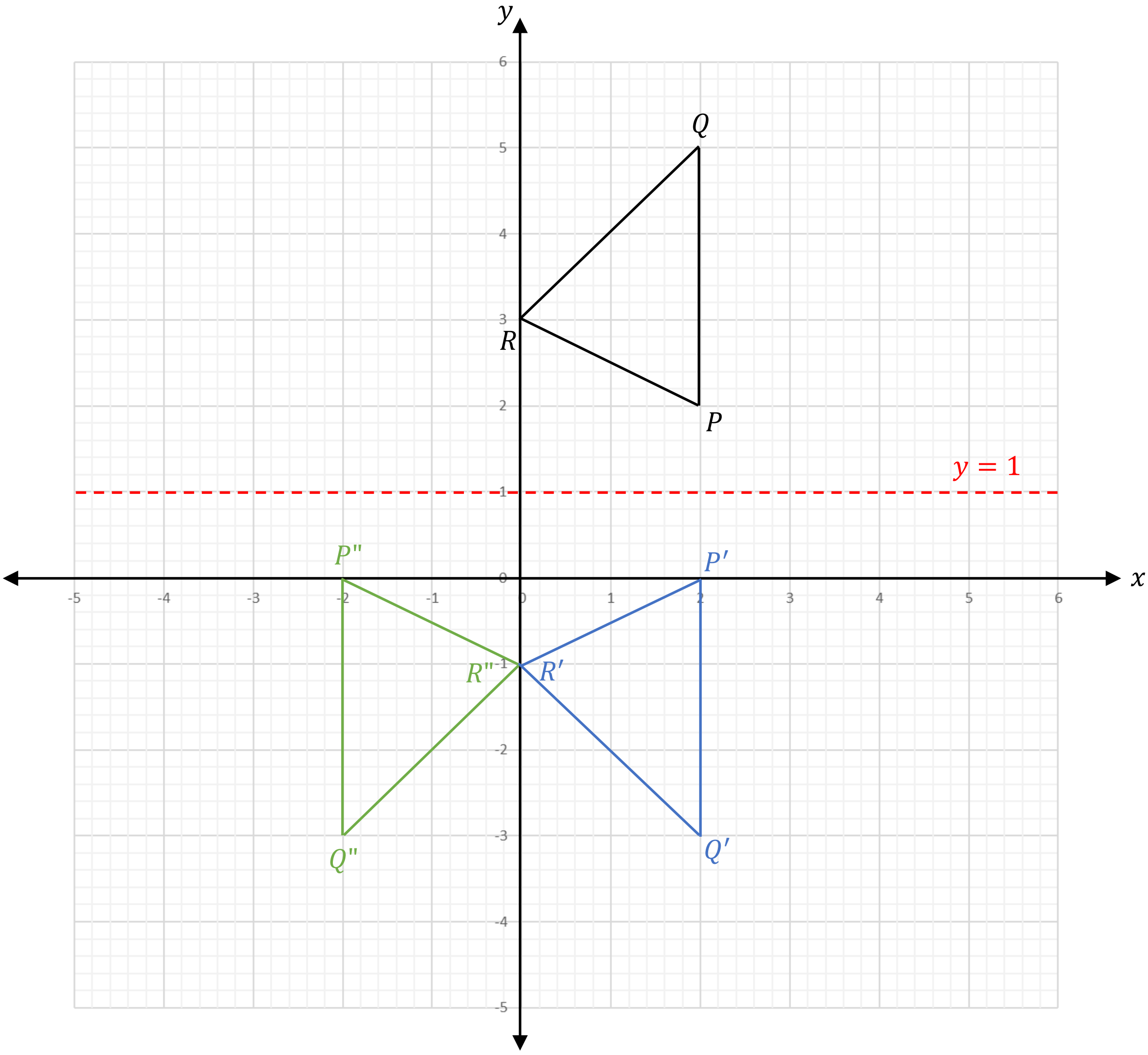
Required to draw $\Delta P'Q'R'$, a reflection of ΔPQR in the line $y = 1$.



Q'

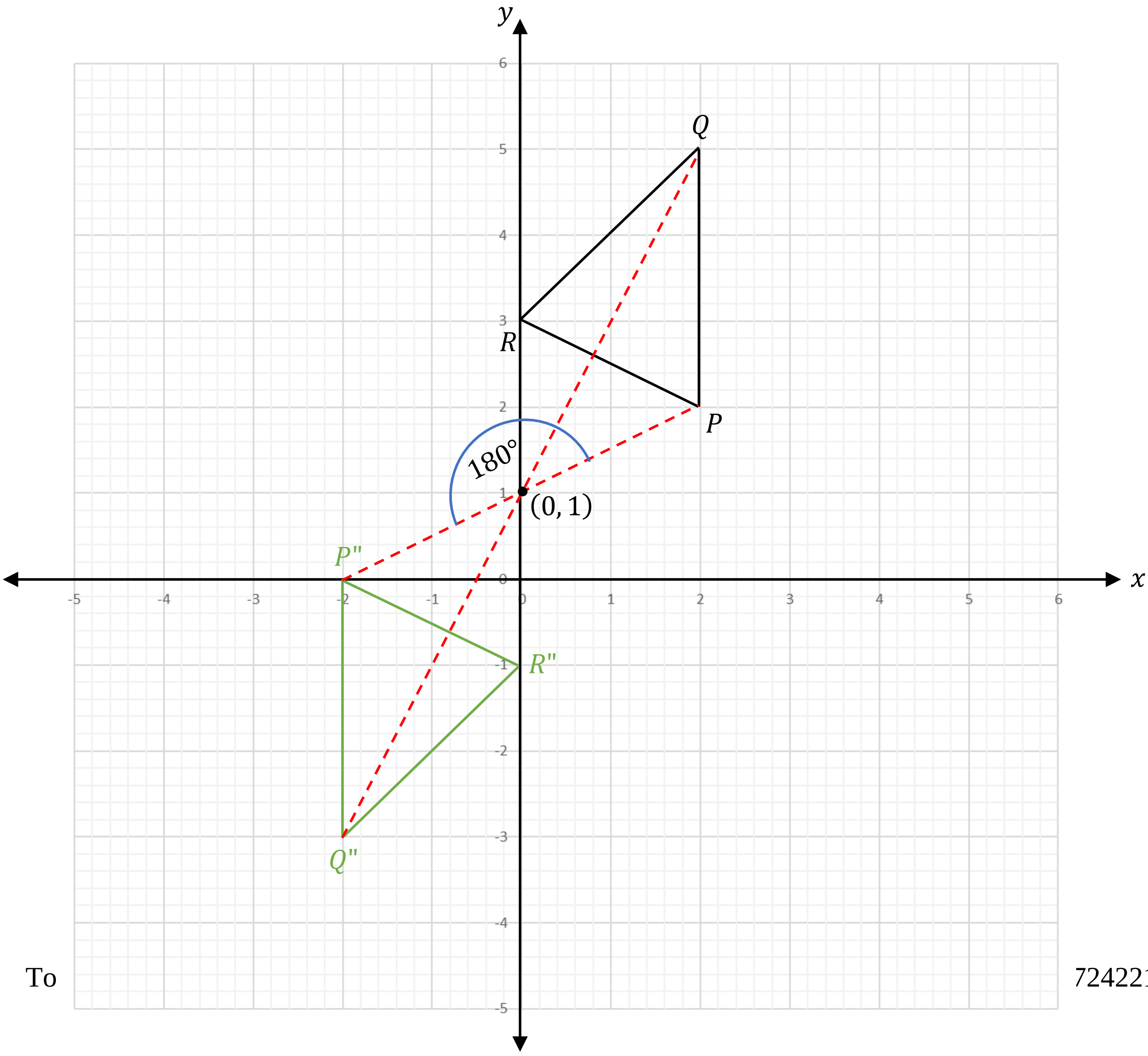
Question 6(b)(ii)

Required to draw $\Delta P''Q''R''$, a reflection of $\Delta P'Q'R'$ in the line $x = 0$.



Question 6(c)

Required to describe, fully, the transformation that maps $\Delta P''Q''R''$ onto ΔPQR.

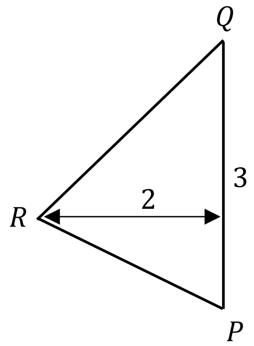


The transformation that maps $\Delta P''Q''R''$ onto ΔPQR is a rotation of 180° about the point $(0, 1)$.

Question 6(d)

Required to calculate the area of the image made with triangle PQR undergoes an enlargement of scale factor 2.

Consider ΔPQR:



Area of $\Delta PQR = \frac{b \times h}{2}$

$= \frac{3 \times 2}{2}$

$= 3$ square units

Area of enlarged triangle $= 3 \times (scale\ factor)^2$

$= 3 \times (2)^2$

$= 3 \times 4$

$= 12$ square units

Question 7(a)(i)

Required to determine the range of the marks obtained by 10 students in a test.

The highest mark is 45.

The lowest mark is 26.

Range = Highest mark – Lowest mark

$= 45 - 26$

$= 19$

Question 7(a)(ii)

Required to determine the median of the marks obtained by 10 students in a test.

Arranging the data in ascending order gives:

~~26~~ ~~29~~ ~~31~~ ~~35~~ 37 38 ~~38~~ ~~38~~ ~~42~~ ~~45~~

Median $= \frac{37+38}{2}$

$= 37.5$

Question 7(a)(iii)

Required to determine the interquartile range of the marks obtained by 10 students in a test.

Arranging the data in ascending order gives:

26 29 31 35 37 38 38 38 42 45

The lower quartile, $Q_1 = 31$.

The upper quartile, $Q_3 = 38$.

$$\text{Interquartile Range} = Q_3 - Q_1$$
$$= 38 - 31$$
$$= 7$$

Question 7(a)(iv)

Required to determine the probability that a student chosen at random scores less than half the total marks in the test.

The total marks in the test $= 60$.

$$\text{Half of the total marks} = \frac{60}{2}$$
$$= 30$$

$$P(student\ scores\ less\ than\ half\ the\ total)$$

$= \frac{Number\ of\ students\ who\ scored\ less\ than\ 30}{Total\ number\ of\ students}$

$= \frac{2}{10}$

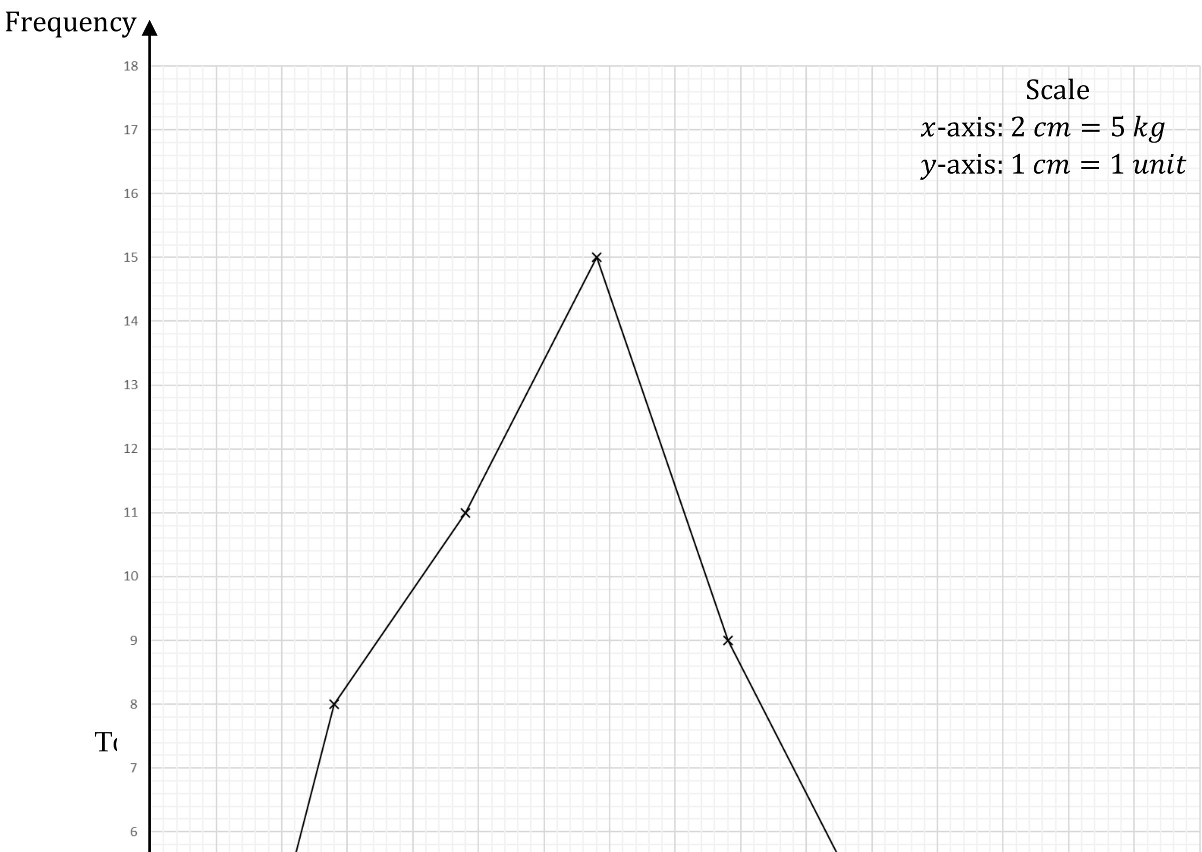
$= \frac{1}{5}$ or 0.2 or 20%

Question 7(b)

Required to draw a frequency polygon to represent the information in the table.

Mass (kg)	**Midpoint**	**Frequency**
$60 - 64$	62	8
$65 - 69$	67	11
$70 - 74$	72	15
$75 - 79$	77	9
$80 - 84$	82	5
$85 - 89$	87	2

Title: Frequency polygon showing the masses, in kg, of 50 adults prior to the start of a fitness program.

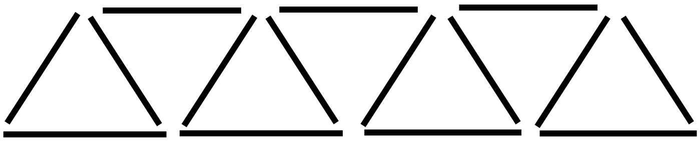


Mass (kg)

Question 8(a)

Required to draw Figure 4 of the sequence.

Figure 4 of the sequence is shown below.



Question 8(b)

Required to complete the rows (i), (ii), (iii) and (iv).

	Figure	Number of Toothpicks in Pattern	Perimeter of Figure
	1	3	$0+1+2=3$
	2	7	$1+2+2=5$
	3	11	$2+3+2=7$
(i)	4	15	$3+4+2=9$
	⋮		

(ii)

(iii)

	20	79	$19+20+2=41$
	$\vdots$		
	32	127	$31+32+2=65$
	$\vdots$		
(iv)	n	$4n-1$	$(n-1)+n+2=2n+1$

(i) For Figure 4, number of toothpicks $= 4(4)-1$

$= 16-1$

$= 15$

(ii) For Figure 4, number of toothpicks $= 4(20)-1$

$= 80-1$

$= 79$

(iii) $4n-1=127$

$4n=127+1$

$4n=128$

$n=\frac{128}{4}$

$n=32$

(iv) For Figure n, number of toothpicks $= 4n-1$

Question 9(a)(i)

Required to show, by calculation, that the EXACT roots of the quadratic equation

$x^2 + 2x - 5 = 0$ are $-1 \pm \sqrt{6}$.

$x^2 + 2x - 5 = 0$ is of the form $ax^2 + bx + c = 0$ where $a = 1, b = 2$ and $c = -5$.

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

$$= \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-5)}}{2(1)}$$

$$= \frac{-2 \pm \sqrt{4 + 20}}{2}$$

$$= \frac{-2 \pm \sqrt{24}}{2}$$

$$= \frac{-2 \pm \sqrt{4 \times 6}}{2}$$

$$= \frac{-2 \pm \sqrt{4}\sqrt{6}}{2}$$

$$= \frac{-2 \pm 2\sqrt{6}}{2}$$

$$= \frac{2(-1 \pm \sqrt{6})}{2}$$

$$= -1 \pm \sqrt{6}$$

Question 9(a)(ii)

Required to solve the simultaneous equations: $2 + x = y$

$xy = 5$

$2 + x = y$ → Equation 1

$xy = 5$ → Equation 2

Substituting Equation 1 into Equation 2 gives:

$x(2 + x) = 5$

$2x + x^2 = 5$

$x^2 + 2x - 5 = 0$

The exact roots of the quadratic equation $x^2 + 2x - 5 = 0$ are $-1 \pm \sqrt{6}$.

Hence, $x = -1 - \sqrt{6}$ and $x = -1 + \sqrt{6}$.

When $x = -1 - \sqrt{6}$,

$y = 2 + \left(-1 - \sqrt{6}\right)$

$= 2 - 1 - \sqrt{6}$

$= 1 - \sqrt{6}$

When $x = -1 + \sqrt{6}$,

$y = 2 + \left(-1 + \sqrt{6}\right)$

$= 2 - 1 + \sqrt{6}$

$= 1 + \sqrt{6}$

$\therefore x = -1 - \sqrt{6}$ and $y = 1 - \sqrt{6}$ or $x = -1 + \sqrt{6}$ and $y = 1 + \sqrt{6}$.

Question 9(b)(i)

Required to complete the table for the function $y = 2^x$.

When $x = -1$,

$y = 2^{-1}$

$y = \frac{1}{2}$

When $x = 1$,

$y = 2^1$

$y = 2$

When $x = 2$,

$y = 2^2$

$y = 4$

When $x = 4$,

$y = 2^4$

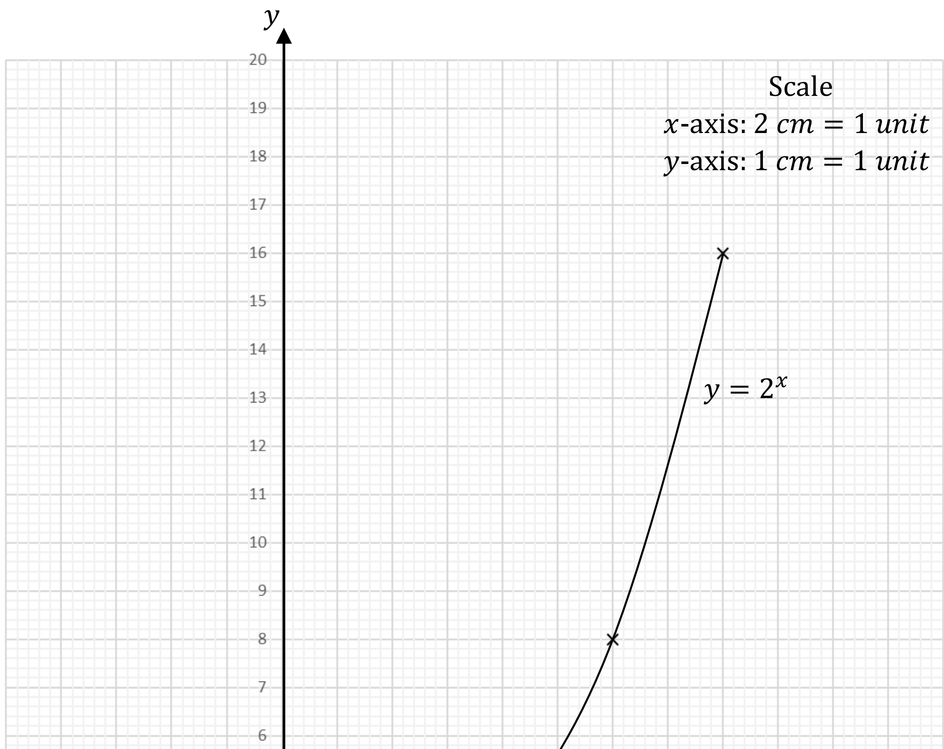
$y = 16$

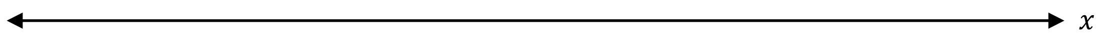
The completed table is shown below:

x	-1	0	1	2	3	4
y	$\frac{1}{2}$	1	2	4	8	16

Question 9(b)(ii)

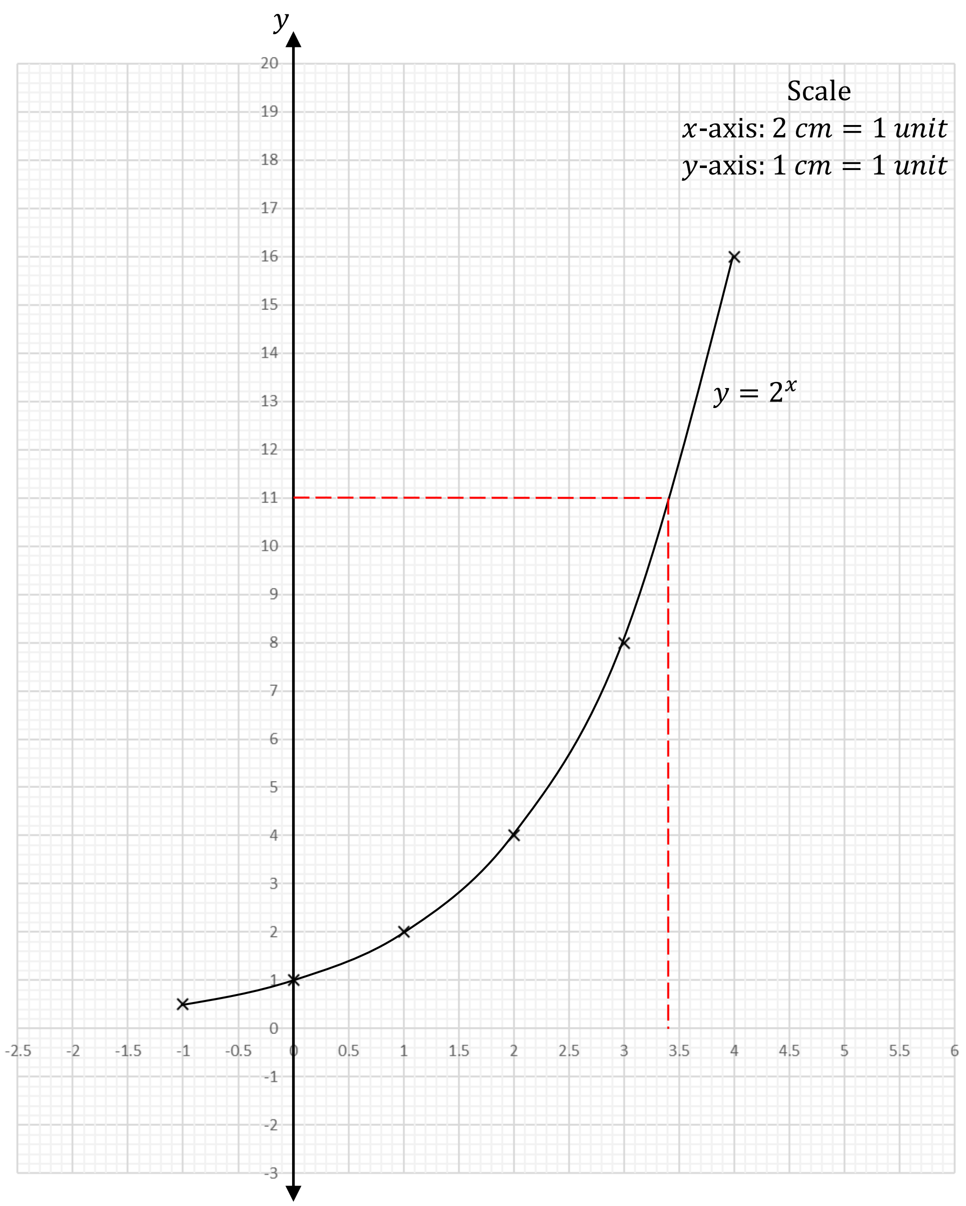
Required to draw the graph of $y = 2^x$.

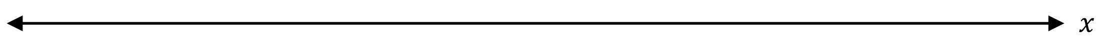




Question 9(b)(iii)

Required to determine the value of x for which $2^x = 11$ by drawing appropriate lines on the graph.





∴ When $2^x = 11, x = 3.4$.

Question 10(a)(i)

Required to calculate the measure of $A\hat{C}D$, giving reasons for each step of your answer.

The angle $A\hat{O}D$ subtended by a chord (AD) at the center of a circle, O, is twice the angle that the chord subtends at the circumference, standing on the same arc.

Hence,

$$A\hat{C}D = \frac{1}{2}A\hat{O}D$$

$$= \frac{1}{2}(114°)$$

$$= 57°$$

Question 10(a)(ii)

Required to calculate the measure of $A\hat{E}D$, giving reasons for each step of your answer.

The angle between a tangent $(EA$ and $ED)$ to a circle and a radius $(OA$ and $OD)$ at the point of contact $(A$ and $D)$ is a right angle.

Hence, $O\hat{A}E = O\hat{D}E$

$= 90°$

Consider the quadrilateral $AODE$.

The sum of the interior angles of a quadrilateral is 360°.

$A\hat{E}D = 360° - (90° + 114° + 90°)$

$= 360° - 294°$

$= 66°$

Question 10(a)(iii)

Required to calculate the measure of $O\hat{A}C$, giving reasons for each step of your answer.

The angle between a tangent (DG) to a circle and a chord (DC) at the point of contact (D) is equal to the angle $(D\hat{A}C)$ in the alternate segment.

Since OA and OD are both radii of the same circle, then $OA = OD$ and ΔOAD is isosceles.

$O\hat{A}D = O\hat{D}A$

$= \frac{180° - 114°}{2}$

$= \frac{66°}{2}$

$= 33°$

The base angles of an isosceles triangle are equal and the sum of the interior angles in a triangle is 180°.

Hence,

$O\hat{A}C = 33° - 18°$

$= 15°$

Question 10(a)(iv)

Required to calculate the measure of $A\hat{B}C$, giving reasons for each step of your answer.

The sum of the interior angles in a triangle add up to 180°.

$A\hat{D}C = 180° - (18° + 57°)$

$= 180° - 75°$

$= 105°$

The opposite angles of a cyclic quadrilateral are supplementary.

Hence,

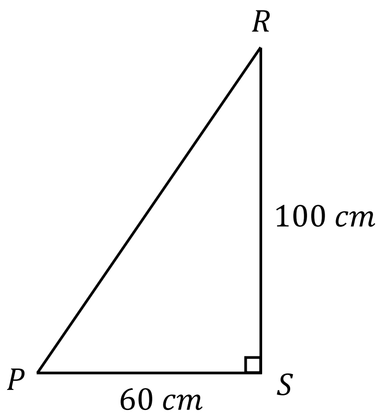
$A\hat{B}C = 180° - 105°$

$= 75°$

Question 10(b)(i)

Required to calculate the length of the wire RP.

Consider ΔPRS:



Using Pythagoras' Theorem:

$RP^2 = PS^2 + SR^2$

$= (60)^2 + (100)^2$

$= 3600 + 10\ 000$

$= 13\ 600$

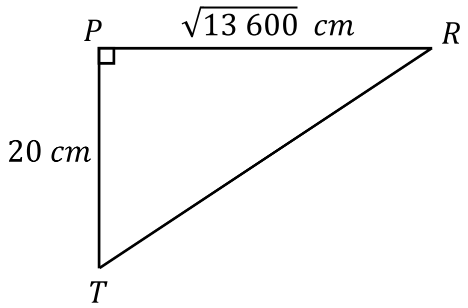
$RP = \sqrt{13\ 600}$

$= 116.6\ cm$ (to 1 decimal place)

Question 10(b)(ii)

Required to calculate the length of the wire RT.

Consider ΔPRT:



Using Pythagoras' Theorem:

$RT^2 = PT^2 + PR^2$

$= (20)^2 + \left(\sqrt{13\ 600}\right)^2$

$= 400 + 13\ 600$

$= 14\ 000$

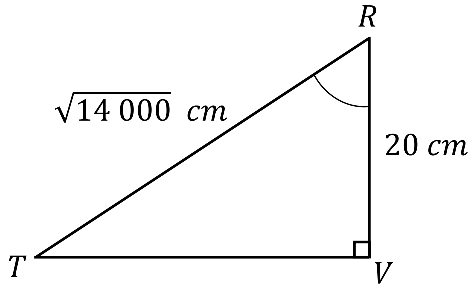
$RT = \sqrt{14\ 000}$

$= 118.3\ cm$ (to 1 decimal place)

Question 10(b)(iii)

Required to calculate the angle TRV.

Consider ΔTRV:



$$\cos T\hat{R}V = \frac{VR}{RT}$$

$$= \frac{20}{\sqrt{14\,000}}$$

$$= 0.169$$

$$T\hat{R}V = \cos^{-1}(0.169)$$

$$= 80.3° \quad \text{(to 1 decimal place)}$$

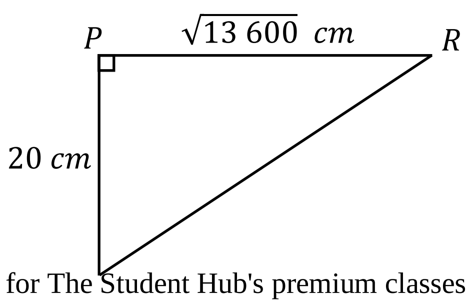
Question 10(b)(iv)

Required to complete the following statements:

The size of the angle through which the wire moves from RP to RT is …………………

An angle which is the same in size as angle RTV is …………………

Consider ΔPRT:



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From RP to RT, the wire moves through $P\hat{R}T$.

$\tan P\hat{R}T = \frac{PT}{PR}$

$= \frac{20}{\sqrt{13\ 600}}$

$= 0.171$

$P\hat{R}T = \tan^{-1}(0.171)$

$= 9.7°$ (to 1 decimal place)

$R\hat{T}V$ has the same size as $P\hat{T}V$ (or $S\hat{U}W$ or $Q\hat{W}U$).

The completed statements are as follows:

The size of the angle through which the wire moves from RP to RT is ……… 9.7°……….

An angle which is the same in size as angle RTV is …… angle PRT…….

Question 11(a)(i)

Required to determine the vector $\overrightarrow{OQ}$.

$\overrightarrow{OP} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

$\overrightarrow{PQ} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$

So, we have,

$\overrightarrow{OQ} = \overrightarrow{OP} + \overrightarrow{PQ}$

$= \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} -1 \\ 2 \end{pmatrix}$

$= \begin{pmatrix} 3 + (-1) \\ 4 + 2 \end{pmatrix}$

$= \begin{pmatrix} 2 \\ 6 \end{pmatrix}$

Question 11(a)(ii)

Required to show that $\overrightarrow{OQ}$ is parallel to $\overrightarrow{RS}$, giving a reason for your answer.

$$\overrightarrow{RS} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$= \frac{1}{2}\begin{pmatrix} 2 \\ 6 \end{pmatrix}$$

$$= \frac{1}{2}\overrightarrow{OQ}$$

Since $\overrightarrow{RS}$ is a scalar multiple of $\overrightarrow{OQ}$, then $\overrightarrow{OQ}$ and $\overrightarrow{RS}$ are parallel.

Question 11(b)(i)

Required to express $\overrightarrow{XZ}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$.

$$\overrightarrow{XZ} = \overrightarrow{XY} + \overrightarrow{YZ}$$

$$\overrightarrow{XZ} = \boldsymbol{a} + \boldsymbol{b}$$

Question 11(b)(ii)

Required to express $\overrightarrow{MY}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$.

M is the midpoint of XZ.

$$\overrightarrow{XM} = \frac{1}{2}\overrightarrow{XZ}$$

$$= \frac{1}{2}(\boldsymbol{a} + \boldsymbol{b})$$

$$\therefore \overrightarrow{MX} = -\frac{1}{2}(\boldsymbol{a} + \boldsymbol{b})$$

$\overrightarrow{MY} = \overrightarrow{MX} + \overrightarrow{XY}$

$= -\frac{1}{2}(\boldsymbol{a} + \boldsymbol{b}) + \boldsymbol{a}$

$= -\frac{1}{2}\boldsymbol{a} - \frac{1}{2}\boldsymbol{b} + \boldsymbol{a}$

$= \frac{1}{2}\boldsymbol{a} - \frac{1}{2}\boldsymbol{b}$

$= \frac{1}{2}(\boldsymbol{a} - \boldsymbol{b})$

Question 11(c)(i)

Required to determine the inverse of A.

$A = \begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix}$

$\det A = ad - bc$

$= (-1)(2) - (0)(3)$

$= -2 - 0$

$= -2$

$adj(A) = \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

$= \begin{pmatrix} 2 & 0 \\ -3 & -1 \end{pmatrix}$

$\therefore A^{-1} = \frac{1}{\det A} \times adj(A)$

$= \frac{1}{-2}\begin{pmatrix} 2 & 0 \\ -3 & -1 \end{pmatrix}$

$= \begin{pmatrix} \frac{2}{-2} & \frac{0}{-2} \\ \frac{-3}{-2} & \frac{-1}{-2} \end{pmatrix}$

$$= \begin{pmatrix} -1 & 0 \\ \frac{3}{2} & \frac{1}{2} \end{pmatrix}$$

Question 11(c)(ii)

Required to show that $A^{-1}A = I$, the identity matrix.

The identity matrix is $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

Now,

$$A^{-1} = \frac{1}{-2}\begin{pmatrix} 2 & 0 \\ -3 & -1 \end{pmatrix}$$

So, we have,

$$A^{-1}A = \frac{1}{-2}\begin{pmatrix} 2 & 0 \\ -3 & -1 \end{pmatrix}\begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix}$$

$$= \frac{1}{-2}\begin{pmatrix} (2 \times -1) + (0 \times 3) & (2 \times 0) + (0 \times 2) \\ (-3 \times -1) + (-1 \times 3) & (-3 \times 0) + (-1 \times 2) \end{pmatrix}$$

$$= \frac{1}{-2}\begin{pmatrix} -2 + 0 & 0 + 0 \\ 3 + (-3) & 0 + (-2) \end{pmatrix}$$

$$= \frac{1}{-2}\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

$$= \begin{pmatrix} \frac{-2}{-2} & \frac{0}{-2} \\ \frac{0}{-2} & \frac{-2}{-2} \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

Hence, $A^{-1}A = I$.

Question 11(c)(iii)

Required to determine the matrix A^2.

$A^2 = A \times A$

$$= \begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix} \begin{pmatrix} -1 & 0 \\ 3 & 2 \end{pmatrix}$$

$$= \begin{pmatrix} (-1 \times -1) + (0 \times 3) & (-1 \times 0) + (0 \times 2) \\ (3 \times -1) + (2 \times 3) & (3 \times 0) + (2 \times 2) \end{pmatrix}$$

$$= \begin{pmatrix} 1 + 0 & 0 + 0 \\ -3 + 6 & 0 + 4 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 \\ 3 & 4 \end{pmatrix}$$

$\therefore A^2 = \begin{pmatrix} 1 & 0 \\ 3 & 4 \end{pmatrix}$

Question 11(c)(iv)(a)

Required to explain why the matrix product AB is not possible.

The number of columns of A which is 2 is not equal to the number of rows of B which is 3. Hence, the product AB is not possible.

Question 11(c)(iv)(b)

Required to state the order of the matrix product BA.

The size of the matrix B is 3×2.

The size of the matrix A is 2×2.

Therefore, the size of the matrix product BA is 3×2.