Name and Surname : ……...

Grade/Class : 10/……. **Mathematics Teacher** : …….

Hudson Park High School

GRADE 10

MATHEMATICS

November Paper 2

Marks : 100 Date : 04 November 2024

Time : 2 hours

Examiner(s) : SLT VNT PHL VPT SBL SMR Moderator(s) : SLT VNT PHL VPT SBL SMR

INSTRUCTIONS

1. Illegible work, in the opinion of the marker, will earn zero marks.

2. Number your answers clearly and accurately, exactly as they appear on the question paper.

3. **Fill in the details requested on the front of this Question Paper and the Answer Booklet, before you start answering any questions.**

4. Hand in your submission in the following manner :

   (on top) **Answer Booklet**
   (below) **Question Paper**

   Please **DO NOT STAPLE** your Answer Booklet and Question Paper together.

5. Employ relevant formulae and show all working out.
   Answers alone *may* not be awarded full marks.

6. (Non-programmable and non-graphical) Calculators may be used, unless their usage is specifically prohibited.

7. Answers must be written in blue or black ink, as distinctly as possible, on both sides of the page. An HB pencil (but not lighter eg. 2H) may be used for diagrams.

8. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.

9. If (Euclidean) GEOMETRIC statements are made, REASONS must be stated appropriately.

QUESTION 1

1.1. The maximum temperature (in degrees Celcius) at 20 tourist resort centres were measured and recorded. The results were as follows :

22	23	24	25	26	28	29	29	30	32
32	33	34	35	36	37	37	38	39	40

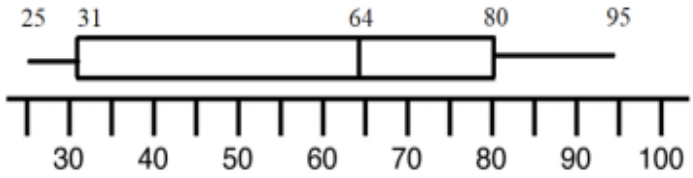
For this data, determine the :

1.1.1. median (1)

1.1.2. mean (2)

1.1.3. interquartile range (3)

1.2. The box and whisker plot below shows the test results (as a percentage) for a Grade 10 class.



What percentage of the class achieved above 31 % ? (1)

1.3. In a class of 30 learners, the average for their Standardised Test (out of 50 marks) was found to be 35. When the learners checked their marks in class after the test, it was found that a learner's mark had been entered incorrectly.

Instead of entering the correct mark of 42 (out of 50), the teacher incorrectly entered it as 24 (out of 50).

With the mark corrected, calculate the new class average (as a percentage). (3)

1.4. A supermarket sells light bulbs. The store kept a record of the wattage of the light bulbs that they sold in the month of September 2024. The monthly sales are summarized in the table below.

Wattage Interval	**Frequency**
$80 \leq x < 95$	3
$95 \leq x < 110$	17
$110 \leq x < 125$	31
$125 \leq x < 140$	16
$140 \leq x < 155$	10

1.4.1. How many light bulbs were sold in the month of September 2024 ? (1)

1.4.2. For the data, determine the :

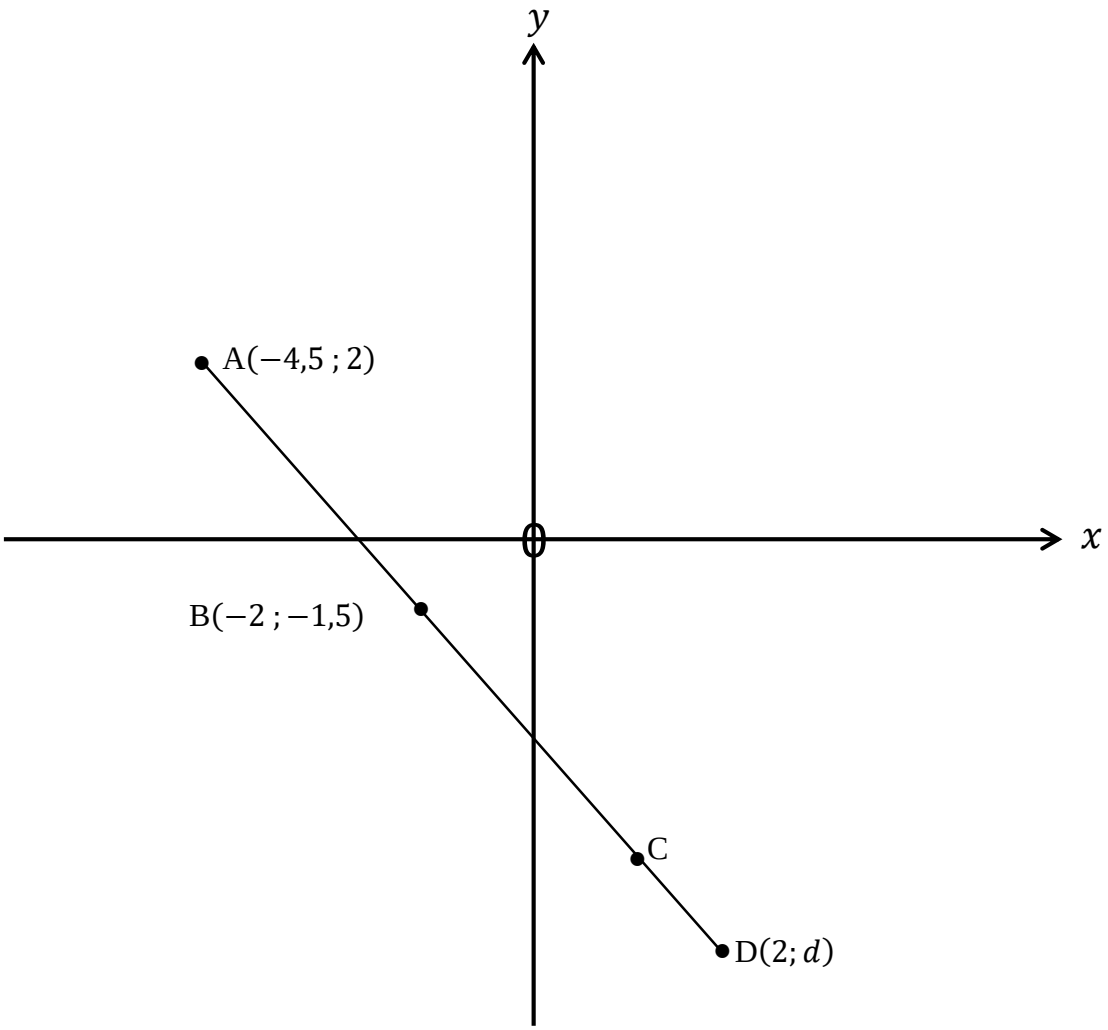
(a) estimated mean (2)

(b) interval in which the 80^{th} percentile lies. (2)

[15]

QUESTION 2

2.1. ABCD is a straight line, with AB = BC. A$(-4{,}5\ ;\ 2)$, B$(-2\ ;\ -1{,}5)$, C and D$(2;\ d)$.

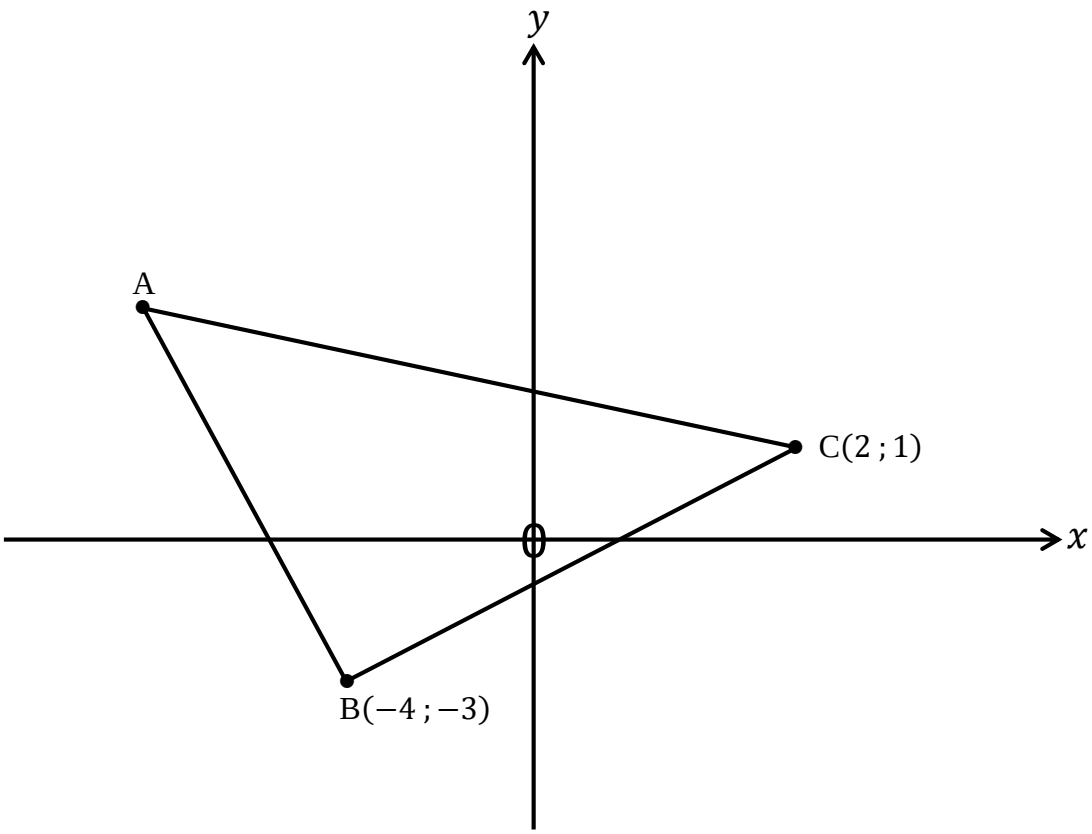


Calculate the :

2.1.1. coordinates of C (2)

2.1.2. value of d. (4)

2.2. A, B$(-4\,;-3)$ and C$(2\,;1)$ are the vertices of ΔABC. AB = $\sqrt{52}$ and AB $\perp$ BC.



2.2.1. (a) Calculate the gradient of BC. (1)

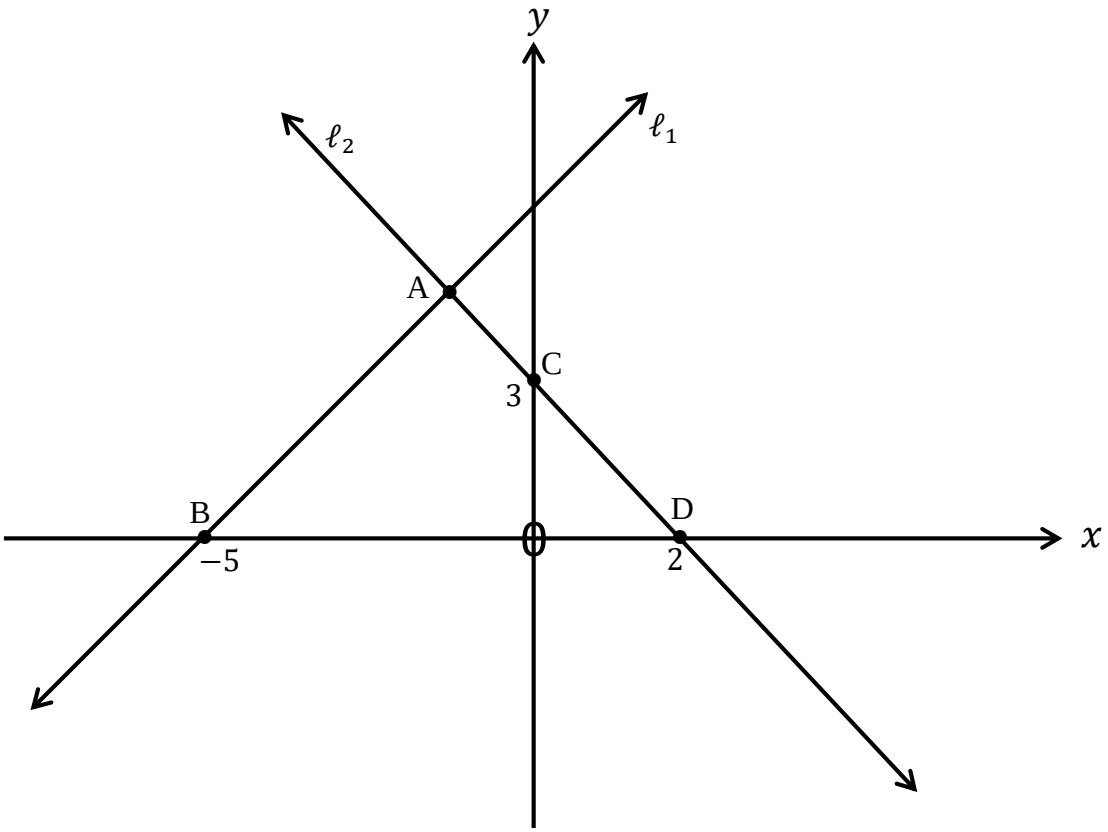
(b) Determine the equation of AB. (3)

2.2.2. (a) Calculate the length of BC in surd form. (2)

(b) Determine the size of $\hat{C}$. (3)

2.2.3. Now, if you are told that A$(-8\,;3)$ and that ABDC is a parallelogram (D not shown in diagram), determine the coordinates of D. (2)

2.3. Straight lines ℓ_1 and ℓ_2 intersect at point A$\left(-1\,;\frac{9}{2}\right)$. C is a y-intercept. B and D are x-intercepts.



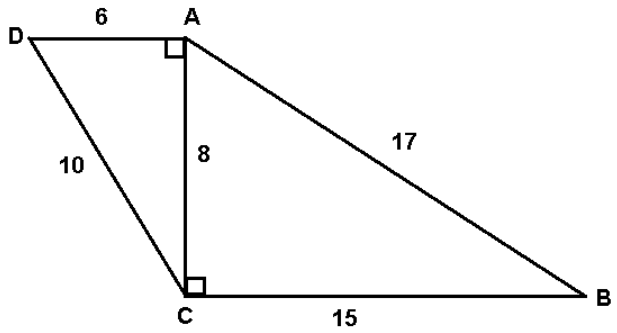
Calculate the area of quadrilateral AC0B. (3)

[20]

QUESTION 3

3.1. **CALCULATORS MAY NOT BE USED IN THIS QUESTION**

ΔABC and ΔACD are right angled triangles as shown in the diagram below.
$AB = 17,\ BC = 15,\ AC = 8,\ AD = 6$ and $CD = 10$.



Determine the following in simplest form :

3.1.1. $\sin \widehat{B}$ (1)

3.1.2. $\sec \widehat{D}$ (1)

3.1.3. $\tan(90° - A\widehat{C}D)$ (1)

3.2. **CALCULATORS MAY NOT BE USED IN THIS QUESTION**

3.2.1. Draw the special diagrams used to deal with the special angles of :

(a) $45°$ (1)

(b) $30°$ and $60°$ (1)

3.2.2. Hence, simplify the following fully, showing all relevant working out :

(a) $\sin 45°$ (1)

(b) $\sec^2 30° - \tan^2 30°$ (3)

3.3. Solve for x, correct to **ONE** decimal place :

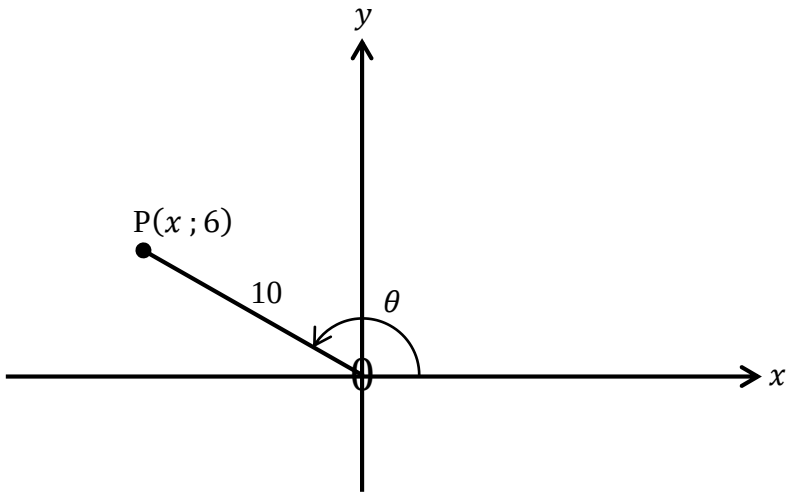
3.3.1. $3\cos x + 3 = 4$ $\quad x \in [0; 90°]$ (2)

3.3.2. $\sin\left(\frac{x+10°}{2}\right) = \cos(-420°)$ $\quad \frac{x+30°}{2} \in [0°; 90°]$ (3)

3.3.3. $\frac{2\ \text{cosec}\ x}{3} - 1 = 5$ $\quad x \in [0; 90°]$ (3)

3.4. **CALCULATORS MAY NOT BE USED IN THIS QUESTION**

In the diagram, $\mathrm{P}(x\,;6)$, $0\mathrm{P} = 10$ and the angle between the $0\mathrm{P}$ and the direction of the positive x-axis is θ :



Determine the following in simplest form :

3.4.1. x (1)

3.4.2. $\cos\theta$ (1)

3.4.3. $\cos\ (180° - \theta)$ (2)

3.5. Given : $\tan\theta = p \quad (p > 0)$ and $90° \leq \theta \leq 270°$.

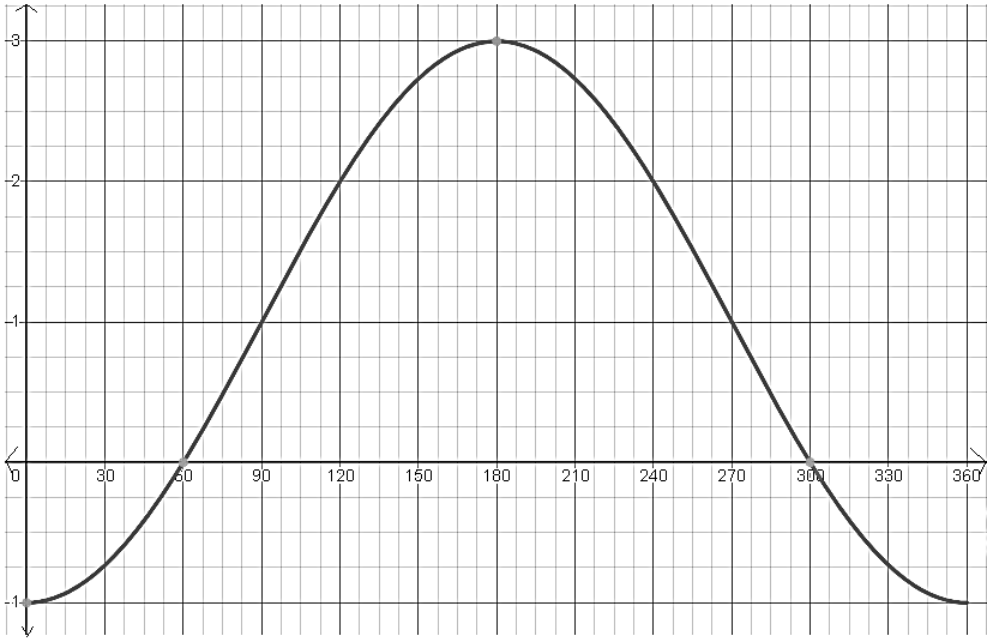
3.5.1. Represent the given information in a diagram drawn in the correct quadrant. Show all relevant details on your diagram. (4)

3.5.2 Hence, determine $\cos\theta$ in terms of p. (1)

[26]

QUESTION 4

4. The graph of $f(x) = a\cos x + b$ is given below for $0° \leq x \leq 360°$.



4.1. Write down the values of :

4.1.1. a (1)

4.1.2. b (1)

4.2. State the range of f. (1)

4.3. Use the graph to determine for which value(s) of x:

4.3.1. f is a decreasing function (1)

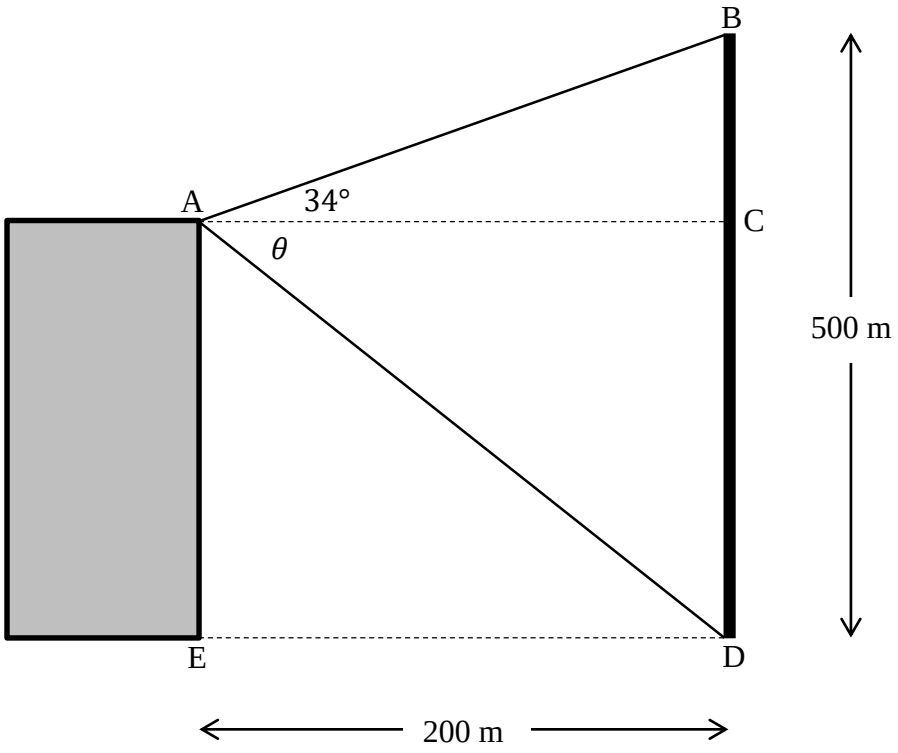
4.3.2. $f(x) - 2 < 0$ (2)

4.4. If f is reflected in the y-axis and then translated 4 units vertically downwards to become h, determine the equation of h in y-form. (2)

[8]

QUESTION 5

5. A block of flats is 200 m (DE) away from a vertical cellphone tower BCD.
E and D are in the same horizontal plane.
The height of the cellphone tower (BCD) is 500 m.
E and D are in the same horizontal plane.
An engineer standing at A measures the angle of elevation of B from A to be 34°.
The angle of depression of D from A is θ.



Calculate the :

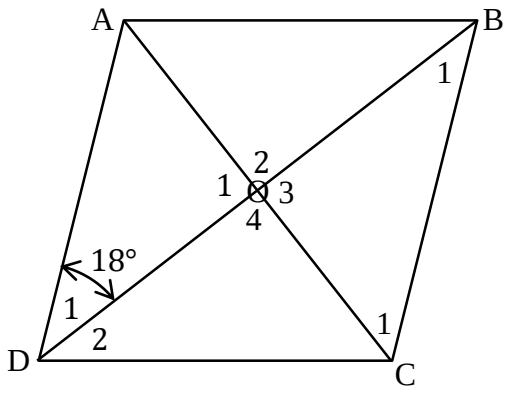
5.1. height of the building, AE (4)

5.2. angle of depression of D from A, θ (2)

[6]

QUESTION 6

6.1. ABCD is a rhombus with $\widehat{D}_1 = 18°$. The diagonals intersect at O.

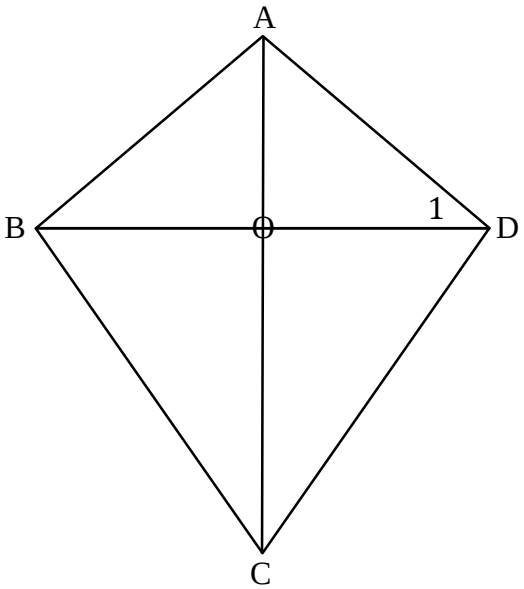


6.1.1. Give the reason why $\widehat{D}_2 = 18°$ (1)

6.1.2. Write down the size of $\widehat{B}_1$ (1)

6.1.3. Hence, calculate $\widehat{C}_1$ (2)

6.2. ABCD is a quadrilateral with AB = AD, $C\widehat{B}O = C\widehat{D}O$ and $A\widehat{B}O = 30°$



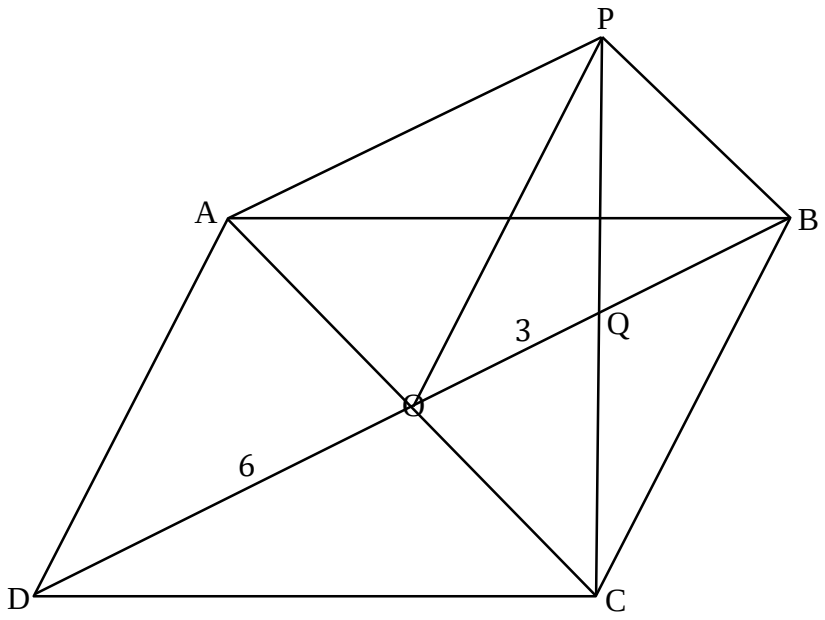
6.2.1. Calculate $\widehat{D}_1$ (1)

6.2.2. Prove that ABCD will be a kite. (2)

[7]

QUESTION 7

7. ABCD is a parallelogram and DOQB // AP. DO = 6 and OQ = 3.



7.1. Calculate :

7.1.1. AP (4)

7.1.2. QB (1)

7.2. Give the reasons why the following quadrilaterals will be parallelograms :

7.2.1. APBO (1)

7.2.2. POCB (1)

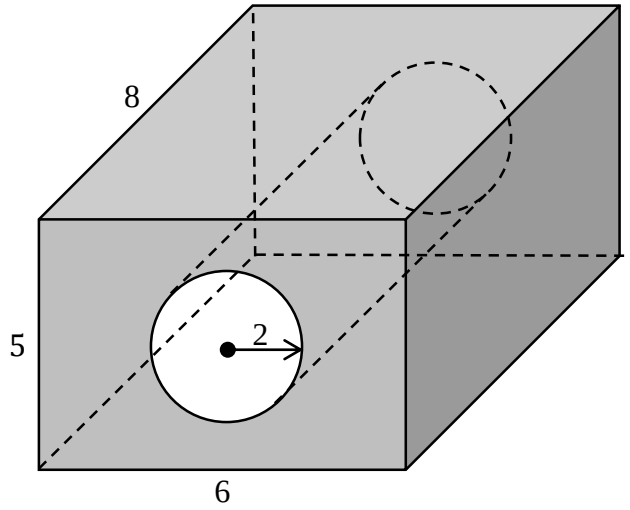
7.3. Give the reason why area ΔAOB = area ΔPOB. (2)

[9]

QUESTION 8

$A = bh$	$V = Ah$
$A = \pi r^2$	$V = \frac{1}{3}Ah$
$A = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$
$A = \pi rh$	$C = 2\pi r$
$A = \frac{1}{2}bh$	

8.1. The solid shown was made by drilling a right circular cylinder (with radius 2 cm) out of a solid right rectangular prism with dimensions of 5 cm, 6 cm and 8 cm.



For the solid shown, calculate the :

8.1.1. Volume (3)

8.1.2. Total surface area (4)

8.2. The volume of a sphere, with radius r, is V. If the radius of the sphere is doubled, by what factor will the volume of the sphere increase ? (2)

[9]

TOTAL 100