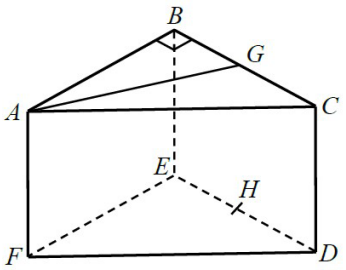
GHS Sorted Past Paper - MC
S5-10 Applications of Trigonometry in 3-dimensional Problems

1. [20 - 21 S3 Final Exam - 16] (89%)

16. In the figure, $ABCDEF$ is a right triangular prism and ΔABC is a right-angled triangle. G and H are the mid-points of BC and ED respectively. The angle between AG and the plane $BCDE$ is

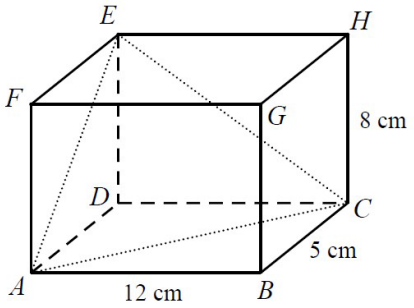
A. $\angle AGC$.
B. $\angle AGB$.
C. $\angle AGE$.
D. $\angle AGH$.



2. [21 - 22 S5 Final Exam - 34] (39%)

34. The figure shows a cuboid $ABCDEFGH$. Let a be the angle between AE and the plane $ABCD$, b be the angle between CE and the plane $ABCD$ and c be the angle between the plane ACE and the plane $ABCD$. Which of the following is true?

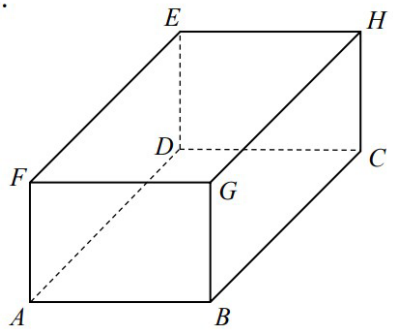
A. $b < c < a$
B. $b < a < c$
C. $c < a < b$
D. $c < b < a$

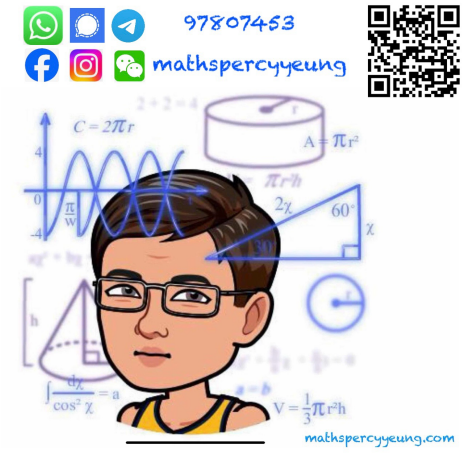


3. [22 - 23 S5 Final Exam - 38] (20%)

38. In the figure, $ABCDEFGH$ is a cuboid. $AB = 4$ cm, $AF = 3$ cm and $FE = 7$ cm. Find the angle between EG and the plane $BCEF$ correct to 1 decimal place.

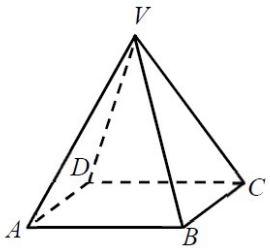
A. 17.3°
B. 18.1°
C. 18.4°
D. 19.2°





4. [22 - 23 S5 Standardized Test - 09] (56%)

9. $VABCD$ is a right pyramid with square base $ABCD$. M is the mid-point of VC. Let the angle between the plane VAB and plane $ABCD$ be α, $\angle MAC$ be β and the angle between VA and the plane $ABCD$ be γ. Which of the following must be true?



A. $\alpha < \beta < \gamma$
B. $\alpha < \gamma < \beta$
C. $\beta < \alpha < \gamma$
D. $\beta < \gamma < \alpha$

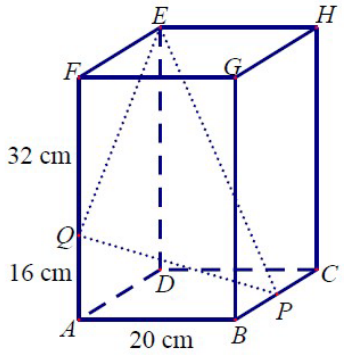
5. [23 - 24 S5 Final Exam - 41] (21%)

41. The base of the right pyramid $VABC$ is an equilateral triangle ABC. Let θ be the angle between ΔVAB and ΔVBC. If $AB : VB = 6 : 5$, then $\theta =$

A. 60°.
B. 64°.
C. 68°.
D. 77°.

6. [20 - 21 S6 Mock Exam - 41] (26%)

41. In the figure, $ABCDEFGH$ is a rectangular block with a square base of side length 20 cm. P is the mid-point of BC. Let Q be a point lying on AF such that $AQ = 16$ cm and $QF = 32$ cm. Find the angle between the plane PQE and the plane $ADEF$ correct to the nearest degree.

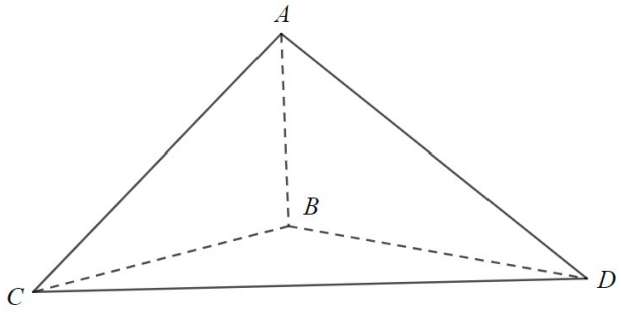


A. 49°
B. 50°
C. 59°
D. 60°

7. [21 - 22 S6 Mock Exam - 39] (32%)

39. The figure shows a tetrahedron $ABCD$ with base BCD lying on the horizontal ground. It is given that B is vertically below A. If $\angle ACB = 20°$, $\angle ADB = 30°$, $\angle CBD = 120°$ and $CD = 100$ m, find AB correct to the nearest m.

A. 26 m
B. 42 m
C. 122 m
D. 198 m



8. [22 - 23 S6 Mock Exam - 39] (33%)

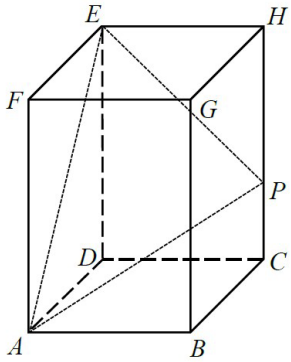
39. $VABCD$ is a right pyramid with a rectangular base $ABCD$ where $AB > BC$. Let α be the angle between VA and the base $ABCD$, β be the angle between the plane VAB and the base $ABCD$ and γ be the angle between the plane VBC and the base $ABCD$. Which of the following is true?

A. $\alpha < \beta < \gamma$
B. $\alpha < \gamma < \beta$
C. $\gamma < \alpha < \beta$
D. $\gamma < \beta < \alpha$

9. [23 - 24 S6 Mock Exam - 38] (32%)

38. In the figure, $ABCDEFGH$ is a cuboid. P is a point on HC such that $HP : PC = 2 : 1$. It is given that $AB : BC : CH = 3 : 4 : 9$. Find the angle between the plane AEP and the plane $CDEH$ correct to 1 decimal place.

A. 42.8°
B. 44.8°
C. 46.8°
D. 48.8°



10. [24 - 25 S6 Mock Exam - 40] (54%)

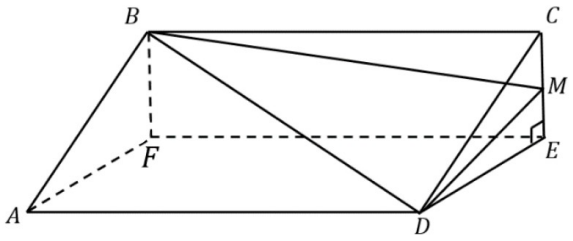
40. The figure shows a right triangular prism $ABCDEF$ where $\angle CED = 90^\circ$. M is the mid-point of CE. Suppose $BC = 5$, $CE = 2$ and $\angle CDE = 30°$. Find $\angle BMD$ correct to 1 decimal place.

A. 90.0°

B. 90.1°

C. 92.6°

D. 93.1°



GHS Sorted Past Paper - Conventional Questions
S5-10 Applications of Trigonometry in 3-dimensional Problems

1. [21 - 22 S3 Final Exam - 03] (78%)

3. **Figure 1** shows a trapezoidal prism $ABCDEFGH$.

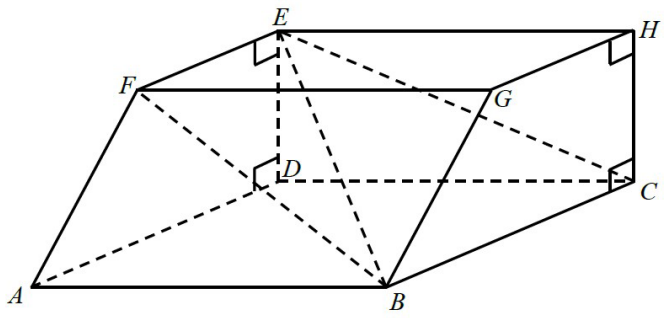


Figure 1

(a) Write down the projection of EB on plane $ABCD$. _____ **(0.5 marks)**

(b) Write down the projection of FB on plane $CDEH$. _____ **(0.5 marks)**

(c) Write down the angle between line EB and plane $ABCD$. _____ **(0.5 marks)**

(d) Write down the angle between planes $BCEF$ and $ABCD$. _____ **(0.5 marks)**

2. [20 - 21 S6 Mock Exam - 19]

19. **Figure 4(a)** shows a triangular metal sheet ABC with $\angle BAC = 32°$ and $\angle ABC = 42°$. D is a point on AB such that $\angle ACD = 68°$ and $CD = 24$ cm.

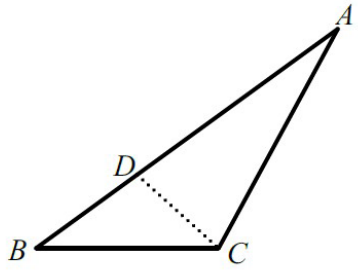


Figure 4(a)

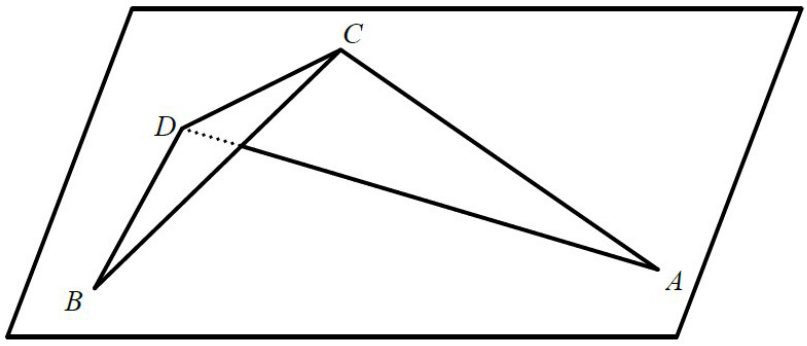


Figure 4(b)

(a) Find the length of AC and BC. **(3 marks)**

(b) In **Figure 4(b)**, the metal sheet is bent along CD and placed on a horizontal ground such that the plane ABD lies on the ground and the distance between A and B is 30 cm.

(i) Find $\angle ACB$.

(ii) Find the angle between the plane ACD and the plane BCD. **(6 marks)**

3. [22 - 23 S5 Final Exam - 18] (56%)

18. **Figure 2(a)** shows a piece of triangular paper card ABC with $AB = 12$ cm, $BC = 15$ cm and $\angle ABC = 75°$. D is a point on AC such that $AD : DC = 2 : 1$.

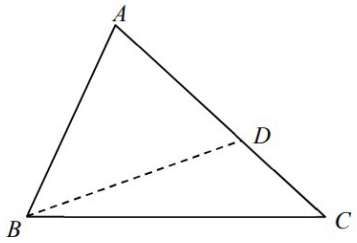


Figure 2(a)

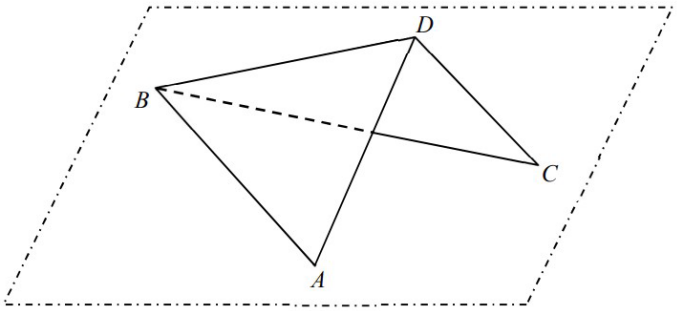


Figure 2(b)

(a) Find

(i) DC,

(ii) $\angle ACB$. **(4 marks)**

(b) The triangular paper card described in **(a)** is folded along BD such that AB and BC lies on the horizontal ground as shown in **Figure 2(b)**. It is given that the angle between plane BCD and the horizontal ground is $90°$.

Find the angle between plane ABD and the horizontal ground. **(4 marks)**

4. [21 - 22 S5 Final Exam - 17] (45%)

17. **Figure 4(a)** shows a quadrilateral $ABCD$ with $CD = AD$. $AB = 9$ cm, $BC = 15$ cm, $\angle ABC = 132°$ and $\angle ADC = 48°$.

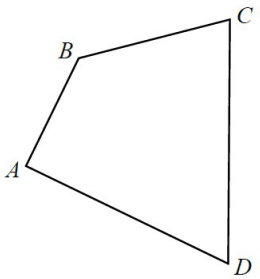


Figure 4(a)

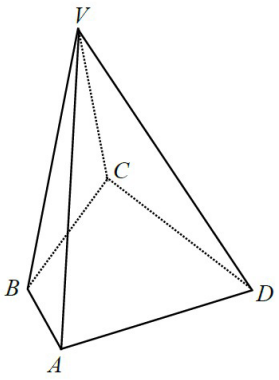


Figure 4(b)

(a) Find the length of AD. **(3 marks)**

(b) AC and BD meet at a point M. In **Figure 4(b)**, V is a point vertically above M. If the volume of the pyramid $VABCD$ is 600 cm^3, find the angle between the plane VAD and the plane $ABCD$. **(5 marks)**

5. [22 - 23 S5 Standardized Test - 04] (65%)

4. In **Figure 1**, ΔABC lies on a horizontal plane. $AB = 9$ cm, $BC = 12$ cm and $\angle ABC = 120°$. The point D is vertically above B such that $CD = 20$ cm. Find

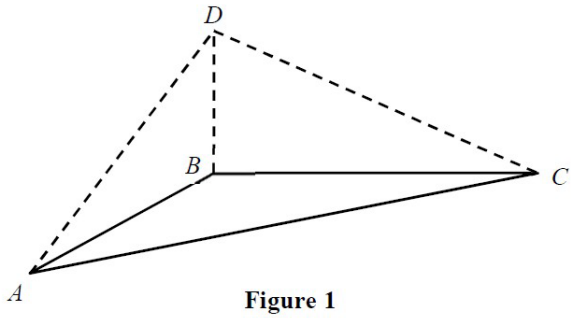


Figure 1

(a) the angle between DC and the plane ABC, **(2 marks)**
(b) the angle between the plane ABC and ADC. **(4 marks)**

6. [22 - 23 S5 Standardized Test - 05] (62%)

5. **Figure 2** shows a right triangular prism $ABCDEF$ with ΔBCF as the base. $AB = 15$ cm, $AD = 10$ cm, $CF = 6$ cm and $BF = 8$ cm. G is a point on DC such that $\angle DGA = \angle CGF = \alpha$.

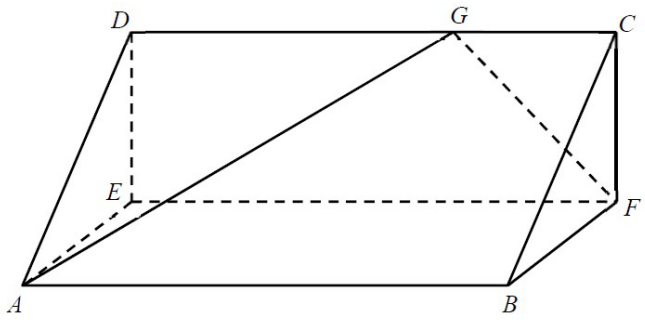


Figure 2

(a) Express DG and GC in terms of α. **(2 marks)**
(b) Hence, or otherwise, find α. **(2 marks)**
(c) Find $\angle AGF$. **(2 marks)**

7. [23 - 24 S5 Final Exam - 18] (75%)

18. In **Figure 2**, the acute-angled triangular metal frame ABC is held such that BC lies on the horizontal ground. It is given that $AB = 10\,\text{cm}$, $AC = 8\,\text{cm}$ and $\angle BAC = 50°$.

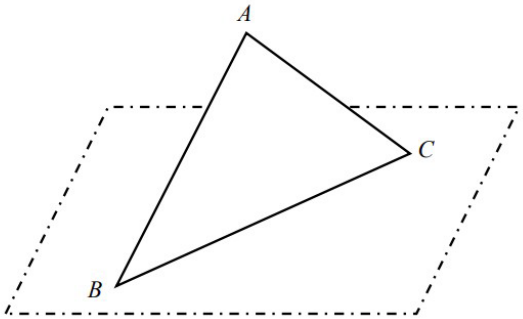


Figure 2

(a) Find
(i) the length of BC,
(ii) $\angle ABC$.

(4 marks)

(b) A worker finds that the angle between AB and the horizontal ground is 30°. Let M be the mid-point of BC. The worker claims that the angle between AM and the horizontal ground exceeds 37°. Is the claim correct? Explain your answer. **(4 marks)**

8. [24 - 25 S5 Final Exam - 18] (54%)

18. In **Figure 2(a)**, $ABCD$ is a paper card in the shape of a trapezium with $AB//DC$. It is given that $\angle ABC = 70°$, $\angle BAC = 30°$, $AB = 20$ cm and $DC = 25$ cm.

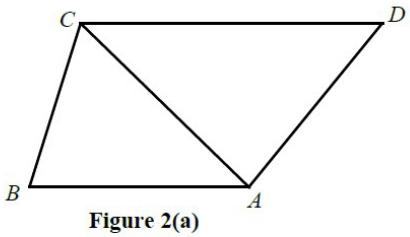


Figure 2(a)

(a) Find the length of BC. **(2 marks)**

(b) In **Figure 2(b)**, the paper card in **Figure 2(a)** is folded along AC such that the distance between B and D is 22 cm.

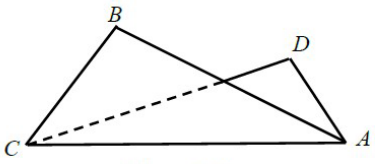


Figure 2(b)

(i) Find $\angle BCD$.

(ii) Someone claims that the angle between the plane ABC and plane ADC must be smaller than $48°$. Do you agree? Explain your answer.

(6 marks)

9. [21 - 22 S6 Mock Exam - 18] (46%)

18. **Figure 4** shows a rectangular box $ABCDEFGH$ with the face $ABCD$ lying on a horizontal ground. P is a point on CH. A flat acute-angled triangular metal sheet AEP is put inside the box. It is given that $AP = 32$ cm, $EP = 28$ cm and $\angle EAP = 60°$.

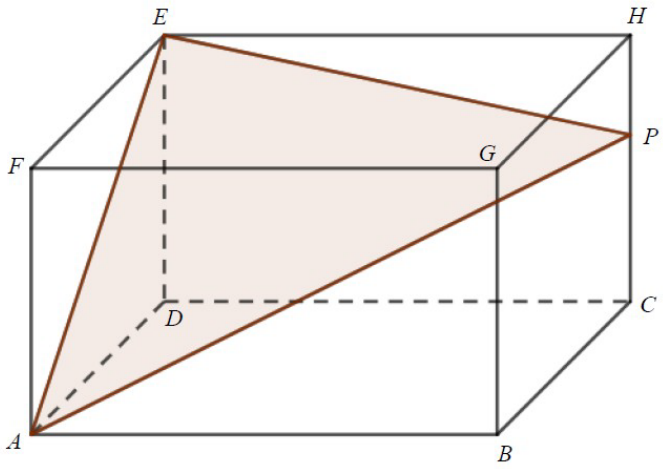


Figure 4

(a) Find $\angle AEP$. **(2 marks)**

(b) Suppose $CP = 11$ cm and $PH = 5$ cm. EP produced meets the horizontal ground at Q. Find

(i) AQ,

(ii) the angle between the plane AEP and the horizontal ground. **(6 marks)**

10. [22 - 23 S6 Mock Exam - 18] (34%)

18. **Figure 2(a)** shows a triangular paper card ABC with $AB = 7$ cm, $AC = 8$ cm and $BC = 9$ cm. D is a point on BC such that AD is the angle bisector of $\angle BAC$.

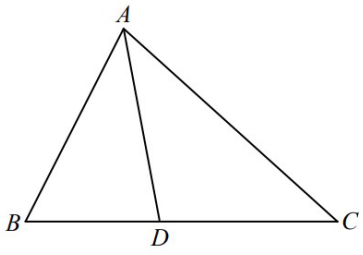


Figure 2(a)

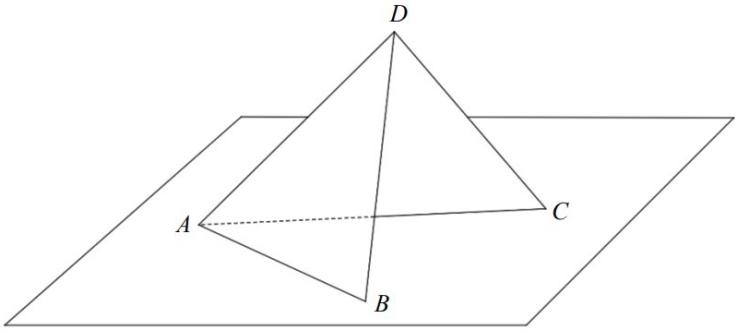


Figure 2(b)

(a) Find BD. **(3 marks)**

(b) The paper card in **Figure 2(a)** is folded along AD such that AB and AC lie on the horizontal ground as shown in **Figure 2(b)**. If $\angle BDC = 60°$, find the angle between the plane ABD and the plane ACD. **(4 marks)**

11. [23 - 24 S6 Mock Exam - 18] (40%)

18. In **Figure 3(a)**, $ABCD$ is a piece of paper card in the shape of a quadrilateral. AB = 25 cm, CD = 30 cm, AD = 15 cm, $\angle BCD = 29°$ and $\angle ADB = 90°$.

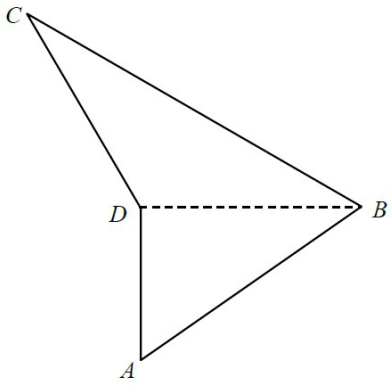


Figure 3(a)

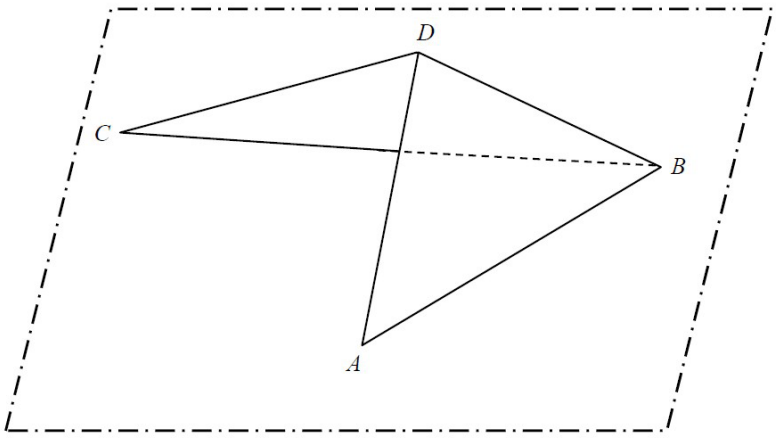


Figure 3(b)

(a) Find $\angle CBD$. **(2 marks)**

(b) The paper card in **Figure 3(a)** is folded along BD such that AB and BC lie on the horizontal ground as shown in **Figure 3(b)**. It is given that $\angle ADC = 120°$. Someone claims that the angle between the plane ABD and the plane BCD is less than 120°. Do you agree? Explain your answer.

(4 marks)

12. [24 - 25 S6 Mock Exam - 18] (45%)

18. In **Figure 2(a)**, $ABCDE$ is a regular pentagon and O is the centre of rotational symmetry of the pentagon. AB and DC are produced to meet at P and OP cuts BC at Q. It is given that $BP = 8$ cm.

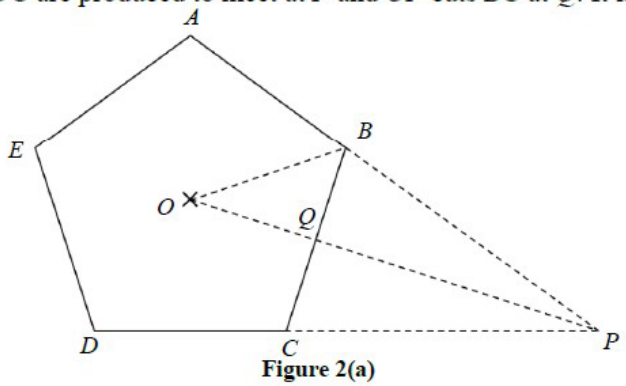


Figure 2(a)

(a) (i) Write down the value of $\angle OBP$.

(ii) Find OP. **(3 marks)**

(b) Figure 2(b) shows a net which consists of three identical regular pentagons $ABCDE$, $ABFGH$ and $CDIG'F'$. Pentagons $ABFGH$ and $CDIG'F'$ are folded along AB and CD respectively such that $G'F'$ coincides GF and forms a 3-dimensional figure in **Figure 2(c)**. O is the projection of G on the pentagon $ABCDE$.

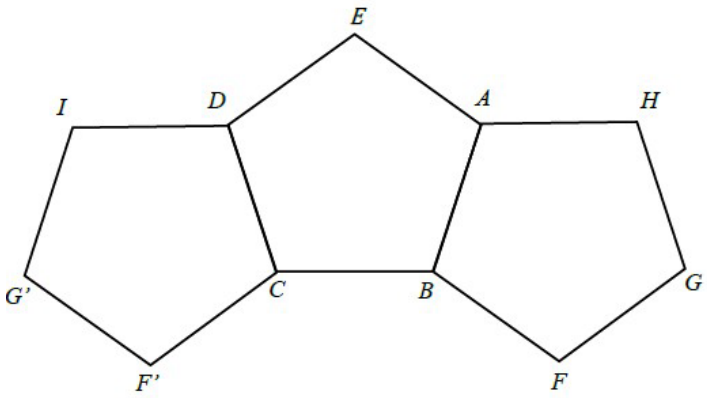


Figure 2(b)

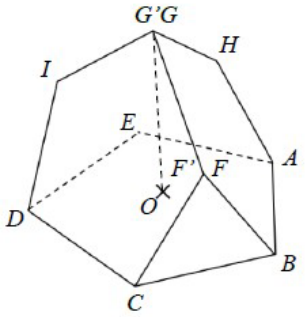


Figure 2(c)

Find the angle between GF and the pentagon $ABCDE$. **(4 marks)**