

Grade Grabber 9

50 Mark Paper

Set Notation Recap:

| <i>Symbol</i> | <i>Interpretations</i> | | |
|---------------|-----------------------------------|---------------------|-------------|
| \cap | intersection | and | the part of |
| \cup | union | or | merge |
| A' | not A | | |
| \subset | subset | is contained in | |
| $\not\subset$ | not a subset | is not contained in | |
| \in | element | is a member of | |
| \notin | not an element | is not a member of | |
| \emptyset | the empty set | { } | |
| $n(A)$ | the number of elements in set A | | |
| \mathcal{E} | the universal set | | |

Question 1

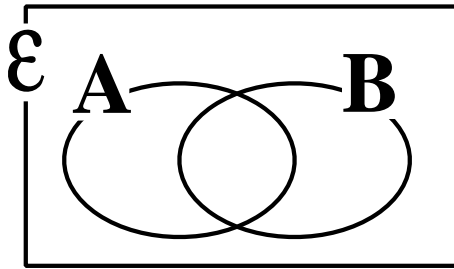
Given that $\mathcal{E} = \{ \text{the positive integers} \}$ $P = \{ \text{prime numbers} \}$ $E = \{ \text{even numbers} \}$

(a) List the following sets, either in words or by listing their elements;

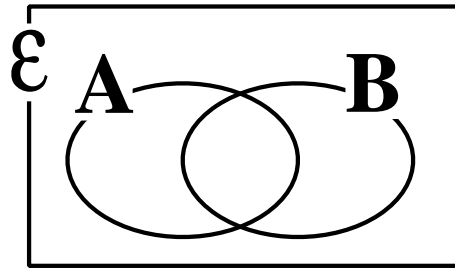
(i) E' [1 mark](ii) $P \cap E$ [1 mark](iii) $n(P \cap E)$ [1 mark](iv) $E \cup E'$ [1 mark](v) $P \cap P'$ [1 mark](b) Is $28577463968538 \in E$? [1 mark](c) Is $9 \in P$? [1 mark](d) Is $E' \subset P$? [1 mark](e) Is $27 \notin P$? [1 mark](f) Is it true that the set $\{ \text{factors of } 15 \} \not\subset E$? [1 mark]

Question 2

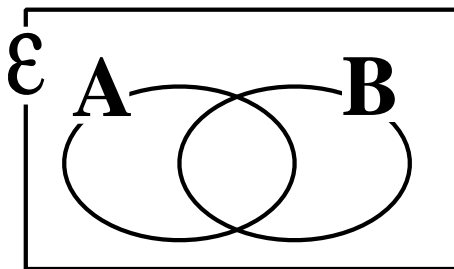
On each diagram, shade in the region specified,



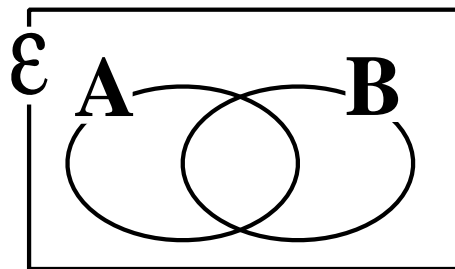
(i) A'



(ii) $A \cup B'$



(iii) $A' \cup B$



(iv) $(A \cup B') \cap (A' \cup B)$

[4 marks]

Question 3

Expand the brackets and simplify:

(i) $(2x - 3)(7x - 5)$

[2 marks]

(ii) $(3 + \sqrt{2})(3 - \sqrt{2})$

[2 marks]

(iii) $(2x^2)^3$

[2 marks]

Question 4

Find $\frac{dy}{dx}$ given that $y = 5x^3 + \frac{1}{x^3} + 2x + \frac{1}{4}$

[4 marks]

Question 5

A straight line passes through the points (2, 6) and (12, 11)

(i) What is the gradient of the line ?

[2 marks]

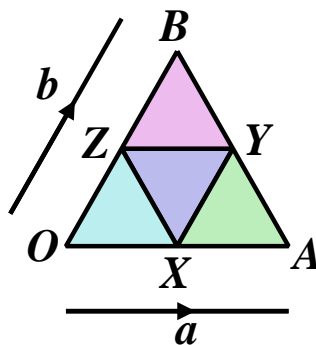
(ii) Write down the equation of the straight line in the form $y = mx + c$ where m and c are constants to be found.

[2 marks]

Question 6

The diagram below shows four congruent equilateral triangles arranged edge-to-edge to form a large equilateral triangle.

Notice that; $\vec{OA} = a$
and; $\vec{OB} = b$



Describe, in terms of the vectors a and b , the following;

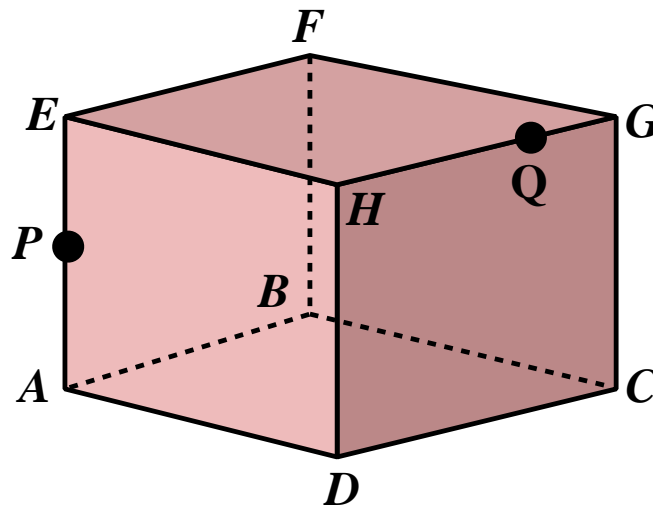
- | | | |
|--------------------|---------------------|--------------------|
| (i) \vec{OX} | (ii) \vec{AX} | (iii) \vec{ZB} |
| (iv) \vec{YZ} | (v) \vec{ZO} | (vi) \vec{BA} |
| (vii) \vec{ZX} | (viii) \vec{OY} | (ix) \vec{AZ} |

[9 marks]

Question 7

$ABCDEFGH$ is a cube of side 4 cm.

$AP = 2$ cm and $HQ = 3$ cm.



Calculate;

(i) the lengths of EQ and PD

[2 marks]

(ii) the length of PQ

[1 mark]

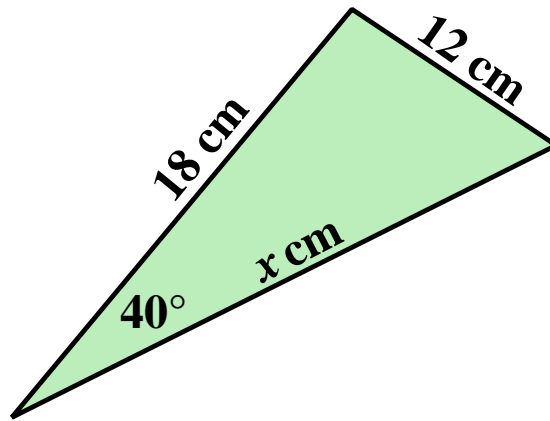
(iii) the angle between PQ and the plane $EFGH$

[2 marks]

(iv) the angle QPD

[3 marks]

Question 8



- (i) Find the length of the side marked x in the diagram above.

[3 marks]

- (ii) Find the area of the triangle.

[2 marks]