Name_____

ONE

A collection of five whole numbers has a mode of 3, a median of 4 and a mean of 5. List all the possible collections of five numbers.

TWO

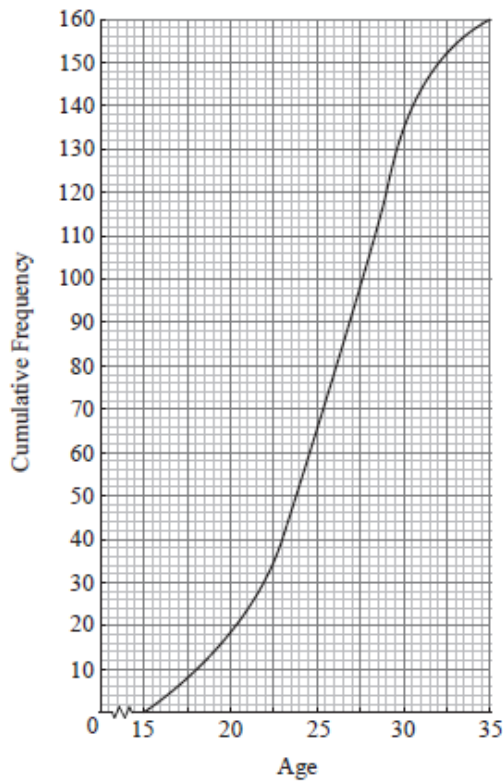The ages of people attending a music concert are given in the table below.

Age	$15 \leq x < 19$	$19 \leq x < 23$	$23 \leq x < 27$	$27 \leq x < 31$	$31 \leq x < 35$
Frequency	14	26	52	52	16
Cumulative Frequency	14	40	92	p	160

(a) Find p.

The cumulative frequency diagram is given below.

(b) Use the diagram to estimate

(i)   the 80th percentile;

(ii) the interquartile range.

THREE

Two boxes M and N contain red (R) and green (G) balls.
Box M contains five red balls and three green balls.
Box N contains four red balls and six green balls.

A ball is taken at random from box M and moved into box N. A ball is
then taken at random from box N.

(a)   Copy and complete the tree diagram.

ball from box M   ball from box N

                                              R
          $\dfrac{5}{8}$ R
                               ____
                                              G

                                              R
          $\dfrac{3}{8}$ G
                               ____
                                              G

(b)   Calculate the probability that the ball taken from box N is green.

(c)   Given that the ball taken from box N is green, find the probability
       that the ball taken from box M is red.

FOUR

Let A and B be events such that $P(A) = \dfrac{1}{2}$, $P(B) = \dfrac{3}{4}$ and $P(A \cup B) = \dfrac{7}{8}$.

(a)   Calculate $P(A \cap B)$.

(b)   Calculate $P(A|B)$.

(c)   Are the events A and B independent? Give a reason for your answer.
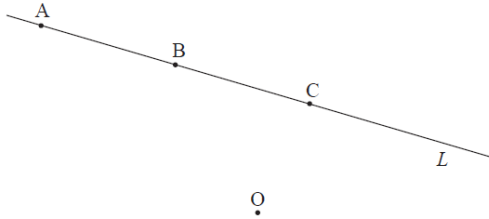
FIVE

A line L passes through points $A(-2, 4, 3)$ and $B(-1, 3, 1)$.

(a) (i) Show that $\vec{AB} = \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$.

   (ii) Find $\left| \vec{AB} \right|$.

(b) Find a vector equation for L.

The following diagram shows the line L and the origin O. The point C also lies on L.

Point C has position vector $\begin{pmatrix} 0 \\ y \\ -1 \end{pmatrix}$.

(c) Show that $y = 2$.

(d) (i) Find $\vec{OC} \cdot \vec{AB}$.

   (ii) Hence, write down the size of the angle between OC and L.

(e) Hence or otherwise, find the area of triangle OAB.

SIX

A line L_1 passes though points $P(-1, 6, -1)$ and $Q(0, 4, 1)$.

(a) (i) Show that $\vec{PQ} = \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$.

   (ii) Hence, write down an equation for L_1 in the form $r = a + tb$.

A second line L_2 has equation $r = \begin{pmatrix} 4 \\ 2 \\ -1 \end{pmatrix} + s \begin{pmatrix} 3 \\ 0 \\ -4 \end{pmatrix}$.

(b) Find the cosine of the angle between $\vec{PQ}$ and L_2.

(c) The lines L_1 and L_2 intersect at the point R. Find the coordinates of R.