Name: _____

Weekly Review #9

1. A quadratic function, $f(x) = ax^2 + bx$, is represented by the mapping diagram below.



(a) Use the mapping diagram to write down **two** equations in terms of *a* and *b*.

(2)

- (b) Find the value of
 - (i) *a*;
 - (ii) *b*.

(2)

(c) Calculate the *x*-coordinate of the vertex of the graph of f(x).

(2) (Total 6 marks)

- 2. A concert choir is arranged, per row, according to an arithmetic sequence. There are 20 singers in the fourth row and 32 singers in the eighth row.
 - (a) Find the common difference of this arithmetic sequence.

(3)

There are 10 rows in the choir and 11 singers in the first row.

(b) Find the **total** number of singers in the choir.

(3) (Total 6 marks)

3. Maria travels to school either by walking or by bicycle. The probability she cycles to school is 0.75.

If she walks, the probability that she is late for school is 0.1. If she cycles, the probability that she is late for school is 0.05.

(a) Complete the tree diagram below, showing the appropriate probabilities.



(b) Find the probability that Maria is late for school.

(3) (Total 6 marks)

(3)

4. In a research project on the relation between the gender of 150 science students at college and their degree subject, the following set of data is collected.

| | | Degree Subject | | |
|--------|--------|----------------|---------|-----------|
| | | Biology | Physics | Chemistry |
| Gender | Male | 40 | 16 | 35 |
| | Female | 15 | 24 | 20 |

Find the probability that a student chosen at random

(a) is male;

- (b) is either male or studies Chemistry;
- (c) studies Physics, given that the student is male.

(2) (Total 6 marks)

(2)

(2)

5. (a) Complete the truth table shown below.

| р | q | $p \land q$ | $p \lor (p \land q)$ | $(p \lor (p \land q)) \Rightarrow p$ |
|---|---|-------------|----------------------|--------------------------------------|
| Т | Т | | | |
| Т | F | | | |
| F | Т | | | |
| F | F | | | |

(3)

(b) State whether the compound proposition $(p \lor (p \land q)) \Rightarrow p$ is a contradiction, a tautology or neither.

(1)

Consider the following propositions.

p: Feng finishes his homework q: Feng goes to the football match

(c) Write in symbolic form the following proposition.

If Feng does not go to the football match then Feng finishes his homework.

(2) (Total 6 marks)

A market researcher consulted males and females to determine whether the type of coffee they 6. drink is associated with gender. The types of coffee are Cappuccino, Latte, Americano, Macchiato and Espresso. A χ^2 test was conducted, at the 5 % significance level, and the χ^2 value was found to be 8.73. Write down (a) the null hypothesis; (i) the alternative hypothesis. (ii) (2) Write down the number of degrees of freedom for this test. (b) (1) Write down the critical value for this test. (c) (1) State whether the type of coffee drunk is independent of gender. Give a reason for your (d) answer. (2) (Total 6 marks)

7. 56 students were given a test out of 40 marks. The teacher used the following box and whisker plot to represent the marks of the students.



- Write down (a)
 - the median mark; (i)
 - the 75th percentile mark; (ii)
 - (iii) the range of marks.

(4)

(2)

(b) Estimate the number of students who achieved a mark greater than 32.

(Total 6 marks)

Consider the function $f(x) = x^3 - 3x^2 - 24x + 30$. 8.

| (a) | Write down $f(0)$. | |
|-----|---------------------|--|
| (a) | Write down $f(0)$. | |

Find f'(x). (b)

(3)

(1)

(c) Find the gradient of the graph of f(x) at the point where x = 1.

(2)

The graph of f(x) has a local maximum point, M, and a local minimum point, N.

- (d) (i) Use f'(x) to find the *x*-coordinate of M and of N.
 - (ii) Hence or otherwise write down the coordinates of M and of N.

(e) Sketch the graph of f(x) for $-5 \le x \le 7$ and $-60 \le y \le 60$. Mark clearly M and N on your graph.

(4)

Lines L_1 and L_2 are parallel, and they are tangents to the graph of f(x) at points A and B respectively. L_1 has equation y = 21x + 111.

(f) (i) Find the *x*-coordinate of A and of B.

(ii) Find the *y*-coordinate of B.