Yr 10 Maths A Exam revision   Extended Response Questions.

Question 1
Michael's Plumbing charges $50 a visit plus $25 per hour.
(a) Sketch a graph of the costs for visits between 0 and 5 hours
(b) Find an equation relating the cost of the visit (C) and the length of the visit (t, in hours).
(c) What does a 45-minute visit from the plumber cost?
(d) If the bill is $81.25, how long did the plumber stay?

Question 2
Rent-a-Bike supplies bikes to groups of people to cycle the countryside. They charge a daily rate of $150 for bikes for 20 people and $330 for 50 people.
(a) State the equation relating the number of people and the cost of the bikes. (Assume that there is a linear relationship.)
(b) At the same rate, what would be the charge for a group of 30 people?

Question 3
An elevator is descending towards the basement of a building at a steady rate. It descends 4 metres every 3 seconds and it reaches the basement ($h = 0$) after 33 seconds.
(a) Sketch a graph that describes the relationship between the height, h, of the elevator and the time, t.
(b) Find the gradient of the graph and hence, the rate of descent of the elevator.
(c) Write down an equation that describes the relationship between the height, h, of the elevator and the time, t.
(d) How high is the elevator in the building when $t = 0$?

Question 4
A brick layer charges $40 for a call-out plus $50 per hour of work. If T is the total earnings for t hours of work, find:
  a a rule connecting T and t
  b the total earnings (T) from a job if it takes 5 hours to complete.
  c the number of hours (t) if a job costs $690.

Question 5
Jacques is test driving a new model Rocket Roadster. The speed of the car can be modelled using the equation $S(t) = -3t^2 + 12t + 27$, where S is the speed in metres per second (m/s) and t is time, in seconds.
  a) What was the initial speed, in km/h, of the car when the testing began? Write your answer correct to 1 decimal place.
  b) By converting $S(t)$ into turning point format, determine the maximum speed, in km/h correct to 1 decimal place, that the Rocket Roadster can reach in this road test and the time taken, in seconds, to reach that speed.

Question 6
A certain type of carpet has a width of $(x + 2)$ metres. Customers can purchase the carpet in any length. Mr Barnes buys $(x + 5)$ m of this carpet for his rumpus room and Mr Snowdon buys a 4 m length for his family room.
  a) Write an expression for the area of carpet that each man buys.
  b) Write an expression for the difference in area if Mr Barnes has the longer piece of carpet.
  c) Factorise and simplify this expression.
  d) If Mr Barnes has bought 6 m^2 more than Mr Snowdon, find the width of the carpet.
  e) What area of carpet did each man buy?

Question 7
An Xbox games package comes in a box that has a length **10 cm longer than its width** and a height that is **7 cm greater than its width**.
  a) Using the variable x **to represent the width** of the box, write an equation for the box's volume.
  b) Find the volume of the box if its width is 30 cm.
  c) The manufacturer wants to include another controller and decides that the box should have a volume of 94 000 cm^3 but retain the same shape. Using trial and error, find the width for this volume, if x must be an integer.

Question 8
Martha decides to redesign the front cover of her diary which has an area equal to $(x^2 - 3x - 10)$ cm^2.
  a) Factorise this expression to find the dimensions of the diary cover in terms of x.
  b) Write down the shorter length in terms of x.
  c) If the shorter sides of the diary cover are 12 cm in length, find the value of x.
  d) What is the area of the front cover of Martha's diary?

Question 9
Robyn keeps guinea pigs in a small square enclosure with sides measuring x m. The number of guinea pigs is increasing so she wants to increase the size of the enclosure by 1 m on one side and 3 m on the adjacent side.
  a) Draw a labelled diagram of the original square and show the additions to it.
  b) Write an expression for the area of the new enclosure.
  c) To satisfy animal safety requirements, the area of the enclosure must be at least 15 m^2. Find the dimensions of the enclosure.
  d) To make sure the enclosure is big enough, Robyn decides to make the area 17 m^2. Determine the new dimensions of the enclosure (to the nearest cm).

Question 10
During an 8-hour period, an experiment is done in which the temperature of a room follows the relationship $T = h^2 - 8h + 21$, where T is the temperature in degrees Celsius h hours after starting the experiment.
  a) Change the equation into turning point form and hence sketch the graph of this quadratic.
  b) What is the initial temperature?
  c) After three hours, is the temperature increasing or decreasing?
  d) After five hours is the temperature increasing or decreasing?
  e) State the minimum temperature and when it occurred.
  f) What is the temperature after 8 hours?

Question 11
The parabola $y = x^2 + bx + c$ has x intercepts (2, 0) and (6, 0).
  a) Find the values of b and c.
  b) State the equation.
  c) Complete the square and find the turning point.
  d) Sketch the parabola.

Question 12

Bridgette is practising her golf drives. The path the golf ball takes is defined by the quadratic equation $h = -\frac{1}{6}(d-6)^2 + 6$, where h is the height of the ball above the ground for a horizontal distance of d. Both h and d are in metres.

a) Find the value of h when $d = 0$.

b) State the turning point of the equation $h = -\frac{1}{6}(d-6)^2 + 6$

c) Sketch the graph of this relationship.

d) What horizontal distance does the golf ball cover in its flight?

e) 370What is the maximum height the golf ball reaches?

f) At what horizontal distance was the golf ball at its maximum height?

Question 13

Jan is practising for the World Diving Championships. The path she takes from the diving board into the water is given by the quadratic equation $y = -0.75x^2 + 3x + 8$, where y metres is the height above the water level and x metres is the horizontal distance from the edge of the board.

a) Using a graphics calculator, sketch the graph of $y = -0.75x^2 + 3x + 8$.

b) What is the height of the diving board above the water?

c) What was the maximum height Jan reached during her dive?

d) What was the horizontal distance Jan covered before she hit the water?

Question 14

An eight-sided die is rolled three times to see whether 5 occurs.

a) Draw a tree diagram to show the sample space. Let f represent rolling a five.

b) Calculate:
   a. P(three 5s)
   b. P(no 5s)
   c. P(two 5s)
   d. P(at least two 5s).

Question 15

On grandparents day at a school a group of grandparents was asked where they most like to take their grandchildren — the beach (B) or shopping (S). The results are illustrated in the Venn diagram below. Use the Venn diagram given to calculate the following probabilities relating to the place grandparents most like to take their grandchildren.
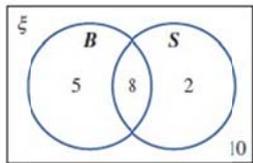
a) What is the probability that a randomly selected grandparent preferred to take their grandchildren to the beach or shopping?

b) What is the probability that a randomly selected grandparent preferred to take their grandchildren to the beach, given that they preferred to take their grandchildren shopping?

Question 16

Two marbles are chosen, without replacement, from a jar containing only red and green marbles. The probability of selecting a green marble and then a red marble is 0.72. The probability of selecting a green marble on the first draw is 0.85. What is the probability of selecting a red marble on the second draw if the first marble drawn was green?

Question 17

Andrew does not know the answer to two questions on a multiple choice exam. The first question has four choices and the second question he does not know has five choices.

a) What is the probability that he will get both questions wrong?

b) If he is certain that one of the choices cannot be the answer in the first question, how will this change the probability that he will get both questions wrong?

Question 18

In the scientific area of Genetics, probability is used to assist in determining the likelihood of inherited characteristics. For example; a widow's peak hairline is dominant; a straight hairline is recessive. Consider a mother who is heterozygous dominant (Ww) for the widow's peak and a father who is homozygous recessive (ww).

a) Complete this table.

	W	w
w		
w		

b) Use your table to determine the probability that their offspring will have a widow's peak.

Question 19

A pencil case contains 3 black pens and 2 red pens. The pencil case is shaken, one falls out and is put back in the case. This is repeated twice more. Each pen has an equal chance of falling out.

a) Represent this information on a tree diagram.

b) Find the probability of getting three black pens.

c) Find the probability of getting at least two red pens.

Question 20

When all of Saphron's team players turn up for their twice weekly netball training the chance that they then win their Saturday game is 0.65. If not all players are at the training session then the chance of winning their Saturday game is 0.40. Over a four week period, Saphron's players all turn up for training three times.

a) Using a tree diagram, with T to represent all players training and W to represent a win, represent the winning chance of Saphron's netball team.

b) Using the tree diagram constructed in part

   a, determine the probability of Saphron's team winning their Saturday game. Write your answer correct to 4 decimal places.

Question 21

There are 40 children in a room and they are either right-handed or left-handed. There are 17 right-handed boys, and 9 left-handed children. Of the 40 children, 21 are girls.
How many left-handed girls are in the room?

Question 22

For the probability table (two way table) shown, A is the event 'no more than 15 years of age' and B is the event 'smoker'.

	B	B'	
A	0.08		
A'		0.6	
	0.67		

a) Complete the probability table.
b) What is the probability that:
   - i. a person older than 15 years of age does not smoke?
   - ii. a person is a smoker and is older than 15 years of age?
   - iii. the person is a smoker over the age of 15 or is a non- smoker less than or equal to 15 years of age?

Question 23

An examination of 250 people showed that of those in the group who are less than or equal to 20 years of age, 80 wear glasses and 55 do not. Also, 110 people over 20 years of age must wear glasses.

a) Represent the information as a probability table.
b) Calculate the probability that a randomly selected person of the group:
   - i. does not wear glasses and is over 20 years of age
   - ii. is 20 years of age or younger.

Question 24

Two hundred and eighty children were asked to indicate their preference for ice-cream flavours. It was found that 160 of the children like chocolate flavour, 145 like strawberry and 50 like both flavours. Use this information to complete a two way table.
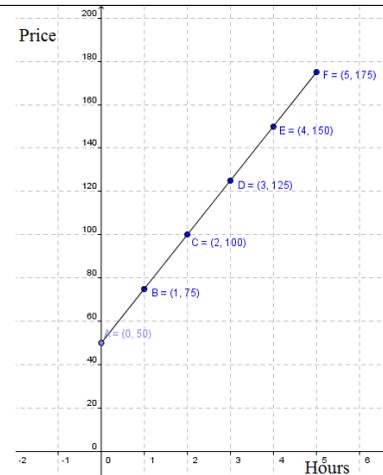
Question 25

Complete a probability table for each of the following, given:
1. $\Pr(A \cap B) = 0.3$, $\Pr(A' \cap B') = 0.2$ and $\Pr(A) = 0.6$
2. $\Pr(B \cap A') = 0.7$, $\Pr(B) = 0.8$ and $\Pr(B' \cap A) = 0.1$
3. $\Pr(A \cap B) = 0.5$, $\Pr(A' \cap B') = 0.1$ and $\Pr(B') = 0.4$

Yr 10 Maths A Exam revision
Extended Response Questions.
Solutions

1.

(b) A visit of 0 hours costs $50 ($y$-intercept).
A visit of 1 hour costs $75.
Consider the points (0, 50) and (1, 75).

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{75 - 50}{1 - 0}$$
$$= 25$$
$$C = mt + c$$
$$C = 25t + 50 \text{ [2 marks]}$$

(c) When $t = \frac{3}{4}$ hours,

$$C = 25 \times \frac{3}{4} + 50$$
$$= 68\frac{3}{4}$$

A 45-minute plumbing visit costs $68.75. [2 marks]

(d)
f C = $81.25,
81.25 = 25t + 50
31.25 = 25t
t = 1.25

The plumber would have stayed for $1\frac{1}{4}$ hours. [3 marks]

2. **(a)** Let p = number of people and C =

---

cost.
Two points are given, (20, 150) and (50, 330)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{330 - 150}{50 - 20}$$
$$= \frac{180}{30}$$
= 6 [1 mark]
$C = mp + c$
The equation now becomes:
$C = 6p + c$
Substitute the point (20, 150).
150 = 6 × 20 + c
150 = 120 + c
c = 30
The relationship between the number of people and the bike hire cost is:
$C = 6p + 30$ [2 marks]

(b) When p = 30,
$C = 6 \times 30 + 30$
= 210
It will cost $210 for a group of 30 people to hire bikes for the day.
[2 marks]

3. **a)**
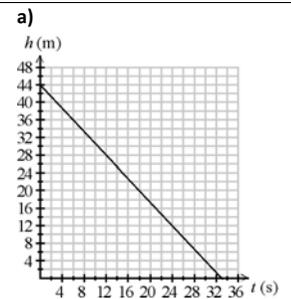
(b) Gradient = $-\frac{4}{3}$, hence rate of descent is $\frac{4}{3}$ m/s

(c) $h = -\frac{4}{3}t + 44$

(d) The elevator is 44 metres high.
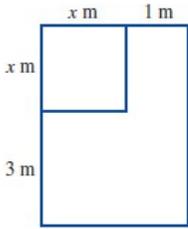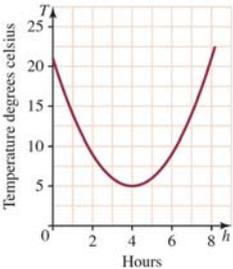
4.
a $T = 50t + 40$
b $290
c 13 hours

5.
a) 97.2 km/h
b) 140.4 km/h in 2 seconds

6.
a) Mr Barnes has $(x + 2)(x + 5)$ m²;
Mr Snowdon has $4(x + 2)$ m².
b) $(x + 2)(x + 5) - 4(x + 2)$
c) $(x + 2)(x + 1)$
d) The carpet has a width of 3 m.
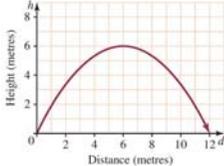e) Mr Barnes bought 18 m² and Mr Snowdon bought 12 m².
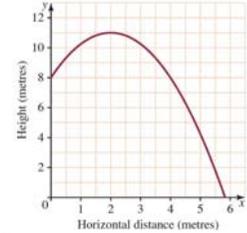
7.
a) $V = x(x + 10)(x + 7)$
b) 44 400 cm³
c) 40 cm

8.
a) $(x - 5)(x + 2)$
b) $(x - 5)$ is the shorter length.
c) $x = 17$
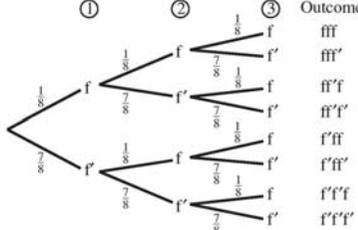d) 228 cm²

9.
a)

x m   1 m
x m
3 m

a.
b) $(x + 1)(x + 3)$
c) 5 m by 3 m
d) 5.24 m by 3.24 m

10.

a)
b) 21°C
c) Decreasing
d) Increasing
e) 5 °C after 4 hours
f) 21°C

11.
a) $b = -8$, $c = 12$
b) $y = x^2 - 8x + 12$
c) $(4, -4)$
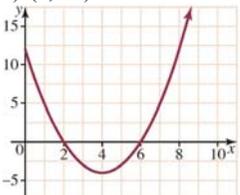
12.
a) 0
b) (6, 6)

c)
d) 12 m
e) 6 m
f) 6 m

13.

a)
b) 8 m
c) 11 m above the water
d) 5.83 m

14.

b. i. $\frac{1}{512}$

ii. $\frac{343}{512}$

iii. $\frac{21}{512}$

iv. $\frac{11}{256}$

15.
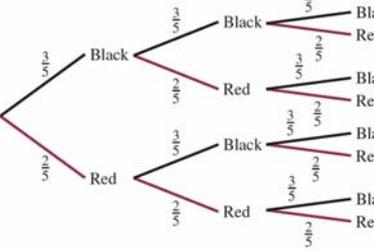a. $\frac{15}{25} = \frac{3}{5}$

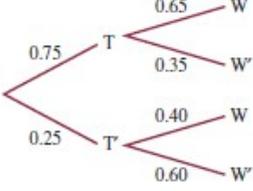b. $\frac{8}{10} = \frac{4}{5}$

16. 0.847

17.
a. $\frac{3}{5}$

b. $\frac{8}{15}$

18.
a.

	W	w
w	Ww	ww
w	Ww	ww

b. 50%

19.

b. 0.216
c. 0.352

20.
a.

b. 0.5875
c. $\frac{8}{47}$

21. 7

22.
a.

	B	B'	
A	0.08	0.32	0.4
A'	0.25	0.35	0.6
	0.33	0.67	1

b. i. 0.35
ii. 0.25
iii. 0.57

23.
a.

	G	G'	
A	0.32	0.22	0.54
A'	0.44	0.02	0.46
	0.76	0.24	1

A is people less than 20 years of age

G is people who wear glasses.

b. i. 0.02

ii. 0.54

24.

	S	S'	
C	50	110	160
C'	95	25	120
	145	135	280

C is chocolate, S is strawberry.

25.
a.

	B	B'	
A	0.3	0.3	0.6
A'	0.2	0.2	0.4
	0.5	0.5	1

b.

	B	B'	
A	0.1	0.1	0.2
A'	0.7	0.1	0.8
	0.8	0.2	1

c.

	B	B'	
A	0.5	0.3	0.8
A'	0.1	0.1	0.2
	0.6	0.4	1

26.