Carlingford High School

Mathematics
Year 10 Yearly Examination
5.2 Course
2015

Name: _____ Class: 5.2.____

Circle your teacher's name: Ms Strilakos   Ms Kellahan
Time allowed: 1 hour 30 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Questions marked with an asterisk * are extension level questions.
- Complete the examination in blue or black pen.

TOPIC	Multiple Choice	Linear Relation-ships	Compound Interest	Area and Volume	Quadratics & Inequali-ties	Data Analysis	Graphs	Trigon-ometry	Probab-ility	Vari-ation	Geometry	Total
MARK	/9	/9	/11	/8	/18	/10	/6	/11	/10	/3	/7	/102

SECTION 1   (9 Marks)

MULTIPLE CHOICE   (please circle the correct answer)

Q.1   The gradient of the line that is parallel to the line with equation $y = 3 + \frac{x}{2}$ is:

A.   2   B. $\frac{3}{2}$ C.   3   D. $\frac{1}{2}$
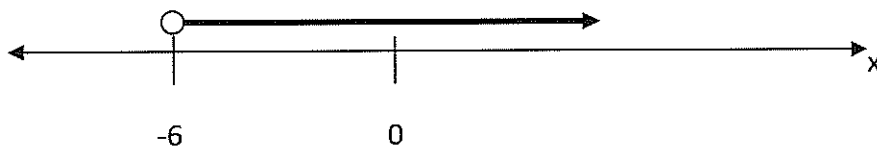
Q.2   The equation of the line that passes through the points $(-2, 7)$ and $(-2, 2)$ is:

A. $y = -2$ B. $x = -2$ C. $y = 7$ D. $y = 2$
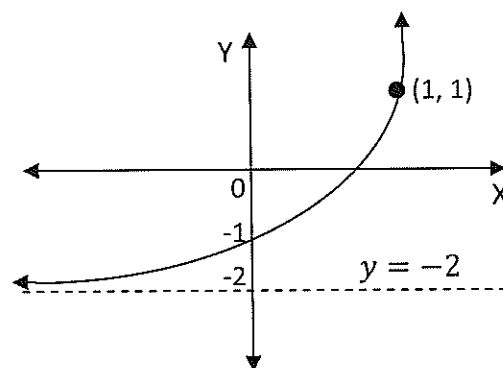
Q.3   The equation $m^2 + 7m + 12 = 0$ has the solutions:

A. $m = 12$ and $m = 1$ B. $m = 6$ and $m = 2$

C. $m = 3$ and $m = 4$ D. $m = -3$ and $m = -4$

Q.4   The inequality represented by the following line is:

A. $x \leq -6$ B. $x < -6$ C. $x \geq -6$ D. $x > -6$
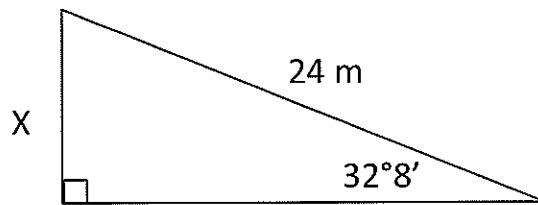
Q.5

The equation of the graph above is:

A. $y = x^2 - 1$ B. $y = 3^x - 1$ C. $y = 3^x - 2$ D. $y = \frac{-1}{x}$

Q.6   The probability of drawing two Hearts in a row from a pack of playing cards, if

you are drawing without replacement, is:

A. $\dfrac{1}{16}$ B. $\dfrac{1}{2652}$ C. $\dfrac{3}{51}$ D. $\dfrac{2}{16}$

Q.7   The length of the side indicated in the following triangle, to 3 d.p. is:

A.   45.122 m   B.   12.765 m   C.   38.210 m   D.   28.342 m

Q.8   Given that the cost of buying Cinema tickets is directly proportional to the number of

tickets purchased, and if I buy 3 tickets it costs me $55.80, the cost of purchasing 4

tickets would be:

A. $74.40   B. $24.80   C. $41.85   D. $111.60

Q.9   The table below shows the outcomes when purple, green, blue, pink and orange marbles
are drawn **with** replacement from a bag.

The expected number of times in 200 draws that a marble will be
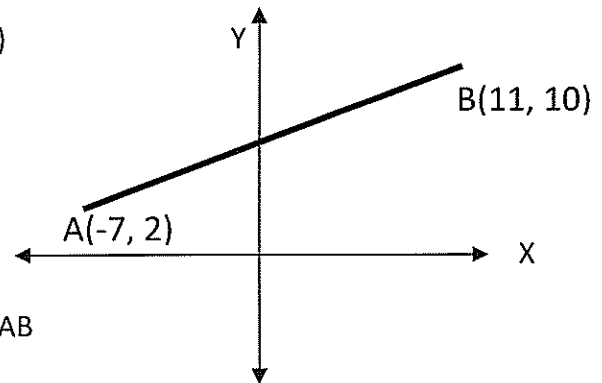drawn that is either purple, green or blue is:

A.   76   B.   152   C.   28   D.   34

Outcome	Frequency
Purple	28
Green	34
Blue	14
Pink	18
Orange	6
Total	100

SECTION 2 **(89 marks)**

Q1.   For the line interval shown in the diagram on the right, what is:

(i)   The length of the interval AB (2d.p.)

B(11, 10)

A(-7, 2)

(ii)   The coordinates of the midpoint of AB

(iii)   The gradient of AB?

[4 marks]

Q.2   For the line with equation $y = 4x + 10$ find:

(i)   the x-axis intercept

(ii)   the y-axis intercept

[2 marks]

Q.3   Find the equation of the line that is perpendicular to the line with equation

$2x - 5y = 10$ and which passes through the point (6, 4).

[3 marks]

Q.4   Paul invests $36 000 for 4 years at 7.2% p.a. interest compounded every 6 months.

Calculate:

(i)   The final value of the investment

(ii)   The compound interest earned on the investment.   [3 marks]

Q.5   Philippa bought a new lounge suite that cost $5480. She paid a 10% deposit and repayed
        the balance at a flat rate of 10% p.a. interest in equal monthly instalments over the
        following 3 years.

(i)   How much deposit did she pay?

(ii)   How much interest will she pay on the balance owing?

(iii)   What was the amount of each monthly repayment?

         (Give you answer to the nearest cent)

                                                                            [5 marks]

Q.6   Sammi paid $18 700 for a new car. The car will depreciate in value by an average of
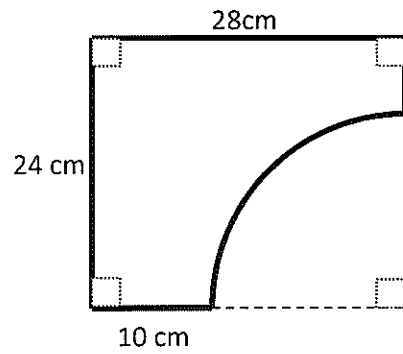
        12% p.a.

(i)   Find the market value of the car after 4 years to the nearest dollar.

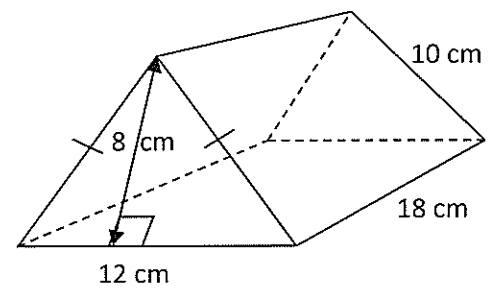(ii)   How long will it take for the car's value to drop to $7642.23?

                                                                            [3 marks]

Q.7   Find the area of the following figure (to 2 d.p):

28cm

24 cm

10 cm

[3 marks]

Q.8   (i)   Sketch the net for the prism on the right, showing measurements.

10 cm

8 cm

18 cm

12 cm

(ii)   Calculate the surface area of the prism.

(iii)   Find the volume of the prism.

[5 marks]

Q.9   Expand and simplify each of the following binomial products:

(i) $(x-6)(x+8)$ (ii) $(2g-3)(4g+5)$

[4 marks]

Q.10   Factorise each of the following quadratic expressions:

(i) $y^2+16y+28$ (ii) $w^2-5w-24$

[2 marks]

Q.11   Solve each of the following equations:

(i) $k^2=144$ (ii) $h^2=16h$

[4 marks]

Q.12   The length of a rectangle is 5 times more than its width, w. The perimeter of the rectangle is 156 cm.

(i)   Write an equation to describe the perimeter of the rectangle in terms of w.

(ii)   Hence using your answer to (i) find the length and width of the rectangle.

[3 marks]

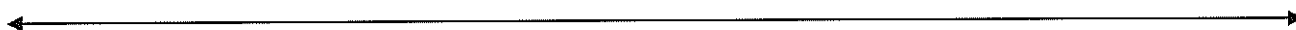Q.13   Solve the following inequalities:

(i) $3(4-y)\le18$

[3 marks]

(ii) $6+\dfrac{x}{5}>4$

[2 marks]

Q.14   The following data shows the results of 12 students on a Mathematics test.

   5   6   7   7   8   10   12   12   13   14   16   18

Find: (i)   The range

        (ii)   The median

        (iii)   The interquartile range

        (iv)   The percentage of students who scored between 5 and 13 on the test?

        (v)   Show this data on a Box-and-Whiskers Plot

[6 marks]

Q.15   Two paddocks are surveyed for a particular species of plant. The paddocks are sectioned
       off into individual 1 square metre sections, and the number of plants in each section is
       counted. The stem and leaf plot shows the number of specimens found in each square
       metre in each of the two paddocks.

| Paddock A	Stem	Paddock B
3 2	1	0 2 7 8 8 9 9
8 5 3	2	3 4 5 6 8 9
9 9 8 5	3	2 2 3
6 5 3	4	1 2
3 2	5	

   (i)   Which is the larger of the two paddocks?

   (ii)   Which paddock has the larger total number of specimens?

   (iii)   In which paddock is the median number of specimens per square metre larger?

   (iv)   How would you describe the distribution of plants in each paddock.

[4 marks]

Q.16 The graph of the parabola $y = -x^2 + 19$ is shown on the right.

(i) What is the equation of the axis of symmetry?

(ii) What is the parabola's maximum value?

(iii) Find the x-coordinates of the points on the
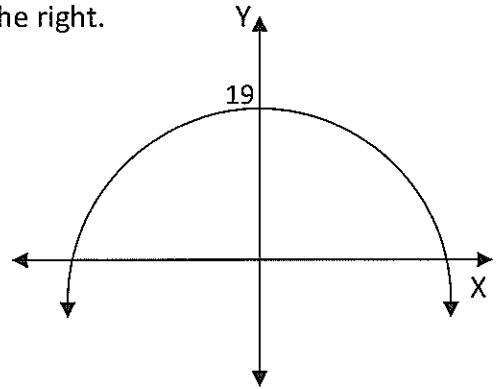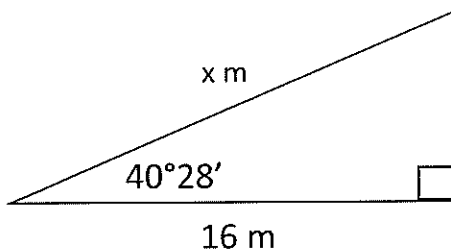
parabola with a y-coordinate of 3.

[4 marks]

Q.17 Find whether the point $(3, 2)$ lies inside, outside or on the circle with equation

$x^2 + y^2 = 16$ (Show all working).

[2 marks]

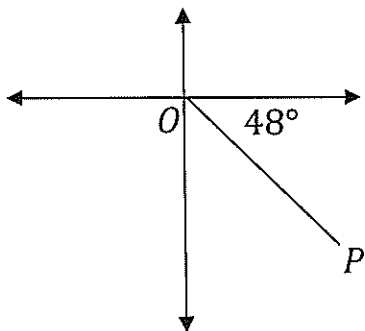Q.18 Find the value of the pronumeral in the following (to nearest whole number):

x m

40°28′

16 m

[2 marks]

Q.19 A stretch of road rises 28 metres for every 200 metres travelled uphill on a road.

Find the angle to the nearest minute at which the road is inclined to the horizontal.
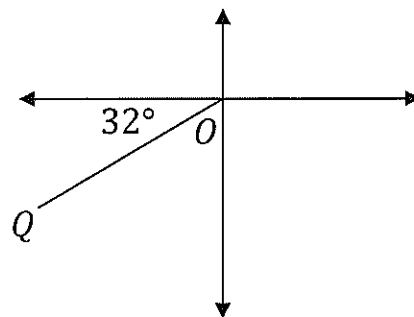
[2 marks]

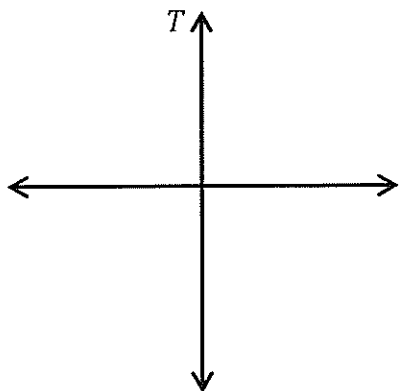Q.20　Write the bearing of each given point from O.

(i)

(ii)

[2 marks]

Q.21　Show the position of a point P on the given compass rose in each of the following if P has a bearing of:
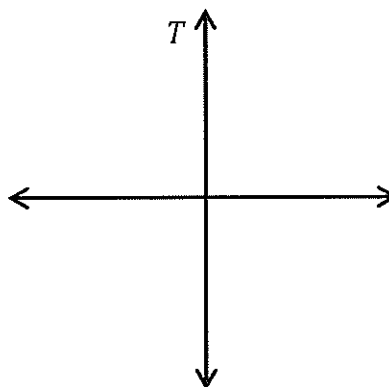
(i)　　　　23° from T

(ii)　　128° from T

[2 marks]

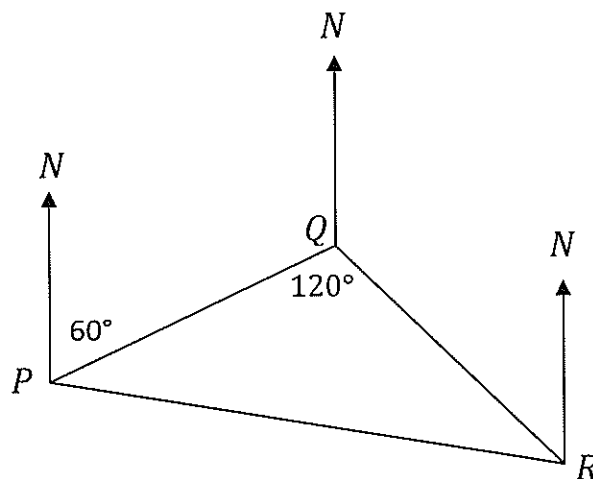Q.22　From the diagram on the right:

(i)　　Find the magnitude of ∠PQN
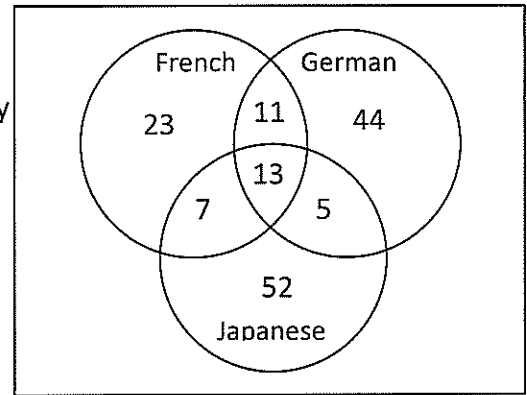
Hence find the bearing of:

(ii)　　Q from R

(iii)　　P from Q

[3 marks]

Q.23 At Carlingside High School, the students in Year 10 are asked which languages they study. The results are shown in the Venn Diagram.

(i) If all students in Year 10 study a language, how many students are there in Year 10? _____

(ii) What is the probability of selecting a student who studies German? _____

(iii) What is the probability of selecting a student who studies French and Japanese only? _____

(iv) What is the probability of selecting a student who studies German and French? _____ [4 marks]

Q.24 A box contains 4 blue and 6 red counters. Two draws of a counter are made **without** replacement.

(i) Draw a tree diagram to represent the possible outcomes **with their respective probabilities**.

What is the probability of drawing:

(ii) A red counter first?

(iii) One red counter?

(iv) A blue counter on the second draw?

(v) A red counter on the second draw, given that the first counter drawn is blue?

[6 marks]

Q.25   The height H of a pyramid of given volume varies inversely as the area of the base A.

If the height is 20cm when the area of the base is 20cm²,

(i)   Write an equation for H in terms of A.

What is:
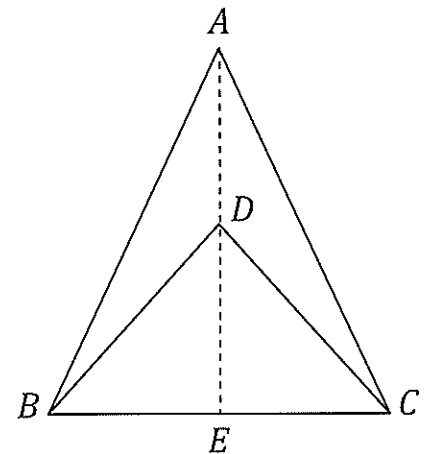
(ii)   The height when the base is 40cm²?

(iii)   The area of the base when the height is 5cm?
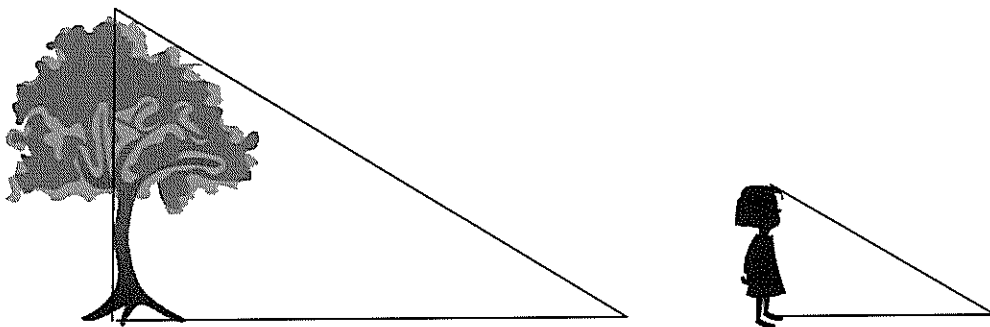
[3 marks]

Q.26   Given that AB = AC and DB = DC,

(i)   Prove that ΔABD ≡ ΔACD

(ii)   Hence show that ∠ABD = ∠ACD.

[4 marks]

Q.27.   Kassi's height is 1.6 metres and the length of her shadow is 2.4 metres. What is the height of a tree if it's shadow measured at the same time is 36 metres long?

[3 marks]

END OF PAPER

Carlingford High School

Mathematics
Year 10 Yearly Examination
5.2 Course
2015

Name: _____Solutions_____ Class: 5.2.____

Circle your teacher's name: Ms Strilakos   Ms Kellahan

Time allowed: 1 hour 30 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
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TOPIC	Multiple Choice	Linear Relation-ships	Compound Interest	Area and Volume	Quadratics & Inequali-ties	Data Analysis	Graphs	Trigon-ometry	Probab-ility	Vari-ation	Geometry	Total
MARK	/9	/9	/11	/8	/18	/10	/6	/11	/10	/3	/7	/102

MULTIPLE CHOICE   (please circle the correct answer)

Q.1   The gradient of the line that is parallel to the line with equation $y = 3 + \frac{x}{2}$ is:

A.   2   B. $\frac{3}{2}$ C.   3   D. $\frac{1}{2}$

Q.2   The equation of the line that passes through the points $(-2, 7)$ and $(-2, 2)$ is:

A. $y = -2$ B. $x = -2$ C. $y = 7$ D. $y = 2$
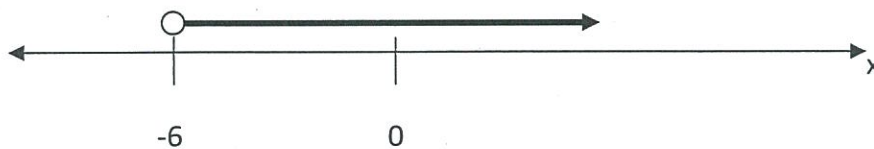
Q.3   The equation $m^2 + 7m + 12 = 0$ has the solutions: $(m+4)(m+3) = 0$

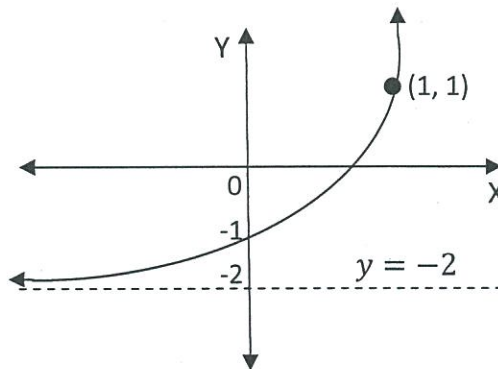A. $m = 12$ and $m = 1$ B. $m = 6$ and $m = 2$

C. $m = 3$ and $m = 4$ D. $m = -3$ and $m = -4$

Q.4   The inequality represented by the following line is:

-6   0

A. $x \leq -6$ B. $x < -6$ C. $x \geq -6$ D. $x > -6$

Q.5

The equation of the graph above is:

A. $y = x^2 - 1$ B. $y = 3^x - 1$ C. $y = 3^x - 2$ D. $y = \frac{-1}{x}$
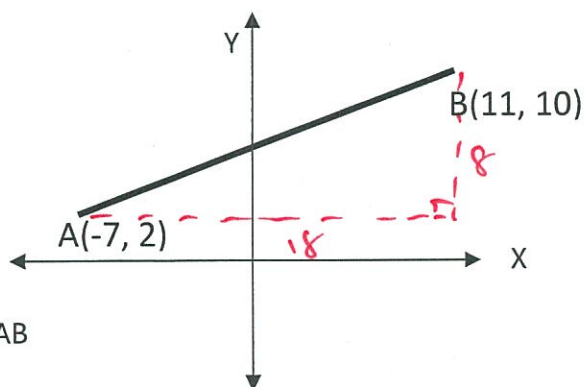
SECTION 2 (89 marks)

Q1. For the line interval shown in the diagram on the right, what is:

(i) The length of the interval AB (2d.p.)

$$AB^2 = 18^2 + 8^2$$
$$AB^2 = 388$$
$$AB = 19.70 \text{ units.}$$

[diagram: Y-axis and X-axis with line interval from A(-7, 2) to B(11, 10), showing horizontal 18 and vertical 8]

(ii) The coordinates of the midpoint of AB

$$M = \left(\frac{-7+11}{2}, \frac{2+10}{2} \right)$$
$$= (2, 6)$$

(iii) The gradient of AB?

$$m = \frac{8}{18} = \frac{4}{9}$$

[4 marks]

Q.2 For the line with equation $y = 4x + 10$ find:

(i) the x-axis intercept

$$y = 0:$$
$$0 = 4x + 10$$
$$4x = -10$$
$$x = -\frac{10}{4} = -\frac{5}{2}$$

(ii) the y-axis intercept

$$x = 0:$$
$$y = 10$$

[2 marks]

Q.3 Find the equation of the line that is perpendicular to the line with equation

$2x - 5y = 10$ and which passes through the point (6, 4).

$$-5y = -2x + 10$$
$$y = \frac{2}{5}x - 2$$
$$m_1 = \frac{2}{5}$$
$$m_2 = -\frac{5}{2}$$

$$y - y_1 = m(x - x_1)$$
$$y - 4 = -\frac{5}{2}(x - 6)$$
$$y - 4 = -\frac{5}{2}x + 15$$
$$y = -\frac{5}{2}x + 19$$

[3 marks]

Q.4   Paul invests $36 000 for 4 years at 7.2% p.a. interest compounded every 6 months.

Calculate:

(i)   The final value of the investment

$$A = P(1+r)^n$$
$$= 36000 (1.036)^8 = \$47\,772.78$$

(ii)   The compound interest earned on the investment.   [3 marks]

$$I = 47772.78 - 36000 = \$11772.78$$

Q.5   Philippa bought a new lounge suite that cost $5480. She paid a 10% deposit and repayed the balance at a flat rate of 10% p.a. interest in equal monthly instalments over the following 3 years.

(i)   How much deposit did she pay? $0.1 \times 5480 = \$548$

(ii)   How much interest will she pay on the balance owing?

$$\text{Interest} = 0.1 \times (\underset{\text{Balance}}{5480 - 548}) \times 3$$
$$= \$1479.60$$

(iii)   What was the amount of each monthly repayment?

(Give you answer to the nearest cent)

$$\frac{\text{Balance + Interest}}{\text{No. of months}} = \frac{4932 + 1479.60}{36} = \$178.10$$

[5 marks]

Q.6   Sammi paid $18 700 for a new car. The car will depreciate in value by an average of 12% p.a.

(i)   Find the market value of the car after 4 years to the nearest dollar.

$$18700 \times (1 - 0.12)^4 = \$11214$$
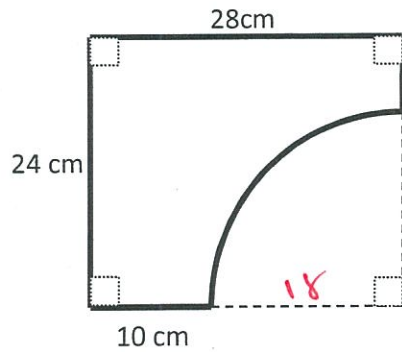
(ii)   How long will it take for the car's value to drop to $7642.23?

$$18700 \times 0.88^n = 7642.23$$
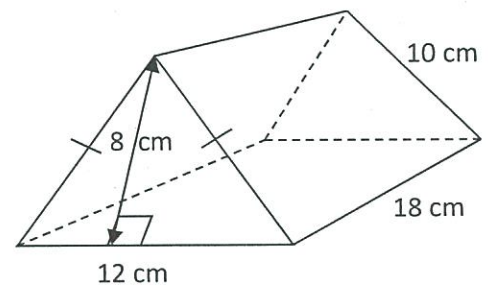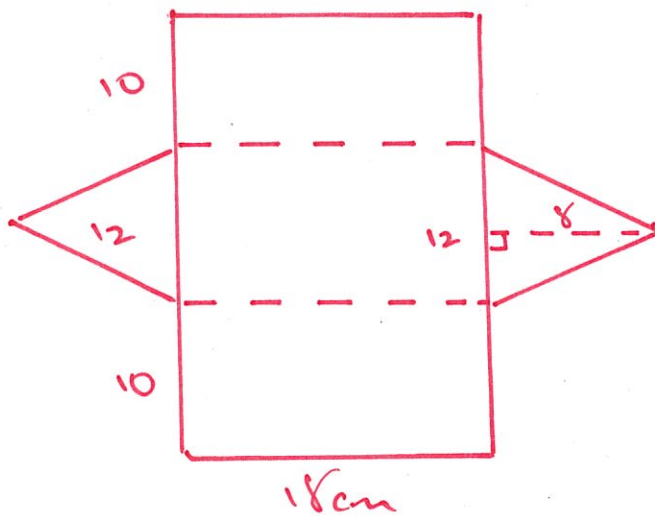$$0.88^n = 0.408675$$
$$\therefore n = 7 \text{ years.}$$

[3 marks]

Q.7 Find the area of the following figure (to 2 d.p):

28cm

24 cm

10 cm

18

$$\text{Area} = (24 \times 28) - (\tfrac{1}{4} \times \pi \times 18^2)$$
$$= 672 - 254.47$$
$$= 417.53 \text{ cm}^2$$

[3 marks]

Q.8 **(i)** Sketch the net for the prism on the right, showing measurements.

10

12

12

8

10

18cm

10 cm

8 cm

12 cm

18 cm

(ii) Calculate the surface area of the prism.

$$(18 \times 32) + (2 \times \tfrac{1}{2} \times 12 \times 8) = 576 + 96$$
$$= 672 \text{ cm}^2$$

(iii) Find the volume of the prism.

$$V = Ah = (\tfrac{1}{2} \times 12 \times 8) \times 18$$
$$= 864 \text{ cm}^3$$

[5 marks]

Q.9   Expand and simplify each of the following binomial products:

(i) $(x - 6)(x + 8)$

$x^2 + 8x - 6x - 48$

$= x^2 + 2x - 48$

(ii) $(2g - 3)(4g + 5)$

$8g^2 + 10g - 12g - 15$

$= 8g^2 - 2g - 15$ [4 marks]

Q.10   Factorise each of the following quadratic expressions:

(i) $y^2 + 16y + 28$

$(y + 14)(y + 2)$

(ii) $w^2 - 5w - 24$

$(w - 8)(w + 3)$

[2 marks]

Q.11   Solve each of the following equations:

(i) $k^2 = 144$

$k = \pm 12$

(ii) $h^2 = 16h$

$h^2 - 16h = 0$

$h(h - 16) = 0$

$h = 0, 16$ [4 marks]

Q.12   The length of a rectangle is 5 times more than its width, w. The perimeter of the rectangle is 156 cm.

w

$P = 156$ $5w$

(i)   Write an equation to describe the perimeter of the rectangle in terms of w.

$P = 2w + 10w$ ~~anxietie~~

$P = 12w$ ~~anxiety~~

(ii)   Hence using your answer to (i) find the length and width of the rectangle.

$12w = 156$ Length $= 5w$

$w = 13cm$ $= 5 \times 13$

$= 65cm$ [3 marks]

Q.13   Solve the following inequalities:

(i) $3(4 - y) \le 18$

$12 - 3y \le 18$

$-3y \le 6$

$y \ge -2$

[3 marks]

(ii) $6 + \frac{x}{5} > 4$
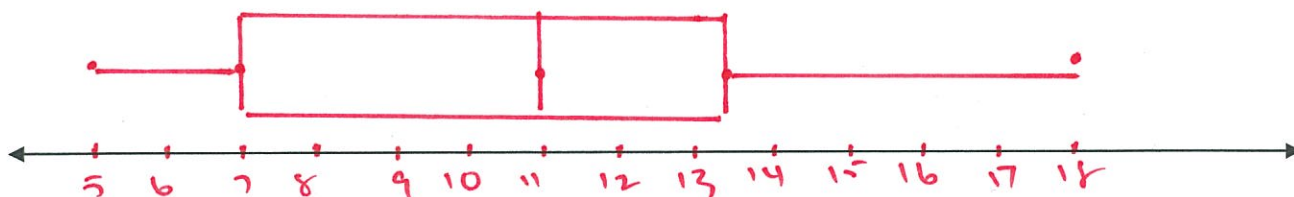
$\frac{x}{5} > -2$

$x > -10$

[2 marks]

Q.14 The following data shows the results of 12 students on a Mathematics test.

5   6   7   7   8   10   12   12   13   14   16   18

Find: (i) The range $18 - 5 = 13$

(ii) The median $\frac{10+12}{2} = 11$

(iii) The interquartile range $13.5 - 7 = 6.5$

(iv) The percentage of students who scored between 5 and 13 on the test? 75%

(v) Show this data on a Box-and-Whiskers Plot

[6 marks]

Q.15 Two paddocks are surveyed for a particular species of plant. The paddocks are sectioned off into individual 1 square metre sections, and the number of plants in each section is counted. The stem and leaf plot shows the number of specimens found in each square metre in each of the two paddocks.

Paddock A	Stem	Paddock B
3 2	1	0 2 7 8 8 9 9
8 5 3	2	3 4 5 6 8 9
9 9 8 5	3	2 2 3
6 5 3	4	1 2
3 2	5	

(i) Which is the larger of the two paddocks? B - $18m^2$ compared with $14m^2$

(ii) Which paddock has the larger total number of specimens? A Mean = $\frac{491}{14} = 35.1$ B - $\frac{448}{18} = 24.9$

(iii) In which paddock is the median number of specimens per square metre larger? A - Median = 38.5 B - 24.5

(iv) How would you describe the distribution of plants in each paddock.

A - Symmetric
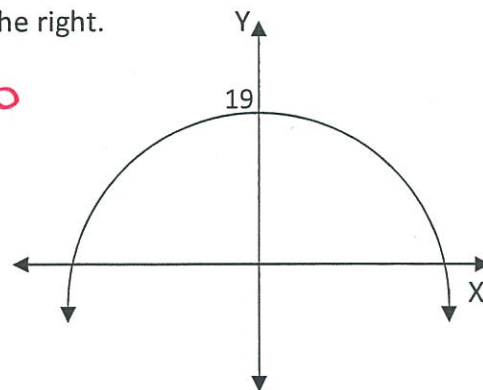B - Positively skewed.

[4 marks]

Q.16 The graph of the parabola $y = -x^2 + 19$ is shown on the right.

(i) What is the equation of the axis of symmetry? $X = 0$

(ii) What is the parabola's maximum value? 19

(iii) Find the x-coordinates of the points on the

parabola with a y-coordinate of 3.

$$y = 3$$

$$3 = -x^2 + 19$$

$$x^2 = 16$$

$$x = \pm 4$$

[4 marks]

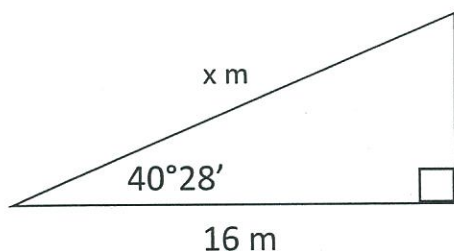Q.17 Find whether the point $(3, 2)$ lies inside, outside or on the circle with equation

$x^2 + y^2 = 16$ (Show all working).

$$3^2 + 2^2 = 13 < 16$$

$$\therefore \text{ inside}$$

[2 marks]

Q.18 Find the value of the pronumeral in the following (to nearest whole number):

x m

40°28′

16 m

$$\cos 40°28' = \frac{16}{x}$$

$$x = \frac{16}{\cos 40°28'}$$
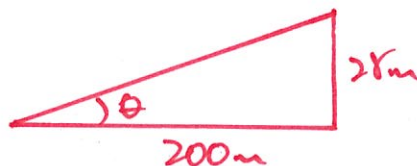
$$= 21 \text{ m}.$$

[2 marks]

Q.19 A stretch of road rises 28 metres for every 200 metres travelled uphill on a road.

Find the angle to the nearest minute at which the road is inclined to the horizontal.

$$\tan\theta = \frac{28}{200}$$
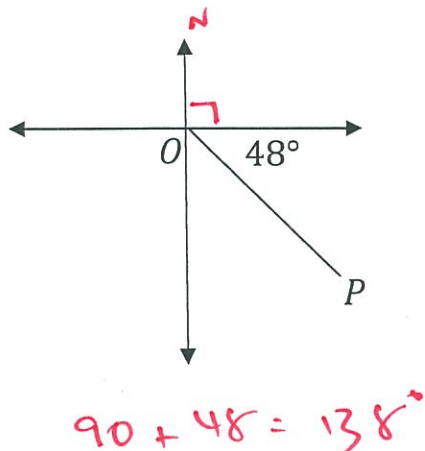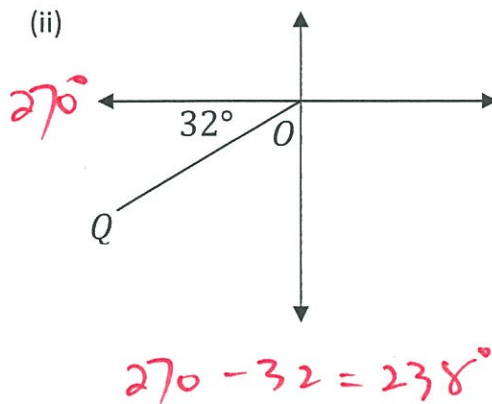
28m

θ

200m

$$\theta = 7°58'$$

[2 marks]

Q.20 Write the bearing of each given point from O.

(i)

$90 + 48 = 138°$

(ii)

$270°$

$270 - 32 = 238°$

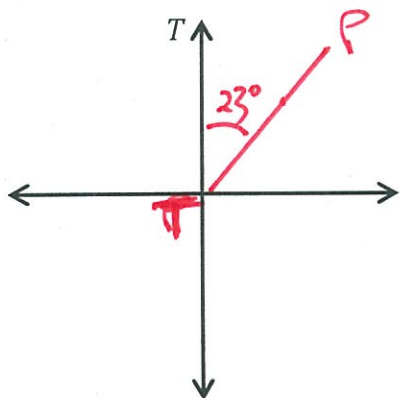[2 marks]

Q.21 Show the position of a point P on the given compass rose in each of the following if P has a bearing of:

(i)   23° from T

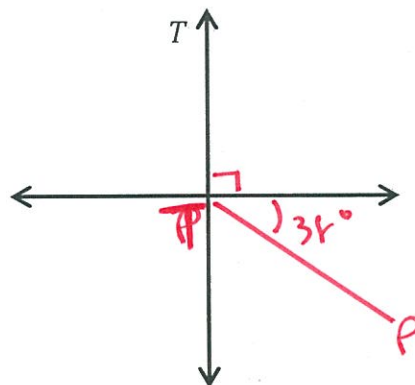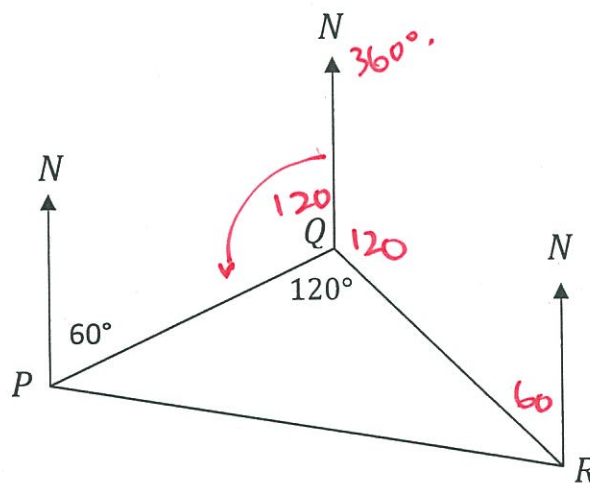

$23°$

(ii)   128° from T

$38°$

[2 marks]

Q.22 From the diagram on the right:

(i)   Find the magnitude of ∠PQN $180 - 60$
                                       $= 120°$

Hence find the bearing of:

(ii)   Q from R $300°$

(iii)   P from Q $240°$

$360°$

120

120

$120°$

$60°$
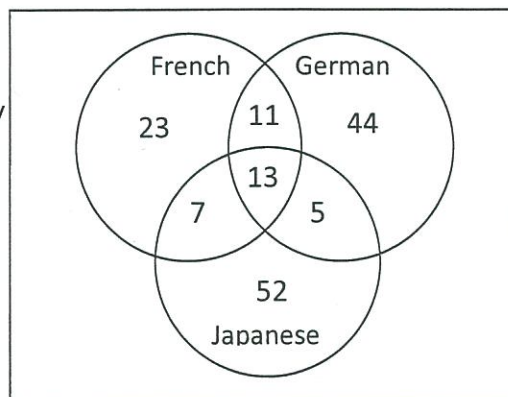
60

[3 marks]

Q.23 At Carlingside High School, the students in Year 10 are asked which languages they study.

The results are shown in the Venn Diagram.

(i) If all students in Year 10 study a language, how many

students are there in Year 10? __155·__

(ii) What is the probability of selecting a student who

studies German? ___$\frac{23}{155}$___

(iii) What is the probability of selecting a student who

studies French and Japanese only? ___$\frac{2}{155}$___

(iv) What is the probability of selecting a student who

studies German and French? ___$\frac{24}{155}$___   [4 marks]

French / German

23   11   44

13

7   5

52

Japanese

Q.24 A box contains 4 blue and 6 red counters. Two draws of a counter are made **without** replacement.

(i) Draw a tree diagram to represent the possible outcomes **with their respective probabilities**.

$\frac{4}{10}$ — B $\overset{\frac{3}{9}}{\underset{\frac{6}{9}}{}}$ B, R

$\frac{6}{10}$ — R $\overset{\frac{4}{9}}{\underset{\frac{5}{9}}{}}$ B, R
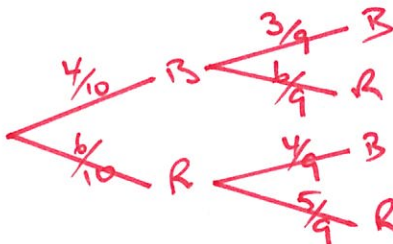
What is the probability of drawing:

(ii) A red counter first? $\frac{6}{10}$ or $\frac{3}{5}$

(iii) One red counter?

$P(BR) + P(RB) = \left(\frac{4}{10} \times \frac{6}{9}\right) + \left(\frac{6}{10} \times \frac{4}{9}\right)$

$= \frac{8}{15}$

(iv) A blue counter on the second draw?

$P(BB) + P(RB) = \left(\frac{4}{10} \times \frac{3}{9}\right) + \left(\frac{6}{10} \times \frac{4}{9}\right)$

$= \frac{2}{5}$

(v) A red counter on the second draw, given that the first counter drawn is blue?

$P(BR) = \frac{4}{10} \times \frac{6}{9} = \frac{4}{15}$

[6 marks]

Q.25   The height H of a pyramid of given volume varies inversely as the area of the base A.

If the height is 20cm when the area of the base is 20cm², ~~~~~~~~

(i)   Write an equation for H in terms of A.

$$H = \frac{k}{A}$$

What is:

(ii)   The height when the base is 40cm²?

$$20 = \frac{k}{20} \quad \therefore k = 400$$

(iii)   The area of the base when the height is 5cm?
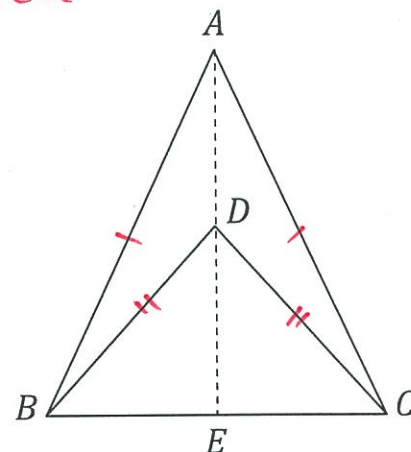
$$H = \frac{400}{40} = 10 \text{ cm}$$

[3 marks]

$$5 = \frac{400}{A}$$

Q.26   Given that AB = AC and DB = DC,

$$A = \frac{400}{5} = 80 \text{ cm}^2$$

(i)   Prove that ΔABD ≡ ΔACD

$$AB = AC \text{ (given)}$$
$$BD = CD \text{ (given)}$$
$$AD \text{ (common)}$$
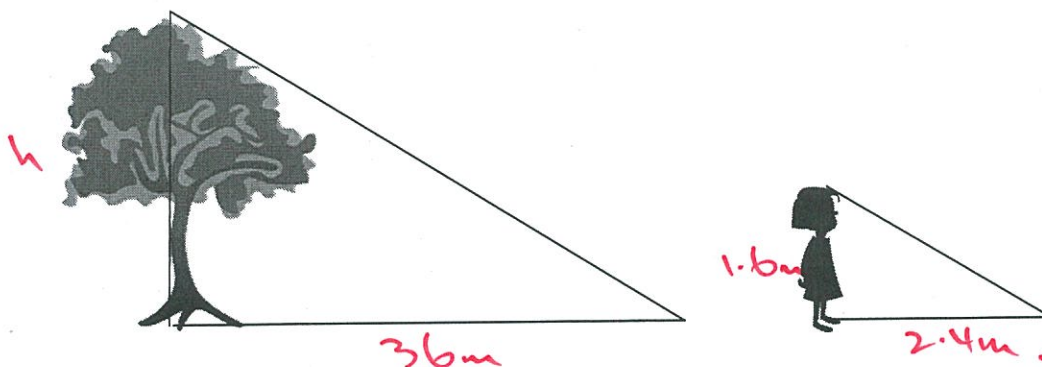$$\therefore \triangle ABD \equiv \triangle ACD \text{ (SSS)}$$

(ii)   Hence show that ∠ABD = ∠ACD.

Corresponding angles in congruent   [4 marks]
triangles equal.

Q.27.   Kassi's height is 1.6 metres and the length of her shadow is 2.4 metres. What is the height of a tree if it's shadow measured at the same time is 36 metres long?

h

36m

1.6m

2.4m.

$$\frac{h}{1.6} = \frac{36}{2.4}$$

$$h = \frac{36 \times 1.6}{2.4} = 24 m.$$

[3 marks]

END OF PAPER