Name: .... Class: ....

(FORT ST H.S)

Year 10

Common Test 1

Stage 5 Mathematics

General Instructions

- Working time – 90 minutes.
- Write using blue or black pen.
- Board-approved calculators may be used.
- All necessary working should be shown in every question.
- Answer in the space provided.

Total marks – 90

- Attempt all questions.
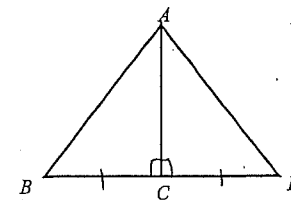- Marks for each question are indicated.

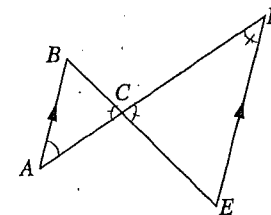| Areas Assessed	Section	Mark
Deductive Geometry.	A	/20
Algebra.	B	/31
Consumer arithmetic.	C	/22
Working Mathematically.	D	/17
	Total	/90

Section A:

Question 1. (3 marks)

In the diagram $BC = CD$ and $\angle ACB = \angle ACD = 90°$.

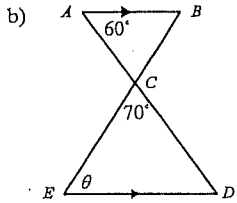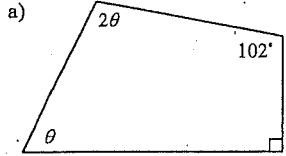Prove that $\triangle ABC \equiv \triangle ADC$ giving all reasons.

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Question 2. (3 marks)

Prove that $\triangle ABC \,|||\, \triangle DEC$ giving all reasons

....

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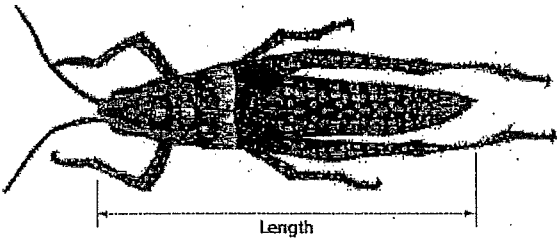**Question 3.** (5 marks)

Evaluate θ for the following diagrams, *giving reasons* for your answer.

Note: Marks will be awarded for communicating all reasoning.

a)

b)

Question 4. (1 mark)

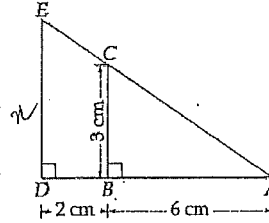The image shows an insect drawn using a scale factor of 3.

SCALE
3:1

Length

CSIRO Entomology

By firstly measuring the image, find the actual length of the insect.

Question 5. (2 marks)

$\triangle ABC$ is similar to $\triangle ADE$.

$AB = 6$ cm, $BC = 3$ cm and $DB = 2$ cm.

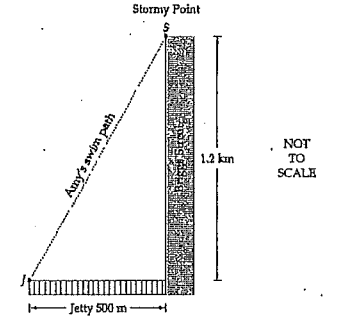NOT
TO
SCALE

Evaluate the length of ED.

_____

_____

_____

_____

....

Question 6. (2 marks)

The interior angle of a regular polygon is $140°$.

How many sides does the polygon have?

_____

_____

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....

Question 7. (2 marks)

Amy swims each morning from Stormy Point (S) to the end of the jetty (J), she then runs along the jetty to bridge street and directly back to Stormy point.

NOT
TO
SCALE

How far has she travelled?

_____

_____

Question 8. (2 marks)

Find the size of an interior angle of a regular polygon whose angle sum is $6120°$.

_____

_____

_____

_____

Section B: Algebra

Question 1. (4 marks)

A line passes through the points $A(-2,7)$ and $B(4,-3)$.

i) Find the gradient of the line.

.....

ii) Hence, find the equation of the line passing through AB leaving your answer in general form.

Question 2. (5 marks)

A line has the equation $6x - 2y - 5 = 0$.

i) Rewrite the equation in gradient-intercept form.

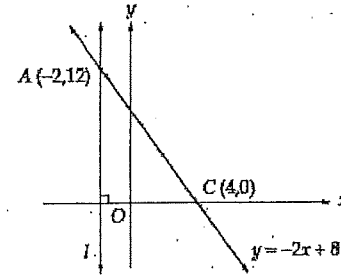ii) Where does the line cross the y axis?

iii) What is the gradient of the line?

iv) What is the equation of a line parallel to $6x - 2y - 5 = 0$ that passes through the point $(-1,-4)$? Give your answer in general form.

Question 3. (4 marks)

The line $y = -2x + 8$ crosses the x axis at $C(4,0)$ and intersects line l at $A(-2,12)$.

i) What is the equation of line l?

ii) Determine if the point $(-3,14)$ lies on the line $y = -2x + 8$.

A circle is to be drawn with diameter AC.

iii) What are the coordinates of the centre of this circle?

iv) Calculate the radius of this circle.

Question 4. (1 mark)

If $x = \sqrt{b^2 - 4ac}$, evaluate x if $a = 2, c = -6$ and $b = -4$

Question 5. (2 marks)

If $y = \dfrac{x+4}{2x}$, find an expression for x in terms of y.

Question 6. (4 marks)

Solve the following equations:

i) $\dfrac{x+1}{3} - \dfrac{x-1}{2} = 14$

ii) $x^2 = 4x$

Question 7. (4 marks)

By firstly factorising, solve

i) $x^2 - 11x + 18 = 0$

ii) $5m^2 - 11m - 12 = 0$

Question 8. (2 marks)

By using the quadratic formula, solve $4x^2 + 3x - 5 = 0$ correct to 2 decimal places.

Question 9. (2 marks)

Find the solution to the inequality

$$3(2-x) - 2x > 1$$

Question 10. (3 marks)

At a football game Rueben bought 5 hotdogs and 4 drinks for $50·30.

Jessica at the same game bought 8 hotdogs and 1 drink for $63·20.
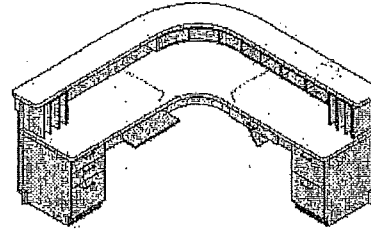
Find the cost of a hotdog.

Section C: Consumer Arithmetic.

Question 1. (3 marks)

Shintaro borrows $150 000 to set up a furniture business.

He repays the debt over 10 years at a *simple* interest rate of 9% pa.

(i) What is the total amount to be repaid?

(ii) Find the monthly repayment.

Question 2. (4 marks)

(i) Claudia invests $50 000 with Standard Credit Union for a term of 5 years.

Her investment earns interest at 3.1% per annum compounded annually.

How much will Claudia's investment be worth at the end of 5 years?
Give your answer to the nearest dollar.

(ii) Claudia's friend Zoe also has $50 000 to invest for a term of 5 years.

She invests with General Bank. Her investment earns interest at 3% per annum, compounded monthly.

Which friend makes the better investment? Justify your answer with appropriate calculations.

Question 3. (2 marks)

The table shows the total value of an investment of $1 compounding at varying rates of interest.

Period	5%	6%	7%	8%
1	1.0500	1.0600	1.0700	1.0800
2	1.1025	1.1236	1.1449	1.1664
3	1.1576	1.1910	1.2250	1.2597
4	1.2155	1.2625	1.3108	1.3605
5	1.2763	1.3382	1.4026	1.4693
6	1.3401	1.4185	1.5007	1.5869
7	1.4071	1.5036	1.6058	1.7138
8	1.4775	1.5939	1.7182	1.8509
9	1.5513	1.6895	1.8385	1.9990
10	1.6289	1.7909	1.9672	2.1589
11	1.7103	1.8983	2.1049	2.3316
12	1.7959	2.0122	2.2522	2.5182

Use the table above to answer the following questions.

i) Find the total value if $20 000 is invested at 5% p.a. for 8 years, compounded annually.

ii) Find the total value if $15 000 is invested at 12% p.a. for 5 years, compounded bi-annually.

Question 4. (4 marks)

Lindsay bought a car priced at $20 000 on terms.
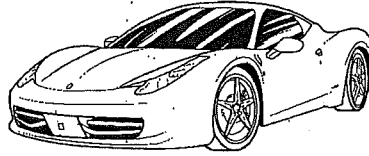
He paid a 12% deposit and monthly repayments of $677 for 4 years.

i) Find the deposit.

ii) Find the total amount in repayments.

iii) How much interest has been charged on the loan?

iv) What is the equivalent flat rate per annum?

Question 5. (2 marks)

In June, Phaedra received a statement for her credit card account.

The account has no interest free period and simple interest is calculated and charged to account on the statement date.

Ms Ima Bigspender
Credit limit: $2000

Sum Bank

Credit Card Statement

Statement date: 20 June 2006

Previous balance	Payments	Purchases	Interest charged
$263.83	$263.83	$617.72	

Date	Purchases	Amount
23 May	Concert tickets	$617.72

Annual percentage rate: 18.2%

Daily percentage rate: 0.0498%

Note: Interest is charged on amounts from (and including) the date of purchase up to (and including) the statement date.

i) How many days is she charged interest on her purchase?

ii) Calculate the interest charged to her account?

Question 6. (2 marks)

Efim buys a photocopier for $5400. If the copier depreciates at 12% p.a. compounded monthly, find its value after 5 years.

Question 7. (5 marks)

The table below shows the monthly repayment on home loans.

Monthly repayments

Amount borrowed	Term of loan				
	10 years	15 years	20 years	25 years	30 years
	120 months	180 months	240 months	300 months	360 months
$80 000	$970.62	$764.52	$669.15	$617.45	$587.01
$90 000	$1091.95	$860.09	$752.80	$694.63	$660.39
$100 000	$1213.28	$955.65	$836.44	$771.82	$733.76
$110 000	$1334.60	$1051.22	$920.08	$849.00	$807.14
$120 000	$1455.93	$1146.78	$1003.73	$926.18	$880.52
$130 000	$1577.26	$1242.35	$1087.37	$1003.36	$953.89
$140 000	$1698.59	$1337.91	$1171.02	$1080.54	$1027.27
$150 000	$1819.91	$1433.48	$1254.66	$1157.72	$1100.65
$160 000	$1941.24	$1529.04	$1338.30	$1234.91	$1174.02

i) Poppy can afford to make repayments up to the value of $1000 per month.

What is the most Poppy can borrow and how many years will it take for her to repay the loan?

Most she can borrow = ..

Time to repay the amount = .

ii) Daniel borrows $160 000 over 15 years from the same bank. If he chooses to repay the same amount over 20 years instead of 15, how much more interest is he charged?

Section D: Working mathematically.

Question 1. (5 marks)

Line k intersects the y axis at $B(0,13)$. Point $A(6,1)$ is the intersection of lines k and l.

Not to scale

B 13

line k

line l

A = (6, 1)

C
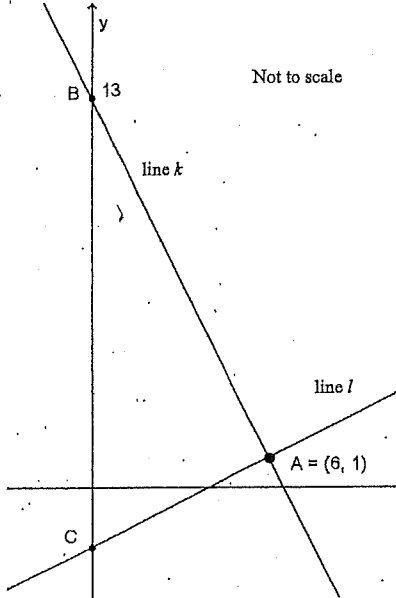
i) Show that equation of line k is given by

ii) It is known that line k is perpendicular to line l.

Find the equation of line l in gradient-intercept form.

....

....

....

....

....

iii) Find the area of triangle ABC

Question 2. (5 marks)

(a) Show $\triangle PQS \,|||\, \triangle QRP$
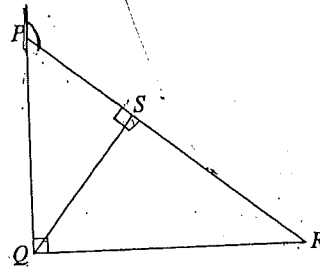
(b) Hence show $\triangle PQS \,|||\, \triangle QRS$

(c) Deduce that $(QS)^2 = PS \times RS$

Question 3. (7 marks)

Huw has borrowed $300 000 from a home mortgage lender. Interest is charged at 6% p.a., compounded monthly.
The table below shows an incomplete monthly repayment schedule.

Principal	Interest	Principal + Interest	Repayment	Balance
$300,000	$1,500	$301,500		

i) Explain why the interest owing after one month is given in the cell B2 is $1500.

_____

_____

_____

....

ii) If Huw intended to repay the loan, what amount would the repayment have to exceed?

iii) Huw comes into some money left from a dear old aunt. After one month he is able to make a repayment of $75,000.

Find the balance owing after 1 month.

_____

....

iv) If Huw is able to make another repayment of $75,000, find the balance owing after two months.

....

v) Huw continues to make repayments of $75000. Complete the table to show the balance after four repayments.

Is he able to repay the loan is four months?

....

vi) What is the equivalent *flat rate* interest Huw paid in the four months? Correct to two d.p.

_____

_____

_____

....

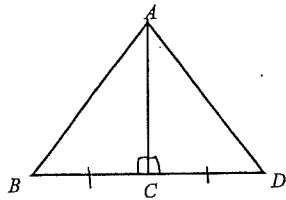## Section A:

Question 1. (3 marks)

In the diagram $BC = CD$ and $\angle ACB = \angle ACD = 90°$.

Prove that $\triangle ABC \equiv \triangle ADC$ giving all reasons.
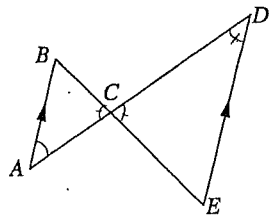
In $\triangle ABC$ and $\triangle ADC$.

$BC = CD$ (given)

$\angle ACB = \angle ACD$ (given)

Side AC is ~~shared~~ COMMON

$\therefore \triangle ABC \equiv \triangle ADC$ (SAS)

Question 2. (3 marks)

Prove that $\triangle ABC \; ||| \; \triangle DEC$ giving all reasons

In $\triangle ABC$ and $\triangle DEC$

$\angle BCA = \angle DCE$ (vertically opposite)
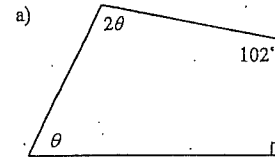
$\angle BAC = \angle CDG$ (Alternate angles)

$\angle CBA = \angle DEC$ (Alternate angles)

$\therefore \triangle ABC \; ||| \; \triangle DEC$ (equiangular)

Page 2

Question 3. (5 marks)

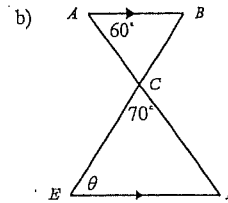Evaluate θ for the following diagrams, *giving reasons* for your answer.

Note: Marks will be awarded for communicating all reasoning.

a)

$2\theta + 102° + 90° + \theta = 360°$ (∠ sum of quad)

$\therefore 3\theta = 168°$

$\therefore \theta = 56°$

b)

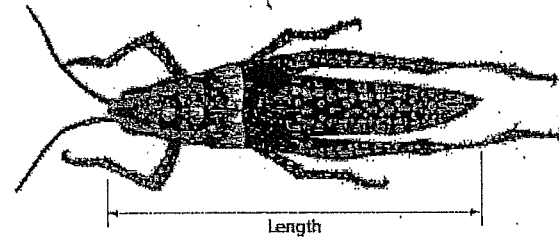In $\triangle CDE$ and $\triangle ABC$

$\angle CDE = \angle CBA$ (alternate)

$\therefore \angle CDE = 60$

$\theta = 180 - (70 + 60)$ (sum of triangle)

$\therefore \theta = 50°$

Question 4. (1 mark)

The image shows an insect drawn using a scale factor of 3.

SCALE 3:1

Length

CSIRO Entomology

By firstly measuring the image, find the actual length of the insect.

Actual length : Image

3 : 1

15 cm : 5 cm

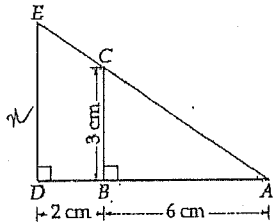Page 3

Question 5. (2 marks)

$\triangle ABC$ is similar to $\triangle ADE$.

$AB = 6$ cm, $BC = 3$ cm and $DB = 2$ cm.

NOT TO SCALE

Evaluate the length of ED.

$\dfrac{3}{x} = \dfrac{6}{8}$ (side in proportion for similar $\triangle$'s)

$24 = 6x$

$x = 4$ ✓

Question 6. (2 marks)

The interior angle of a regular polygon is $140°$.

How many sides does the polygon have?

let n be number of sides

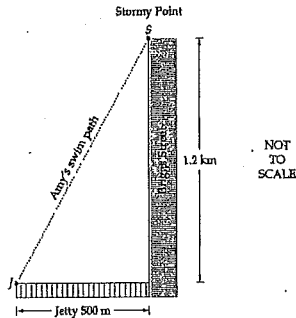$\dfrac{(n-2) \times 180}{n} = 140$

$180n - 360 = 140n$

$40n = 360$

$n = 40$ ✓

$\therefore$ polygon has 9 sides).

Question 7. (2 marks)

Amy swims each morning from Stormy Point (S) to the end of the jetty (J), she then runs along the jetty to bridge street and directly back to Stormy point.

Stormy Point

1.2 km

NOT TO SCALE

Amy's swim path

Jetty 500 m

How far has she travelled?

$0.5^2 + 1.2^2 = SJ^2$

$1.69 = SJ^2$

$SJ = \sqrt{1.69}$

$SJ = 1.3$ $\therefore$ Sandy travels 1.3 km ✓

Question 8. (2 marks)

Find the size of an interior angle of a regular polygon whose angle sum is $6120°$.

$(n-2) \times 180 = 6120$

$180n - 360 = 6120$

$180n = 6480$

$\therefore n = 36$

$\dfrac{(36-2) \times 180}{36}$

$= 170$

$\therefore$ Interior angle $= 170°$

Section B: Algebra

Question 1. (4 marks)

A line passes through the points $A(-2, 7)$ and $B(4, -3)$.

i) Find the gradient of the line.

$m = \dfrac{-3-7}{4-(-2)}$

$m = \dfrac{-10}{6}$

$m = \dfrac{-5}{3}$

$\therefore$ gradient $= \dfrac{-5}{3}$ ✓ 2

ii) Hence, find the equation of the line passing through AB leaving your answer in general form.

$y - 7 = -\dfrac{5}{3}(x + 2)$

$3y - 21 = -5x - 10$

$\therefore 5x + 3y - 11 = 0$

Question 2. (5 marks)

A line has the equation $6x - 2y - 5 = 0$.

i) Rewrite the equation in gradient-intercept form.

$-2y = -6x + 5$

$2y = 6x - 5$

$y = 3x - \dfrac{5}{2}$ ✓

ii) Where does the line cross the y axis?

$-\dfrac{5}{2}$ ✓

iii) What is the gradient of the line?

3 ✓

iv) What is the equation of a line parallel to $6x - 2y - 5 = 0$ that passes through the point $(-1, -4)$? Give your answer in general form.

$m_1 \times m_2 = -1$ then line is parallel

$y = 3x - \dfrac{5}{2}$

$\therefore$ the gradient of line parallel

$= -\dfrac{1}{3}$

$y + 4 = -\dfrac{1}{3}(x + 1)$

$y + 4 = -\dfrac{1}{7}x - \dfrac{1}{3}$

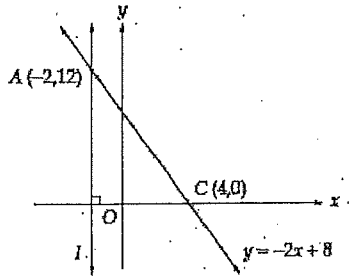$y = -\dfrac{1}{3}x + \dfrac{1}{3}$ ③

$3y = -x + 13$

$x + 3y - 13 = 0$ ✓

$\therefore$ equation of line

$\therefore$ $x + 3y - 13 = 0$

Question 3. (4 marks)

The line $y = -2x + 8$ crosses the x axis at $C(4,0)$ and intersects line l at $A(-2,12)$.

i) What is the equation of line l?

$$l: \quad x = -2$$

ii) Determine if the point $(-3,14)$ lies on the line
$$y = -2x + 8.$$

$(-2 \times -3) + 8 = 14$

∴ point $(-3, 14)$ lies on the line

A circle is to be drawn with diameter AC.

iii) What are the coordinates of the centre of this circle?

$$M\left(\frac{-2+4}{2}, \frac{0+12}{2}\right)$$

$$M(1, 6)$$

∴ centre coordinates are $(1, 6)$

iv) Calculate the radius of this circle.

$$r = \frac{\sqrt{(4+2)^2 + (0-12)^2}}{2}$$

$$r = \frac{\sqrt{180}}{2}$$

$$r = \frac{6\sqrt{5}}{2}$$

Question 4. (1 mark)

If $x = \sqrt{b^2 - 4ac}$, evaluate x if $a = 2, c = -6$ and $b = -4$

$$x = \sqrt{(-4)^2 - 4 \times 2 \times (-6)}$$

$$\therefore x = 8$$

Question 5. (2 marks)

If $y = \dfrac{x+4}{2x}$, find an expression for x in terms of y.

$$2xy = x + 4$$

$$2xy - x = 4$$

$$x(2y - 1) = 4$$

$$\therefore x = \frac{4}{2y-1}$$

Question 6. (4 marks)

Solve the following equations:

i) $\dfrac{x+1}{3} - \dfrac{x-1}{2} = 14$

$$\frac{2(x+1) - 3(x-1)}{6} = 14$$

$$2(x+1) - 3(x-1) = 84$$

$$2x + 2 - 3x + 3 = 84$$

$$-x + 5 = 84$$

$$-x = 79$$

$$\therefore x = -79$$

ii) $x^2 = 4x$

$$\frac{x^2}{x} = 4$$

$$\therefore x = 4, 0$$

Question 7. (4 marks)

By firstly factorising, solve

i) $x^2 - 11x + 18 = 0$

$$x^2 - 9x - 2x + 18 = 0$$

$$x(x-9) - 2(x-9) = 0$$

$$(x-2)(x-9) = 0 \quad \therefore x = 2 \text{ or } 9$$

ii) $5m^2 - 11m - 12 = 0$

$$5m^2 + 4m - 15m - 12 = 0$$

$$m(5m+4) - 3(5m+4) = 0$$

$$(m-3)(5m+4) = 0$$

$$\therefore m = 3 \text{ or } \frac{-4}{5}$$

Question 8. (2 marks)

By using the quadratic formula, solve $4x^2 + 3x - 5 = 0$ correct to 2 decimal places.

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \times 4 \times -5}}{2 \times 4}$$

$$x = \frac{-3 \pm \sqrt{89}}{8}$$

$$x = \frac{-3 + \sqrt{89}}{8} \text{ or } \frac{-3 - \sqrt{89}}{8}$$

$$\therefore x = 0.80 \,(2dp) \text{ or } -1.55 \,(2dp)$$

Question 9. (2 marks)

Find the solution to the inequality

$$3(2-x) - 2x > 1$$

$$6 - 3x - 2x > 1$$

$$6 - 5x > 1$$

$$-5x > -5$$

$$x < 1$$

Question 10. (3 marks)

At a football game Rueben bought 5 hotdogs and 4 drinks for $50.30.

Jessica at the same game bought 8 hotdogs and 1 drink for $63.20.

Find the cost of a hotdog.

$$8h + d = 63.20 \quad - ①$$
$$5h + 4d = 50.30 \quad - ②$$

$$d = 63.20 - 8h \quad - ③$$

sub ③ into ②

$$5h + 4(63.20 - 8h) = 50.30$$

$$5h + 252.8 - 32h = 50.30$$

$$-27h = -202.5$$

$$h = \$7.5$$

sub h into ①

$$8 \times 7.5 + d = 63.20$$

$$\therefore d = \$3.20$$
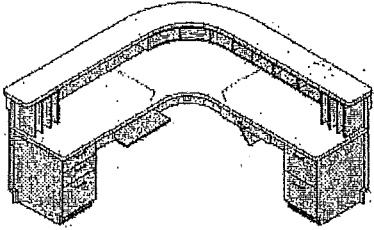
∴ hotdog costs $7.50 and drink costs $3.20

Section C: Consumer Arithmetic .

Question 1. (3 marks)

Shintaro borrows $150 000 to set up a furniture business.

He repays the debt over 10 years at a *simple* interest rate of 9% pa.

(i) What is the total amount to be repaid?

$I = 150000 \times 0.09 \times 10$

$I = 135000$

Total repayment $= 150\,000 + 135\,000$

∴ Total $= \$285\,000$ ✓

(ii) Find the monthly repayment.

$Monthly = \dfrac{285\,000}{(10 \times 12)}$

∴ monthly repayment $= \$2375$ ✓

Question 2. (4 marks)

(i) Claudia invests $50 000 with Standard Credit Union for a term of 5 years.

Her investment earns interest at 3.1% per annum compounded annually.

How much will Claudia's investment be worth at the end of 5 years?
Give your answer to the nearest dollar.

$A = 50000(1+0.031)^5$

$A = 58245.62781$

∴ Investment is worth $58245 (nearest) ✓

(ii) Claudia's friend Zoe also has $50 000 to invest for a term of 5 years.

She invests with General Bank. Her investment earns interest at 3% per annum, compounded monthly.

Which friend makes the better investment? Justify your answer with appropriate calculations. 0.03

$A = 50000\left(1+\dfrac{0.03}{12}\right)^{12 \times 5}$

$A = 58371.23057$

∴ Zoe's investment is worth $58371 (nearest.

∴ Zoe made a better choice as her final value fore her investment was $186 more than Claudia's ✓

2 ✓

Question 3. (2 marks)

The table shows the total value of an investment of $1 compounding at varying rates of interest..

Period	5%	6%	7%	8%
1	1.0500	1.0600	1.0700	1.0800
2	1.1025	1.1236	1.1449	1.1664
3	1.1576	1.1910	1.2250	1.2597
4	1.2155	1.2625	1.3108	1.3605
5	1.2763	1.3382	1.4026	1.4693
6	1.3401	1.4185	1.5007	1.5869
7	1.4071	1.5036	1.6058	1.7138
8	1.4775	1.5939	1.7182	1.8509
9	1.5513	1.6895	1.8385	1.9990
10	1.6289	1.7909	1.9672	2.1589
11	1.7103	1.8983	2.1049	2.3316
12	1.7959	2.0122	2.2522	2.5182

Use the table above to answer the following questions.

i) Find the total value if $20 000 is invested at 5% p.a. for 8 years, compounded annually.

1.4775×20000

∴ Total value = $29550 ✓

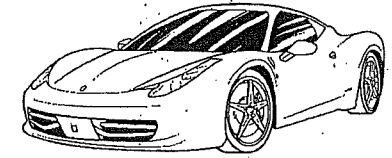ii) Find the total value if $15 000 is invested at 12% p.a. for 5 years, compounded bi-annually.

$A = 15000\left(1+\dfrac{0.12}{2}\right)^{2 \times 5}$

$A = 268627.1545$

∴ Total value = $268627.15

Question 4. (4 marks)

Lindsay bought a car priced at $20 000 on terms.

He paid a 12% deposit and monthly repayments of $677 for 4 years.

i) Find the deposit.

20600×0.12

∴ Deposit = $2400 ✓

ii) Find the total amount in repayments.

Total repayments
$= \$677 \times 4 \times 12$
$= \$32496$

iii) How much interest has been charged on the loan?

Interest charged
$= \$32496 - (\$20000 - \$2400)$
$= \$14896$

iv) What is the equivalent flat rate per annum?

Flat rate per annum
$= \dfrac{14896}{17600} \div 4$
$= 0.21159$
$\doteq 21.16\%$ (to 2 d.p)

Question 5. (2 marks)

In June, Phaedra received a statement for her credit card account.

The account has no interest free period and simple interest is calculated and charged to account on the statement date.

```
Ms Ima Bigspender                    Sum Bank
Credit limit: $2000
                              Credit Card Statement
Statement date: 20 June 2006

Previous      Payments    Purchases      Interest
balance                                  charged

$263.83       $263.83      $617.72

Date          Purchases              Amount
23 May        Concert tickets        $617.72

Annual percentage rate: 18.2%
Daily percentage rate: 0.0498%

Note: Interest is charged on amounts from (and including) the date of
purchase up to (and including) the statement date.
```

i) How many days is she charged interest on her purchase?

   29 days

ii) Calculate the interest charged to her account?

   $I = 617.72 \times 0.000498 \times 29$ *(0.000498 written above)*

   $I = \$8.92$

Question 6. (2 marks)

Efim buys a photocopier for $5400. If the copier depreciates at 12% p.a. compounded monthly, find its value after 5 years.

$FV = 5400\left(1 - \frac{0.12}{12}\right)^{12\times5}$

$FV = 2954.645864$

∴ Value in 5 years is

$\$2954.65$

Question 7. (5 marks) 4

The table below shows the monthly repayment on home loans.

Monthly repayments

Amount borrowed	Term of loan				
	10 years	15 years	20 years	25 years	30 years
	120 months	180 months	240 months	300 months	360 months
$80 000	$970.62	$764.52	$669.15	$617.45	$587.01
$90 000	$1091.95	$860.09	$752.80	$694.63	$660.39
$100 000	$1213.28	$955.65	$836.44	$771.82	$733.76
$110 000	$1334.60	$1051.22	$920.08	$849.00	$807.14
$120 000	$1455.93	$1146.78	$1003.73	$926.18	$880.52
$130 000	$1577.26	$1242.35	$1087.37	$1003.36	$953.89
$140 000	$1698.59	$1337.91	$1171.02	$1080.54	$1027.27
$150 000	$1819.91	$1433.48	$1254.66	$1157.72	$1100.65
$160 000	$1941.24	$1529.04	$1338.30	$1234.91	$1174.02

i) Poppy can afford to make repayments up to the value of $1000.per month.

What is the most Poppy can borrow and how many years will it take for her to repay the loan?

Most she can borrow = $\$130\,000$

Time to repay the amount = 30 years or 360 months

ii) Daniel borrows $160 000 over 15 years from the same bank. If he chooses to repay the same amount over 20 years instead of 15, how much more interest is he charged?

Interest in 20 years

$1338.30 \times 240 = \$321192$

$I = 321192 - 160000$

∴ $I = 161192$

Interest in 15 years

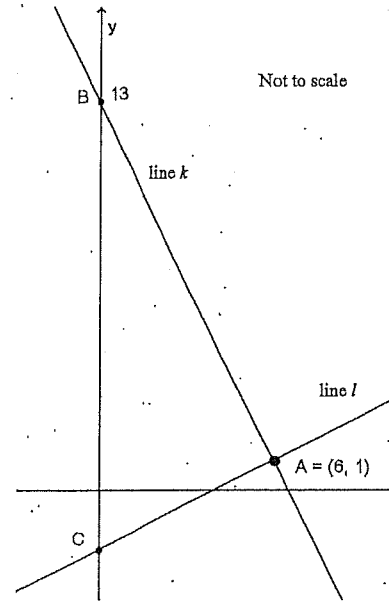$1529.04 \times 180 = \$275227.2$

∴ Interest $= \$115227.$

$161192 - 115227$

$= 45965$

∴ Daniel is charged $45965 more

Section D: Working mathematically.

Question 1. (5 marks)

Line k intersects the y axis at $B(0,13)$. Point $A(6,1)$ is the intersection of lines k and l.

i) Show that equation of line k is given by $y = -2x + 13$ $(0, 13)(6, 1)$

$\frac{y-13}{x-0} = \frac{1-13}{6-0}$

$6(y-13) = -12x$

$6y - 78 = -12x$

$6y = -12x + 78$

∴ equation of line is equal to

$y = -2x + 13$

ii) It is known that line k is perpendicular to line l.

Find the equation of line l in gradient-intercept form.

$m_1 \times m_2 = -1$ (perpendicular)

If line k is perpendicular to line l then gradient for line $l = \frac{1}{2}$

$y - 1 = \frac{1}{2}(x - 6)$

$y - 1 = \frac{1}{2}x - 3$

$y = \frac{1}{2}x - 2$

iii) Find the area of triangle ABC

$AB = \sqrt{(6-0)^2 + (1-13)^2}$

$AB = \sqrt{180}$

when $x=0$ $y=-2$ $(0,-2)(6,1)$

$AC = \sqrt{(6-0)^2 + (1+2)^2}$

$AC = \sqrt{45}$

$\sqrt{45}^2 + \sqrt{180}^2 = BC^2$

∴ $BC = 225$

Area $= \frac{1}{2} \times \sqrt{45} \times \sqrt{180}$

∴ Area $= 45$ units^2

Question 2. (5 marks)

(a) Show ΔPQS ||| ΔQRP
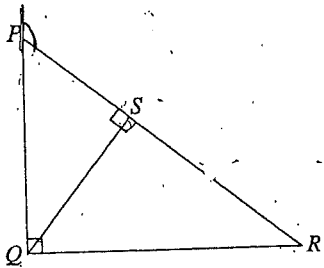
In ΔPQS, ΔQRP

$\angle PSQ = \angle PQR = 90°$ (given)

$\angle P$ is common

$\therefore$ ΔPQS ||| ΔPRQ

(Equiangular).

(b) Hence show ΔPQS ||| ΔQRS

In ΔPQS, ΔQRS

$\angle PSQ = \angle RSQ = 90°$ (Given)

Let $\angle QPS = \alpha$ $\therefore \angle QRS = 90° - \alpha$

$\therefore \angle RQS = 90° - (90° - \alpha)$

$= \alpha = \angle QPS$

$\therefore$ ΔPQS ||| ΔQRS (Equiangular)

(c) Deduce that $(QS)^2 = PS \times RS$

Since ΔPQS ||| ΔQRS proven above

then $\dfrac{PS}{QS} = \dfrac{QS}{RS}$

$\therefore PS \times RS = QS \times QS$

$= (QS)^2$

Question 3. (7 marks)

Huw has borrowed $300 000 from a home mortgage lender. Interest is charged at 6% p.a., compounded monthly. The table below shows an incomplete monthly repayment schedule.

	Principal	Interest	Principal + interest	Repayment	Balance
2	$300,000	$1,500	$301,500	$75000	$226500
3	$226500	$1132.75	$227632.5	$75 000	$152632.50
4	$152632.50	$763.16	$153395.66	$75000	$78345.66
5	$78345.66	$391.98	$78787.64	$75 000	$3787.64

i) Explain why the interest owing after one month is given in the cell B2 is $1500.

Because they used simple interest formula for one month.

$I = 300000 \times 0.06 \times \dfrac{1}{12}$

$I = \$1500$

ii) If Huw intended to repay the loan, what amount would the repayment have to exceed?

(illegible) (illegible)

$1500

iii) Huw comes into some money left from a dear old aunt. After one month he is able to make a repayment of $75,000.

Find the balance owing after 1 month.

$226500

iv) If Huw is able to make another repayment of $75,000, find the balance owing after two months.

$152632.50

v) Huw continues to make repayments of $75000. Complete the table to show the balance after four repayments.

Is he able to repay the loan is four months?

No he is not

vi) What is the equivalent *flat rate* interest Huw paid in the four months? Correct to two d.p.

$3787.64 = 300000 \times R \times \dfrac{4}{12}$

$\dfrac{3787.64}{100\,000} = \dfrac{R}{100}$

$\dfrac{R}{100} = 0.0378764$

$R = 3.79 \ (2 dp)$